

**Certificate of Need Application
Encompass Health Rehabilitation Hospital of Bangor, LLC**

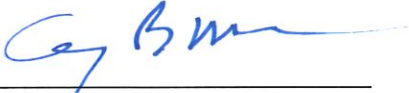
Date: December 18, 2023
Project Title: Encompass Health Rehabilitation Hospital of Bangor, LLC (“Encompass Bangor”): New Inpatient Rehabilitation Hospital Service and Facility
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Copies of all notices, correspondence and decisions relating to this project’s CON Application should also be copied to the following third party*:

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***Encompass hereby gives CONU the authority to communicate directly with either John Doyle or Marty Chafin.**



Signature

12.18.23

Date

**Certificate of Completeness
Certificate of Need Application
Encompass Health Rehabilitation Hospital of Bangor, LLC**

The undersigned hereby certifies that this Application, along with all Attachments, is complete and provides all information necessary to satisfy the Certification of Need requirements. The undersigned makes this representation pursuant to Chapter 6, Section 4, of the Maine Certificate of Need Procedures Manual (10-444 C.M.R. Ch. 503).

Encompass Health Rehabilitation Hospital of Bangor, LLC



Carey McRae, Esq.
Associate General Counsel, State Regulatory & Compliance
Encompass Health Corporation

SYNOVUS
Synovus Bank, Member FDIC

OFFICIAL CHECK

Before Synovus will replace or reimburse any party for the amount of an Official Check, Synovus may require such additional information, documentation (including a surety bond), and time as is reasonably required by Synovus to evaluate the claim.

1000909767

December 13, 2023
DATE

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611

PAY FIFTY SIX THOUSAND DOLLARS AND ZERO CENTS

TO THE ORDER OF Treasurer, State of Maine
Encompass Health Corporation
REMITTER ID# app fee-Bangor,ME; 02000100 879 795
FOR
PAYABLE THROUGH SYNOVUS BANK COLUMBUS, GEORGIA

\$ *****56,000.00

Elouise Harris
AUTHORIZED SIGNATURE

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I. Abstract

The Project.

Encompass Health Corporation, a Delaware-based for profit corporation in good standing, is proposing to establish a new 50-bed freestanding inpatient rehabilitation facility (“IRF”) in Bangor, Penobscot County. The new facility, Encompass Health Rehabilitation Hospital of Bangor, LLC (“Encompass Bangor” or “Project”), will be wholly-owned by Encompass Health Corporation, a national leader in inpatient rehabilitation (“rehab”) services with 161 inpatient rehab hospitals in 37 states and Puerto Rico. Encompass Health Corporation (“Encompass Health”, “Encompass”, or “EHC”) brings to the local market the resources and experience of a national company that has proven high quality, cost-effective programs and services along with the financial strength to ensure that its patients and specialized staff members have access to an extensive array of rehab-specific clinical equipment and technology. Notably, *Encompass Health’s sole purpose is to own and operate inpatient rehabilitation post-acute care facilities and services.* As a leading provider and operator of health care facilities, Encompass Health has a proven long-term commitment to caring for patients.

Encompass Bangor will provide specialized state-of-the-art rehabilitative care to patients recovering from a wide array of injuries and illnesses, including stroke, traumatic brain injury, spinal cord injury, amputations, orthopedic surgery or injury, cardiac episodes, and pulmonary conditions. The proposed project will complement rather than compete with existing inpatient rehab providers in Maine as Encompass works to appropriately increase utilization of IRF services for patients who are in need of, and would benefit from, intensive inpatient rehabilitative and restorative care. Moreover, the proposed project will be an independent freestanding IRF that will accept and care for patients from all hospitals and health systems equally.

Encompass currently operates an inpatient rehabilitation facility in Portland, Maine. New England Rehabilitation Hospital of Portland is a Joint Venture between Maine Medical Center and Encompass Health (“New England Rehab”). Residents of southern Maine now have access to Encompass’ proven, high-quality programs as evidenced by New England Rehab’s numerous accreditations, certifications, and high quality outcomes described later in this application.

Encompass proposes to bring its proven intensive inpatient rehabilitative experience to northern Maine so that northern Maine residents have access to Encompass’ programs and services close to home. Similar to the New England Rehabilitation Hospital, Encompass Bangor will leverage the strength of Encompass Health to meet the needs of the local community by developing programs, services, facility amenities, and community relationships specific to the local market.

The proposed 50-bed inpatient rehab hospital will include:

- All private rooms, including two bariatric rooms;
- Well-equipped therapy gym with specialized equipment and an Activities of Daily Living (“ADL”) suite;
- Dedicated outdoor therapy area;
- Dialysis treatment area for patients to remain on-site when dialysis is needed;
- Activities / day room for patients and families; and,
- Sufficiently-sized and appropriately-designed support spaces.

The site plan for the proposed facility is provided as Attachment A. The total CON project cost estimate for the proposed 50-bed hospital is \$61,394,057. Encompass Health Maine Real Estate, LLC (“EHMRE”), a wholly-owned subsidiary of Encompass Health Corporation, will develop the project and own the real estate, including the hospital building and site improvements. EHMRE is a Delaware corporation with authorization to transact business in Maine. For planning purposes, Encompass Health anticipates the new facility will begin admitting patients on January 1, 2027.

Encompass Bangor will hold the License and be the licensed operator of the proposed Project and lease the hospital building, land, and site improvements from EHMRE. Encompass Health, the parent entity to Encompass Bangor and EHMRE, will fund the project from its ample existing cash, cash flow from operations, and funds available under its credit facility. An organizational chart showing the relationship between the Applicant entity and the real estate entity is included in Attachment B. A letter confirming availability of funds is provided in Attachment F.

II. Fit, Willing, and Able

Relevant criteria for inclusion in this section are specific to the determination that the applicant is fit, willing and able to provide the proposed services at the proper standard of care as demonstrated by, among other factors, whether the quality of any health care provided in the past by the applicant or a related party under the applicant's control meets industry standards.

With its 161 inpatient rehab hospitals in 37 states and Puerto Rico, Encompass' services represent approximately 25% of the licensed acute rehabilitation beds nationally and approximately 33% of Medicare patients served. Service area patients and their families will benefit from Encompass' proven high quality, cost-effective programs and services, including their rehab-specific hospital design, clinical equipment, and technology. Notably, 132 of Encompass Health's inpatient rehab hospitals hold one or more disease-specific certifications from The Joint Commission's Disease-Specific Care Certification Program in areas such as stroke, brain injury, or hip fracture rehabilitation. In total, Encompass Health hospitals hold a total of 370 Disease-Specific Certifications as of July 2023.

1. Proposed Programs, Services, and Facility Design Ensure High Quality Care is Provided.

Encompass brings to the local market the resources and experience of a national company that has proven high quality, cost-effective programs and services along with the financial strength to ensure that its patients and specialized staff members have access to an extensive array of rehab-specific clinical equipment and technology. Encompass Health's sole purpose is to own and operate CIPR post-acute care facilities and services. As a leading provider and operator of health care facilities, Encompass Health has a proven long-term commitment to caring for patients.

The proposed programs and services will provide state-of-the-art rehabilitative care to patients recovering from a wide array of injuries and illnesses, including stroke, traumatic brain injury, spinal cord injury, amputations, orthopedic surgery or injury, cardiac episodes, and pulmonary conditions. The success of the programs and services to be provided at Encompass Bangor is evidenced by Encompass Health's higher than expected patient outcomes and comparatively low average costs (detailed later in this application).

The success of the programs and services is due in large part to the synergy of Encompass Health's comprehensive team approach to rehabilitation services and the use of the latest technology and treatments available. The facility design specifically allows for and supports the use of extensive equipment and technology by specially-trained staff in a patient-centered environment.

Specific *programs and services* to be offered at Encompass Bangor address a wide range of diagnosis including, but not limited to, the following.

- Stroke
- Brain injury
- Neurological conditions
- Cardiovascular conditions
- Joint replacement
- Orthopedic

- Hip fracture
- Spinal cord injury
- Amputee
- Parkinson's Disease
- Multiple sclerosis
- Burns
- Pulmonary/respiratory
- Pain management

The success of these programs and services is due in large part to the highly qualified and specially trained *physicians and staff members* who comprise a **comprehensive, multidisciplinary team** including:

- **Medical Director:** A Physical Medicine and Rehabilitation (“PMR”) physician who frequently meets with the patient during the patient’s inpatient stay and is ultimately responsible for implementing the patient’s care plan as the multidisciplinary team leader.
- **Rehabilitation nursing:** Implements each patient’s medical care program as directed by his or her physician.
- **Occupational therapy:** Designs and delivers activity-based therapy to promote independence in the areas of self-care, home management and community reintegration.
- **Physical therapy:** Evaluates and designs a treatment program to address limitations in physical function, mobility, and safety.
- **Respiratory therapy:** Ensures proper respiratory function through services such as oxygen supplements and aerosol treatments.
- **Speech-language pathology:** Assesses and treats individuals with communication and comprehension disorders, cognitive difficulties, and swallowing disorders.
- **Dietary and nutritional counseling:** Supervises all meals to ensure patients meet their required nutritional needs.
- **Pharmacist:** On-site pharmacists educate the patients regarding their medicines, including post-discharge care.
- **Case management:** Coordinates with the physician to ensure the patient’s needs are met and involves the family and other caregivers in the patient’s rehabilitation. The Case Manager is also responsible for:
 - Working with the family prior to the patient’s discharge to provide training to help family members care for patients after discharge.
 - Visiting the patient’s home prior to discharge to identify and then address any special needs (such as equipment) the patient will have upon returning home.

- Coordination and collaboration of services between the patient and community service providers who will be responsible for providing care to the patient post-discharge.

Patients benefit not only from the extensive array and number of staff members in place at Encompass Health hospitals, such as that proposed for the 50-bed freestanding IRF, but also from the unique patient-centric programs staff members institute at their facilities to ensure patients receive high quality care.

A few *employee-driven patient-centric programs* that will be in place at Encompass Bangor, as they are at all Encompass facilities, include the following.

- **No Pass Policy** which ensures that any and all staff members must never pass by a patient's room when the nurse call light is on or when it is clear that, even without the call light on, the patient would benefit from assistance. Notably, this operational mandate applies to all staff members, not just nursing staff, so that any and all staff members ensure that patients and families' needs are the highest priority at all times.
- **Welcome Announcement** is one small way in which the staff members can make a new patient feel welcome and know that his/her admission to the hospital is recognized by all staff members as a new beginning. While the patient's name isn't announced so that the patient's privacy is protected, the announcement makes clear that a new patient in a specific room number has arrived and will join the other patients in his/her journey along the road to rehabilitation and recovery.
- **Patient's in-room information board** is an often-overlooked ubiquitous aspect of an inpatient's room at virtually every acute care hospital in the U.S. However, the staff members at Encompass recognized the full potential and importance of the in-room board to the patient, family, and staff members and so have focused on this tool as a means to enhance patient involvement, and thus ultimately quality of care.
 - For example, each patient can refer to the board for that day's rehabilitation schedule, any special daily activities in the Day Room, and a photograph of the physician who is responsible for his/her care during the inpatient stay, among other items. The patient and staff will also see reminders of any special precautions or needs, e.g., indication that an alarm will sound when the patient gets out of bed. In this way, the patient and staff have a visible reminder of the patient's activities and specific needs that goes beyond the typical in-room information board of general acute care hospitals, improving it to specifically meet the needs of inpatient rehab patients.
- **Victory Bell** that is in place at the entrance to the Therapy Gym is another way that the staff recognize individual patients and their success in rehabilitation. The Victory Bell is used by patients when they are being discharged from the hospital, signaling to other patients and all staff members that the patient has passed a significant milestone in his/her life, and that the other patients can too. (The Encompass Health hospital's Victory Bell is similar to the "Survivor Bell" that many oncology programs have in place for their patients to ring to announce the successful end of their treatment.)

The *facility design* supports and promotes the programs and services offered by Encompass hospitals, ensuring that Encompass staff members can provide high quality, intensive rehabilitation and restorative services in a cost-effective manner. As illustrated below, the facility design is patient-centered, with an emphasis on clinical outcomes, patient safety, and the use of technology and innovation in caring for patients. (Please refer to [Attachment C](#) for the facility-wide 50-bed floor plan and pictures of typical Encompass Health hospital features).

The proposed facility includes the following amenities.

- Fifty (50) private wheelchair accessible patient rooms with wheelchair accessible private bathrooms, and sufficient space bedside for caregivers and family members to interact with the patient comfortably. Notably, all patient rooms are designed with full capability of acute care inpatient rooms, *e.g.*, head walls and gases are incorporated into the design, reflecting the medical complexity of patients served.
 - Two (2) of the patient rooms are designed as private bariatric rooms, providing larger and specially designed rooms to care for bariatric patients who require additional space in both the patient room and bathroom in addition to specialized equipment, *e.g.*, overhead track system with lift capability.
 - Six (6) of the patient rooms are negative-pressure rooms (two of which are isolation rooms) which will enable Encompass Bangor to care for patients with infectious and/or contagious diseases such as COVID-19.
- A Therapy Gym with specialized equipment and of sufficient size ensures that patients and staff members have appropriate space to work for the patient to complete his/her daily rehabilitation and affords family members and caregivers the opportunity to attend the patient's therapy session.
 - A listing and brief description of the hospital's planned clinical rehab equipment and technology that will be included in the Therapy Gym is provided in [Attachment D](#).
 - Of note is that the Therapy Gym will include the facility infrastructure to house such specialty equipment as a ceiling-mounted zero-gravity mobility assistance device to help the patient recover his/her gait and balance while on a treadmill or specially-designed platforms.
- A dialysis treatment area with multiple designated patient bays for patients requiring dialysis care during their inpatient stay, which will ensure that patients do not require transport to off-site facilities for dialysis which would interrupt their therapy a minimum of three days per week and ultimately increase their length of stay in the IRF program.
- A dedicated and separate Activities of Daily Living Suite within the Therapy Gym provides patients and their families a home-like setting where the patient can relearn ADL activities in order to live as independently as possible when returning home. The ADL Suite includes a kitchen with a stove, sink, refrigerator, dishwasher, cabinets, and tables and chairs; a laundry room with a washer and dryer; and a homelike bathroom intentionally designed with a small, non-compliant American with Disabilities Act ("ADA") doorway since that is what most patients will face when they return to the community.

- A large Dining / Dayroom Area where patients engage in communal dining as part of their ongoing rehabilitation and restoration.
- A separate Dayroom / Activity Area that is used for socialization and rehabilitation of patients, including special activities involving family and/or community members.
- Sufficiently-sized and appropriately-designed support functions such as the admissions area, nursing stations, pharmacy, and medical records to ensure that the specialized needs of the rehabilitation patients are met.
- Additional features specific to the local community include the use of interior design themes, colors, and photographs consistent with and reflective of the area, *e.g.*, local landmarks, landscapes, and events, to provide a sense of community to the patients and also to enhance the mental acuity of patients through recognition of familiar sites and images throughout the hallways.

In much the same way that patients benefit from the employee-driven patient-centric programs and services mentioned above (*e.g.*, No Pass Policy, Welcome Announcement, and Victory Bell), patients benefit from *patient-centric facility design features* that are in place at all Encompass facilities and will be included in the proposed project.

- **Color-coded hallways** at Encompass does not simply mean that there is a color-coded stripe painted down the hallway or a doorway is painted a certain color, as is sometimes the case in other facilities. Rather, the entire inpatient unit, including all walls and hallways, is painted a consistent and distinct color from those used in other inpatient hallways so that patients can easily find their way to and from their rooms and the therapy gym, dining room, and/or day room during their inpatient stay. Staff members' experience is that all patients, not just those suffering from a neurological episode, benefit from this patient-centric facility design feature that will be implemented at the proposed new hospital.
- **Electronic patient status/nurse call boards throughout the inpatient hallways** ensure that all staff members can, at all times, see when a patient in his/her inpatient room has requested assistance, and thus timely respond to the patient's needs. This facility design feature goes hand-in-hand with the No Pass Policy implemented at all Encompass hospitals, ensuring that patients' needs are immediately known and responded to by staff members.
- **Patient-centered inpatient units** are intentionally sized based upon best-practices to promote high quality care and staff efficiency and effectiveness. Specific design features include:
 - *All private rooms*, with each room standardized in design and support space allocation. Patient rooms are designed to improve quality of care and support patient healing, provide family support, and enhance clinical efficiency and effectiveness. Patient rooms are acuity-adaptable and standardized to allow care of all diagnosis groups and to facilitate efficient processes, from patient care to cleaning and maintenance.
 - *Clear sight lines of nursing units to inpatient rooms* to ensure patient safety and high-quality care. The clear sight lines from staff to patient and staff to staff enhance staff interaction with patients, increase responsiveness of staff to patients, and mitigate falls and other injuries, thus ultimately enhancing quality of care.

2. Patients Benefit from Encompass' Corporate Structure, Support, Infrastructure & Resources.

Patients at Encompass Bangor will also benefit from Encompass' proven high quality, cost-effective programs that extensively utilize specialized staff and technology to deliver higher than expected clinical outcomes. A listing of select corporate programs and services that will benefit the patients and families of the proposed new hospital follows.

- **TeamWorks** is a company-wide clinical initiative to continually improve quality of care through the identification, standardization, and implementation of best-practices across all of Encompass' hospitals. Just two of the many ways this program has benefited patients include (1) a quicker admission process and (2) greater coordination pre-admission and post-discharge between community health care providers and Encompass hospitals.
- **Patient Safety Task Force** is comprised of employees across all regions and disciplines who are primarily responsible for identifying changes and/or improvements in processes, policies, or programs to increase patient and staff safety in Encompass hospitals.
- **Post-Acute Innovation Center** is an example of Encompass' ongoing efforts to continually enhance quality of care. The Center was established in 2017 as a partnership with Cerner Corporation to develop clinical decision support tools that can more effectively and efficiently manage patients across multiple care settings, thus enhancing care coordination between a patient's providers, regardless of the provider's location.
- **National partnership with the American Heart Association/American Stroke Association** to increase patient independence after a stroke and reduce stroke mortality through community outreach and information campaigns. This multi-year project is expected to accelerate adoption of the recent AHA/ASA Stroke Rehabilitation Guidelines, increase patient awareness of post-stroke options, and provide practical support to patients and their families to improve recovery outcomes.
- **National partnership with the Association of Rehabilitation Nurses (ARN)**, providing extensive opportunities and benefits to all Encompass Health's rehabilitation nursing staff. This partnership encourages access to valuable resources available through ARN and Encompass Health and promotes attendance at the ARN annual conference where attendees will receive Continuing Education Units (CEUs) for both certification as a Certified Rehabilitation Registered Nurse (CRRN) and license renewal as well as learn about best practices across the industry. Recent research indicates better clinical outcomes related to falls and wounds when a higher percentage of CRRNs are working at the patient bedside.
- **Participation in The Joint Commission's Disease-Specific Care Certification Programs** has resulted in 132 of Encompass Health's inpatient rehab hospitals currently holding one or more disease-specific certifications from The Joint Commission's Disease-Specific Care Certification Program in areas such as stroke, brain injury, or hip fracture rehabilitation. In total, Encompass Health hospitals hold a total of 370 Disease-Specific Certifications as of July 2023.

- **Advanced Technology** includes rehab-specific clinical equipment and technologies such as those included in Attachment D as well as the following corporate-wide information technology.
 - A proprietary rehab-specific clinical information system (ACE-IT) interfaces Encompass patients' clinical information with acute care hospitals' clinical information systems to facilitate patient transfers, reduce readmissions, and enhance outcomes.
 - An internally developed, real-time management reporting system (BEACON) enhances clinical and business processes to ensure that the high quality care provided by Encompass hospitals is delivered in the most cost-efficient manner.
 - Predictive data analytic programs ReAct and Sepsis/SIRS Alert enhance patient quality of care by closely monitoring even the most subtle changes in a patient's status, reducing readmissions to acute care hospitals, and ultimately enhancing quality of care.

- **Financial Resources and Strength** of Encompass provide the local hospitals with sufficient means to purchase needed equipment and technology, ensure the appropriate complement and number of staff are in place to care for patients, and the facility is designed and well-maintained with all of the latest amenities – all of which combine to enhance quality of care for the patient and family, as evidenced by Encompass Health's existing IRFs.

- **Post-Acute Care Owner and Operator.** Encompass Health's sole purpose is to own and operate IRF post-acute care facilities and services. As a leading provider and operator of health care facilities, Encompass Health has a proven long-term commitment to caring for patients.

3. Patients Benefit from Encompass' High Quality, Cost-Effective Care.

The mere establishment of beds is not sufficient to ensure that the proposed project will provide health services that improve the health care of the service area population. Rather, it is the proven programs, services, staff, and facility design discussed previously that are integral to the delivery of high-quality care. The high-quality care at the proposed Encompass Bangor will reflect the proven programs and services of Encompass, regardless of how quality is defined.

As mentioned previously, 132 of Encompass Health's inpatient rehab hospitals hold one or more disease-specific certifications from The Joint Commission's Disease-Specific Care Certification Program in areas such as stroke, brain injury, or hip fracture rehabilitation. In total, Encompass Health hospitals hold a total of 370 Disease-Specific Certifications as of July 2023.

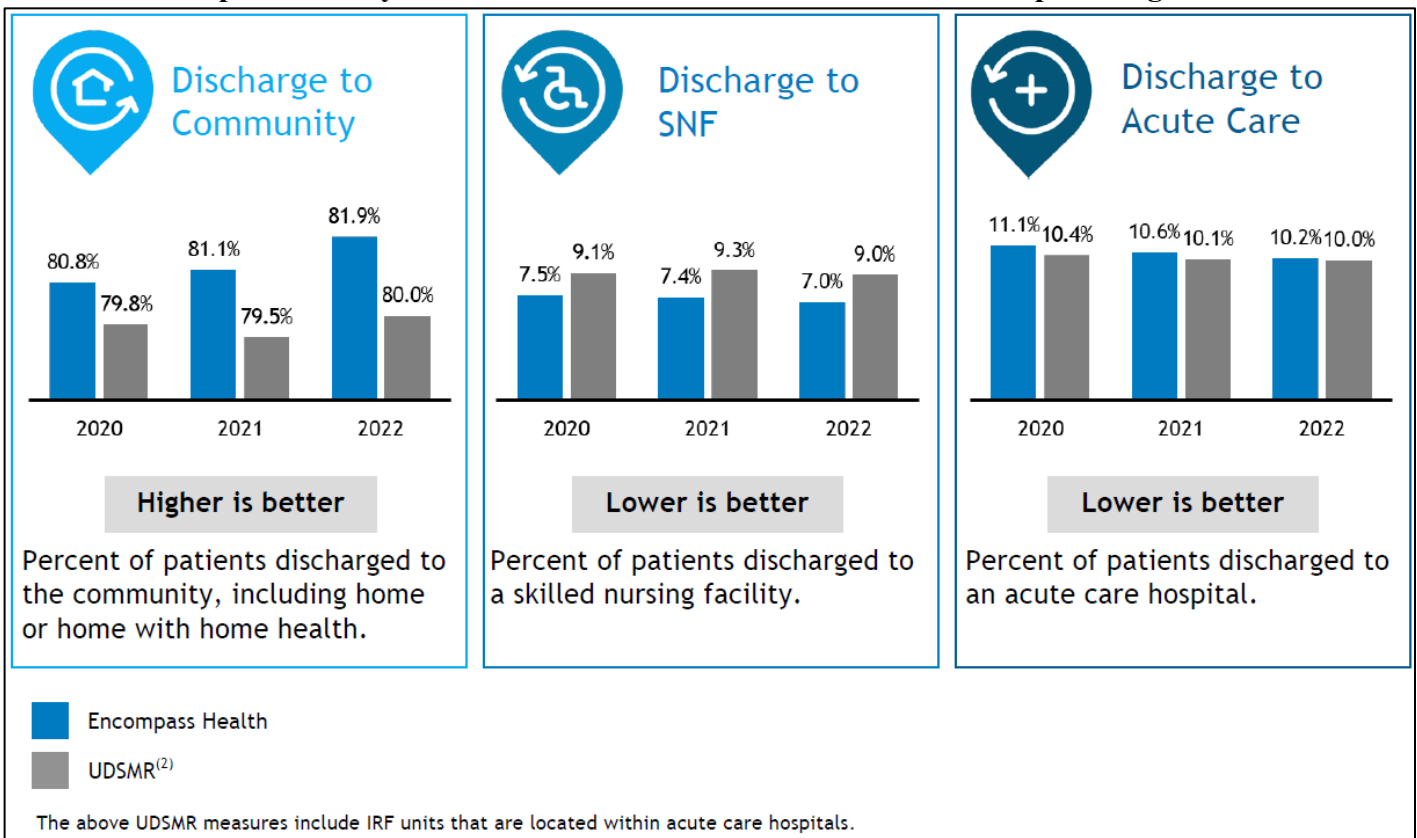
Illustrative of Encompass' commitment to high quality care are the Disease-Specific Care Certifications for Encompass' inpatient rehabilitation facility in Portland, Maine. The New England Rehabilitation Hospital of Portland, a Joint Venture of Maine Medical Center and Encompass Health, holds The Joint Commission's Gold Seal of Approval® for Disease-Specific Care Certification in the following four (4) areas:

- Stroke Rehabilitation;
- Hip Fracture Rehabilitation;
- Amputee Rehabilitation; and,
- Brain Injury Rehabilitation.

It is anticipated that the proposed Bangor Rehab Hospital will also seek one or more disease-specific certifications from The Joint Commission specific to the needs of the local community. Additionally, Encompass Health is committed to ensuring that the proposed Project will meet all other applicable licensure, certification, and accreditation requirements, including but not limited to Medicare and Medicaid certification.

Further evidence of Encompass Health’s provision of quality care is the percentage of patients discharged to the community versus to a SNF or acute care hospital. As shown below, Encompass has a proven track record of returning approximately 82% of its patients back to the community, outperforming other providers nationally. The proposed new rehab hospital will utilize Encompass Health’s proven programs to ensure high quality care is provided to its patients.

Figure 1
Encompass’ Quality Measures Exceed National Standards in Multiple Categories



(2) Data compares Encompass Health IRFs to IRFs comprising the Uniform Data System for Medical Rehabilitation (“UDSMR”), part of Netsmart, a data gathering and analysis tool for the rehabilitation industry which represents approximately 80% of the industry, including Encompass Health sites. Data is adjusted by applying Encompass Health IRF case-mix to non-Encompass Health UDS IRFs.

Source: Investor Reference Book, Published May 31, 2023; Encompass Health.

Consistent with Encompass’ success nationally in returning patients to their home/community upon discharge, Encompass Health’s existing IRF provider in Maine has discharge to community rates, *i.e.*, post-acute care (“DTC-PAC”), above the national average, as shown in the following table.¹ The DTC-PAC measures assess successful discharge to the community from a PAC setting (in this instance IRF), with successful discharge to the community including no unplanned rehospitalizations and no death in the 31 days following discharge.

Table 1		
<i>Encompass has Higher Rates of Return to Home/Community than National Average*</i>		
Rate of Successful Patient Return to Home and Community from an IRF		
Encompass Maine IRF	County	Rate
New England Rehabilitation Hospital of Portland	Cumberland	73.06%
National Rate		66.93%
Source: Medicare.gov, Inpatient Rehabilitation Facility (IRF) Compare. Data for 10/01/2020 – 09/30/2022.		
*New England Rehab’s rate is statistically higher (better) than the national rate.		

Encompass hospitals across the nation continually engage in primary research to determine the best practices and protocols for a variety of diagnoses so that patients will always have the highest level of outcomes and quality care.

A listing of select current research at Encompass hospitals nationally follows.

- Western PA Patient Registry
- Audiology & Speech Language Registry
- Psych and Neuro of Spatial Cognition
- SDM-Stroke
- SDMM-Geriatric
- Incontinence Study
- Project Steady
- Speed and Distance
- Stroke Studies (several separate studies are underway at various facilities)
- Review of Stroke Patients that Return to Acute
- Stroke Rehabilitation Disparities
- C. Diff EIP
- Flexor Tendon Repair
- Fitness to Drive in Older Adults
- Home Modifications
- AO Spine
- Prolonging Safe Driving - Stroke

¹ Please note that while both Figure 1 and Table 1 address Encompass hospitals’ discharge rates to home/community, the data source and time period in each analysis differs. Figure 1 is based on calendar year data whereas Table 1 is based on an aggregated 24-month time period.

- Prism Adaptation Therapy
- Step-Hi
- Tele-rehab vs in-clinic therapy
- The Impact of Falls Prevention Education on Fall Rates
- Is The Ability To Detect A Foreign Accent Located In The Right Hemisphere?
- Bleeding in tracheotomy patients
- Dynamic Body-weight Support (DBWS) on Inpatient Rehabilitation
- Predicting D/C Destination in Hip Fractures
- IM Impact on Falls
- Acuity rating project
- MMJ Study
- Amputee Rehab Outcome Research

Finally, Encompass Health maintains clinical teaching affiliations with universities, colleges, and technical schools throughout the U.S. to provide physical therapy, occupational therapy, speech language pathology, and nursing students the opportunity to participate in clinical and technical rotations at its facilities around the country. Encompass, through its New England Rehab facility in Portland, has established relationships with local universities and colleges to provide training programs at their hospitals, including the following universities and colleges based in Maine or with a campus or program in Maine:

- Kennebec Valley Community College
- Maine College of Health Professions
- Southern Maine Community College
- Tufts University School of Medicine
- Boston University
- Saint Joseph's College
- University of Southern Maine
- University of Maine System.

4. Encompass' Facilities Benefit Service Area Residents and Hospitals by Caring for COVID-19 Patients.

Encompass cares for patients who are positive for COVID-19, as well as patients who previously had this highly contagious disease and are recovering from the effects of it. The successful treatment of patients recovering from COVID-19 is illustrated by information included in Attachment E.

Service area patients and families will benefit from Encompass' acceptance and rehabilitation of patients recovering from COVID-19 in several ways, including for example:

- Direct care and rehabilitation received at Encompass in order for the patient to recover to his/her highest functioning level.
- Coordination of care between Encompass caregivers and the patient's community-based physicians to ensure continuity of care for the patient discharged from Encompass.
- Enhanced access to general acute care beds and services. Encompass' acceptance of COVID-19 positive patients allows general acute care hospitals to discharge patients to IRF services as soon as possible, freeing up much-needed resources to admit patients in need of general acute care services.

Of note in Attachment E is a recent research article published in the *Archives of Rehabilitation Research and Clinical Translation* that assesses sociodemographic, medical complexity, and outcomes of persons receiving care at IRFs with and without a diagnosis of COVID-19. The research was based on a retrospective cohort study using electronic medical record (“EMR”) data from 138 of Encompass Health’s inpatient rehab programs across 34 states and Puerto Rico. Encompass Health’s Chief Medical Officer, Dr. Elissa J. Charbonneau, was one of the authors of the study.

Thus, in addition to the direct patient care provided by Encompass for COVID-19 positive patients and patients recovering from COVID-19, Encompass’ experience and expertise as a national inpatient rehabilitation provider benefits the entire rehabilitation industry and its caregivers through research on a variety of topics, including for people with and without COVID-19 diagnoses. (See, e.g., page 6 of the research article, *Baseline Characteristics and Outcomes for People with and Without COVID-19 Diagnoses Receiving Inpatient Rehabilitation Care Across the US in 2020-2021* which states that “this is the first study to report country-level (USA) baseline characteristics and outcomes for persons with COVID-19 completing inpatient rehabilitation.”)

The ability of Encompass to accept and care for a patient population with a highly contagious disease – and assist the general acute care hospitals in discharging their patients as soon as possible – is illustrative of the many benefits of the proposal.

III. Financial Feasibility

Relevant criteria for the inclusion in this section are specific to the determination that the economic feasibility of the proposed services is demonstrated in terms of the:

Encompass has prepared financial projections for the first three years of operation of Encompass Bangor. The full details are included in the financial module, provided as Attachment F. Also included in Attachment F is the proposed lease between Encompass Bangor and EHMRE, a letter confirming availability of funds for the project, and Encompass' most recent Audited Financial Statements.

A. Capacity of the applicant to support the project financially over its useful life, in light of the rates the applicant expects to be able to charge for the services to be provided by the project.

As reflected in its financial proforma for the proposed project, Encompass Bangor will have the capacity to successfully operate its proposed facility. Moreover, Encompass Health Corporation, ultimate parent entity of Encompass Bangor, has vast operating experience and on-going financial strength and viability to successfully support Encompass Bangor.

B. The applicant's ability to establish and operate the project in accordance with existing and reasonable anticipated future changes in federal, state and local licensure and other applicable or potentially applicable rules.

With its 161 inpatient rehab hospitals in 37 states and Puerto Rico, Encompass Health Corporation's services represent approximately 25% of the licensed acute rehabilitation beds nationally and approximately 33% of Medicare patients served. Encompass has a long history of operating IRFs in accordance with federal, state, and local licensing and other applicable rules. Encompass has experienced many changes in rules and payment methodologies throughout its almost 40 years of operation and has repeatedly demonstrated the ability to successfully adapt to these changes and continue to meet the need of its patients and families.

IV. Public Need

Relevant criteria for inclusion in this section are specific to the determination there is a public need for the proposed services as demonstrated by certain factors, including, but not limited to:

A. Whether, and the extent to which, the project will substantially address specific health problems as measured by health needs in the area to be served by the project.

1. Maine has One of the Nation’s Lowest Utilization of IRF Services.

Maine has among the nation’s lowest utilization of IRF services, as demonstrated by the graph on the following page.

As shown below, Maine ranks 38th nationally in terms of IRF Medicare Fee-for-Service (“Medicare FFS”) utilization, with 3.78 Medicare FFS IRF discharges per 1,000 persons ages 65 and over (“65+”) compared to the national average of 6.49 Medicare FFS IRF discharges per 1,000 persons ages 65+. The significant difference between Maine’s IRF utilization and the national average reflects a *gap in care*, demonstrating that the state overall has too few available and accessible IRF beds for its population, particularly its population ages 65+.

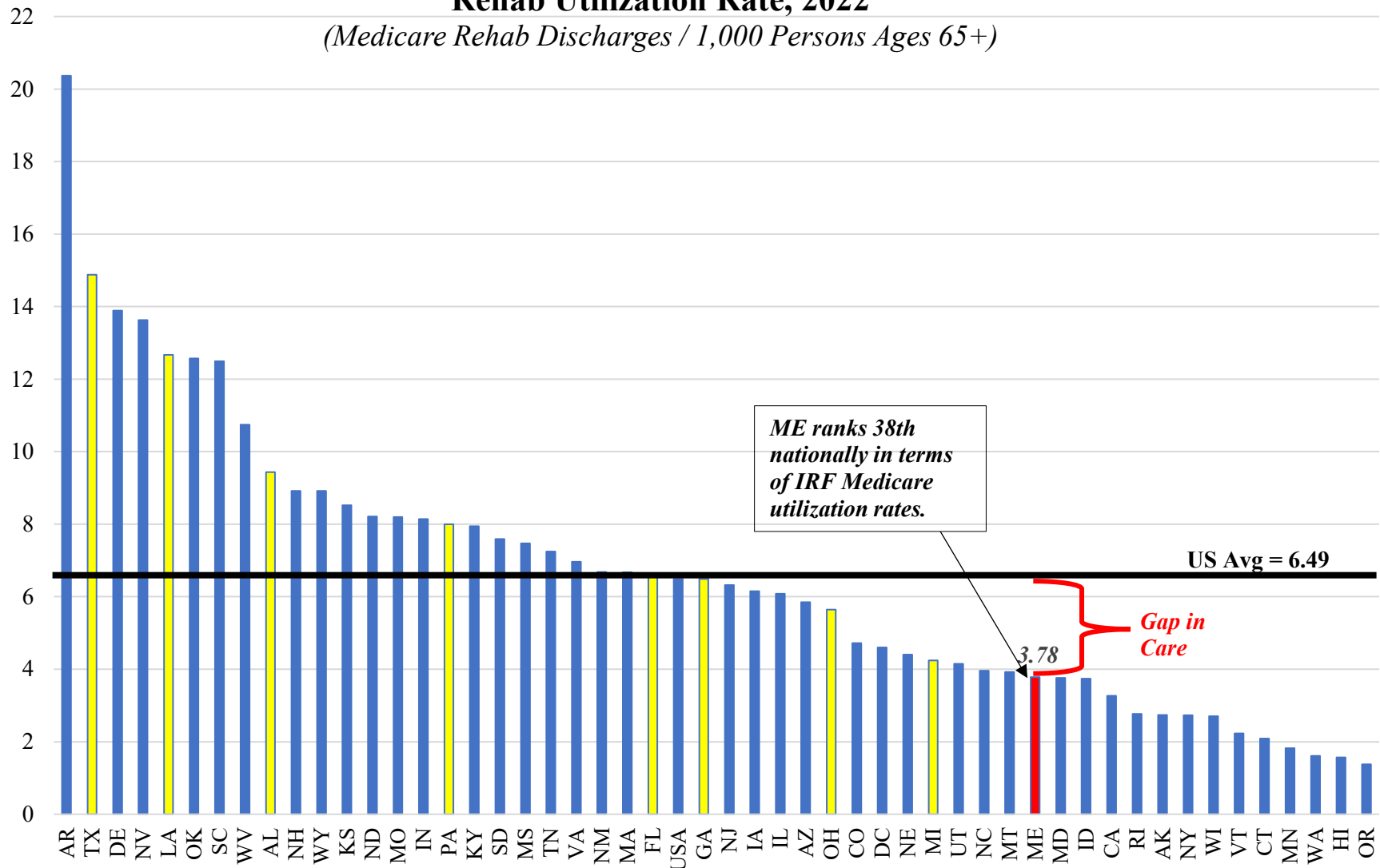
The utilization of IRF services by the population ages 65+ is an important indicator of need since that population is the primary user of IRF services. For example, nationally, Medicare Fee-for-Service patients accounted for approximately 52% of IRF discharges, according to the *Report to the Congress: Medicare Payment Policy, March 2023* from the Medicare Payment Advisory Commission (“MedPAC”). (National data are not available for Medicare Advantage plan members’ utilization of services, including IRF utilization.)

Specific to Maine, New England Rehab Hospital’s experience is illustrative. For the 12 months ending September 30, 2022 (the most recent period for which Maine Health Data Organization (“MHDO”) data are available), approximately 71% of New England Rehab’s discharges were for patients covered by Medicare FFS or Medicare Advantage plans.

The proposed Project will improve the health of Maine residents, particularly those in the defined service area who will have increased accessibility, acceptability, continuity, and quality of health services available to patients who are in need of, and would benefit from, intensive inpatient rehabilitative services. Encompass has proven experience in increasing accessibility, acceptability, continuity, and quality of healthcare services through its Portland facility, as demonstrated by its high rate of successful returning patients to home and community (73.06% which is better than the 66.93% national rate), its Joint Commission accreditation, and its Disease-Specific Care Certifications (also by The Joint Commission) in Stroke Rehabilitation, Hip Rehabilitation, Amputee Rehabilitation, and Brain Injury Rehabilitation.

Similar to New England Rehab, the proposed Encompass Bangor will be Joint Commission accredited and will seek certification in Disease-Specific Care Certifications appropriate to its patient population.

Figure 2
Rehab Utilization Rate, 2022
(Medicare Rehab Discharges / 1,000 Persons Ages 65+)



Sources: Medicare Standard Analytical IP File (FFS Only), 2022. Medicare Advantage (MA) data from CMS Geographical Variation Public Use Files, 2021.

Note: Ranking based on 50 states plus Washington, D.C.

States Highlighted in Yellow Have Similar or Higher MA Penetration Rates than Maine

2. Service Area Definition and Population Projections.

Similar to the statewide gap in care, residents in northern Maine have a gap in care because there are too few IRF beds to ensure that patients in need of intensive inpatient rehabilitative and restorative care receive that care in a timely manner and close to home.

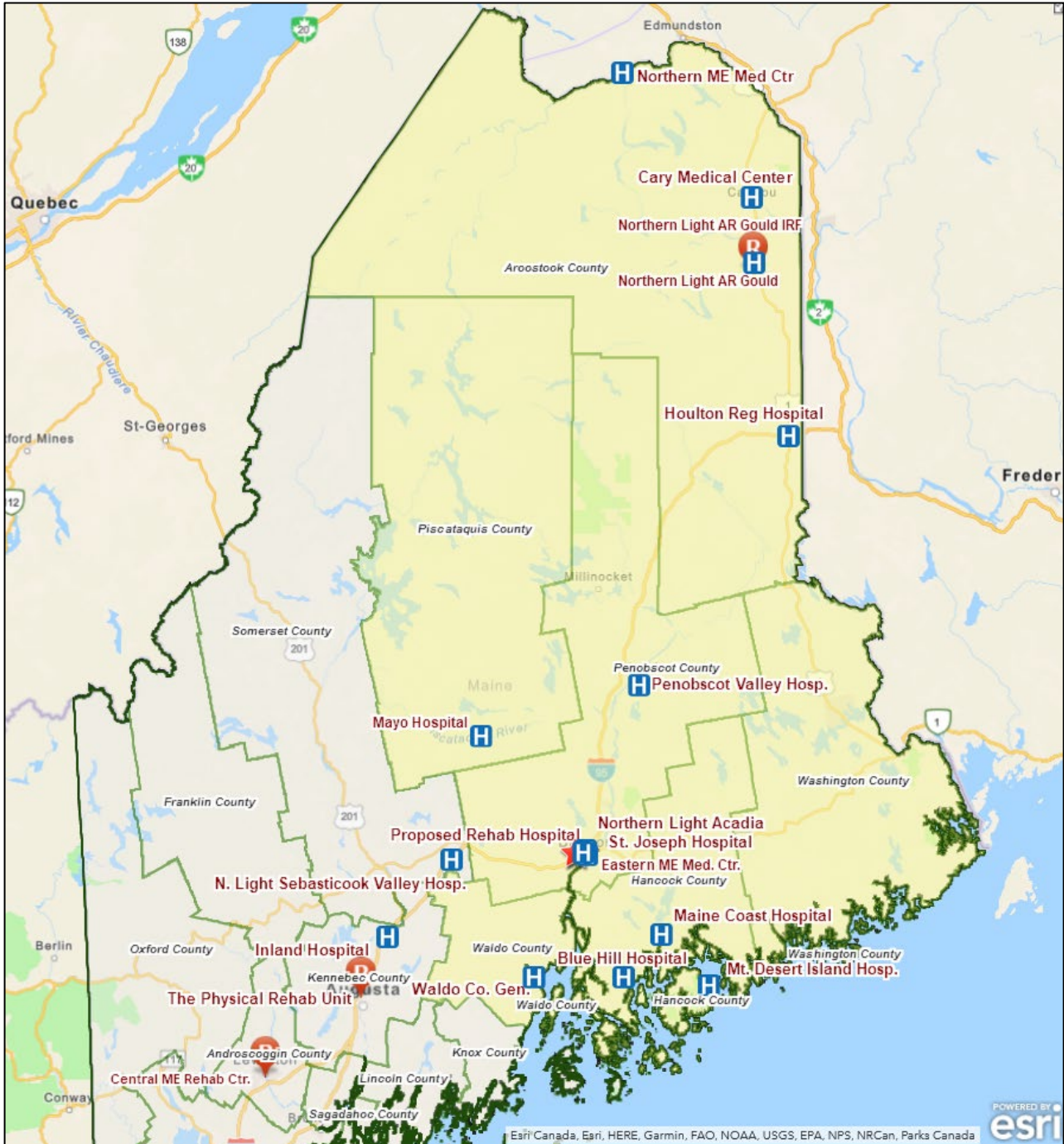
The recent closure of the inpatient rehab unit at Northern Light Eastern Maine Medical Center in Bangor (“Eastern Maine Medical Center”) has increased the gap in care for residents who need and would benefit from locally-available and accessible IRF services. Eastern Maine Medical Center permanently closed its IRF unit in late December 2022. As shown below, prior to the closure of its IRF services, the hospital’s program was well-utilized, with an average daily census of 20.2 patients in CY22 for an average annual 81.0% occupancy in its final year.

Table 2			
Northern Light Eastern Maine Medical Center			
Inpatient Rehabilitation Facility Utilization, 2020-2022			
Operational Metric*	2020	2021	2022
Beds	25	25	25
Discharges	467	369	301
Inpatient Days	7,724	7,282	7,388
Average Length of Stay (ALOS)	16.5	19.7	24.5
Average Daily Census (ADC)	21.1	20.0	20.2
Percent Occupancy	84.4%	79.8%	81.0%
*Data reported for 12 months ending September 30 th . Source: American Hospital Directory (AHD), www.ahd.com . Note: 2020 was a leap year, thus utilization based on 366 days per year.			

Encompass Bangor’s proposed 50-bed IRF will help to address the identified gap in care exacerbated by the closure of Eastern Maine Medical Center’s specialized unit.

Encompass Bangor’s program expects to serve residents from counties throughout northern Maine. Encompass Bangor’s proposed service area is a six-county area including Penobscot (in which the proposed hospital will be located), Piscataquis, Washington, Hancock, Waldo, and Aroostook Counties, as shown on the map on the following page. For ease of review, existing general acute care hospitals and inpatient rehabilitation facilities are also shown on the map. Also shown on the map is the service area’s sole remaining IRF provider in northern Maine: Northern Light AR Gould IRF in Presque Isle, ME (Aroostook County) which currently operates a five-bed IRF program.

Figure 3
Encompass Rehabilitation Hospital of Bangor
Proposed Service Area



- Proposed Service Area Counties
- Inpatient Rehab Facility
- Proposed IRF
- General Acute Care Hospital

Service Area Counties' Population is Increasing, Most Notably in the Population Ages 65 and Over

As shown below, total service area population is projected to increase between now (2023) and 2030.

Table 3				
Total Population by Service Area County, 2023-2030				
County	2023 Total Pop	2030 Total Pop	Numeric Change	% Change
Aroostook	66,758	66,937	179	0.3%
Hancock	55,867	56,707	840	1.5%
Penobscot	152,038	153,327	1,289	0.8%
Piscataquis	16,561	15,935	-626	-3.8%
Waldo	40,355	42,405	2,049	5.1%
Washington	31,680	33,555	1,874	5.9%
Total	363,260	368,866	5,606	1.5%
Sources: Maine Population Outlook 2020-2030, June 2023 and Maine State and County Population Projections 2040 from the Office of the State Economist, Maine Department of Administrative and Financial Services.				

Of note is that the population ages 65 and over is projected to significantly increase between now (2023) and 2030, with a projected 20.0% increase during that time period.

Table 4				
Population Ages 65 and Over by Service Area County, 2023-2030				
County	2023 Population	2030 Population	Numeric Change	% Change
Aroostook	17,754	20,789	3,035	17.1%
Hancock	15,582	18,584	3,001	19.3%
Penobscot	31,444	38,221	6,777	21.6%
Piscataquis	5,004	6,069	1,065	21.3%
Waldo	10,265	12,522	2,257	22.0%
Washington	8,422	9,981	1,560	18.5%
Total	88,470	106,165	17,695	20.0%
Sources: Maine Population Outlook 2020-2030, June 2023 and Maine State and County Population Projections 2040 from the Office of the State Economist, Maine Department of Administrative and Financial Services.				

The significant aging of the population is an important indicator of need for additional IRF beds in the northern Maine service area. As shown below, the population ages 65 and over is projected to comprise nearly 30% of the total population by 2030.

Table 5 Population Ages 65 and Over as a Percentage of Total Population, 2023-2030		
County	2023	2030
Aroostook	26.6%	31.1%
Hancock	27.9%	32.8%
Penobscot	20.7%	24.9%
Piscataquis	30.2%	38.1%
Waldo	25.4%	29.5%
Washington	26.6%	29.7%
Total	24.4%	28.8%
Sources: Maine Population Outlook 2020-2030, June 2023 and Maine State and County Population Projections 2040 from the Office of the State Economist, Maine Department of Administrative and Financial Services.		

3. Service Area Residents Need Additional CIPR Beds.

The historically low service area counties’ utilization rates of inpatient rehab services reflect the current barriers to IRF services facing residents in the defined service area, which is simply that there are too few IRF beds in northern Maine. As shown below, all of the service area counties have IRF utilization rates significantly below the Maine average, which is one of the nation’s lowest.

As demonstrated, service area residents throughout the service area are utilizing IRF services at rates significantly below the Maine average and other post-acute care (“PAC”) services. Thus, absent sufficient numbers of IRF beds, service area residents are utilizing less intensive rehab services (such as SNF or home health) in lieu of the more intensive inpatient rehabilitative and restorative care. For example, Penobscot County’s Medicare FFS residents’ IRF discharge rate (3 per 1,000 persons) is less than half (42.9%) of the already-low statewide rate of 7 discharges per 1,000 Medicare FFS residents. All other counties are similarly a relatively small percentage of the state’s low IRF utilization rate per 1,000 beneficiaries.

At the same time, all of the service area counties’ Medicare population is utilizing home health and/or SNF services at a rates closer to the respective statewide averages. The substitution of home health or SNF for IRF services in each service area county results in a disproportionately high percentage of home health and/or SNF services compared to IRF services. (See Table 6 below details.)

Figure 4, which follows Table 6, graphically illustrates service area residents’ discharge rates for general acute care and PAC services as a percentage of the respective service’s statewide average. For example, while Penobscot County’s IRF utilization as a percentage of the statewide IRF rate is 42.9%, the county’s SNF utilization as a percentage of the statewide SNF rate is 121%, indicating that because there are too

few IRF beds in the county, patients who are in need of and would benefit from IRF services are being discharged to the less intensive (and therefore less optimal) SNF services instead.

The same scenario is true for all service area counties: Medicare IRF service utilization is significantly below the low statewide average because there are simply too few IRF beds in the service area. Thus, residents of the service area who are in need of IRF services are being discharged to less intensive services such as home health or SNF services instead of the physician-prescribed intensive inpatient rehabilitative and restorative care that Encompass Bangor proposes to offer.

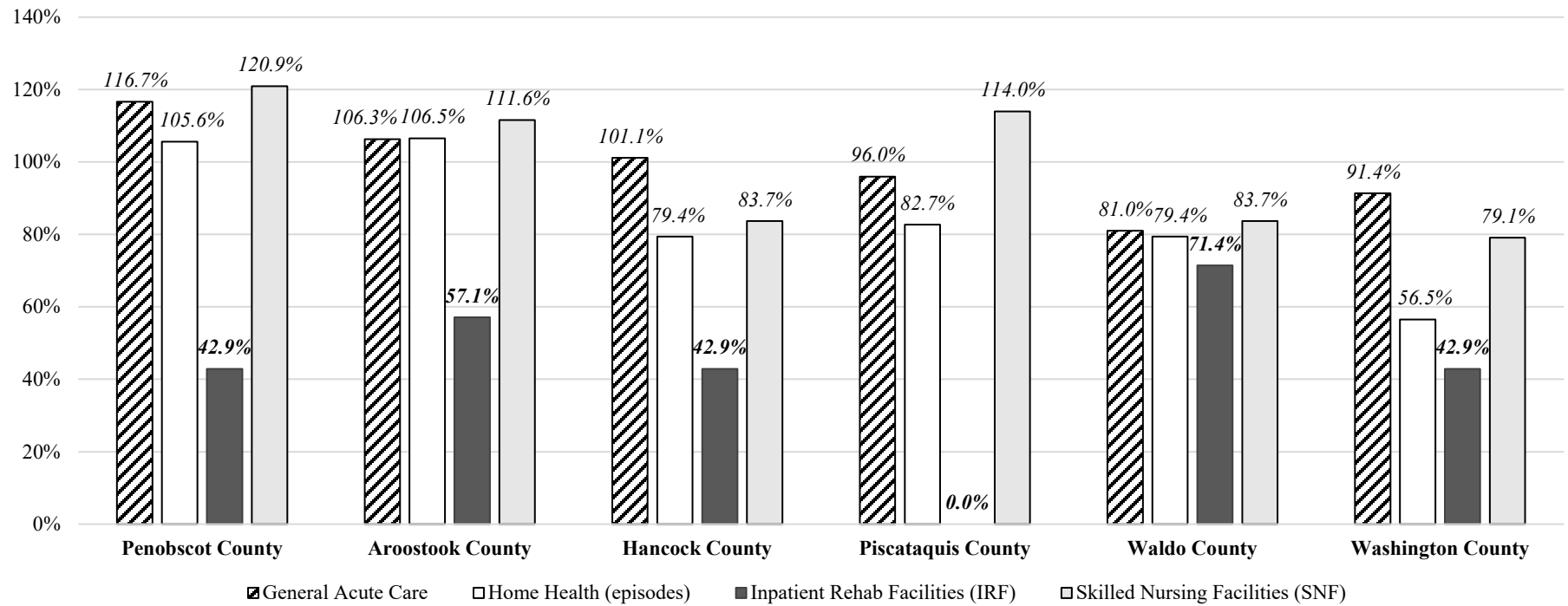
Consideration of residents' accessibility to general acute care hospitals is relevant for two reasons:

- i. A comparison of accessibility to general acute care services provides a benchmark against which to compare the post-acute care utilization, including inpatient rehab.
- ii. The vast majority (approximately 91%) of Encompass rehab patients are admitted to an inpatient rehab facility upon discharge from a general acute care hospital. (The remainder of patients are admitted from community physicians' offices or SNFs.)

Table 6
2021 Acute Care and Post-Acute Care Utilization, Medicare Beneficiaries (All Ages)
Service Area Counties' Residents have Low IRF Utilization Compared to Maine and Other Post-Acute Services

	Service Area Counties							
Health Care Utilization (Covered Stays or Episodes per 1,000 Beneficiaries)	US Avg	Maine Avg	Penobscot County	Aroostook County	Hancock County	Piscataquis County	Waldo County	Washington County
General Acute Care	220	174	203	185	176	167	141	159
<i>Post-Acute Care Services</i>								
Home Health (episodes)	277	214	226	228	170	177	170	121
Inpatient Rehab Facilities (IRF)	11	7	3	4	3	0	5	3
Skilled Nursing Facilities (SNF)	55	43	52	48	36	49	36	34
Ratio: SNF to IRF	5.0	6.1	17.3	12.0	12.0	0.0	7.2	11.3
Source: Centers for Medicare & Medicaid Services ("CMS"), Geographic Variation Public Use Files, 2021, data represents Medicare Fee for Service Enrollees and is for the identified Post-Acute Care services only.								

Figure 4
Service Area Counties 2021 Health Care Utilization of Inpatient Rehab Services
Compared to Utilization of General Acute Care & Other PAC Services
(Percentages shown are County's PAC Services Compared to Respective Statewide Average)



Source: CMS Geographic Variation Public Use File. Data represents Medicare Fee for Service Enrollees.

As shown in the data above, while service area residents' utilization of general acute care hospitals is generally commensurate with the statewide average (*i.e.*, close to 100% of the overall Maine rate), inpatient rehabilitation utilization is significantly lower. Consider the following facts documented by the data:

- The majority of service area residents' utilization of general acute care hospitals (for all services in aggregate) is largely commensurate with the Maine average, indicating that there is, overall, sufficient general acute care hospitals and beds to meet service area residents' current needs.
- Thus, "getting in the door" to a general acute care hospital doesn't appear to be a fundamental problem for service area residents.
- The discharge of service area residents from those general acute care hospitals to post-acute care services is primarily to SNF and home health care services.
- Thus, being discharged to some type of PAC service doesn't appear to be a problem for service area residents.
- However, **service area residents have a disproportionately low rate of utilization of inpatient rehabilitation services** compared to the statewide average and to other PAC services generally.
- Thus, service area residents do not appear to have sufficiently-accessible and available inpatient rehabilitation services upon discharge from general acute care hospitals.
- In short, when the vast majority of service area county residents 'get out the door' of the general acute care hospital, their options for inpatient rehabilitation services are limited, as evidenced by the low IRF utilization rates compared to the already-low Maine average.
- For these reasons, the proposed hospital will not duplicate existing services. Rather, the proposed project will address the identified **gap in care** facing service area residents in need of intensive inpatient physical rehabilitative care.

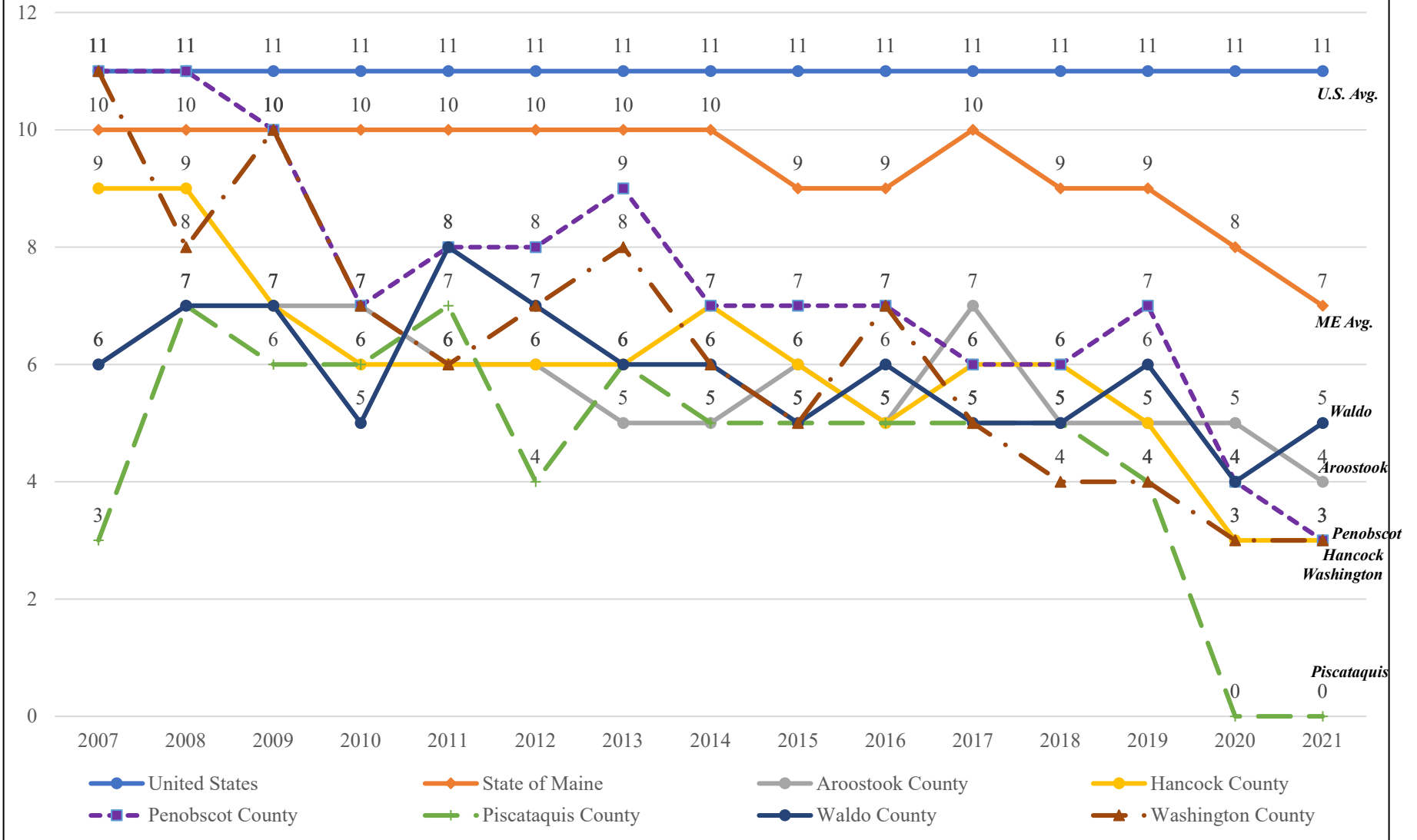
The documented gap in care means that many patients who are recovering from clinical conditions that would benefit from comprehensive, intensive physical rehabilitation services in an inpatient setting are instead subject to a variety of suboptimal alternatives, including:

- Discharge to a lesser intensive setting such as skilled nursing facility;
- Discharge to home with home health care services; or,
- Foregoing needed rehab care altogether.

Notably, the gap in care, which has existed for many years in the defined service area (as illustrated below), has worsened and will continue to worsen absent the proposed project because of the aging service area population.

Figure 5

**Service Area Counties' Discharge Rates are Significantly Below State and National Average
(IRF Discharges/1,000 Medicare FFS Beneficiaries)**



Source: CMS Geographic Variation Public Use File



4. Other Post-Acute Care Services are Not an Appropriate Substitute for IRF Care.

The lack of a sufficient number of IRF beds in the service area means patients may be forced to choose less intensive (and therefore less optimal) post-acute care services such as a SNF or home health services in lieu of inpatient rehab when intensive inpatient rehab care is needed. The distinct differences between SNF and home health post-acute care services and the proposed, more intensive IRF services are detailed below. As documented, these post-acute care services are not an appropriate substitute for the proposed IRF services to be provided at Encompass Bangor.

(a) *Distinct Differences between IRF and SNF Rehab Services.*

The differences between intensive inpatient rehab services in an IRF and therapies offered in a SNF are illustrated below. As shown, two significant differences are the much higher number of therapy hours per day that a patient receives in the IRF setting compared to a SNF and the involvement and direction of a physician leading the multidisciplinary team. The national data demonstrate that IRFs have a much higher rate of patients discharged to the community than SNFs, with IRFs returning approximately 68% of their patients to the community and SNFs returning approximately 44%. Patients who receive care at an Encompass Health facility are even more likely to be discharged back to their community, evidenced by Encompass Health’s rate of discharges to the community of approximately 82%.

Figure 6

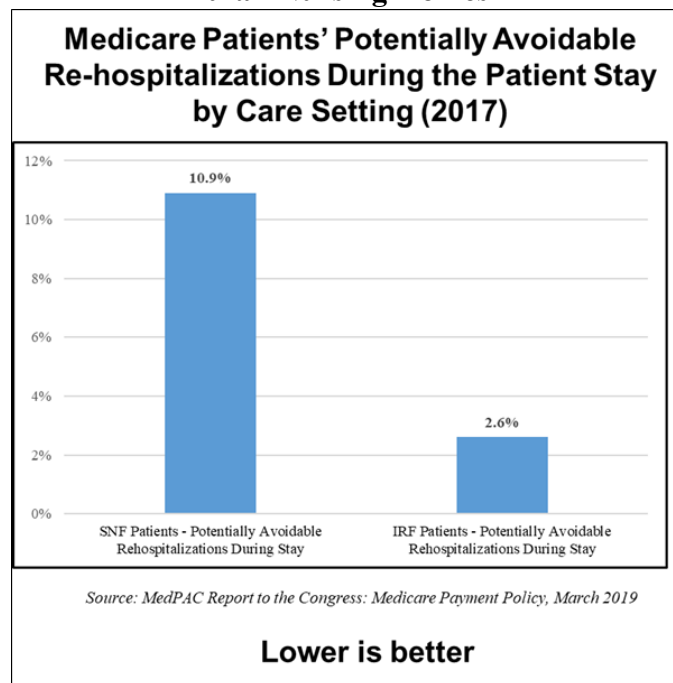
	Inpatient Rehabilitation Hospital 	Nursing Home 
Required by Medicare		
Minimum Stay at the Acute	None	3 days
Physician Visits	Min. 3 times per week	Min. ~1x/month or every 30 days
Rehabilitation Program	Min. 3 hours per day, 5 days a week or 15 hours over 7 days	Not required
Multi-Disciplinary Team Approach/ Coordinated Program of Care	Required	Not required
MD or DO Rehabilitation Director	Required	Not required
RN Oversight and Availability	24 hours per day	Min. 8 consecutive hours per day
Nursing Training and Expertise	Rehabilitation Specialty Expertise	None
Discharge to Community (Industry Avg.)	67.6%	43.5%
Encompass Health	81.9%	

Sources: CMS regulations, MedPAC March 2023 Report to Congress, and Encompass Health Investor Reference Book, Published May 31, 2023.

Note: National discharge to community rates are 2021 data; Encompass data is for 2022.

A 2019 MedPAC study further distinguishes clinical outcomes of IRFs and nursing homes, as shown in the figure below.

Figure 7
Rehabilitation Hospitals have lower Hospital Readmissions than Nursing Homes



The differences between the IRF setting and the nursing home setting is also documented by a 2014 study which found that “when patients are matched on demographic and clinical characteristics, rehabilitation in IRFs leads to lower mortality, fewer readmissions and ER visits, and more days at home (not in a hospital, IRF, SNF or LTCH) than rehabilitation in SNFs for the same condition. **This suggests that the care delivered is not the same between IRFs and SNFs. Therefore, different post-acute care settings affect patient outcomes.**”² [Emphasis added.] (See Attachment G for an illustrative exhibit regarding the study and a two-page summary of the findings, supplementing the full report also included.)

A number of other highly-regarded studies have also demonstrated that not only do a variety of patients receive significant benefit from intensive medical rehabilitation services after a general acute care stay, but that comparatively intensive medical rehabilitation services provided in a comprehensive IRF are superior to the care provided in other post-acute care settings. Please refer to Attachment G for select articles, with summaries below.

The *American Heart Association/American Stroke Association’s 2016 Guideline for Adult Stroke Rehabilitation and Recovery* makes it clear that patients who have suffered from a stroke have the best chance to achieve their full potential if they receive sustained and coordinated rehabilitation care. Notably, the research also recognizes that though inpatient rehabilitation services may in the short term be more costly than other post-acute services, the positive clinical results of IRF services such as reduced downstream medical morbidity and additional costs associated therewith must be considered. These

² Source: Joan E. DaVanzo, Ph.D., M.S.W., Al Dobson, Ph.D., Audrey El-Gamil, Justin W. Li, and Nikolay Manolov, Ph.D.; Assessment of Patient Outcomes of Rehabilitative Care Provided in Inpatient Rehabilitation Facilities and After Discharge; 2014.

guidelines have been endorsed by the American Academy of Physical Medicine and Rehabilitation and the American Society of Neurorehabilitation. Excerpts from the study follow.

“Results: Stroke rehabilitation requires a sustained and coordinated effort from a large team, including the patient and his or her goals, family and friends, other caregivers (eg, personal care attendants), physicians, nurses, physical and occupational therapists, speech-language pathologists, recreation therapists, psychologists, nutritionists, social workers, and others. Communication and coordination among these team members are paramount in maximizing the effectiveness and efficiency of rehabilitation and underlie this entire guideline. Without communication and coordination, isolated efforts to rehabilitate the stroke survivor are unlikely to achieve their full potential.

Conclusions: As systems of care evolve in response to healthcare reform efforts, post-acute care and rehabilitation are often considered a costly area of care to be trimmed but without recognition of their clinical impact and ability to reduce the risk of downstream medical morbidity resulting from immobility, depression, loss of autonomy, and reduced functional independence. The provision of comprehensive rehabilitation programs with adequate resources, dose, and duration is an essential aspect of stroke care and should be a priority in these redesign efforts.”

(Stroke. 2016;47:e98-e169. DOI: 10.1161/STR.0000000000000098.)

Specific to Encompass, the importance of caring for stroke patients (among other patient types as well) is illustrated by Encompass’ **national partnership with the American Heart Association/American Stroke Association** to increase patient independence after a stroke and reduce stroke mortality through community outreach and information campaigns. Encompass entered into this multi-year project to accelerate adoption of the AHA/ASA Stroke Rehabilitation Guidelines, increase patient awareness of post-stroke options, and provide practical support to patients and their families to improve recovery outcomes.

The benefits of rehabilitative care following injury was the focus of research by the University of Washington in conjunction with the State of Washington’s Department of Health. The research, titled *“Acute Rehabilitation after Trauma: Does it Really Matter?”*, demonstrated improved functional outcomes of injured patients following admission at designated trauma rehabilitation services in Washington as well as the positive impact inpatient rehabilitation services have on improving functional outcomes and limiting disabilities for trauma patients. The relevance of this research is that Encompass provides a wide array of services to patients, including those who have experienced severe trauma. Encompass’ wide array of services to patients in need of intensive inpatient rehab is distinctly different than SNFs (and home health) providers. Excerpts from the study follow.

“Trauma is the most common cause of significant functional impairment, disability, and mortality worldwide. According to the CDC, the annual work-lost cost in the United States for injured patients who survive to hospital discharge is an astonishing \$150 billion. These injured patients are typically motivated and productive members of society who almost universally desire recovery of functional independence and return to community living and work. Helping them regain their functional independence has the potential to improve their quality of life considerably, and also decrease the socioeconomic impact of their injuries.

The care of these injured patients does not end on discharge from the acute care hospital, and many of these patients require ongoing rehabilitation after discharge. This rehabilitation can occur in one of several settings, including an inpatient rehabilitation facility (IRF), skilled nursing facility (SNF), or in the outpatient setting.

Our data would suggest that post-discharge care at an IRF rather than a SNF has the potential to profoundly improve functional outcomes for acutely injured patients.

Conclusions: Acute trauma patients should be recognized as an underserved population that would benefit considerably from inpatient rehabilitation services after discharge from the hospital.” (J Am Coll Surg 2016;223:755e763. © 2016 by the American College of Surgeons. Published by Elsevier Inc. All rights reserved.)

An additional study, published on the Journal of the American Medical Association (“JAMA”) Network Open, compared functional status improvements of stroke patients receiving post-acute care at CIPRs (or IRFs) to SNFs. The findings were similar to the previously cited AHA/ASA Guidelines: inpatient rehabilitation in IRFs for patients with stroke was associated with substantially improved physical mobility and self-care function compared with rehabilitation in SNFs. Excerpts from the study follow.

“OBJECTIVE: To compare functional outcomes in patients with stroke after post-acute care in inpatient rehabilitation facilities (IRF) vs skilled nursing facilities (SNF).

Findings: This cohort study included 99,185 patients who received post-acute care in inpatient rehabilitation or skilled nursing facilities after a stroke. Care in an inpatient rehabilitation facility was associated with greater improvement in mobility and self-care compared with care in a skilled nursing facility, and a significant difference in functional improvement remained after accounting for patient, clinical, and facility characteristics at admission.”

(JAMA Network Open. 019;2(12):e1916646.doi:10.1001/jamanetworkopen.2019.16646.)

The consistent findings in the above referenced research are that patients receiving post-acute care in an IRF setting while recovering from an acute injury or stroke display higher levels of functionality and reduced disabilities than patients receiving services in other post-acute care environments, including SNFs.

While SNFs most definitely have an important role as a post-acute care provider, the inappropriate substitution of less intensive SNF rehab services for the more comprehensive, intensive inpatient rehab care provided in an IRF when intensive inpatient rehab care is needed and a patient can participate in and benefit from same, is not one of them.

(b) Distinct Differences between IRF Services and Home Health Care.

The very nature of IRF services compared to SNF is a primary reason for the different outcomes, *i.e.*, the more intensive and specialized care the patient receives, the higher the likelihood the patient will recover more functionality, all things being equal. Thus, when comparing IRF to home health care and the complete absence of intensive therapy three hours per day (at least five days per week) and lack of specialized equipment (such as an overhead track system to help the patient recover his/her gait and

balance while on a treadmill or specially-designed platforms; virtual reality augmented sEMG biofeedback technology that enables patients to relearn how to swallow; or a robot that assists in improving motor control and motor skills of a patient's arms and hands following a stroke or injury), it is clear that patients undergoing intensive inpatient rehabilitation therapy will regain more function and independence than comparable patients receiving intermittent, less intensive therapy at home without specialized equipment and staff.

(c) Distinct Differences between IRF Services and Discharge without IRF Services.

Finally, for those patients who have been prescribed intensive inpatient rehab care by his/her physician but forego that care altogether, the impact is self-evident: inability to ensure maximum recovery and return to the highest level of independence.

5. There is a Quantified Need for the Proposed 50-bed Freestanding IRF.

The following analysis quantifies the bed need for service area residents who would benefit from IRF services, and is based on the following assumptions:

- The analysis is based on rehab-appropriate discharges for patients residing in the defined service area. Rehab-appropriate discharges are identified by MSDRG and based on Encompass Health Corporation's extensive national experience, as well as its experience in Portland, Maine.
- The analysis includes an in-migration factor of 10.0% due to the "snowbird" effect and the in-state patients in other counties who travel Bangor-based Northern Light Eastern Maine Medical Center for services.
- The projected number of service area rehab-appropriate discharges is based on the most recent year of MHDO data available (12 months ending Sept. 30, 2022) increased by the projected Medicare population growth rate from 2022 to 2030.
- The 10.4% target rehab discharge rate is based on Encompass' experience in Portland, Maine.
- IRF bed inventory is based on existing and approved beds in the defined service area counties.

Table 7
Encompass Bangor Maine: Projected IRF Bed Need, 2030
Based on Service Area Residents' Rehab-Appropriate Discharges (MHDO Data)

Inpatient Rehab Bed Need Projections for Defined Service Area	Projected Need, 2030
Service Area Residents' Rehab-Appropriate Discharges, Medicare FFS (only)	3,171
<i>Multiplied by Growth Factor Used to Project CY2030 Medicare only RAMSDRGs</i>	<i>1.2347</i>
<i>Equals Service Area Residents' Rehab-Appropriate Discharges, Medicare FFS (only)</i>	<i>3,915</i>
<i>Multiplied by Expected Discharge Rate to Inpatient Rehab, Medicare FFS Patients</i>	<i>10.4%</i>
<i>Equals Est. Svc Area Discharges from Acute Care in Need of Rehab Bed, Medicare Only</i>	<i>407</i>
<i>Divided by Percentage of Service Area Rehab-Appropriate Patients who are Medicare FFS</i>	<i>35.9%</i>
<i>Equals Total Projected Service Area Rehab Discharges in Need of Rehab Bed, All Payors</i>	<i>1,133</i>
<i>Multiplied by EHC Expected Average Length of Stay, All Payors</i>	<i>12.4</i>
<i>Equals Projected Service Area Rehab Patient Days in Need of Rehab Bed</i>	<i>14,053</i>
<i>Plus In-migration factor (other Maine counties and out-of-state residents)</i>	<i>10.0%</i>
<i>Equals Total Projected Rehab Patient Days in Need of Rehab Bed</i>	<i>15,459</i>
<i>Divided by Calendar Days</i>	<i>365</i>
<i>Equals Inpatient Rehab Bed Need @ 100% Occupancy</i>	<i>43</i>
<i>Divided by Optimal Occupancy Factor</i>	<i>80%</i>
<i>Equals Bed Need @ State Standard / Target Occupancy</i>	<i>54</i>
<i>Minus Current Existing and CON-Approved Service Area IRF Beds</i>	<i>5</i>
<i>Equals Net Bed Need</i>	<i>49</i>

Sources: Maine Health Data Organization 2021Q4-2022Q3 Level2 data and Maine Population Projections by County, Office of the State Economist, Department of Administrative and Financial Services, June 2023.

Notes: numbers may not calculate exactly as shown due to rounding.

Number of beds needed is rounded up to whole bed.

B. Whether the project will have a positive impact on the health status indicators of the population to be served.

The proposed 50-bed IRF will have a positive impact on the health status of the population to be served by ensuring available and accessible inpatient rehabilitation beds when appropriate. Encompass Bangor will complement existing services by ensuring that service area patients have an IRF bed when needed, rather than be admitted to a less optimal setting such as home health or SNF; or forego the needed intensive inpatient rehabilitative and restorative care altogether. Neither of those scenarios is optimal for patient care; thus, the proposed project will have a positive impact on the service area residents.

Patients of IRFs in general, and Encompass facilities in particular, typically regain a higher level of functioning, have lower hospital readmission rates, and achieve overall better patient outcomes than other types of less intensive post-acute care. Moreover, Encompass' treatment protocols generally result in higher functionality gains than other IRF providers even though Encompass' costs are generally lower than other IRFs on a per-discharge basis, indicating that Encompass' model of care promotes quality and cost-effectiveness.

Additionally, Encompass Bangor patients will benefit from Encompass' position as the nation's largest provider of IRF services and have access to the quality initiatives, research methods, and clinical and administrative expertise that are currently in place at its 161 IRFs around the country, including New England Rehabilitation Hospital in Portland.

C. Whether the services affected by the project will be accessible to all residents of the area proposed to be served.

The proposed 50-bed inpatient rehabilitation hospital will be accessible to all residents of the service area, as medically appropriate. Encompass facilities participate in the Medicare and Medicaid programs, as well as have policies and procedures that ensure access to patients regardless of race, sex, age, religion, ethnicity, disability, or ability to pay. A copy of Encompass Health's Admission Policy, Nondiscrimination in the Delivery of Healthcare Policy, and Financial Assistance Policy are provided in Attachment H.

V. Orderly and Economic Development

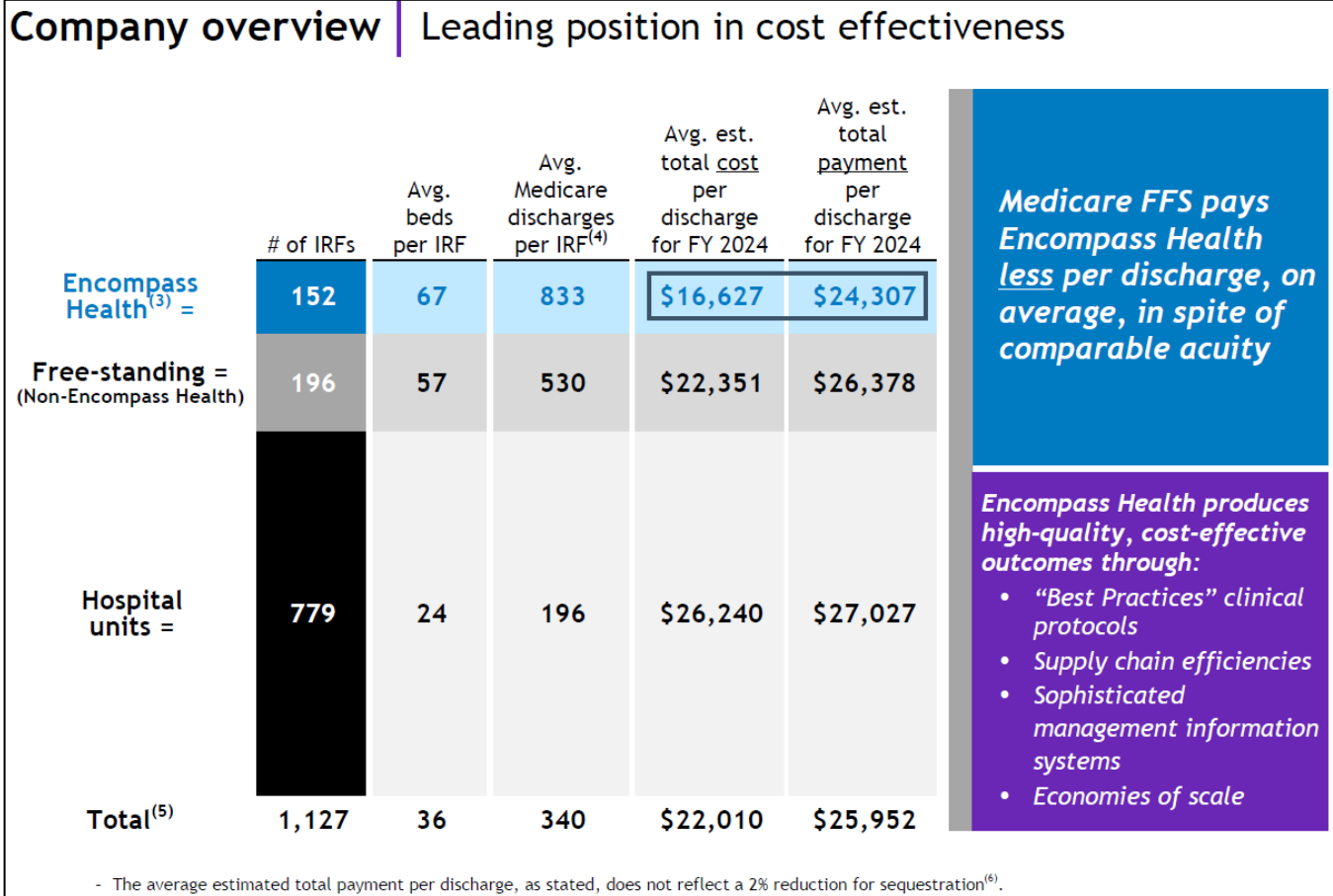
Relevant criteria for inclusion in this section are specific to the determination that the proposed services are consistent with the orderly and economic development of health facilities and health resources for the State as demonstrated by:

A. The impact of the project on total health care expenditures after taking into account, to the extent practical, both the costs and benefits of the project and competing demands in the local service area and statewide for available resources for health care.

The proposed Project is consistent with the orderly and economic development of health facilities and health resources because Encompass Bangor will be a cost-effective provider of IRF services in two primary ways.

- First, the provision of intensive inpatient rehabilitative care when needed, rather than a lower level of care such as skilled nursing care or home health, is a cost containment approach to healthcare because those patients receive the right level of care in the right setting – ultimately reducing the long-term costs of care by reducing readmissions and emergency department visits while increasing independence, self-care, and mobility. Thus, patients who are appropriately placed in IRF for their physician-prescribed intensive inpatient rehabilitative and restorative care, rather than in a less intensive setting, ultimately cost the healthcare system less while restoring the patient to his/her highest level of functioning and independence.
- Second, as shown below, Encompass Bangor will specifically be a cost-effective provider compared to other IRF providers because the new hospital will implement and use Encompass Health’s proven programs and services, which result in efficient and cost-effective care. Thus, Encompass Bangor will allow for the most efficient functioning of the health care system possible to address the identified gap in care for additional IRF beds in northern Maine.

Figure 8
Encompass Provides Cost-Effective Care



(3) The 152 IRFs shown for Encompass excludes Altru Rehabilitation Hospital (opened August 2, 2022); Patricia Neal Rehabilitation Hospital (opened March 7, 2023); Rehabilitation Hospital of Western Wisconsin (opened March 7, 2023); Ascension St. John Rehabilitation Hospital, an affiliate of Encompass Health -Owasso (opened March 21, 2023); Encompass Health Rehabilitation Hospital of Clermont (opened April 18, 2023) and Wesley Rehabilitation Hospital, an affiliate of Encompass Health (closed March 2022).

(4) In 2022, the Company averaged 1,397 total Medicare & Non-Medicare discharges per IRF in its then 143 consolidated IRFs that were open the full year.

(5) Source: FY 2024 CMS Proposed Rule Rate Setting File and the last publicly available Medicare cost reports (FYE 2020/2021/2022) or in the case of new IRFs, the Q4 2022 CMS Provider of Service File.

- All data provided was filtered and compiled from the Centers for Medicare and Medicaid Services (CMS) Fiscal Year 2024 IRF Proposed Rule Rate Setting File found at: <https://www.cms.gov/files/zip/fy-2024-irf-pps-data-files-nprm.zip>. The data presented was developed entirely by CMS and is based on its definitions which are different in form and substance from the criteria Encompass Health uses for external reporting purposes. Because CMS does not provide its detailed methodology, Encompass Health is not able to reconstruct the CMS projections or the calculation.
- The CMS file contains data for each of the 1,127 inpatient rehabilitation facilities used to estimate the policy updates for the FY 2024 IRF-PPS Proposed Rule. Most of the data represents historical information from the CMS fiscal year 2020 and 2021 periods and may or may not reflect the same Encompass Health hospitals in operation today. The total was reduced by one to reflect the closure of Wesley Rehabilitation Hospital, an affiliate of Encompass Health (closed March 2022).

Source: Investor Reference Book, Published May 31, 2023; Encompass Health.

In summary, Encompass Health leverages its demonstrated best practices, proven staffing models, comprehensive information technology, centralized administrative functions, supply chain efficiencies, economies of scale, and sole focus and commitment to the healthcare industry to ensure that its community-focused, local hospitals consistently provide the highest clinical outcomes in the most cost-effective manner.

B. The availability of state funds to cover any increase in state costs associated with utilization of the project's services.

It is not anticipated that the costs to the State of Maine will increase because of this project, primarily for two reasons. First, the majority of patients are projected to be Medicare patients (FFS or Medicare Advantage), thus there is no cost to the state for those patients. Second, Encompass Health has a national reputation for being a high-quality, cost-effective provider of intensive inpatient rehabilitation services. The implementation and use of Encompass' proven programs and services results in efficient and cost-effective care; thus, the proposed project will allow for the most efficient functioning of the Maine health care system possible.

C. The likelihood that more effective, more accessible or less costly alternative technologies or methods or service delivery may become available.

The proposed project is the only viable alternative to ensure that service area residents have the appropriate number of IRF beds locally available and accessible. There are no more effective, more accessible, or less costly alternatives to providing IRF services to the service area population requiring this level of care.

Option 1: Maintain Status Quo.

The status quo is not an acceptable alternative for service area patients who are in need of, and would benefit from, intensive inpatient rehabilitative care. Currently, these service area residents too often must be admitted to a less optimal setting such as home health or SNF; or forgo the needed intensive inpatient rehabilitative and restorative care altogether. Neither of those scenarios is optimal for patient care; thus, the proposed project will address the identified gap in care by providing needed IRF beds in northern Maine.

Absent sufficient number of beds in the service area, patients will continue to be discharged to a lesser intensive setting such as a home health or skilled nursing facility or forego needed rehab care altogether. The inability of patients in need of intensive inpatient care to timely receive that care negatively impacts all patients. Additionally, discharging a patient to a less intensive setting when more intensive services are needed increases the likelihood of readmission for that patient, which not only results in suboptimal outcomes but also increases costs to the patient and the health system as a whole.

Option 2: Travel to Distance IRF Providers for Care.

Patients in northern Maine currently are being discharged in disproportionately high numbers to less intensive PAC settings because there are too few IRF beds in the service area. Though discharge of service area patients to existing IRF providers outside the service area may be considered an "option", it is realistically not a viable option because of the difficulty of travel to distant IRF providers that places the patient far from his/her medical home and family during the approximate two-week IRF stay. Moreover, while travel to distant IRF providers is difficult on all patients and families, the hardship of travel for the elderly family members of patients is even greater.

The difficulty of placement of a patient from northern Maine to a distant IRF is illustrated by the fact that currently, only approximately one percent (1%) of service area residents are discharged to an IRF provider because of the lack of available IRF beds locally and the difficulty of travel to distant IRFs. (Source: MHDO data 2021Q4 – 2022Q3.) Thus, the option of requiring northern Maine residents to travel to IRFs distant from their family and caregivers, as well as their medical home community, is not a viable alternative to the proposed Project.

Option 3: Establish the Proposed Project.

There is no existing alternative to the establishment of the proposed new freestanding IRF. Service area residents are too often discharged to a less intensive, and therefore less optimal, post-acute care service such as home health or SNF, or forego needed IRF services altogether, because there are too few IRF beds in northern Maine.

VI. Outcomes and Community Impact

Relevant criteria for inclusion in this section are specific to the determination that the project ensures high-quality outcomes and does not negatively affect the quality of care delivered by existing services providers.

Encompass Health is a Proven High-Quality Provider of Inpatient Rehabilitation Services

As detailed elsewhere in this application, Encompass brings to the local market the resources and experience of a national company that has proven high quality, cost-effective programs and services along with the financial strength to ensure that its patients and specialized staff members have access to an extensive array of rehab-specific clinical equipment and technology. The success of the programs and services to be provided at Encompass Bangor is evidenced by Encompass Health’s higher than expected patient outcomes and comparatively low average costs, described in detail earlier in this application and summarized below:

- 132 of Encompass Health’s inpatient rehab hospitals hold one or more disease-specific certifications from The Joint Commission’s Disease-Specific Care Certification Program.
- Encompass has a proven track record of returning approximately 82% of its patients back to the community, outperforming other providers nationally.
- Medicare FFS pays Encompass Health *less* per discharge, on average, in spite of comparable acuity.

Further evidence of Encompass Health’s provision of high-quality care and outcomes are the CMS rankings and quality metrics at New England Rehab Hospital in Portland, as shown below.

Table 8 New England Rehabilitation Hospital Provides High Quality Care <i>(Higher is better for all quality indicators)</i>		
CMS Quality Indicator	New England Rehab Hosp.	National Average
<i>Results of Care:</i>		
Change in patients’ ability to care for themselves	13.4	13.3
Change in patients’ ability to move around	34.7	32.2
<i>Effective Care:</i>		
Percentage of patients who are at or above an expected ability to care for themselves at discharge	70.4%	62.1%
Percentage of patients who are at or above an expected ability to move around at discharge	72.7%	61.2%
<i>Successful Return to Home or Community:</i>		
Rate of successful return to home or community	73.06%	66.93%
Source: CMS Medicare Compare website as of 10/11/23; https://www.medicare.gov/care-compare/details/inpatient-rehabilitation/203025?city=Portland&state=ME&zipcode=&measure=irf-results-of-care . Note: Time period of data reported for Results of Care and Effective Care categories is 1/1/22-12/31/22; Successful Return to Home or Community data are 10/1/20-9/30/21; 10/1/21-9/30/22.		

In addition, Encompass hospitals have policies and protocols in place that aid in achieving high quality outcomes. These policies will also be in place at the proposed Encompass Bangor IRF. A copy of Encompass’ IRF-PAI Quality Indicator and Credentialing Policy, one example of these policies, is provided as Attachment I.

Encompass Bangor will have a Positive Relationship to Existing Providers

Encompass has proven success in entering a market that has historically low rates of IRF utilization and increasing service area residents’ appropriate use of needed intensive inpatient rehab care. In this way, Encompass’ education of area physicians, case managers, caregivers, and patient population benefits not only patients and their families, but also existing IRF and area SNF providers by appropriately educating the market on the benefits of post-acute rehab care to patients.

Consequently, Encompass’ entry in markets has resulted in a “rising tide lifting all boats” scenario in terms of a greater number of medically-appropriate patients in need of rehab services being identified and then ultimately admitted to the appropriate level of care. Attachment J includes several examples of Encompass’ positive impact on existing providers, including both IRF and SNF entities, in CON-regulated states where in each instance the state’s respective health planning agency approved a new freestanding hospital similar to the project Encompass Bangor proposes to establish.

The positive relationships of New England Rehab Hospital to area SNFs and home health agencies (“HHAs”) is further evidence that Encompass Bangor is expected to similarly have a positive relationship to the existing health care delivery system. The following lists include the many SNFs and HHAs to which New England Rehab Hospital refers patients who require a level of SNF or home health care, thus illustrating that Encompass rehab hospitals complement rather than compete with other post-acute care providers.

Skilled Nursing Facility	Location
Atlantic Rehab & Nursing	Calais
Augusta Rehab Center	Augusta
Bangor Nursing and Rehab Center	Bangor
Barron Center	Westbrook
Blue Hill Med Serge	Blue Hill
Bodwell Unit (midcoast)	Brunswick
Brentwood Manor	Yarmouth
Brewer Rehab	Brewer
Bridgton Health Care	Bridgton
Bridgton Hospital Swing Unit	Bridgton
Camden Health Care	Camden
Cedar Ridge	Skowhegan
Clover Manor	Auburn
Coastal Manor	Yarmouth
Collier’s Rehab	Ellsworth
Colonial Health Care	Lincoln
Country Manor	Coopers Mills

Skilled Nursing Facility	Location
Courtland Rehab	Ellsworth
Cove's Edge	Damariscotta
D'Youville Pavilion	Lewiston
Durgin Pines	Kittery
Eastside Rehab	Bangor
Evergreen Manor	Saco
Falmouth By The Sea	Falmouth
Freeport Nursing Home	Freeport
Fryeburg Health Care Center	Fryeburg
Glenridge (Maine General)	Augusta
Gorham House	Gorham
Gray Birch (Maine General)	Augusta
Greenwood Center	Sanford
Harbor Hill	Belfast
Harbor Home	York
Hawthorne House	Freeport
High View Manor	Madawaska
Horizons	Brunswick
Kennebunk Nursing Home	Kennebunk
Klearview Manor Nursing Home	Fairfield
Lakewood	Waterville
Ledgeview	West Paris
Ledgewood Manor	Windham
Madigan Healthcare	Houlton
Maine Veteran's Home	Caribou
Maine Veteran's Home	Scarborough
Maine Veteran's Home	South Paris
Maple Crest Rehab Center	Madison
Market Square	South Paris
Marshwood Center	Lewiston
Mere Point (Bodwell)	Brunswick
Mineral Springs	North Conway NH.
Montello Manor	Lewiston
Newton Center	Sanford
Norway Rehab and Living Center	Norway
Oak Grove	Waterville
Orchard Park	Farmington
Orono Commons	Orono
Penobscot Nursing Home	Penobscot
Pine Point Manor	Scarborough
Piper Shores	Scarborough
Pleasant Hill Nursing Home	Fairfield
Quarry Hill	Camden
Riverridge	Kennebunk
Ross Manor	Bangor

Skilled Nursing Facility	Location
Rumford Community Home	Rumford
Sandy River	Farmington
Seal Rock	Saco
Seaside	Portland
Sedgewood Commons	Falmouth
Somerset Rehab Center	Bingham
Songee Rehab	Bar Harbor
South Portland Nsg. Home	South Portland
Southridge	Biddeford
Springbrook	Westbrook
St. Andre	Biddeford
St. Andrews	Boothbay Harbor
St. Joseph's Manor	Portland
St. Joseph's Nursing Home	Frenchville
Stillwater Health Care	Bangor
Tallpines	Belfast
The Cedars	Portland
Victorian Villa Nursing Home	Canton
Westgate Manor	Bangor
Winship Green	Bath
Winward Gardens	Camden
Woodlawn Rehab	Skowhegan

Home Health Agencies	City or Area(s) of Coverage
Amedisys Home Health	Portland
Androscoggin Home Care and Hospice	Auburn, Wilton, Norway & Bridgton
Able Home Health	Saco
Bangor Area VNA	Bangor
Calais Regional Hospital Home Health	Calais
Community Health and Counseling	Bangor, Ellsworth, Lincoln,
Community Health and Counseling	Machias & Calais
Corner Stone VNA	York County in Maine
CHANS	Brunswick
Kindred	Bangor, Portland, Sanford & Lewiston
Hancock County Home Care & Hospice	Aroostook, Ellsworth & Caribou
Healthreach Homecare and Hospice	Waterville
St. Joseph's Home Care	Bangor
Inland Home Care	Waterville
Interim Healthcare	So. Portland, Brunswick, Lewiston
Kno-Wal-Lin Home Care & Hospice	Rockland, Belfast & Newcastle
Miles Home Health and Hospice	Damariscotta
St. Andrew's Home Health	Boothbay Harbor
Home Health Visiting Nurses	Cumberland and York Counties
VNA Home Health & Hospice	South Portland

Home Health Agencies	City or Area(s) of Coverage
Visiting Nurses of Aroostook	Houlton, Fort Kent & Caribou
Waldo County Home Health Care Services	Belfast
York Hospital Home Care	York

Specific to general acute care hospitals, the proposed 50-bed IRF will complement existing services by ensuring that service area patients have an inpatient rehabilitation bed available when needed, which will facilitate timely discharge of patients from the general acute care hospital to inpatient rehab. Absent sufficient numbers of IRF beds, patients in need of those services oftentimes remain in the general acute care hospital longer than necessary, negatively impacting both the patient ready for discharge to a rehab program and patients in need of that occupied general acute care bed.

VII. Service Utilization

Relevant criteria for inclusion in this section are specific to the determination that the project does not result in inappropriate increases in service utilization, according to the principles of evidence-based medicine adopted by the Maine Quality Forum.

According to its website, “The Maine Quality Forum (MQF) is a state agency that is responsible for monitoring and improving the quality of health care in the State of Maine...The projects that the MQF supports align with the needs of its stakeholders as it relates to advancing the Institute for Healthcare Improvement (IHI) triple aim.

- Improving the patient experience of care (including quality and satisfaction);
- Improving the health of populations; and
- Reducing the per capita cost of health care.”

As evidenced throughout this application, Encompass’ proposed 50-bed inpatient rehabilitation hospital in Bangor aligns with the MQF’s IHI Triple Aim by providing adequate and available high-quality inpatient rehabilitation services to residents of its service area close to their family/caregivers and medical home community. The overall health of the population will improve and the per capita cost of health care will be reduced by patients receiving the appropriate level of rehabilitative care in an IRF environment, which ultimately reduces the long-term costs of care by reducing readmissions and emergency department visits while increasing independence, self-care, and mobility.

In short, the Project provides the state with a cost containment approach to ensuring appropriate health care utilization because IRF patients will receive the right level of care in the right setting, ultimately reducing the long-term costs of care while restoring the patient to his/her highest level of functioning and independence.

Moreover, in addition to ensuring the appropriate utilization of IRF services, the Project will enable general acute care hospitals to appropriately utilize their resources by ensuring that, for example, patients in need of IRF services do not remain in the general acute care bed longer than necessary waiting on discharge to a post-acute care service. Similarly, by reducing readmissions of patients to the hospital and the emergency departments of general acute care hospitals, the Project will help minimize inappropriate and/or unnecessary utilization of general acute care resources.

Specific to IRF and SNF providers, Encompass’ education of area physicians, case managers, caregivers, and patient population is expected to benefit existing IRF and area SNF providers by appropriately educating the market on the benefits of post-acute rehab care to patients, ultimately resulting in a “rising tide lifting all boats” scenario in terms of a greater number of medically-appropriate patients in need of rehab services being identified and then ultimately admitted to the appropriate level of care.

VIII. Timely Notice

Evidence that the applicant has followed the appropriate procedures outlined in the Maine Certificate of Need Procedures Manual.

Encompass intends to fully comply with the regulatory requirements of the CON statute.

List of Attachments	
A	Site Plan
B	Organizational Chart
C	Architectural Information <ul style="list-style-type: none"> ▪ Schematic Floor Plan ▪ Pictures of Typical Encompass Health Hospital Features
D	List of Clinical Rehab Equipment and Technology
E	Articles on the Successful Treatment of COVID-19 Patients
F	Financial Information <ul style="list-style-type: none"> ▪ Completed CONU Financial Forecast Module ▪ Proposed lease between Encompass Bangor and EHMRE ▪ Letter Confirming Availability of Funds for the Project ▪ EHC Audited Financial Statements
G	Research Articles/Studies on Effectiveness of IRF Services
H	Admission Policy Nondiscrimination in the Delivery of Healthcare Policy Financial Assistance Policy
I	IRF-PAI Quality Indicator and Credentialing Policy
J	Project will Have a Positive Relationship to Existing Providers

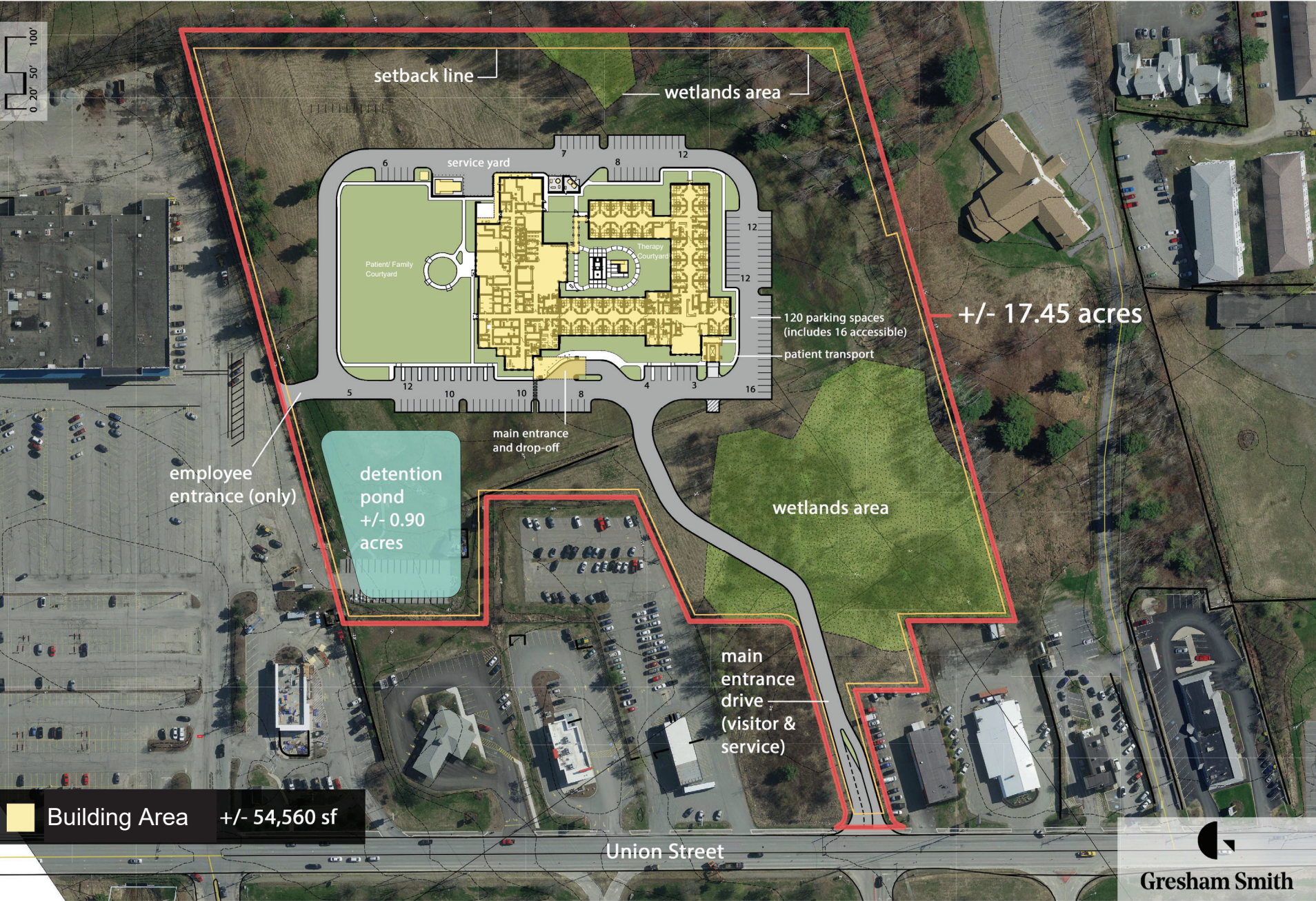
Attachment A

Site Plan



Bangor, Maine - 50 Bed Site Plan

Union Street - Single Story



Building Area +/- 54,560 sf

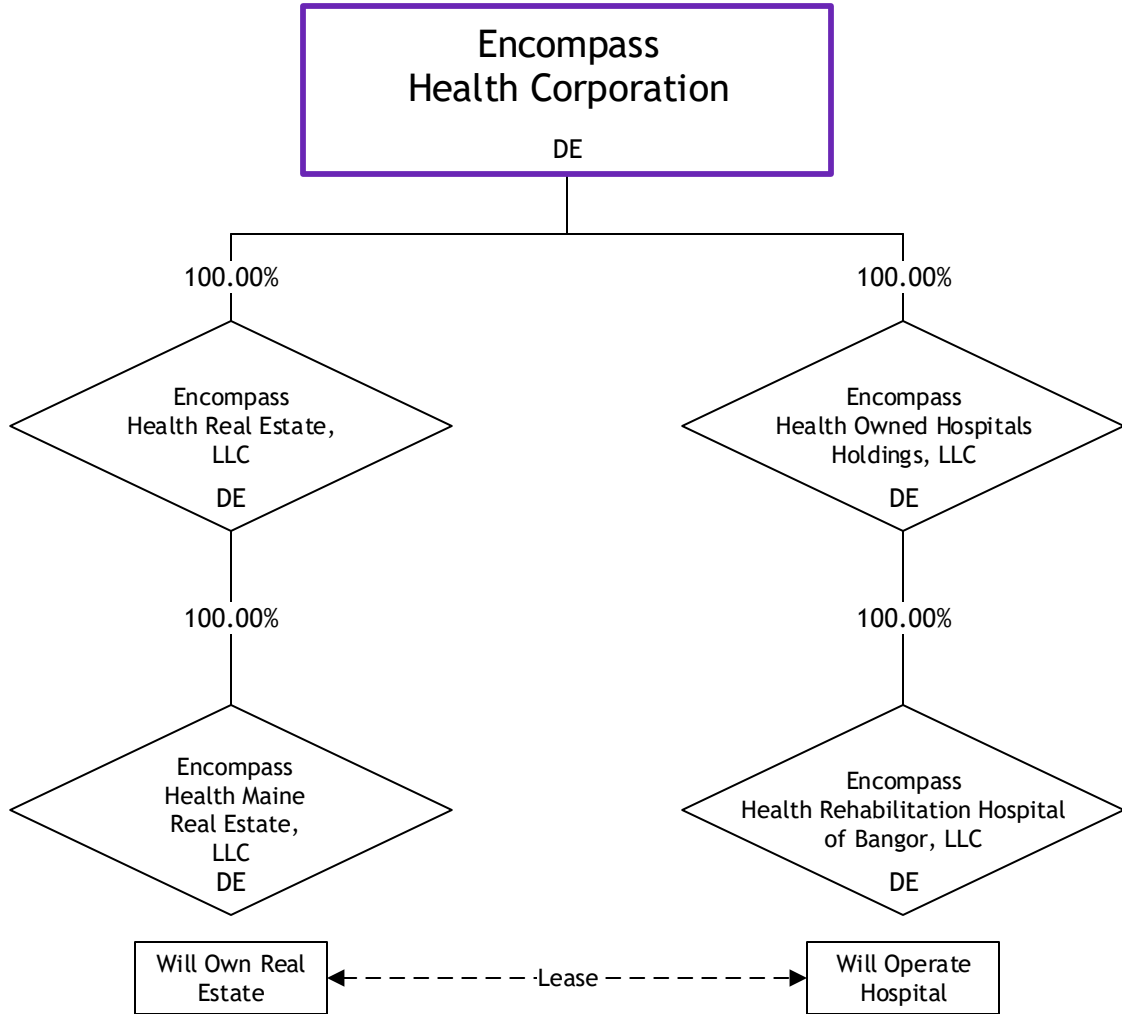
+/- 17.45 acres

Union Street

Gresham Smith

Attachment B
Organizational Chart

Encompass Health Maine Real Estate, LLC and
Encompass Health Rehabilitation Hospital of Bangor, LLC



Attachment C

Architectural Information

- **Schematic Floor Plan**
- **Pictures of Typical Encompass Facilities**

Drawn By: Author
Checked By: Checker
Approved By: Approver



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EHC BANGOR MAINE - 50 BED INPATIENT REHABILITATION HOSPITAL

UNION STREET - SINGLE STORY

Revision

No.	Date	Description
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OVERALL CLINICAL
PLAN

A201

09.08.2023

This Line is 3 Inches When Printed Full Size

758

6

7

12

8

12

12

10

10

8

4

3

16

CLINICAL AREA SCHEDULE		
Name	Area	CLINICAL SPACES LEGEND
CLINICAL	34412.17 SF	■ CLINICAL
NON-CLINICAL	19086.63 SF	■ NON-CLINICAL

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Encompass Health Recently Constructed Hospitals



Spacious Private Rooms and Baths



Sample Lobbies



Sample Therapy Gyms



Sample Activities of Daily Living (ADL) Suites



Sample Nursing Stations and Hallway



Sample Outside Grounds



Sample Dining Room



Attachment D

List of Clinical Rehab Equipment and Technology

THESE ITEMS ARE STANDARD IN ALL NEW HOSPITALS

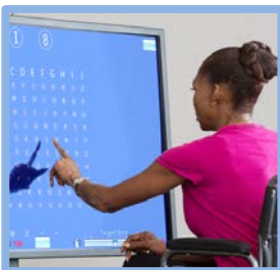
Rehabilitation Equipment & Technology

Clinical technologies are invaluable tools in the therapy process and offer patients an exciting and enjoyable experience during their road to recovery. Encompass Health's Therapy Innovations Committee (TIC) evaluates the most cutting-edge, innovative clinical technologies on the market today. The committee establishes and maintains technology standards for new hospitals and identifies best-in-class technologies for Disease Specific Certifications (DSC) to support the gold star quality of care HealthSouth is known for. Some examples of these technologies are as follows:



Bioness Vector Overhead Track System®

Bioness Vector is an overhead track and harness system that provides a safe ambulation environment for both therapist and patient. Without the fear of falling, patients can focus more fully on their tasks of gait and balance.



B.I.T.S. Bioness Integrated Therapy System®

Using a 50" touch screen monitor, BITS is designed to improve visual abilities for a wide range of patients with visually-related learning problems, strabismus, amblyopia, and traumatic brain injury. BITS offers 16 unique programs with customizable features designed to enhance outcomes for physical and occupational therapy patients.



Saeboflex®

Stroke survivors and other neurologically impaired patients use this custom-fitted hand and arm splint to increase shoulder, elbow, wrist and hand function. During therapy exercises, the splint is used to retrain the hand's grasp and release movements.



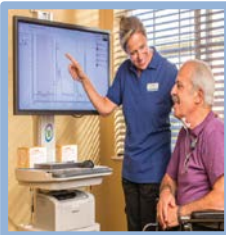
Bioness H200®

When stroke, brain injury or spinal cord injury occur, a person's neurological abilities, like grasping, can be impaired. The innovative NESS H200 helps improve hand function and voluntary movement.



Bioness L300™

This small wireless device is worn on a patient's leg to help improve walking abilities. Through electrical stimulation, NESS L300 retrains lower leg muscles, increasing motion and blood circulation enabling the return to a more normal step.



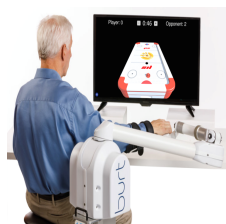
Synchrony®

Unlike any other dysphagia rehabilitation solution available, Synchrony™ enables SLPs and patients to literally "See the Swallow" using virtual reality augmented sEMG biofeedback. This important capability helps SLPs evaluate the specific dynamics of a normal, effortful or Mendelsohn swallow in real time, while guiding a series of therapeutic exercise activities that are engaging and fun for patients.



Interactive Metronome™

Interactive Metronome is a brain-based rehabilitation assessment and training program created to improve a patient's ability to plan, organize and use language.



BURT®

BURT® is a user-friendly robot that assists in improving motor control and fine motor skills in the arms and hands. This robot contains integrated gaming software to practice movement patterns and provides customizable features to tailor to patient-specific rehabilitation treatments.



VitalStim®

For those who suffer from dysphagia, a common condition among stroke and brain injury survivors, this therapy greatly improves swallowing ability with electrical stimulation.

Attachment E

Articles on the Successful Treatment of COVID-19 Patients



Original Research

Baseline Characteristics and Outcomes for People With and Without COVID-19 Diagnoses Receiving Inpatient Rehabilitation Care Across the US in 2020-2021

Elissa J. Charbonneau, DO, MS ^{a,b},
 Prateek Grover, MD, PhD, MHA ^{a,c}, Jeffery S. Johns, MD ^{a,d},
 Susan M. McDowell, MD ^{a,e}, Joseph V. Stillo, MD, PhD, MA ^a

^a Encompass Health Corp, Birmingham, AL

^b Tufts University Medical School, Boston, MA

^c Washington University School of Medicine, St Louis, MO

^d Vanderbilt University Medical Center, Nashville, TN

^e University of Kentucky, Lexington, KY

KEYWORDS

Rehabilitation;
 Outcomes;
 COVID-19

Abstract Objective: To assess sociodemographic, medical complexity, and outcomes of persons receiving care at inpatient rehabilitation facilities (IRFs) with and without a diagnosis of COVID-19. **Design:** A retrospective cohort study using electronic medical record (EMR) data from 138 IRFs across 34 states and Puerto Rico.

Setting: N/A.

Participants: IRF EMR data for 212,663 patients discharged between 04/01/2020 and 05/31/2021 (N=212,663), of which 16,199 (COVID-19 group) had a primary or secondary COVID-19 diagnosis based upon ICD codes set (ICD-10 codes U07.1, B94.8, Z86.19, Z86.16).

Main Outcome Measures: Four categories: (a) sociodemographic, (b) medical complexity, (c) process, that is, standard IRF processes, and clinical outcomes (collected routinely as part of administrative reporting), and (d) functional outcomes. Patients with missing functional data associated with short/incomplete stays (n=623) were excluded from analysis of functional outcomes category only. Standard descriptive analysis techniques were employed for comparing categorical and continuous variables between groups.

List of abbreviations: BIMS, Brief Interview for Mental Status; CIM, critical illness myopathy; CIPN, critical illness polyneuropathy; CMI, Case Mix Index; CMS, Center for Medicare and Medicaid Services; EMR, electronic medical record; IRF, inpatient rehabilitation facility; LOS, length of stay; PHQ, Patient Health questionnaire; RIC, Rehabilitation Impairment Category; SNF, skilled nursing facility.

Disclosures: The investigators have no financial or nonfinancial disclosures to make in relation to this project.

Cite this article as: Arch Rehabil Res Clin Transl. 2023;000:100281

<https://doi.org/10.1016/j.arrct.2023.100281>

2590-1095/© 2023 The Authors. Published by Elsevier Inc. on behalf of American Congress of Rehabilitation Medicine. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Results: Statistically significant differences were noted between the COVID-19 group and non-COVID groups for race (26.0% vs 19.7% non-minority, $P < .001$), Case Mix Index (1.49 vs 1.46, $P < .001$), Center for Medicare and Medicaid Services 60% rule qualification (79.0% vs 73.4%, $P < .001$), time to onset (24.3 vs 18.0 days, $P < .001$), length of stay (14.2 vs 12.9 days, $P < .001$), and discharge disposition (to community: 75.3% vs 81%, $P < .001$; to acute care facility: 15.6% vs 10.8%, $P < .001$). The COVID-19 group had higher frequency of respiratory and cardiovascular disease, diabetes, encephalopathy, morbid obesity, and critical illness neuropathy and myopathy. Clinically insignificant differences were noted for age, sex, depression, and cognitive assessment. Ability to participate and functional outcomes were comparable between the groups.

Conclusion: There are significant differences between the COVID-19 and non-COVID group in some sociodemographic, medical complexity, process and clinical outcomes, but not in functional outcomes. The ability to participate in the IRF-required intensity of therapy services along with attainment of comparable levels of functional outcomes supports the benefit of IRFs for persons with COVID-19.

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Although lessening now in frequency, the human coronavirus SARS-CoV-2,¹ with its clinical disease manifestations collectively known as COVID-19, has disrupted the health care system on a global scale since late 2019. This disruption by the pandemic has affected the entire continuum of care in the US, from acute to post-acute and community care settings. Several national public health emergency exemptions have helped to improve access to care for both COVID-19 and non-COVID populations.² From a functioning perspective, rehabilitation has been a major strategy for maximizing participation for people diagnosed with COVID-19.³ This vital need for rehabilitation for COVID-19 patients has also been highlighted by agencies such as the World Health Organization.^{4,5}

There is recognition that for the more severely (14%) and critically-ill patients with COVID-19 (5%), inpatient rehabilitation has played a vital role over the past 2 years.⁶ Inpatient rehabilitation facilities (IRFs) aim to deliver coordinated rehabilitation care to address multisystem manifestations associated with COVID-19, with potential minimization of subsequent sequelae.⁷ The benefit of inpatient rehabilitation for COVID-19 has been described by studies such as the New York and New Jersey Research Consortium study (n=320).⁸ Another study⁹ comparing 139 patients with COVID-19 with 196 patients without COVID-19 concluded that COVID-19 positive status is not a barrier to discharge or functional outcomes. Some European studies demonstrate the benefit of early rehabilitation as well.¹⁰

However, most of these studies are relatively small and describe a geographically limited sample. Additionally, access to inpatient rehabilitation needs to be fortified in the face of payment denials that might result from payer policy and review in order to make a stronger case for COVID-19 inpatient rehabilitation care at the national policy level. Country-level studies contrasting baseline characteristics and outcomes for people with and without COVID-19 simultaneously receiving care in IRFs across the nation are needed. This study aims to provide evidence supporting care in IRFs across the nation for people with COVID-19 by comparing sociodemographics, medical complexity, and outcomes between people with and without a COVID-19 diagnosis that received inpatient rehabilitation care from

04/01/2020 to 05/31/2021 at 1 of 138 IRFs that are part of a large IRF system across 34 states and Puerto Rico.

Methods

Study design

This was a country-level retrospective cohort study using a standard electronic medical record (EMR), ACE-IT, as the source dataset for IRF data. The study was designated as non-human subjects research by Washington University IRB, because study team members did not have access to any identifiable data, and all data retrieval was conducted by Encompass Health IT personnel, who de-identified it prior to sharing with the study team. Informed consent was, therefore, not applicable because of the nature of this study.

The study sample was composed of patients discharged from 138 Encompass Health IRFs during the time period 04/01/2020 to 05/31/2021. Fifty-three of the IRFs are joint venture hospitals co-owned by larger hospital systems and 5 are partnerships with academic centers. Patients with age less than 18 years (n=3) and cases with incomplete functional data (n=3484) were excluded. COVID-19 diagnoses were identified as by 1 of the following ICD-10 codes: U07.1 (COVID-19), B94.8 (Sequelae of other specified infectious and parasitic diseases), Z86.19 (Personal history of other infectious and parasitic diseases, effective until 12/31/2020), or Z86.16 (Personal history of COVID-19, effective starting 1/1/21). The total sample size was 212,663 with 16,199 identified with (COVID-19 group) and 196,464 without (non-COVID group) a COVID-19 diagnosis.

Four categories of variables were collected, namely, socio-demographic, medical complexity, process and clinical outcomes, and functioning outcomes. Functional data were found to be missing for short or incomplete stays (n=623) due to discharge to the acute care setting, discharge against medical advice, length of stay (LOS) less than 3 days, or inpatient mortality. These patients were excluded when analyzing functional outcomes only and were retained for data analysis of the other 3 variable categories.

Data collection

Sociodemographic variables including age, sex, and race/ethnicity were obtained at admission as coded by data entry into the EMR at registration.

Medical complexity variables at admission included Case Mix Index (CMI),¹¹ Center for Medicare and Medicaid Services (CMS) 60% rule qualification (60% of IRF cases must have 1 of CMS's 13 qualifying conditions so that facilities maintain exemption from the Medicare Hospital Prospective Payment System, "PPS", and are paid under the IRF PPS¹²), etiologic diagnoses specified by Rehabilitation Impairment Category (RIC),¹³ and Case Mix Group¹⁴ determined and tabulated according to CMS regulatory requirements. Comorbid conditions documented by physicians in the EMR during the course of the rehabilitation encounter were tabulated and categorized according to the convention of a report of the National Center for Health Statistics, National Vital Statistics System.¹⁵ At admission, clinicians assessed depression using the Patient Health Questionnaire (PHQ2 and PHQ9)¹⁶ and cognitive status using the Brief Interview for Mental Status (BIMS) Scale.^{17,18}

Process and clinical outcome variables included metrics that were routinely collected outside of the EMR as part of clinical care quality. These included time to onset, defined as the time duration from acute care hospital admission date to IRF admission date¹⁴; LOS is defined as the time duration between the IRF admission and discharge date; inpatient mortality; discharge disposition with options including acute hospital readmission, discharge to home, or skilled nursing facility (SNF); and fall rate, measured as the number of falls per patient days. As entered into the EMR by clinicians, therapy intensity was measured as hours of therapy completed per day, averaged over a 7-day period, with the standard goal being 3 hours per day over 5 days or modified goal being 15 hours over 7 days. Functional outcome variables were measured at admission and discharge using

Section GG of the IRF Patient Assessment Instrument,¹⁴ as required by CMS. Section GG scores were recorded for mobility (bed mobility, sit to stand, transfer from toilet, chair, and car, walk, manage stairs) and self-care (eating, oral hygiene, toilet hygiene, shower/bathing, upper body dressing, lower body dressing, and putting on/taking off footwear) domains.¹⁹ Functional gain for self-care and mobility was calculated as the difference between respective discharge and admission GG scores.

The Net Promotor score was collected by patient questionnaires after discharge in order to describe patient experience of IRF care.²⁰

Data analysis

Categorical variables were described by frequencies and continuous variables by means and standard deviations. Difference in frequencies for categorical variables between the 2 groups were analyzed with the pairwise z-test and frequencies. Differences in mean for continuous variables were analyzed with a 2-tailed unpaired *t* test.

Results

Sociodemographics

Sociodemographics are presented in [table 1](#).

Age

As shown in [figure 1](#), the study cohort showed an average age of 70.3 years. The COVID-19 group was younger by 0.4 years than the non-COVID group (70.0 vs 70.4, *P* < .001).

Sex

As shown in [figure 1](#), the study cohort showed an even distribution of male and female patients (50.5% female vs 49.5%

Table 1 COVID-19 and non-COVID groups—baseline characteristics

Admission Characteristics	Total Cohort (n=212,663)	COVID-19 (n=16,199)	Non-COVID (n=196,464)	<i>P</i> Value
Sociodemographics				
Age (years): mean ± SD*	70.3 (14.3)	70.0 (13.6)	70.4 (14.4)	<.001
Sex: male, n (%) [†]	105,370 (49.5)	8715 (53.8)	96,660 (49.2)	<.001
Race/ethnicity: non-White n (%) [†]	42,973 (20.2)	4218 (26.0)	38,756 (19.7)	<.001
Baseline cognitive and psychological status, n (mean score)*				
Mood assessment: PHQ2	211,910 (0.37)	16,155 (0.33)	195,755 (0.37)	<.001
Mood assessment: PHQ9	35,462 (6.7)	2594 (6.14)	32,868 (6.74)	<.001
Mental status: BIMS	207,240 (16.58)	15,864 (16.64)	191,376 (16.58)	.677
Process indicators of medical complexity				
CMI mean score* (99% CI)	1.464 (1.462-1.466)	1.493 (1.485-1.501)	1.462 (1.460-1.465)	<.001
RIC distribution, n (%)[†]				
- Neurologic condition	45,942 (21.6)	7768 (48.0)	38175 (19.4)	<.001
- Stroke	40,296 (18.9)	1483 (9.2)	38,813 (19.8)	<.001
- Other disabling conditions	25,554 (12)	3354 (20.7)	22,200 (11.3)	<.001
Time to onset: days* (95% CI)	18.5 (17.3-18.9)	24.3 (19.6-26.1)	18 (16.8-18.5)	<.001
CMS 60% rule qualifying, n (%) [†]	157,052 (73.9)	127,325 (79.0)	144,264 (73.4)	<.001

Abbreviations: CI, confidence interval.

* Difference in mean for continuous variables were analyzed with 2-tailed unpaired *t* test.

† Difference in frequencies for categorical variables between the 2 groups were analyzed with the pairwise z-test and frequencies.

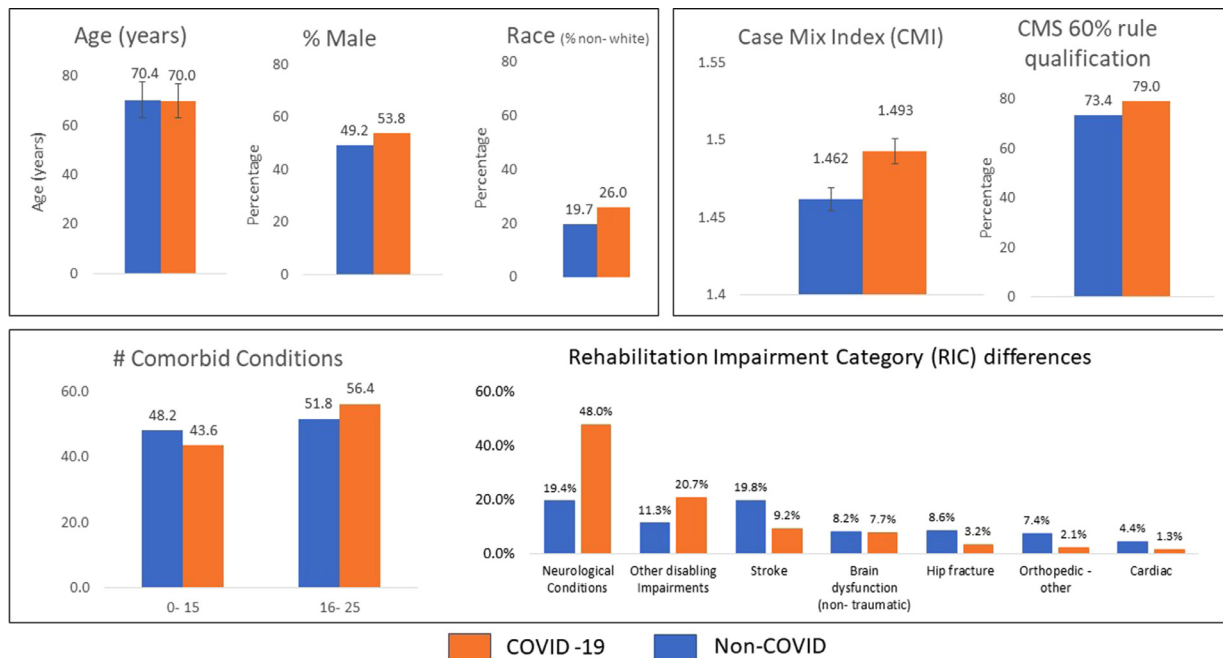


Fig 1 Major differences between COVID-19 and non-COVID groups: sociodemographics and medical complexity metrics.

male, $P < .01$). Males had a higher percentage of COVID-19 than females (53.8% vs 46.2%, $P < .001$) with an odds ratio of 1.2 for a male to have a COVID-19 diagnosis.

Race/ethnicity

As shown in [figure 1](#), The percentage of minorities (non-white) was significantly higher in the COVID-19 group compared with non-minorities (26.0% vs 19.7%, $P < .001$) in descending order of frequency for the Hispanic, black, Asian, American Indian, and Islander groups.

Medical complexity

Medical complexity is shown in [table 2](#).

CMI

Patients with COVID-19 had a higher CMI (1.493 vs 1.462; $P < .001$; [fig 1](#)).

CMS 60% rule qualifying

The COVID-19 group had 5.6% more CMS-qualified patients (79.0% vs 73.4%; $P < .001$; [fig 1](#)).

RIC-based diagnosis definitions

RIC-based diagnosis definitions are presented in [fig 1](#). The COVID-19 group showed a significant shift in distribution within the IRF-specified RICs. There was a higher percentage of *Neurological conditions* and *other disabling impairments* (difference=31.4% and 1.5%, respectively, $P < .001$). Within the *Neurological conditions* RIC, there was a very high frequency of critical illness myopathy (CIM), and to a lesser extent, critical illness polyneuropathy (CIPN) in the COVID-19 group. 68.4% of patients with COVID-19 in the *Neurological conditions* RIC had CIM compared with 37.0% in the non-COVID group.

Depression assessment

Patients with COVID-19 showed a lower score on the admission PHQ2 (0.33 vs 0.37, difference=-0.04, $P < .001$) and the PHQ9 (6.14 vs 6.74, difference=-0.6, $P < .001$).

Cognitive assessment (BIMS)

Admission BIMS Scale showed no significant difference in the BIMS Score (16.64 vs 16.58, difference=0.06, $P > .5$).

Comorbid conditions

Comorbid conditions are presented in [table 2](#) and [figure 1](#). The COVID-19 group displayed a higher frequency of having 16-25 conditions (56.26% vs 51.76%, $P < .001$). Patients with COVID-19 have higher percentages of influenza and pneumonia (difference=25.1%, $P < .001$) as well as respiratory failure/arrest (difference=19.9%, $P < .001$). Adult respiratory distress syndrome was diagnosed in only 1.01% of patients with COVID-19, but with a significantly higher frequency than in patients without COVID-19 (difference=0.97%, $P < .001$). Patients with COVID-19 have slightly higher percentage of hypertensive disease (difference=0.7%, $P < .033$), higher percentage of diabetes (difference=8.6%, $P < .001$), and lower percentage of cerebrovascular disease (difference=-13.4%, $P < .001$). In addition, COVID-19 patients had a significantly higher percentage of morbid obesity (difference=1.7%, $P < .001$), encephalopathy (difference=4.8%, $P < .001$), and acute embolism and thrombosis of deep vein of lower extremity (difference=1.5%, $P < .001$).

Standard Inpatient Rehabilitation Process and Clinical outcomes

Standard Inpatient Rehabilitation Process and Clinical outcomes are presented in [table 3](#).

Table 2 COVID-19 and non-COVID groups: medical comorbidities with high prevalence, listed in descending order of frequency in COVID-19 group

Comorbid Conditions (%)	Cohort (n=212,663)	COVID-19 (n=16,199)	Non-COVID (n=196,464)	P Value*
Hypertensive diseases	80.43	81.07	80.38	<.033
Diabetes	53.62	61.63	52.96	<.001
Influenza and pneumonia	7.44	30.66	5.52	<.001
Respiratory failure (includes arrest)	7.16	25.5	5.61	<.001
Heart failure	23.86	23.49	23.89	.246
COPD	17.84	17.91	17.83	.806
Cerebrovascular diseases	29.43	17.08	30.45	<.001
Morbid obesity (BMI 40 or greater)	13.14	14.76	13.01	<.001
Encephalopathy, unspecified	9.74	14.21	9.37	<.001
Acute embolism and thrombosis of other specified OR unspecified deep vein of lower extremity	2.87	4.26	2.75	<.001
Adult respiratory distress syndrome*	0.11	1.01	0.04	<.001

NOTE. Gray cells indicate significantly greater frequency in the COVID-19 group.

Abbreviations: BMI, body mass index; COPD, chronic obstructive pulmonary disease.

* Between-groups difference were calculated using the pair-wise z-test.

Time to onset

Time to onset is presented in [figure 2](#). The average time to onset for the study cohort was 18.48 days (99% CI=[17.28, 18.94]). Patients with COVID-19 showed longer onset days compared with non-COVID by 6.3 days (24.3 vs 18 days, $P<.001$).

LOS

Patients with COVID-19 displayed a longer LOS by 1.3 days (14.2 days vs 12.9 days, $P<.001$; [fig 2](#)).

Discharge disposition

Discharge to the community was lower for the COVID-19 group compared with the non-COVID group (75.3% vs 81%, $P<.001$), and discharge to acute care facility was higher for the COVID-19 group (15.6% vs 10.8%, $P<.001$; [fig 2](#)). Discharge rate to SNF was similar for the COVID-19 group and non-COVID group (7.87% vs 7.34%, $P<.013$).

Mortality

Inpatient mortality was similar for both groups: 99.77% of the cohort was discharged alive, with 99.66% of the COVID-19 group and 99.78% of the non-COVID group discharged alive, $P<.002$.

Fall rate

There was no significant difference in the incidence of falls: the fall rate was 8.1 for the COVID-19 group and 7.7 for the non-COVID group, $P<.083$.

Therapy intensity

The average daily therapy intensity (averaged over 7 days) for the COVID-19 group was slightly less than the non-COVID group (2.27 hours vs 2.32 hours, $P<.001$), but this difference was not clinically meaningful ([fig 2](#)).

Table 3 COVID-19 and non-COVID groups—outcomes

Outcomes	Cohort (n=212,663)	COVID-19 (n=16,199)	Non-COVID (n=196,464)	P Value
Process outcomes				
Length of stay in days, mean \pm SD*	13.0 (6.7)	14.2 (8.6)	12.9 (6.5)	<.001
Falls (%) [†]	7.8	8.1	7.7	.083
Discharged alive, n (%) [†]	212,171 (99.77)	16,144 (99.66)	196,027 (99.78)	<.002
Discharge disposition, n (%)[†]				
- Community	171,341 (80.6)	12,203 (75.3)	159,138 (81.0)	<.001
- Acute care	23,709 (11.2)	2533 (15.6)	21,178 (10.8)	<.001
- SNF	15,696 (7.4)	1275 (7.9)	14,421 (7.3)	<.013
- All other (includes expired)	1917 (0.9)	188 (1.2)	1725 (0.9)	<.001
NPS (Promoter), n (%)*	48,448 (76.24)	3859 (80.50)	44,590 (75.89)	<.001
Functional outcomes, mean \pm SD*				
Therapy intensity in hours/day	2.32 (0.32)	2.27 (0.35)	2.32 (0.32)	<.001
GG Mobility admission	32.7 (12.4)	31.9 (12.1)	32.7 (12.4)	<.001
GG Mobility change	32.0 (16.0)	32.8 (16.8)	31.9 (16.0)	<.001
GG Self-care admission	21.5 (6.25)	21.5 (6.6)	21.5 (6.2)	.804
GG Self-care change	13.1 (6.4)	13.5 (6.7)	13.0 (6.4)	<.001

Abbreviation: NPS, Net Promotor score.

[†] Difference in frequencies for categorical variables between the 2 cohorts were analyzed with the pairwise z-test and frequencies.

* Difference in mean for continuous variables were analyzed with 2-tailed unpaired *t* test.

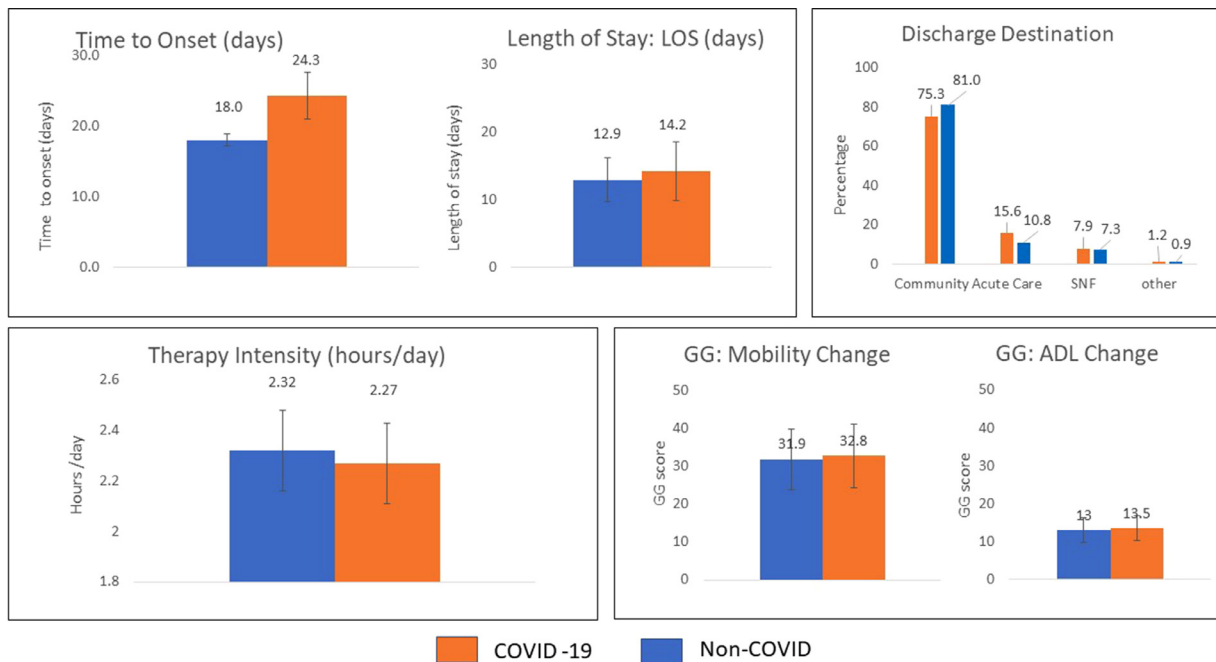


Fig 2 Major differences between COVID-19 and non-COVID groups: standard inpatient rehabilitation process outcome and functional outcome metrics.

Patient experience (Net Promotor score)

The COVID-19 group demonstrated a higher satisfaction score represented by a 4.6% higher “Promoter” score (80.5% vs 75.9%, $P < .001$).

Functional outcomes

Functional outcomes are presented in [table 3](#) and [figure 2](#).

Mobility

Admission mobility scores were lower for the COVID-19 group compared with non-COVID group (31.9 vs 32.7, difference = 0.8, $P < .001$). Discharge mobility scores were similar for both groups with slightly greater gain in the COVID-19 group (32.8 vs 31.9, difference = 0.9, $P < .0001$).

Self-care

There was no difference in the average self-care score on admission between COVID-19 and patients without COVID-19 (21.5, $P > .05$). However, patients with COVID-19 showed a greater change (13.5 vs 13.0, difference = 0.5, $P < .001$).

Discussion

As far as we know, this is the first study to report country-level (USA) baseline characteristics and outcomes for persons with COVID-19 completing inpatient rehabilitation. The large sample size and geographic reach support generalizability of the study findings. This analysis is intended as a first pass at understanding characteristics and outcomes of a sizeable COVID-19 IRF population. We expect that these data will be useful in future analyses for exploring the association of rehabilitation outcomes for patients with COVID-19 with baseline characteristics such as race, insurance

coverage, and other social determinants of health along with specific primary rehabilitation diagnoses such as brain injury, spinal cord injury, and limb loss.

With regard to the sociodemographic findings, it is noteworthy that this study’s mean age of 70.3 years is approximately 10 years higher than reported comparisons in the literature on IRF cohorts, most of which are single center studies.^{21,22} Although the COVID-19 group demonstrates a slightly lower mean age (70.0) than the non-COVID group (70.4), this difference is not felt by the authors to be clinically meaningful in this cohort. The male sex predominance and higher odds of being a male with COVID-19 agree with the other studies.⁸ The recognized racial imbalance of COVID-19 in the community²³ continues to the IRF setting with 6.31% higher frequency in the non-white group with 1.43 times higher likelihood of being a minority. This finding agrees with other studies documenting increased likelihood of COVID-19 positivity in African-American group receiving care in the IRF setting.²¹

These data show higher medical complexity for the COVID-19 group, as shown by the higher CMI and RIC distribution ([table 1](#)). The COVID-19 group comorbidities with high frequency include diseases of the respiratory system, hypertension, and diabetes- these conditions are associated with severe and fatal cases of COVID-19 in the literature.^{24,25} The COVID-19 group also shows a higher incidence of thrombotic complications, consistent with the known thrombogenicity of this disease.²⁶ This complexity is also reflected by longer time to onset days ([table 1](#)), longer LOS ([table 3](#)), and higher discharge to acute care facility and SNF rate ([table 3](#)). Overall, COVID-19 is a multisystem disease affecting neurologic,²⁷ psychiatric, musculoskeletal, pulmonary, and cardiovascular systems.²⁸⁻³⁰ Given the level of physician supervision required in an IRF setting, medical attention to associated comorbidities in the immediate post-acute period allows these to be identified and addressed.

The IRF setting is also conducive to diagnosing underrecognized conditions such as ICU-acquired weakness and related causes.³¹ Timely diagnosis of rehabilitation conditions associated with critical illness^{32,33} such as pain, motor weakness, pulmonary insufficiency, and psychological stress, along with appropriate management using a combination of medical and rehabilitation strategies has been shown to lessen morbidity, reduce LOS, and mitigate chronic disability for several conditions. Weakness is a major manifestation seen with COVID-19. Literature supports the occurrence of peripheral muscle dysfunction secondary to a myopathic etiology for many diseases such as chronic obstructive pulmonary disease and acute respiratory distress syndrome,³⁴ congestive heart failure,³⁵ and uremia,³⁶ with relative disuse being only 1 of many contributors.³⁷ Because skeletal muscle dysfunction as a result of systemic inflammation has been well documented, and inflammation is a key feature of COVID-19,³⁸ it is conceivable that myopathic processes play a major role in explaining the weakness associated with COVID-19 as well. The high frequency of CIM and CIPN found in this study supports the occurrence of comorbid neuropathic and myopathic processes³⁹ in the COVID-19 population, and consideration of these entities contributes to the design and implementation of rehabilitation programs. Future studies could look at how IRF care can be helpful in modification of the disease course to positively affect wide-ranging and variable manifestations of SARS-CoV-2 infection beyond the initial phase, referred to as post-COVID syndrome.⁴⁰

It is important to consider that, in order for IRFs to qualify for CMS's payment methodology for IRFs, they must demonstrate that at least 60% of patients (known as the "60% rule"¹²) are admitted because of a condition that is included within 13 discreet diagnostic categories specified by CMS as CMS 60% rule qualifying conditions. Therefore, accurate identification and documentation of a CMS 60% rule qualifying condition is critical. The COVID-19 group exhibited greater than 5% higher rate of qualification with the 60% rule (table 1), partly due to the shift toward higher frequency of the RIC *neurologic conditions*. CIM and CIPN fall within this category (table 1),¹² and the higher incidence of CIM in the COVID-19 group could account for the shift toward the *Neurological conditions* RIC. The COVID-19 group's high frequency of compliance with the 60% rule also reflects better alignment with medical conditions that, according to CMS, require IRF-level medical and rehabilitation management.¹²

As demonstrated via therapy intensity data (table 3), the COVID-19 group was able to participate in the intensity of therapy services specified per current CMS guidelines as a minimum 3 hours per day 5 days per week or 15 hours spread over 7 days. The study COVID-19 group did not fall at a rate significantly different from the non-COVID group.

The effectiveness of IRF rehabilitation care delivery is supported by the improvement in mobility as well as self-care GG scores (table 3). Unlike other published studies,²¹ self-care admission score was not significantly different between COVID-19 and non-COVID groups, but the lower admission mobility score was similar to previous studies. The average change in self-care and mobility scores was higher in the COVID-19 group than has been previously described.⁸ Overall, the IRF care experience based on Net Promoter

Scores¹⁸ was significantly more positive for patients with COVID-19.

Limitations and future work

Limitations of this study are similar to those typically found with the use of hospital medical record datasets for research purposes. This study did not differentiate between COVID-19 as a primary vs comorbid diagnosis. This is in accordance with the intent of the study to understand the overall effect of COVID-19 on IRF admissions, and the value of IRF for improving clinical and functional outcomes for persons with an acute or subacute diagnosis of COVID-19. There exists a selection bias that favors selection of the most severely ill patients that survived the acute course of illness and require the intensity of rehabilitative services of an IRF setting. Because severity is a major factor determining appropriateness and insurance approval for inpatient rehabilitative care at an IRF setting, the authors suggest cautious application of these data to other post-acute less intense levels of rehabilitative care where similar levels of disease severity might obviate admissibility and levels of service and outcomes are measured differently.⁴¹ While this study primarily presents the United States IRF perspective for COVID-19 care, the provision of effective rehabilitative services is needed even after discharge from IRF.⁴² Hence, understanding how post-acute care modifies the functional trajectory to affect post-COVID syndrome would be a natural subsequent area of study. Other future work includes understanding regional variations in baseline and outcomes for COVID-19, as well the association of outcomes for COVID-19 with baseline characteristics such as race, insurance, and other social determinants of health.

Conclusions

This country-level study provides insight into the rehabilitation of COVID-19 in the inpatient rehabilitation setting in the USA, with recognition of the high medical acuity in this population. Racial disparities do exist in the IRF setting across the nation and requires closer attention through policy and system development. From a programmatic perspective, this study demonstrates that COVID-19 IRF care is successful across the nation, as demonstrated by non-inferior functional outcomes across 138 IRFs in 34 states and Puerto Rico. From a rehabilitation research perspective, these data could aid in our understanding of functional progression during the course of recovery. Taken together, these baseline and outcomes data can serve as descriptive benchmarks to support and guide policy for IRF services for patients affected by COVID-19.

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IN THE NEWS: COVID-19 SUCCESS STORIES



Micah Sims returns home after two month battle with COVID-19 | KRIV-TV Houston
www.fox26houston.com/news/many-covid-19-patients-spend-months-in-rehabilitation



Atlanta-Area Teacher Home after Severe COVID-19 Case, Recovery At Encompass Health | WAGA-TV
www.fox5atlanta.com/news/fulton-county-teacher-hospitalized-for-weeks-after-contracting-covid-19



Georgia Couple Survives Extended Battle with COVID-19 | The Donalsonville (GA) News
www.donalsonvillenews.com/2020/06/10/survivin-g-covid-19-hurleys-on-the-road-to-recovery-is-finally-home



Bakersfield, CA Couple Reunited At Home After Two Divergent Battles With COVID-19 | KGET
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IN THE NEWS: COVID-19 SUCCESS STORIES



Encompass Health Petersburg, VA Hospital Examined As COVID-19 Recovery Center | WTVR-TV

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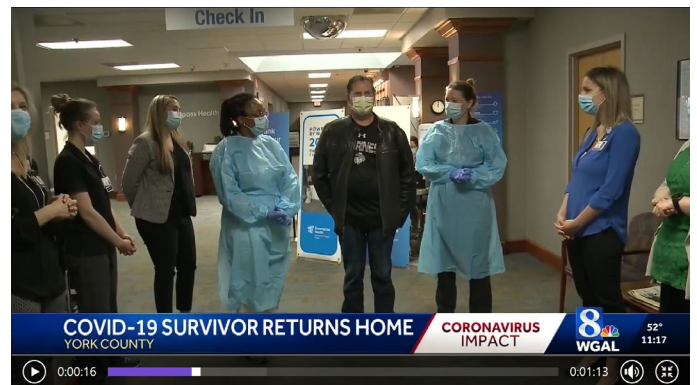
Alabama Man Battling COVID-19 for Two Month Recovers at Regional Rehabilitation Hospital | WXTX

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Massachusetts Couple Finally Reunited After Two Months Battling COVID-19 | The Boston Globe

www.bostonglobe.com/2020/05/28/metro/billerica-couple-reunited-home-after-being-hospitalized-with-covid-19



Pennsylvania Man Returns Home after Weeks of Rehabilitation Following Critical COVID-19 Case | WGAL

www.encompasshealth.com/news-and-events/2020/06/01/19/03/yorkrehab-wade-covid

IN THE NEWS: COVID-19 SUCCESS STORIES



Bakersfield Optometrist Heading Home after Severe COVID-19 Infection, Weeks Of Rehabilitation | KGET

www.kget.com/news/dr-steve-ratty-makes-it-home-from-covid-19-ordeal



91-Year-Old Recovers From COVID-19, Celebrates Birthday At Encompass Health | Jersey Shore Online

<https://www.jerseyshoreonline.com/ocean-county/celebrating-91st-birthday-survivor-of-covid-19>



Memphis Man Recounts Recovery from COVID-19 as More Than Just Lung Issue | WMC-TV <https://encompasshealth.com/news-and-events/2020/05/15/33/memphis-william-kiser>



MidAmerica Rehabilitation Hospital helps patient through COVID-19 Recovery | WDAF-TV www.fox4kc.com/tracking-coronavirus/grateful-to-be-alive-lenexa-man-describes-fight-with-covid-19-challenging-road-to-recovery

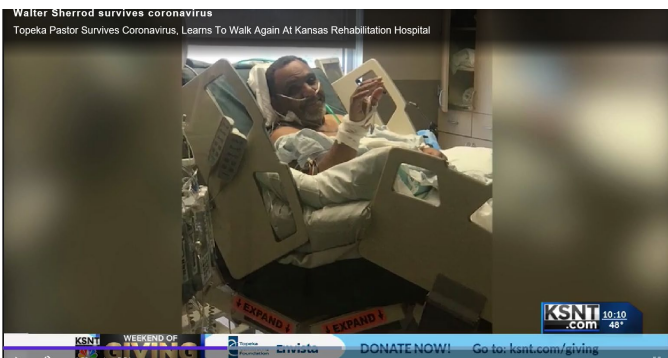
IN THE NEWS: COVID-19 SUCCESS STORIES



Paramedic Contracts COVID-19, Recovers At Encompass Health Rock Hill | WCNC-TV
<https://encompasshealth.com/news-and-events/2020/05/20/14/20/rock-hill-paramedic-conquers-covid>



Husband and wife finish COVID-19 rehabilitation together at MidAmerica Rehabilitation Hospital | KSHB
<https://www.encompasshealth.com/news-and-events/2020/05/12/20/57/midamerica-couple-beats-covid>



COVID-19 Survivor & Topeka Pastor Learns To Walk Again At Kansas Rehabilitation Hospital | KSNT-TV
www.ksnt.com/health/coronavirus/coronavirus-survivor-topeka-pastor-receives-experimental-drugs-learns-how-to-walk-again/



Las Vegas Man Rings Bell At Encompass Health After Making Successful Coronavirus Recovery | KTNV-TV
www.ktnv.com/news/coronavirus/las-vegas-man-determined-in-his-defeat-of-coronavirus

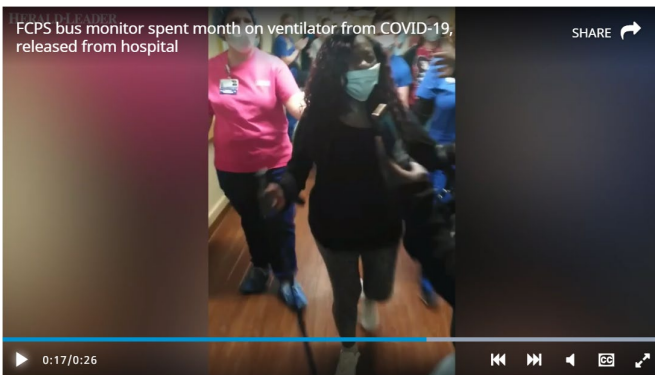
IN THE NEWS: COVID-19 SUCCESS STORIES



Man Heads To AnMed Health Rehab Hospital After Battling COVID-19 | Anderson Independent-Mail
www.independentmail.com/story/news/local/south-carolina/2020/05/08/anmed-coronavirus-patient-gets-one-step-closer-home/3088206001/



Healthcare Professionals Support For Ballard Health Physician Recovering From COVID-19 | WJHL-TV
<https://www.wjhl.com/news/local/ballad-health-doctor-regains-strength-looks-forward-to-work-following-covid-19-battle/>



Woman Leaves Cardinal Hill Rehab Hospital After Battling COVID-19 | The Lexington (KY) Herald-Leader
www.kentucky.com/news/local/education/article242524641.html



Couple Hospitalized With Coronavirus Reunited After Wife Released From Encompass Health Of Treasure Coast | TCPalm (FL)
<https://www.tcpalm.com/story/news/local/indian-river-county/2020/05/06/couple-recovers-coronavirus-vero-beach-after-plasma-donations/5177546002/>

IN THE NEWS: COVID-19 SUCCESS STORIES



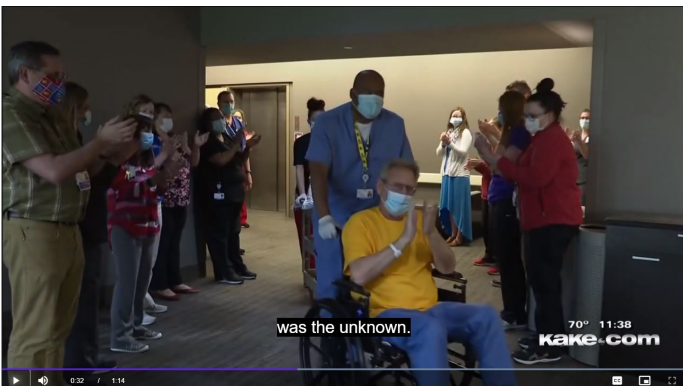
Grove City, Ohio Man Released From Mount Carmel Rehab Hospital After Fighting COVID-19 | WCMH-TV

www.nbc4i.com/news/husband-of-grove-city-woman-who-lost-parents-brother-to-covid-19-gets-released-from-rehab/



Massachusetts Man Moved to Fairlawn Rehabilitation Hospital after Recovering From COVID-19

www.recorder.com/Mahar-football-assistant-coach-Jamie-Paluk-home-after-battling-COVID-19-34065736



Wichita, Kansas Man Released From Wesley Rehabilitation Hospital After Battling COVID-19 | KAKE-TV

www.kake.com/story/42059760/wichita-man-shares-story-of-battling-covid-19-as-he-heads-home-to-recover



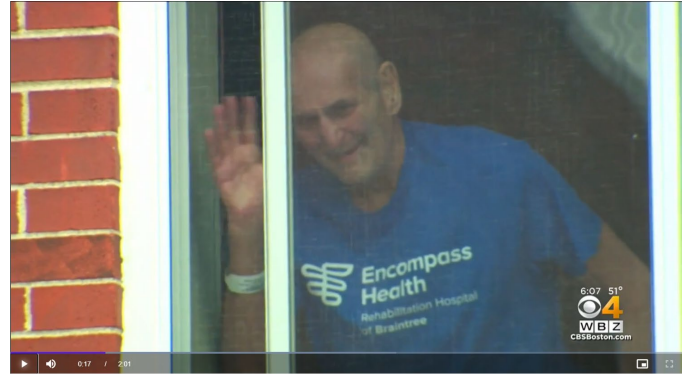
Van Matre Rehabilitation Hospital Medical Director Quoted In Piece About Couple Reuniting After COVID-19 Battle | WREX-TV

www.wrex.com/2020/04/22/rockford-couple-reunites-after-conquering-covid-19

IN THE NEWS: COVID-19 SUCCESS STORIES



Chaplain Discharged From Encompass Health Rehabilitation Hospital Of Sugar Land | KPRC-TV
www.click2houston.com/news/local/2020/04/19/waller-county-precinct-3-chaplain-makes-full-recovery-after-testing-positive-for-coronavirus/?__vfz=medium%3Dsharebar



Sandwich Man Recovers From Coronavirus While Fighting Leukemia | CBS Boston
<https://boston.cbslocal.com/video/4562955-sandwich-man-recovers-from-coronavirus-while-fighting-leukemia/>

Attachment F

Financial Information

- **Completed CONU Financial Forecast Module**
- **Proposed Lease between Encompass Bangor and EHMRE**
- **Letter Confirming Availability of Funds for the Project**
- **EHC Audited Financial Statements**

Encompass Health Rehabilitation Hospital of Bangor, LLC (Operating Entity)

Bangor
Establishment of 50-Bed Facility

Required Tables

Directions: When completing the tables please note that **only the shaded fields require information**. The worksheets are designed to automatically calculate totals and pre-populate fields as information is entered. If you have any questions please contact Unit staff. All tables are required tables unless determined as not applicable by CONU staff.

Applicants must submit an electronic version of the completed workbook to DLRS.con@maine.gov.

Table	Description	Table	Description
<u>1A</u>	Project Costs		
<u>1B</u>	Construction Timing		
<u>1C</u>	Depreciation Expense (no 'fill-in' required)		
<u>1D</u>	Exempt Project Expenses	<u>12C</u>	Balance Sheet - With Project
<u>2</u>	Debt Financing Arrangement: Sources & Uses of Funds		
<u>9B</u>	Income Statement - Project Only	<u>21</u>	Ratios (no 'fill-in' required)
<u>9C</u>	Income Statement - With Project (no 'fill-in' required)	<u>24</u>	Calculation of Fee Due (no 'fill-in' required)

**Encompass Health Rehabilitation Hospital of Bangor, LLC (Operating Entity)
Establishment of 50-Bed Facility**

TABLE 1A
PROJECT COSTS

Construction Costs		
1	New Construction	\$ -
2	Renovation	-
3	Site Work	-
4	Fixed Equipment	-
5	Design/Building Contingency (auto-5%)	-
6	Additional Requested Contingency (no more than 3%)	-
7	Construction Manager Fee	-
8	Other (please specify in <i>Assumptions</i>)	-
	Subtotal	\$ -
Related Project Costs		
		Table
1	Major Moveable Equipment	\$ 4,071,220
2	Furniture, Fixtures & Other Equipment	2,160,789
3	Architectural / Engineering Fees	-
4	Land Acquisition	-
5	Purchase of Building	-
6	Administrative Expenses & Permits	2,541,000
7	Debt Financing Expenses	-
8	Debt Service Reserve Fund	-
9	Contingency (auto-5%)	438,650
10	Working Capital	-
11	Other (please specify in <i>Assumptions</i>)	-
	Subtotal	\$ 9,211,659
Total Project Costs		\$ 9,211,659

Debt Financing Expenses		
1	Capital Interest (Please complete <i>Construction Timing & Debt Financing</i>)	\$ -
2	Bond Discount or Placement Fee	-
3	Misc. Financing Fees & expenses (issuance costs)	-
4	Other	-
	Subtotal	\$ -
Less Interest Earnings on Fund		
1	Debt Service Reserve Funds	\$ -
2	Capitalized Interest Account	-
3	Construction Fund	-
4	Other	-
	Subtotal	\$ -
Total Debt Financing Expenses		\$ -
feeds to line 7 above		

**Encompass Health Rehabilitation Hospital of Bangor, LLC (Operating Entity)
Establishment of 50-Bed Facility**

Table 1B
Construction Timing

Expenditure		-3			
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Construction Costs					
New Construction	-	\$ -	\$ -	\$ -	\$ -
Renovation	-	-	-	-	-
Site Work	-	-	-	-	-
Fixed Equipment	-	-	-	-	-
Design Bidding Contingency	-	-	-	-	-
Requested Contingency	-	-	-	-	-
Construction Manager Fee	-	-	-	-	-
Other	-	-	-	-	-
Related Project Costs					
Major Moveable Equipment	\$ 4,071,220	-	-	-	\$ 4,071,220
Furnishings, Fixtures & other Equipment	2,160,789	-	-	-	2,160,789
Architectural/Engineering Fees	-	-	-	-	-
Land Acquisition	-	-	-	-	-
Purchase of Buildings	-	-	-	-	-
Administrative Expenses & Permits	2,541,000	300,000	-	-	2,241,000
Net Debt Financing Expenses	-	-	-	-	-
Debt Service Reserve Fund	-	-	-	-	-
Contingency (auto-5%)	438,650	-	-	-	438,650
Working Capital	-	-	-	-	-
Other	-	-	-	-	2,541,000
Capital Interest	-	-	-	-	-
TOTAL Project Costs	\$ 9,211,659	\$ 300,000	NOT COMPLETE	NOT COMPLETE	NOT COMPLETE

**Encompass Health Rehabilitation Hospital of Bangor, LLC (Operating Entity)
Establishment of 50-Bed Facility**

Table 1C
Depreciation Expense

	Expenditure	Years Depreciated	Annual Depreciation
Construction Costs			
New Construction	\$ -	40	\$ -
Renovation	-	40	-
Site Work	-	15	-
Fixed Equipment	-	40	-
Design Bidding Contingency	-	40	-
Requested Contingency	-	40	-
Construction Manager Fee	-	40	-
Other	-	0	-
Subtotal	\$ -		\$ -
<hr/>			
Related Project Costs			
Major Moveable Equipment	\$ 4,071,220	8	\$ 508,903
Furnishings, Fixtures & other Equipment	2,160,789	8	270,099
Architectural/Engineering Fees	-		-
Land Acquisition	-	-	-
Purchase of Buildings	-		-
Administrative Expenses & Permits	2,541,000		-
Net Debt Financing Expenses	-	-	-
Debt Service Reserve Fund	-	-	-
Contingency (auto-5%)	438,650	10	43,865
Working Capital	-	-	-
Other	-	10	254,100
Capital Interest	-	-	-
Subtotal	\$ 9,211,659		\$ 1,076,966
	Project Costs	Weighted Life	Annual Depreciation
Totals	\$ 9,211,659		\$ 1,076,966

**Encompass Health Rehabilitation Hospital of Bangor, LLC (Operating Entity)
Establishment of 50-Bed Facility**

Table 1D
Exempt Project Expense Disclosure

	Expenditure	Years Depreciated	Annual Depreciation
Construction Costs			
Parking Garage	\$ -	40	\$ -
Physician Office Space	-	40	-
Parking Lot	-	15	-
Fixed Equipment Related Above	-	40	-
Design Bidding Contingency- 5%	-	40	-
Requested Contingency- Based on 1A	-	40	-
Construction Manager Fee	-	-	-
Other	-	-	-
Subtotal	\$ -		\$ -
<hr/>			
Related Project Costs			
Replacement Equipment (detailed Below)			\$ -
Other Intangible Assets		-	-
NWC		-	-
Limited Assets		-	-
Investments			-
Depreciation			-
			-
Contingency (auto-5%)		10	-
Computer Information Systems (detail below)	2,160,789	8	270,099
Communications Equipment	-	7	-
Other	-	-	-
Subtotal	\$ 2,160,789		\$ 270,099
	Exempt Project Costs	Weighted Life	Annual Depreciation
Totals	\$ 2,160,789	8.00	\$ 270,099

Encompass Health Rehabilitation Hospital of Bangor, LLC (Operating Entity)
Establishment of 50-Bed Facility

Table 2
 Debt Financing Arrangement, Sources & Uses of Funds

Sources of Funds			
1	Financing Instrument		
	a. Interest Rate		
	b. Loan Term (Years)		
	c. Loan Period		
	d. Amount Financed	To:	
2	Equity Contribution	Acquisition?	No (Y or N)
3	Other Sources		
	a. Working Capital		
	b. Fundraising		-
	c. Grants		-
	d. Other (please specify in Assumptions)	Intercompany Cash	9,211,659
Total Required Funds			\$ 9,211,659

Uses of Funds		
1	New Construction	\$ -
2	Renovation	-
3	Site Work	-
4	Fixed Equipment	-
5	Design Bidding Contingency	-
6	Requested Contingency	-
7	Construction Manager Fee	-
8	Other	-
9	Major Moveable Equipment	4,071,220
10	Furnishings, Fixtures & other Equipment	2,160,789
11	Architectural/Engineering Fees	-
12	Land Acquisition	-
13	Purchase of Buildings	-
14	Administrative Expenses & Permits	2,541,000
15	Net Debt Financing Expenses	-
16	Debt Service Reserve Fund	-
17	Contingency (auto-5%)	438,650
18	Working Capital	-
19	Other	-
20	Capital Interest	-
Total Uses of Funds		\$ 9,211,659

**Encompass Health Rehabilitation Hospital of Bangor, LLC (Operating Entity)
Establishment of 50-Bed Facility**

Table 9B

Income Statement: Project Only

	Proposed Year 1 2027	Proposed Year 2 2028	Proposed Year 3 2029
Revenues			
Outpatient Care Revenues	\$ -	\$ -	\$ -
Inpatient Care Revenues	22,439,666	29,543,161	34,337,309
Gross Patient Care Revenues	\$ 22,439,666	\$ 29,543,161	\$ 34,337,309
Free Care	\$ (112,198)	\$ (147,716)	\$ (171,687)
Difference in Net Self-Pay	-	-	-
Contractual Adjustments	(6,338,697)	(7,665,148)	(8,556,027)
Net Patient Care Revenue	\$ 15,988,771	\$ 21,730,297	\$ 25,609,595
Other Operating Revenue	\$ -	\$ -	\$ -
Total Operating Revenue	\$ 15,988,771	\$ 21,730,297	\$ 25,609,595
Operating Expense			
Salaries	\$ 9,012,468	\$ 10,562,504	\$ 11,758,592
Benefits	2,081,880	2,439,938	2,716,235
Supplies	664,951	884,116	1,037,761
Other Operating Expenses	3,721,530	4,289,553	4,692,627
Depreciation	1,076,966	1,083,216	1,089,466
Facility Lease	2,712,382	2,766,630	2,821,962
Total Operating Expense	\$ 19,270,177	\$ 22,025,957	\$ 24,116,643
Net Operating Income (Loss)	\$ (3,281,406)	\$ (295,660)	\$ 1,492,952
Non-Operating Revenue	-	-	-
Excess (Deficit) of Rev Over Exp	\$ (3,281,406)	\$ (295,660)	\$ 1,492,952

**Encompass Health Rehabilitation Hospital of Bangor, LLC (Operating Entity)
Establishment of 50-Bed Facility**

Table 9C

Income Statement: With Project

	Proposed Year 1 2027	Proposed Year 2 2028	Proposed Year 3 2029
Revenues			
Outpatient Care Revenues	\$ -	\$ -	\$ -
Inpatient Care Revenues	22,439,666	29,543,161	34,337,309
Gross Patient Care Revenues	\$ 22,439,666	\$ 29,543,161	\$ 34,337,309
Free Care	\$ (112,198)	\$ (147,716)	\$ (171,687)
Difference in Net Self-Pay	-	-	-
Contractual Adjustments	(6,338,697)	(7,665,148)	(8,556,027)
Net Patient Care Revenue	\$ 15,988,771	\$ 21,730,297	\$ 25,609,595
Other Operating Revenue	\$ -	\$ -	\$ -
Total Operating Revenue	\$ 15,988,771	\$ 21,730,297	\$ 25,609,595
Operating Expense			
Salaries	\$ 9,012,468	\$ 10,562,504	\$ 11,758,592
Benefits	2,081,880	2,439,938	2,716,235
Supplies	664,951	884,116	1,037,761
Other Operating Expenses	3,721,530	4,289,553	4,692,627
Depreciation	1,076,966	1,083,216	1,089,466
Facility Lease	2,712,382	2,766,630	2,821,962
Total Operating Expense	\$ 19,270,177	\$ 22,025,957	\$ 24,116,643
Net Operating Income (Loss)	\$ (3,281,406)	\$ (295,660)	\$ 1,492,952
Non-Operating Revenue	-	-	-
Excess (Deficit) of Rev Over Exp	\$ (3,281,406)	\$ (295,660)	\$ 1,492,952

**Encompass Health Rehabilitation Hospital of Bangor, LLC (Operating Entity)
Establishment of 50-Bed Facility**

TABLE 12C
BALANCE SHEET
WITH PROJECT

ASSETS	Proposed Year 1 2027	Proposed Year 2 2028	Proposed Year 3 2029
Current Assets			
Cash & Investments	\$ 1,495,332	\$ 3,433,236	\$ 4,731,612
Patient Accounts Receivable	2,321,658	3,146,737	3,718,653
Total Current Assets	\$ 3,816,990	\$ 6,579,973	\$ 8,450,265
Property, Plant & Equipment			
Land, Buildings & Improvements			
Fixed Equipment			
Major Moveable Equipment	9,211,659	9,261,659	9,311,659
Construction in Progress			
Total Property, Plant & Equipment	\$ 9,211,659	\$ 9,261,659	\$ 9,311,659
Less: Accumulated Depreciation			
Land, Buildings & Improvements			
Fixed Equipment			
Major Moveable Equipment	(1,076,967)	(2,160,182)	(3,249,648)
Total Accumulated Depreciation	\$ (1,076,967)	\$ (2,160,182)	\$ (3,249,648)
Total Net Property, Plant & Equipment	\$ 8,134,692	\$ 7,101,477	\$ 6,062,011
Other Assets - Right of Use	\$ 45,856,652	\$ 44,501,436	\$ 43,105,000
TOTAL ASSETS	\$ 57,808,334	\$ 58,182,886	\$ 57,617,276
LIABILITIES AND FUND BALANCE			
Current Liabilities			
Accounts Payable	\$ 704,275	\$ 796,291	\$ 864,440
Salaries, Wages & Payroll Taxes Payable	344,739	404,030	449,782
Current Portion of Long-Term Debt	1,355,216	1,396,436	1,438,910
Total Current Liabilities	\$ 2,404,230	\$ 2,596,757	\$ 2,753,132
Long-Term Debt			
Capital Lease Obligations	44,501,436	43,105,000	41,666,090
Total Long-Term Debt	\$ 44,501,436	\$ 43,105,000	\$ 41,666,090
Total Other Non-Current Liabilities	\$ 14,184,074	\$ 16,058,195	\$ 15,282,169
Total Liabilities	\$ 61,089,740	\$ 61,759,952	\$ 59,701,391
Net Equity	\$ (3,281,406)	\$ (3,577,066)	\$ (2,084,115)
TOTAL LIABILITIES & FUND BALANCE	\$ 57,808,334	\$ 58,182,886	\$ 57,617,276

**Encompass Health Rehabilitation Hospital of Bangor, LLC (Operating Entity)
Establishment of 50-Bed Facility**

Table 21
Selected Financial Ratios

Hospital Encompass Health Rehabilitation Hospital of Bangor, LLC (Operating Entity)			
FINANCIAL PERFORMANCE INDICATORS	2027	2028	2029
Profitability			
Operating Margin	-20.5%	-1.4%	5.8%
Net Margin	-20.5%	-1.4%	5.8%
Return on Total Assets	-136.5%	-11.4%	54.2%
Operating Surplus	\$ (3,281,406)	\$ (295,660)	\$ 1,492,952
Total Surplus	\$ (3,281,406)	\$ (295,660)	\$ 1,492,952
Liquidity			
Current Ratio	1.59	2.53	3.07
Days in Account Receivable	53.0	52.9	53.0
Days Cash on Hand	30.0	59.8	75.0
Average Payment Period	32.6	31.5	30.9
Solvency			
Cash Flow to Total Debt	-4.8%	1.8%	6.0%
Efficiency			
Total Asset Turnover	(1.36)	(0.11)	0.54
Fixed Asset Turnover	(0.40)	(0.04)	0.25
Current Asset Turnover	(0.86)	(0.04)	0.18
Other			
Total Net Assets	(3,281,406)	(3,577,066)	(2,084,115)
Gross Patient Service Revenue	22,439,666	29,543,161	34,337,309
Net Patient Service Revenue	15,988,771	21,730,297	25,609,595

**Encompass Health Rehabilitation Hospital of Bangor, LLC (Operating Entity)
Establishment of 50-Bed Facility**

CON FILING FEE CALCULATION

Project Costs - Encompass Health Hospital of Bangor, LLC (From Table 1A)	\$	9,211,659
Project Costs - Encompass Health Maine Real Estate, LLC (Real Estate Entity)	\$	54,343,187
less: Contingencies (From Table 1A)		
Design/Building Contingency (auto-5%)	-	
Additional Requested Contingency (no more than 3%)	-	
Contingency (auto-5%) on Related Project Costs	438,650	
Contingency - Encompass Health Maine Real Estate, LLC	<u>5,630,815</u>	
	<u>6,069,465</u>	
Base Project Costs		<u>57,485,381</u>
less: Debt Financing Fees (Table 1A)	<u>-</u>	
Adjusted Project Costs		57,485,381
Exempt Project Costs (from Table 1D)	<u>2,160,789</u>	
Total Project Costs Subject to Fee	\$	<u>55,324,592</u>
Fee (\$5,000 minimum ; \$1,000 for every \$1M or part thereafter, \$250,000 maximum fee.)	\$	<u>56,000</u>

LEASE AGREEMENT

Encompass Health Maine Real Estate, LLC (“Lessor”)

AND

Encompass Health Rehabilitation Hospital of Bangor, LLC (“Lessee”)

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LEASE AGREEMENT

THIS LEASE AGREEMENT (this "**Lease**") dated as of _____, 20__, is entered into by and between **Encompass Health Maine Real Estate, LLC**, a Delaware limited liability company, having its principal office at 9001 Liberty Parkway, Birmingham, Alabama 35242 ("**Lessor**"), and **Encompass Health Rehabilitation Hospital of Bangor, LLC**, a Delaware limited liability company, having its principal office at 9001 Liberty Parkway, Birmingham, Alabama 35242 ("**Lessee**").

ARTICLE 1 LEASED PROPERTY; TERM

1.1 **Leased Property.** Upon and subject to the terms and conditions hereinafter set forth, Lessor leases to Lessee and Lessee rents from Lessor all of Lessor's interest in and to the following property (collectively, the "**Leased Property**"):

(a) the real property more particularly described on Exhibit "A" attached hereto together with all covenants, licenses, privileges and benefits thereto belonging, and any easements, rights-of-way, rights of ingress and egress or other interests of Lessor in, on or to any land, highway, street, road or avenue, open or proposed, in, on, across, in front of, abutting or adjoining such real property, including any strips and gores adjacent to or lying between such real property and any adjacent real property (the "**Land**");

(b) all buildings, structures, Fixtures (as hereinafter defined) and other improvements of every kind including all alleyways and connecting tunnels, crosswalks, sidewalks, landscaping, parking lots and structures and roadways appurtenant to such buildings and structures that are presently situated upon the Land, drainage and all above-ground and underground utility structures (collectively, the "**Leased Improvements**");

(c) all permanently affixed equipment, machinery, fixtures and other items of real and/or personal property, including all components thereof, now and hereafter located in, on or used in connection with, and permanently affixed to or incorporated into the Leased Improvements, including all furnaces, boilers, heaters, electrical equipment, heating, plumbing, lighting, ventilating, refrigerating, incineration, air and water pollution control, waste disposal, air-cooling and air conditioning systems and apparatus, sprinkler systems and fire and theft protection equipment, carpet, moveable or immovable walls or partitions and built-in oxygen and vacuum systems, all of which are hereby deemed by the parties hereto to constitute real estate, together with all replacements, modifications, alterations and additions thereto, but specifically excluding all items included within the category of Personal Property (collectively, the "**Fixtures**"); and

(d) to the extent permitted by law, all permits, approvals and other intangible property or any interest therein now or hereafter owned or held by Lessor in connection with the Leased Property (collectively, the "**Permits**"), including all contract rights, agreements, trade names, water rights and reservations, zoning rights and warranties (including those relating to construction or fabrication) related to the Leased Property or any part thereof, specifically excluding the general corporate trademarks, service marks, logos or insignia or books and

records of Lessee, and any certificate of need or license related to the business or businesses now or hereafter conducted by Lessee on the Leased Property; and

(e) all site plans, surveys, soil and substrata studies, architectural drawings, plans and specifications, engineering plans and studies, floor plans, landscape plans, and other plans and studies that relate to the Land or the Leased Improvements and are in Lessee's possession or control.

1.2 **Demise of the Leased Property.** Upon and subject to the terms and conditions hereinafter set forth, Lessor leases to Lessee, and Lessee rents from Lessor, all of Lessor's rights and interest in and to the Leased Property, SUBJECT, HOWEVER, to the matters set forth on Exhibit "B" attached hereto (the "**Permitted Exceptions**"), to have and to hold for a total initial term of approximately ten years (the "**Initial Term**") commencing on the date hereof (the "**Commencement Date**") and ending on the tenth anniversary of the last day of the month in which the Commencement occurs, as may be extended pursuant to the terms of Article 33 hereof.

1.3 **Permits.** Lessor shall not be named on any Permit or any applications therefor except to the extent required as owner, but not operator, of the Leased Property.

ARTICLE 2 RENT

2.1 **Definitions.** Capitalized terms used in this Lease but not defined shall have the meanings ascribed to them in Article 35 of this Lease.

2.2 **Intentionally Deleted.**

2.3 **Minimum Rent and Adjustments to Minimum Rent.** Except as set forth in Section 29.2, Lessee shall pay to Lessor, without notice, demand, set off or counterclaim, in advance in lawful money of the United States of America, at Lessor's address set forth herein or at such other place or to such other person, firms or corporations as Lessor from time to time may designate in writing, Minimum Rent, as adjusted annually pursuant to Section 2.3(b) during the Term, as follows:

(a) Minimum Rent. Lessee will pay to Lessor as rent (the "**Minimum Rent**") for the Leased Property the annual sum equal to \$2,712,382.00 payable in advance in 12 equal, consecutive monthly installments, with the first installment due on the Commencement Date and continuing on the first day of each calendar month thereafter during the Term. The Minimum Rent shall be prorated as to any partial month and is subject to adjustment as provided in Sections 2.3(b) and 20.1 below.

(b) Increases to Minimum Rent during the Initial Term and Extended Term. On each Adjustment Date occurring during the Initial Term and any Extended Term, the then-current Minimum Rent shall be increased annually effective at such Adjustment Date by two percent (2.0%) percent of the Minimum Rent in effect immediately prior to such Adjustment Date.

2.4 **Additional Charges.** Lessee will also pay and discharge as and when due (a) all other amounts, liabilities, obligations and Impositions which Lessee assumes or agrees to pay under this Lease including, to the extent applicable, any condominium association dues, assessments or other charges, and (b) in the event of any failure on the part of Lessee to pay any of those items referred to in clause (a) above, every fine, penalty, interest and cost which may be added for non-payment or late payment of such items (the items referred to in clauses (a) and (b) above being referred to herein collectively as the "**Additional Charges**"), and Lessor shall have all legal, equitable and contractual rights, powers and remedies provided in this Lease, by statute or otherwise, in the case of non-payment of the Additional Charges, as well as the Minimum Rent. If any installment of Minimum Rent or Additional Charges (but only as to those Additional Charges which are payable directly to Lessor) shall not be paid within five Business Days after the date when due, Lessee will pay Lessor on demand, as Additional Charges, interest (to the extent permitted by law) computed at the Overdue Rate on the amount of such installment, from the date when due to the date of payment in full thereof (it being understood, however, that in the case of Additional Charges, interest may not be assessed against Lessee until five Business Days after the later to occur of (i) the date when due or (ii) the date on which Lessee received written notice from Lessor of such Additional Charge and the payment date associated therewith). Notwithstanding the immediately preceding sentence, for the first time during any Fiscal Year that an installment of Minimum Rent or Additional Charges is delinquent, Lessor will not assess interest related thereto until fifteen days following written notice from Lessor that such installment is late. In the event Lessor provides Lessee with written notice of failure to timely pay any installment of Minimum Rent or any Additional Charges pursuant to Section 15.1(a) more than three times within any twelve-month period, Lessee shall pay an administrative fee to Lessor in the amount of \$500 for each additional written notice Lessor gives pursuant to Section 15.1(a) during the next twelve months. To the extent that Lessee pays any Additional Charges to Lessor pursuant to any requirement of this Lease, Lessee shall be relieved of its obligation to pay such Additional Charges to the entity to which such Additional Charges would otherwise be due.

2.5 **Net Lease.** The Rent shall be paid absolutely net to Lessor, so that this Lease shall yield to Lessor the full amount of the installments of the Minimum Rent and the payments of Additional Charges from the Commencement Date through the end of the Term, but subject to any provisions of this Lease which expressly provide for payments by Lessor or the adjustment of the Rent or other charges.

ARTICLE 3 IMPOSITIONS

3.1 **Payment of Impositions.** Subject to Article 11 relating to permitted contests, Lessee will pay, or cause to be paid, all Impositions before any fine, penalty, interest or cost may be added for non-payment, such payments to be made directly to the taxing authorities where feasible, and Lessee will promptly, upon request, furnish to Lessor copies of official receipts or other satisfactory proof evidencing such payments. Lessee's obligation to pay such Impositions and the amount thereof shall be deemed absolutely fixed upon the date such Impositions become a lien upon the Leased Property or any part thereof. If any such Imposition may lawfully be paid in installments (whether or not interest shall accrue on the unpaid balance of such Imposition), Lessee may exercise the option to pay the same (and any accrued interest on the unpaid balance

of such Imposition) in installments and, in such event, shall pay such installments during the Term hereof as the same become due and before any fine, penalty, premium, further interest or cost may be added thereto. Lessor, at its expense, shall, to the extent permitted by applicable law, prepare and file all tax returns and reports as may be required by governmental authorities in respect of Lessor's net income, gross receipts, franchise taxes and taxes on its capital stock. Lessee, at its expense, shall, to the extent permitted by applicable laws and regulations, prepare and file all other tax returns and reports in respect of any Imposition as may be required by governmental authorities. If any refund shall be due from any taxing authority in respect of any Imposition paid by Lessee, the same shall be paid over to or retained by Lessee if no Event of Default shall have occurred hereunder and be continuing. Any such funds retained by Lessor due to an Event of Default shall be applied as provided in Article 15. Lessor and Lessee shall, upon request of the other, provide such data as is maintained by the party to whom the request is made with respect to the Leased Property as may be necessary to prepare any required returns and reports. In the event governmental authorities classify any property covered by this Lease as personal property, Lessee shall file all personal property tax returns in such jurisdictions where filing is required. Lessor and Lessee will provide the other party, upon request, with cost and depreciation records necessary for filing returns for any property so classified as personal property. Where Lessor is legally required to file personal property tax returns, and Lessee is obligated for the same hereunder, Lessee will be provided with copies of assessment notices in sufficient time for Lessee to file a protest. Lessee may, upon giving ten days' prior written notice to Lessor, at Lessee's option and at Lessee's sole cost and expense, protest, appeal, or institute such other proceedings as Lessee may deem appropriate to effect a reduction of real estate or personal property assessments and Lessor, if requested by Lessee and at Lessee's expense as aforesaid, shall fully cooperate with Lessee in such protest, appeal, or other action. Billings for reimbursement by Lessee to Lessor of personal property taxes shall be accompanied by copies of an invoice therefor and payments thereof which identify the personal property with respect to which such payments are made. Lessor will cooperate with Lessee in order that Lessee may fulfill its obligations hereunder, including the execution of any instruments or documents reasonably requested by Lessee.

3.2 Proration of Impositions. Impositions imposed in respect of the tax-fiscal period during which the Term terminates shall be prorated between Lessor and Lessee, whether or not such Imposition is imposed before or after such termination, and Lessee's and Lessor's obligation to pay their prorated shares thereof shall survive such termination.

3.3 Utility Charges. Lessee will contract for, in its own name, and will pay or cause to be paid all charges for, electricity, power, gas, oil, water and other utilities used in the Leased Property during the Term.

3.4 Insurance Premiums. Lessee will pay or cause to be paid all premiums for, the insurance coverage required to be maintained by Lessee pursuant to Article 12 during the Term.

ARTICLE 4
NO TERMINATION

Except as provided in this Lease, Lessee shall remain bound by this Lease in accordance with its terms and shall neither take any action without the consent of Lessor to modify,

surrender or terminate the same, nor be entitled to any abatement, deduction, deferment or reduction of Rent, or set-off against the Rent, nor shall the respective obligations of Lessor and Lessee be otherwise affected by reason of (a) any damage to, or destruction of, the Leased Property or any portion thereof from whatever cause or any Taking of the Leased Property or any portion thereof, (b) the lawful or unlawful prohibition of, or restriction upon, Lessee's use of the Leased Property, or any portion thereof, or the interference with such use by any person, corporation, partnership or other entity, or (c) any bankruptcy, insolvency, reorganization, composition, readjustment, liquidation, dissolution, winding up or other proceedings affecting Lessor or any assignee or transferee of Lessor. Except as otherwise specifically provided in this Lease, the obligations of Lessor and Lessee hereunder shall be separate and independent covenants and agreements and the Rent and all other sums payable by Lessee hereunder shall continue to be payable in all events unless the obligations to pay the same shall be terminated pursuant to the express provisions of this Lease. Notwithstanding the foregoing, Lessee shall have the right by separate and independent action to pursue any claim or seek any damages it may have against Lessor as a result of a breach by Lessor of the terms of this Lease.

ARTICLE 5 OWNERSHIP OF LEASED PROPERTY

5.1 **Ownership of the Property.** Lessee acknowledges that the Leased Property is the property of Lessor and that Lessee has only the right to the possession and use of the Leased Property upon the terms and conditions of this Lease.

5.2 **Personal Property.** Lessee may (and shall as provided hereinbelow), at its expense, install, affix or assemble or place on any parcels of the Land or in any of the Leased Improvements any items of the Personal Property, and may remove, replace or substitute for the same from time to time in the ordinary course of Lessee's business. Lessee shall provide and maintain during the entire Term all such Personal Property as shall be necessary in order to operate the Facility in compliance with all licensure and certification requirements, in compliance with all applicable Legal Requirements and Insurance Requirements and otherwise in accordance with customary practice in the industry for the Primary Intended Use.

5.3 **Ownership of Design and Construction Documentation.**

(a) So long as this Lease remains in effect, Lessor shall retain ownership of all design and construction documentation with respect to the Leased Property, and Lessee and its Affiliates shall retain a license to use, at no cost to Lessee, such design and construction documentation, including, but not limited to, any As-Built Plans and Specifications. During the Term, any As-Built Plans and Specifications and other design and construction documents delivered to Lessor by Lessee shall be strictly confidential and shall not be copied, scanned, reproduced, or duplicated in any manner by Lessor, and shall not be distributed, disseminated or provided to any party by Lessor other than prospective lenders and purchasers and their respective attorneys, agents or employees without the express written authorization of Lessee, which authorization shall not be unreasonably withheld. The provisions of this Section 5.3 shall apply to any subsequent owner of the Leased Property during the Term of this Lease.

(b) In the event that the Leased Property is transferred to Lessee pursuant to the terms of this Lease, the ownership of all design and construction documentation with respect to the Leased Improvements, shall be transferred to Lessee or its Affiliates; provided that Lessor shall have no liability or obligation to Lessee or any of its Affiliates in the event Lessor is unable to locate originals or copies of such documents at the time of any such transfer.

(c) At the end of the Term or in the event this Lease is terminated sooner pursuant to its terms, Lessor shall retain ownership of all design and construction documentation with respect to the Leased Improvements.

ARTICLE 6
CONDITION AND USE OF LEASED PROPERTY

6.1 **Condition of the Leased Property.** Lessee acknowledges receipt and delivery of possession of the Leased Property and that Lessee has examined and otherwise acquired knowledge of the condition of the Leased Property prior to the execution and delivery of this Lease and has found the same to be in good order and repair and satisfactory for its purpose hereunder. Lessee is leasing the Leased Property "as is" in its present condition. Lessee waives any claim or action against Lessor in respect of the condition of the Leased Property. LESSOR MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, IN RESPECT OF THE LEASED PROPERTY OR ANY PART THEREOF, EITHER AS TO ITS FITNESS FOR USE, SUITABILITY, DESIGN OR CONDITION FOR ANY PARTICULAR USE OR PURPOSE OR OTHERWISE, AS TO QUALITY OF THE MATERIAL OR WORKMANSHIP THEREIN, LATENT OR PATENT, IT BEING AGREED THAT ALL SUCH RISKS ARE TO BE BORNE BY LESSEE. LESSEE ACKNOWLEDGES THAT THE LEASED PROPERTY HAS BEEN INSPECTED BY LESSEE AND IS SATISFACTORY TO IT.

6.2 **Use of the Leased Property.**

(a) After the Commencement Date and during the entire Term, Lessee shall use or cause to be used the Leased Property and the improvements thereon only as either an inpatient rehabilitation hospital, a long-term acute care hospital or other post-acute healthcare facility or a skilled nursing facility, together with such other uses as may be necessary in connection with or incidental to such use (the "**Primary Intended Use**"). Lessee shall not use the Leased Property or any portion thereof for any other use without the prior written consent of Lessor, which consent shall not be unreasonably withheld, conditioned or delayed.

(b) Lessee covenants that it will obtain and maintain all material approvals needed to use and operate the Leased Property and the Facility for the Primary Intended Use in compliance with all applicable Legal Requirements.

(c) Lessee covenants and agrees that during the Term it will use its reasonable best efforts to operate continuously the Leased Property in accordance with its Primary Intended Use (it being understood that any temporary discontinuance of operations as a result of a casualty or Condemnation or during the performance of any renovations at the Facility will not be deemed a violation of this subsection (c)) and to maintain its certifications for reimbursement and licensure and its accreditation, if compliance with accreditation standards is required to maintain the

operations of the Facility and if a failure to comply would adversely affect operations of the Facility.

(d) Lessee shall not commit or suffer to be committed any waste on the Leased Property, or in the Facility, nor shall Lessee cause or permit any nuisance thereon.

(e) Lessee shall neither suffer nor permit the Leased Property or any portion thereof, including any Capital Addition, to be used in such a manner as (i) might reasonably impair Lessor's (or Lessee's, as the case may be) title thereto or to any portion thereof, or (ii) might reasonably result in a claim or claims of adverse usage or adverse possession by the public, as such, or of implied dedication of the Leased Property or any portion thereof.

(f) Lessee will not utilize any Hazardous Materials on the Leased Property except in accordance with applicable Legal Requirements and will not permit any contamination which may require remediation under any applicable Hazardous Materials Law. Lessee agrees not to dispose of any Hazardous Materials or substances within the sewerage system of the Leased Property, and that it will handle all "red bag" wastes in accordance with applicable Hazardous Materials Laws.

(g) Neither Lessor nor Lessee, during the Term, shall initiate or acquiesce to any zoning change at the Leased Property unless such change is requested in writing by the other party.

6.3 Management of Facility. Lessee shall cause the Facility to be managed at all times by Lessee or an Affiliate of Lessee (it being understood that for purposes of this sentence, the term Lessee means the Person then constituting the "Lessee" hereunder at any given time).

6.4 Lessor to Grant Easements. Lessor will, from time to time, at the request of Lessee and at Lessee's cost and expense, but subject to the approval of Lessor (which consent may not be unreasonably withheld or delayed) (a) grant easements and other rights in the nature of easements, (b) release existing easements or other rights in the nature of easements which are for the benefit of the Leased Property, (c) dedicate or transfer unimproved portions of the Leased Property for road, highway or other public purposes, (d) execute petitions to have the Leased Property annexed to any municipal corporation or utility district, (e) execute amendments to any covenants and restrictions affecting the Leased Property and (f) execute and deliver to any person any instrument appropriate to confirm or effect such grants, releases, dedications and transfers (to the extent of its interest in the Leased Property), but only upon delivery to Lessor of written notice from Lessee confirming that such grant, release, dedication, transfer, petition or amendment is required or beneficial for and not detrimental to the proper conduct of the business of Lessee on the Leased Property and does not reduce its value.

ARTICLE 7 LEGAL, INSURANCE AND FINANCIAL REQUIREMENTS

7.1 Compliance with Legal and Insurance Requirements. Subject to Article 11 relating to permitted contests, Lessee, at its expense, will promptly (a) comply with all material Legal Requirements and Insurance Requirements in respect of the use, operation, maintenance, repair and restoration of the Leased Property, whether or not compliance therewith shall require

structural change in any of the Leased Improvements or interfere with the use and enjoyment of the Leased Property, and (b) directly or indirectly with the cooperation of Lessor, but at Lessee's sole cost and expense, procure, maintain and comply with all material licenses, certificates of need and other authorizations required for (i) any use of the Leased Property then being made, and (ii) the proper erection, installation, operation and maintenance of the Leased Improvements or any part thereof, including any Capital Additions.

7.2 Legal Requirement Covenants. Lessee covenants and agrees that the Leased Property shall not be used for any unlawful purpose. Lessee shall, directly or indirectly with the cooperation of Lessor, but at Lessee's sole cost and expense, acquire and maintain all material licenses, certificates, permits and other authorizations and approvals needed to operate the Leased Property in its customary manner for the Primary Intended Use and any other use conducted on the Leased Property as may be permitted from time to time hereunder. Lessee further covenants and agrees that Lessee's use of the Leased Property and Lessee's maintenance, alteration, and operation of the same, and all parts thereof, shall at all times conform to all applicable Legal Requirements.

7.3 Hazardous Materials. Lessee hereby covenants that no activity shall be undertaken on the Leased Property which would cause (i) the Leased Property to become a treatment, storage or disposal facility of hazardous waste, infectious waste, biomedical or medical waste, within the meaning of RCRA or any Hazardous Material Law, (ii) a release or threatened release of Hazardous Material from the Leased Property within the meaning of CERCLA or SARA or any Hazardous Material Law or (iii) the discharge of Hazardous Material into any watercourse, surface or subsurface of a body of water or wetland, or the discharge into the atmosphere of any Hazardous Material which would require a permit under any Hazardous Material Law. No activity shall be undertaken with respect to the Leased Property which would cause a violation of RCRA, CERCLA, SARA or any Hazardous Material Law. Except as may be required for the ordinary operation of a hospital, Lessee shall not be required to obtain, and Lessee has no knowledge or any reason Lessee will be required to obtain, any permits, licenses, or similar authorizations to occupy, operate or use the Leased Improvements or any part of the Leased Property by reason of any Hazardous Material Law. Lessee hereby agrees to indemnify and defend, at its sole cost and expense, and hold Lessor, its successors and assigns, harmless from and against and to reimburse Lessor with respect to any and all claims, demands, actions, causes of action, losses, damages, liabilities, costs and expenses (including, without limitation, reasonable attorney's fees and court costs) of any and every kind or character, known or unknown, fixed or contingent, asserted against or incurred by Lessor at any time and from time to time by reason or arising out of Lessee's breach or violation of this Article 7.

ARTICLE 8

REPAIRS; RESTRICTIONS AND ANNUAL INSPECTIONS

8.1 Maintenance and Repair.

(a) Lessee, at its expense, will keep the Leased Property in reasonably good order and repair (whether or not the need for such repairs occurs as a result of Lessee's use, any prior use, the elements, the age of the Leased Property or any portion thereof), and, except as otherwise provided in Articles 13 and 14, with reasonable promptness, will make all necessary and

appropriate repairs thereto of every kind and nature, whether interior or exterior, structural or non-structural, ordinary or extraordinary, foreseen or unforeseen or arising by reason of a condition existing prior to or after the commencement of the Term of this Lease (concealed or otherwise). All repairs shall, to the extent reasonably achievable, be at least equivalent in quality to the original work and shall be accomplished by Lessee or a party selected by Lessee. Lessee will not take or omit to take any action the taking or omission of which might materially impair the value or usefulness of the Leased Property or any part thereof for the Primary Intended Use.

(b) Except for the use of any insurance or condemnation proceeds as set forth in Articles 13 and 14 hereof, Lessor shall not under any circumstances be required to build or rebuild any improvements on the Leased Property, or to make any repairs, replacements, alterations, restorations, or renewals of any nature or description to the Leased Property, whether ordinary or extraordinary, structural or nonstructural, foreseen or unforeseen, or to make any expenditure whatsoever with respect thereto in connection with this Lease, or to maintain the Leased Property in any way.

(c) Nothing contained in this Lease and no action or inaction by Lessor shall be construed as (i) constituting the consent or request of Lessor, expressed or implied, to any contractor, subcontractor, laborer, materialman or vendor to or for the performance of any particular labor or services or the furnishing of any particular materials or other property for the construction, alteration, addition, repair or demolition of or to the Leased Property or any part thereof, or (ii) giving Lessee any right, power or permission to contract for or permit the performance of any labor or services or the finishing of any materials or other property in such fashion as would permit the making of any claim against Lessor in respect thereof or to make any agreement that may create, or in any way be the basis for, any right, title, interest, lien, claim or other encumbrance upon the estate of Lessor in the Leased Property or any portion thereof.

(d) Unless Lessor shall convey any of the Leased Property to Lessee pursuant to the provisions of this Lease, Lessee will, upon the expiration or prior termination of this Lease, vacate and surrender the Leased Property to Lessor in the condition in which the Leased Property was originally received from Lessor, except for ordinary wear and tear (subject to the obligation of Lessee to maintain the Property in reasonably good order and repair during the entire Term), damage caused by the gross negligence or willful acts of Lessor, and damage or destruction described in Article 13 or resulting from a Taking described in Article 14 which Lessee is not required by the terms of this Lease to repair or restore and except as repaired, rebuilt, restored, altered or added to as permitted or required by the provisions of this Lease.

8.2 Encroachments; Restrictions. If any of the Leased Improvements shall, at any time, encroach upon any property, street or right-of-way adjacent to the Leased Property, or shall violate the agreements or conditions contained in any applicable Legal Requirement, lawful restrictive covenant or other agreement affecting the Leased Property, or any part thereof, or shall impair the rights of others under any easement or right-of-way to which the Leased Property is subject, then promptly upon the request of Lessor, Lessee shall, at its expense, subject to its right to contest the existence of any encroachment, violation or impairment, (a) obtain valid and effective waivers or settlements of all claims, liabilities and damages resulting from each such encroachment, violation or impairment, whether the same shall affect Lessor or Lessee, or (b) make such changes in the Leased Improvements, and take such other actions, as

Lessor in the good faith exercise of its judgment deems reasonably practicable, to remove such encroachment, or to end such violation or impairment, including, if necessary, the alteration of any of the Leased Improvements, and in any event take all such actions as may be necessary in order to be able to continue the operation of the Facility for the Primary Intended Use substantially in the manner and to the extent the Facility was operated prior to the assertion of such violation or encroachment. Any such alteration shall be made in conformity with the applicable requirements of Article 9. Lessee's obligations under this Section 8.2 shall be in addition to and shall in no way discharge or diminish any obligation of any insurer under any policy of title or other insurance, and Lessee shall be entitled to a credit for any sums recovered by Lessor under any such policy of title or other insurance.

ARTICLE 9
CAPITAL ADDITIONS

9.1 Construction of Capital Additions to the Leased Property.

(a) If no Event of Default shall have occurred and be continuing, Lessee shall have the right, upon and subject to the terms and conditions set forth below, to construct or install Capital Additions on the Leased Property with the prior written consent of Lessor which consent shall not be unreasonably withheld, conditioned or delayed. Prior to commencing construction of any Capital Addition, Lessee shall submit to Lessor in writing a proposal setting forth in reasonable detail any proposed Capital Addition and shall provide to Lessor, as they become available to Lessee, such plans and specifications, permits, licenses, contracts and other information concerning the proposed Capital Addition as Lessor may reasonably request. Without limiting the generality of the foregoing, such proposal shall indicate the approximate projected cost of constructing such Capital Addition and the use or uses to which it will be put.

(b) Lessor shall reasonably cooperate with Lessee regarding the grant of any consents or easements or the like necessary or appropriate in connection with any Capital Addition. Further, no Capital Addition shall be made which would tie in or connect any Leased Improvements on the Leased Property with any other improvements on property adjacent to the Leased Property (and not part of the Land covered by this Lease) including tie-ins of buildings or other structures or utilities, unless Lessee shall have obtained the prior written approval of Lessor, which approval shall not be unreasonably withheld, conditioned or delayed. All proposed Capital Additions shall be architecturally integrated and consistent with the Leased Property.

9.2 Capital Additions Financed by Lessee. Lessee shall have the right to provide or arrange to finance any Capital Addition with any party or if Lessee pays cash for any Capital Addition, this Lease shall be and hereby is amended to provide as follows:

(a) There shall be no adjustment in the Minimum Rent by reason of any such Capital Addition.

(b) Upon the expiration or earlier termination of this Lease, Lessor shall compensate Lessee for all Capital Additions paid for or financed by Lessee in any of the following ways:

(i) By purchasing all Capital Additions paid for by Lessee from Lessee for cash in the amount of the Fair Market Added Value at the time of purchase by Lessor of all such Capital Additions paid for or financed by Lessee; or

(ii) Such other arrangement regarding such compensation as shall be mutually acceptable to Lessor and Lessee.

Any undisputed amount owed by Lessee to Lessor under this Lease at such termination or expiration may be deducted from any compensation for Capital Additions payable by Lessor to Lessee under this Section 9.2.

9.3 Remodeling and Non-Capital Additions. Lessee shall have the right and the obligation to make additions, modifications or improvements to the Leased Property that are not Capital Additions, from time to time as may reasonably be necessary for its uses and purposes and to permit Lessee to comply fully with its obligations set forth in this Lease; provided that such action will be undertaken expeditiously, in a workmanlike manner and will not significantly alter the character or purpose or detract from the value or operating efficiency of the Leased Property and will not significantly impair the revenue producing capability of the Leased Property or adversely affect the ability of Lessee to comply with the provisions of this Lease. Title to all non-Capital Additions, modifications and improvements shall, without payment by Lessor at any time, be included under the terms of this Lease and, upon expiration or earlier termination of this Lease, shall pass to and become the property of Lessor.

9.4 Clarification. Notwithstanding anything to the contrary contained herein, Section 9.1 through Section 9.3 shall only apply to Capital Additions made following the issuance of a certificate of occupancy for the Facility.

ARTICLE 10 LIENS

Subject to the provisions of Article 11 relating to permitted contests, Lessee will not directly or indirectly create or suffer to exist and will promptly discharge at its expense any lien, encumbrance, attachment, title retention agreement or claim upon the Leased Property or any attachment, levy, claim or encumbrance in respect of the Rent, not including, however, (a) this Lease, (b) the Permitted Exceptions, (c) restrictions, liens and other encumbrances which are consented to in writing by Lessor, or any easements granted pursuant to the provisions of Section 6.4 of this Lease, (d) liens for those taxes of Lessor which Lessee is not required to pay hereunder, (e) subleases permitted by Article 23, (f) liens for Impositions or for sums resulting from noncompliance with Legal Requirements so long as (1) the same are not yet payable or are payable without the addition of any fine or penalty or (2) such liens are in the process of being contested as permitted by Article 11, (g) liens of mechanics, laborers, materialmen, suppliers or vendors for sums either disputed or not yet due, provided that (1) the payment of such sums shall not be postponed for more than sixty days after the completion of the action (including any appeal from any judgment rendered therein) giving rise to such lien and such reserve or other appropriate provisions as shall be required by law or generally accepted accounting principles shall have been made therefor or (2) any such liens are in the process of being contested as

permitted by Article 11, and (h) any Encumbrance placed on the Leased Property by Lessor or otherwise caused by Lessor's actions.

ARTICLE 11
PERMITTED CONTESTS

Lessee, after three days' prior written notice to Lessor, on its own or on Lessor's behalf (or in Lessor's name), but at Lessee's expense, may contest, by appropriate legal proceedings conducted in good faith and with due diligence, the amount, validity or application, in whole or in part, of any Imposition, Legal Requirement, Insurance Requirement, lien, attachment, levy, encumbrance, charge or claim (individually, a "**Charge**" and, collectively, "**Charges**") not otherwise permitted by Article 10, which is required to be paid or discharged by Lessee; provided that (a) in the case of an unpaid Charge, the commencement and continuation of such proceedings, or the posting of a bond or certificate of deposit as may be permitted by applicable law, shall suspend the collection thereof from Lessor and from the Leased Property; (b) neither the Leased Property nor any Rent therefrom nor any part thereof or interest therein would be in any immediate danger of being sold, forfeited, attached or lost; (c) Lessor would not be in any immediate danger of civil or criminal liability for failure to comply therewith pending the outcome of such proceedings; (d) in the case of an Insurance Requirement, the coverage required by Article 12 shall be maintained; and (e) if such contest be finally resolved against Lessor or Lessee, Lessee shall, as Additional Charges due hereunder, promptly pay the amount required to be paid, together with all interest and penalties accrued thereon, or otherwise comply with the applicable Charge; provided further that nothing contained herein shall be construed to permit Lessee to contest the payment of Rent, or any other sums payable by Lessee to Lessor hereunder. Lessor, at Lessee's expense, shall execute and deliver to Lessee such authorizations and other documents as may reasonably be required in any such contest and, if reasonably requested by Lessee or if Lessor so desires and then at its own expense, Lessor shall join as a party therein. Lessor shall do all things reasonably requested by Lessee in connection with such action. Lessee shall indemnify and save Lessor harmless against any liability, cost or expense of any kind that may be imposed upon Lessor in connection with any such contest and any loss resulting therefrom.

ARTICLE 12
INSURANCE

12.1 **General Insurance Requirements.** During the Term of this Lease, Lessee shall at all times keep the Leased Property, and all property located in or on the Leased Property insured with the kinds and amounts of insurance described below and written by companies reasonably acceptable to Lessor authorized to do insurance business in the state in which the Leased Property is located. The policies must name Lessor as named insured and losses shall be payable to Lessor and/or Lessee as provided in Article 13. In addition, the policies shall name as an additional insured, as its interests may appear under this Lease only, the holder ("**Facility Mortgagee**") of any mortgage, deed of trust or other security agreement securing any Encumbrance placed on the Leased Property in accordance with the provisions of Article 32 ("**Facility Mortgage**"), if any. Certificates of insurance shall be deposited with Lessor and, if requested, with any Facility Mortgagee(s). The policies on the Leased Property, including the

Leased Improvements, the Fixtures and the Personal Property, shall insure against the following risks:

(a) Loss or damage by fire, vandalism and malicious mischief, extended coverage perils and all physical loss perils, including sprinkler leakage, in an amount not less than 90% of the then Full Replacement Cost thereof (as defined below in Section 12.2) after deductible;

(b) Loss or damage by explosion of steam boilers, pressure vessels or similar apparatus now or hereafter installed in the Facility, with a limit of \$25,000,000 with respect to any one accident;

(c) Loss of rental under an insurance policy covering risk of loss during the first 12 months of reconstruction necessitated by the occurrence of any of the covered hazards described in Sections 12.1(a), (b) or (d), in an amount sufficient to prevent Lessee from becoming a co-insurer;

(d) Loss or damage by hurricane and earthquake in the amount of the Full Replacement Cost, after deductible;

(e) Flood (when the Leased Property is located in whole or in part within a designated flood plain area) and such other hazards and in such amounts as may be customary for comparable properties in the area and if available from insurance companies authorized to do business in the state in which the Leased Property is located; and

(f) Hospital Professional and General and liability insurance in the minimum amount of \$1,000,000 for each occurrence and \$3,000,000 in the aggregate, with excess coverage in the amount of \$10,000,000 in the aggregate; provided that before the lapse of any such policy, Lessee shall obtain at Lessee's sole expense an extended reporting period insurance coverage endorsement covering a period of at least two years ("**tail coverage endorsement**") beyond the lapse of any such Policy.

(g) Workers' Compensation and Employer's Liability Insurance as required by law or regulation. Employer's Liability insurance shall be provided in amounts not less than \$1,000,000 per accident for bodily injury by accident; \$1,000,000 policy limit by disease; and \$1,000,000 per employee for bodily injury by disease.

12.2 Full Replacement Cost. The term "**Full Replacement Cost**" as used herein shall mean the actual replacement cost of the Facility from time to time, including increased cost of construction endorsement, less exclusions provided in the normal fire insurance policy; provided, however, that to the extent that insurance coverage in the amount of the Total Project Costs is commercially available, the Full Replacement Cost shall never be less than the Total Project Costs.

12.3 Additional Insurance. In addition to the insurance described above, Lessee shall maintain such additional insurance as may be reasonably requested from time to time by any Facility Mortgagee which is consistent with insurance coverage for similar buildings in the county and state where the Leased Property is located, or required pursuant to any applicable Legal Requirement and shall at all times maintain adequate worker's compensation insurance

coverage for all persons employed by Lessee on the Leased Property, in accordance with all applicable Legal Requirements.

12.4 Waiver of Subrogation. All insurance policies carried by either party covering the Leased Property, the Fixtures, the Facility and/or the Personal Property, including contents, fire and casualty insurance, shall expressly waive any right of subrogation on the part of the insurer against the other party. The parties hereto agree that their policies will include such a waiver clause or endorsement so long as the same is obtainable without extra cost, and in the event of such an extra charge the other party, at its election, may request and pay the same, but shall not be obligated to do so.

12.5 Form of Insurance. All Policies for the Leased Property shall be issued by insurance companies authorized to do business in the state where the Leased Property is located, each of which insurance companies shall have at least a minimum Policyholder's Rating of "A-" and a Financial Size Rating of VIII according to the current edition of A.M. Best's Insurance Reports, Industrial Risk Insurers, or with such other company as may be approved in advance in writing by Lessor, which approval shall not be unreasonably withheld. Lessee shall pay all premiums therefor, and deliver certificates thereof to Lessor prior to their effective date (and, with respect to any renewal policy, at least 10 days prior to the expiration of the existing policy). In the event of the failure of Lessee to effect such insurance in the names herein called for or to pay the premiums therefor, or to deliver certificates thereof to Lessor at the times required, Lessor, after providing 10 days' written notice to Lessee, shall be entitled, but shall have no obligation, to enact such insurance and pay the premiums therefor, which reasonable premiums shall be repayable by Lessee to Lessor upon written demand therefor, and failure to repay the same shall constitute an Event of Default within the meaning of Section 15.1(b). Each insurer mentioned in this Section shall agree that it will give to Lessor prior written notice before the policy or policies in question shall be materially altered, allowed to expire or canceled.

12.6 Change in Limits. In the event that Lessor, at the end of the 10th anniversary of the Commencement Date and once during each 10-year period thereafter, shall reasonably and in good faith believe the limits of the insurance then carried are insufficient, the parties shall endeavor to agree on the proper and reasonable limits for such insurance to be carried and such insurance shall thereafter be carried with the limits thus agreed on until further change pursuant to the provisions of this Section. If the parties shall be unable to agree thereon, the proper and reasonable limits for such insurance shall be determined by an impartial third party selected by the parties, the costs of which shall be divided equally between the parties.

12.7 Blanket Policy. Notwithstanding anything to the contrary contained in this Section, Lessee's obligations to carry the insurance provided for herein may be brought within the coverage of a so-called blanket policy or policies of insurance carried and maintained by Lessee; provided further that the requirements of this Article 12 are otherwise satisfied.

12.8 No Separate Insurance. Without the prior written consent of Lessor, Lessee shall not, on Lessee's own initiative or pursuant to the request or requirement of any third party, take out separate insurance concurrent in form or contributing in the event of loss with that required in this Article 12 to be furnished by, or which may reasonably be required by a Facility

Mortgagee to be furnished by, Lessee, or increase the amounts of any then-existing insurance required under this Article 12 by securing an additional policy or additional policies.

12.9 Insurance for Contractors. If Lessee shall engage or cause to be engaged any contractor to perform work on the Leased Property, Lessee shall require such contractor and any subcontractor to carry and maintain insurance coverage pursuant to Lessor's requirements, at no expense to Lessor; provided that in cases where such coverage is excessive in relation to the work being done, Lessee may allow any such contractor to carry or maintain alternative coverage in amounts and form acceptable to Lessor, but only upon obtaining Lessor's prior written approval and consent, which shall not be unreasonably withheld.

ARTICLE 13
FIRE AND CASUALTY

13.1 Insurance Proceeds. All proceeds payable by reason of any loss or damage to the Leased Property or any portion thereof, and insured under any policy of insurance required by Article 12 of this Lease shall be paid to Lessor and shall be made available for reconstruction or repair, as the case may be, of any damage to or destruction of the Leased Property, or any portion thereof, and shall be paid out by Lessor from time to time for the cost of such reconstruction or repair in accordance with this Article 13. Any excess proceeds of insurance remaining after the completion of the restoration or reconstruction of the Leased Property shall be retained by Lessor free and clear upon completion of any such repair and restoration except as otherwise specifically provided below in this Article 13. In the event neither Lessor nor Lessee is required or elects to repair or restore the Leased Property and the parties mutually agree to terminate this Lease, then the insurance proceeds generated by policies required by this Lease shall be paid to Lessor. All salvage resulting from any risk covered by insurance shall belong to Lessee, including any salvage relating to Capital Additions paid for by Lessee.

13.2 Reconstruction in the Event of Damage or Destruction Covered by Insurance.

(a) Except as provided in Section 13.7, if during the Term, the Facility is totally or partially destroyed from a risk covered by the insurance described in Article 12, Lessee shall restore the Facility to substantially the same condition as existed immediately before the damage or destruction (utilizing the insurance proceeds to pay for such restoration). Such damage or destruction shall not terminate this Lease.

(b) If the cost of the repair or restoration exceeds the amount of proceeds received by Lessor from the insurance required under Article 12, Lessee shall be obligated to contribute any excess amount needed to restore the Facility after the insurance proceeds have been utilized fully.

13.3 Reconstruction in the Event of Damage or Destruction Not Covered by Insurance. Except as provided in Section 13.7 below, if during the Term the Facility is totally or materially destroyed from a risk (including earthquake) not covered by the insurance described in Article 12, Lessee at its option shall either (a) restore the Facility to substantially the same condition it was in immediately before such damage or destruction and such damage or

destruction shall not terminate this Lease, or (b) acquire the Leased Property from Lessor for a purchase price equal to the Minimum Purchase Price immediately prior to such damage or destruction or (c) if all of the criteria for such substitution are satisfied, offer to substitute a new property substantially equivalent to the Leased Property immediately before such damage or destruction pursuant to the provisions of Article 20.

13.4 The Personal Property. If Lessee is required or elects to restore the Facility as provided in Sections 13.2 or 13.3(a), Lessee shall use any insurance proceeds payable by reason of any loss of or damage to any of the Personal Property to restore or replace such Personal Property with items of substantially equivalent value to the items being replaced.

13.5 Restoration of Capital Additions. If Lessee is required or elects to restore the Facility as provided in Sections 13.2 or 13.3(a), Lessee shall also restore all Capital Additions paid for or financed by Lessee.

13.6 No Abatement of Rent. This Lease shall remain in full force and effect and Lessee's obligation to make rental payments and to pay all other charges required by this Lease shall remain unabated during any period required for repair and restoration.

13.7 Damage Near End of Term. Notwithstanding any provisions of Sections 13.2 or 13.3 to the contrary, if damage to or destruction of the Facility occurs during the last 12 months of the Term, and if such damage or destruction cannot be fully repaired and restored within the lesser of (i) six months or (ii) the period remaining in the Term immediately following the date of loss, either party shall have the right to terminate this Lease by giving notice to the other within thirty days after the date of damage or destruction, in which event Lessor shall be paid the insurance proceeds (with the exception of insurance proceeds on Lessee's Personal Property) and Lessee shall pay to Lessor on demand the amount of any deductible or uninsured loss arising in connection therewith; provided that any such notice given by Lessor shall be void and of no force and effect if Lessee exercises an available option to extend the Term for one Extended Term, or one additional Extended Term, as the case may be, within ninety days following receipt of such termination notice.

13.8 Waiver. Lessee hereby waives any statutory or common law rights of termination which may arise by reason of any damage or destruction of the Facility.

ARTICLE 14 CONDEMNATION

14.1 Parties' Rights and Obligations. If during the Term there is any Taking of all or any part of the Leased Property or any interest in this Lease by Condemnation, the rights and obligations of the parties shall be determined by this Article 14.

14.2 Total Taking. If there is a Taking of all of the Leased Property by Condemnation, this Lease shall terminate on the Date of Taking, and the Minimum Rent and all Additional Charges paid or payable hereunder shall be apportioned and paid to the Date of Taking.

14.3 **Partial Taking.** If there is a Taking of a portion of the Leased Property by Condemnation such that the Facility is not thereby rendered Unsuitable for Its Primary Intended Use, this Lease shall remain in effect. If, however, the Facility is thereby rendered Unsuitable for Its Primary Intended Use, Lessee shall have the right (a) to take such proceeds of any Award as shall be necessary and restore the Facility, at its own expense, to the extent possible, to substantially the same condition as existed immediately before the partial Taking or (b) to terminate this Lease. Lessee shall exercise its option by giving Lessor notice thereof within sixty days after Lessee receives written notice of the Taking.

14.4 **Restoration.** If there is a partial Taking of the Leased Property and this Lease remains in full force and effect pursuant to Section 14.3, Lessee shall accomplish all necessary restoration.

14.5 **Award Distribution.** Except as otherwise provided in Section 14.3 above, the entire Award shall belong to and be paid to Lessor, except that, if this Lease is terminated, Lessee shall be entitled to receive from the Award (if and to the extent the Award includes such item) any sum attributable to the Capital Additions for which Lessee would be entitled to reimbursement at the end of the Term pursuant to the provisions of Section 9.2(b). If Lessee is required or elects to restore the Facility, Lessor agrees that its portion of the Award shall be used for such restoration and it shall hold such portion of the Award in trust, for application to the cost of the restoration and will remit such proceeds of the Award to Lessee upon a written request from Lessee as the restoration work is performed.

14.6 **Temporary Taking.** The Taking of the Leased Property, or any part thereof, by military or other public authority shall constitute a Taking by Condemnation only when the use and occupancy by the Taking authority has continued for longer than six months. During any such six-month period all the provisions of this Lease shall remain in full force and effect and the Rent shall not be abated or reduced during such period of Taking; provided that Lessee will receive any compensation from the Taking authority as a result of such temporary Taking.

ARTICLE 15 DEFAULT BY LESSEE

15.1 **Events of Default.** The occurrence of any one or more of the following events shall constitute events of default (individually, an "**Event of Default**" and, collectively, "**Events of Default**") hereunder:

(a) if Lessee shall fail to make a payment of the Rent payable by Lessee under this Lease when the same becomes due and payable and such failure continues for a period of thirty days after written notice from Lessor to Lessee, or

(b) if Lessee shall fail to observe or perform any other term, covenant or condition of this Lease and such failure is not cured by Lessee within a period of sixty days after receipt by Lessee of written notice thereof from Lessor, unless such failure cannot with due diligence be cured within a period of sixty days, in which case such failure shall not be deemed to continue if Lessee proceeds promptly and with due diligence to cure the failure and diligently completes the

curing thereof (as soon as reasonably possible and subject to extension of time due to the occurrence of any Unavoidable Delay), or

(c) if Lessee shall:

(i) admit in writing its inability to pay its debts generally as they become due,

(ii) file a petition in bankruptcy or a petition to take advantage of any insolvency law,

(iii) make an assignment for the benefit of its creditors,

(iv) consent to the appointment of a receiver of itself or of the whole or any substantial part of its property, or

(v) file a petition or answer seeking reorganization or arrangement under the Federal bankruptcy laws or any other applicable law or statute of the United States of America or any state thereof, or

(vi) be adjudicated a bankrupt or if a court of competent jurisdiction shall enter an order or decree appointing, without the consent of Lessee, a receiver of Lessee or of the whole or substantially all of its respective property, or approving a petition filed against it seeking reorganization or arrangement of Lessee under the federal bankruptcy laws or any other applicable law or statute of the United States of America or any state thereof, and such judgment, order or decree shall not be vacated or set aside or stayed within ninety days from the date of the entry thereof; or

(vii) be liquidated or dissolved, or shall begin proceedings toward such liquidation or dissolution, or shall, in any manner, permit the sale or divestiture of substantially all of its assets other than in connection with a merger or consolidation of Lessee into, or a sale of substantially all of Lessee's assets to, another Person; provided that if (a) the survivor of such merger or the purchaser of such assets shall assume all of Lessee's obligations under this Lease by a written instrument, in form and substance reasonably satisfactory to Lessor, accompanied by an opinion of counsel, reasonably satisfactory to Lessor and addressed to Lessor stating that such instrument of assumption is valid, binding and enforceable against the parties thereof in accordance with its terms (subject to usual bankruptcy and other creditors' rights exceptions), and (b) immediately after giving effect to any such merger, consolidation or sale, Lessee, or such other Person (if not Lessee) surviving the same, shall have a Consolidated Net Worth not less than the Consolidated Net Worth of Lessee immediately prior to such merger, consolidation or sale, all as to be set forth in written notice delivered to Lessor within thirty days of such merger, consolidation or sale, then an Event of Default shall not be deemed to have occurred hereunder; or

15.2 Lessor's Remedies. If an Event of Default shall occur, Lessor shall have the right at its election, then or at any time thereafter so long as such Event of Default is continuing, to pursue any one or more of the following remedies, in addition to any remedies which may be permitted by law or by other provisions of this Lease, without further notice or demand, except as hereinafter provided:

(a) Subject to Section 15.2(d), Lessor shall use reasonable efforts to relet but shall have no absolute obligation to relet. If Lessor does, at its sole discretion, elect to relet the Leased Property, such action by Lessor shall not be deemed as an acceptance of Lessee's surrender of the Leased Property unless Lessor expressly notifies Lessee of such acceptance in writing, Lessee hereby acknowledging that Lessor shall otherwise be reletting as Lessee's agent. It is further agreed in this regard that upon the occurrence of any Event of Default described in this Article 15, Lessor shall have the right, but not the obligation, to enter upon the Leased Property and do whatever Lessee is obligated to do under the terms of this Lease; and Lessee agrees to reimburse Lessor on demand for any reasonable expenses which Lessor may incur in thus effecting compliance with Lessee's obligations under this Lease, and further agrees that Lessor shall not be liable for any damages resulting to Lessee from such action; provided that Lessor is not negligent in performing any of Lessee's obligations hereunder.

(b) Subject to Section 15.2(d), Lessor may terminate this Lease by written notice to Lessee, in which event Lessee shall immediately surrender the Leased Property to Lessor, and if Lessee fails to do so, Lessor may, without prejudice to any other remedy which Lessor may have for possession or arrearage in the Rent, enter upon and take possession of the Leased Property and expel or remove Lessee and any other person who may be occupying said premises or any part thereof in accordance with all Legal Requirements. In addition, Lessee agrees to pay to Lessor within thirty days after demand the amount of all loss and damage which Lessor may suffer by reason of any termination pursuant to this subsection (b), said loss and damage to be determined, at Lessor's option, by either of the following alternative measures of damages:

(i) Although Lessor shall be under no absolute obligation to attempt and shall be obligated only to use reasonable efforts, to relet the Leased Property, until the Leased Property is relet Lessee shall pay to Lessor on or before the first day of each calendar month the monthly rentals and other charges provided in this Lease. After the Leased Property has been relet by Lessor, Lessee shall pay to Lessor on the 10th day of each calendar month the difference between the monthly rentals and other charges provided in this Lease for the preceding calendar month and that actually collected by Lessor for such month; provided that such collections are less than the rental and other charges due under this Lease. If it is necessary for Lessor to bring suit in order to collect any deficiency, Lessor shall have a right to allow such deficiencies to accumulate and to bring an action on several or all of the accrued deficiencies at one time. Any such suit shall not prejudice in any way the right of Lessor to bring a similar action for any subsequent deficiency or deficiencies. Any amount collected by Lessor from subsequent tenants for any calendar month in excess of the monthly rentals and other charges provided in this Lease shall be credited to Lessee in reduction of Lessee's obligations for any calendar month for which the amount collected by Lessor will be less than the monthly rentals and other charges provided in this

Lease; but Lessee shall have no right to such excess other than the above described credit; or

(ii) When Lessor desires, Lessor may demand a final settlement not to exceed the Minimum Purchase Price at the time of such final settlement. Upon demand for a final settlement, Lessor shall have a right to, and Lessee hereby agrees to pay, the difference between the total of all monthly rentals and other charges provided in this Lease for the remainder of the Term and the reasonable rental value of the Leased Property for such period (including a reasonable time to relet the Leased Property), as determined pursuant to the provisions of Article 28 hereof, such difference to be discounted to present value at a rate equal to the lowest rate of capitalization (highest present worth) reasonably consistent with industry standards at the time of such determination and allowed by applicable law.

(c) The rights and remedies of Lessor under subsections (a) and (b) of this Section 15.2 are cumulative, and except as expressly provided otherwise in Section 15.2(d) and Section 15.2(e) below, pursuit of any of the above remedies shall not preclude pursuit of any other remedies prescribed in other sections of this Lease and any other remedies provided by law or equity. Forbearance by Lessor to enforce one or more of the remedies herein provided upon an Event of Default shall not be deemed or construed to constitute a waiver of such Event of Default.

(d) Notwithstanding anything to the contrary set forth in this Section 15.2 or elsewhere in this Lease, the remedies available to Lessor pursuant to Section 15.2(b) above shall only be available upon the occurrence of a Special Default Event (as defined below). The parties specifically agree that Lessor shall not be entitled to terminate this Lease if any Event of Default other than a Special Default Event shall have occurred and be continuing. As used herein, the term "**Special Default Event**" means, individually and collectively, (i) the occurrence of an Event of Default pursuant to Section 15.1 arising out of a default or breach of a Payment Obligation (as defined below) by Lessee, or (ii) the failure of Lessee to satisfy any final, unsecured and unappealable judgment arising out of this Lease which is rendered by a court of competent jurisdiction. As used herein, the term "**Payment Obligation**" means any obligation from time to time owing by Lessee under this Lease, which obligation can be satisfied with the payment of money, including any Rent, fees, costs or charges that would accrue but for the provisions of U.S. Bankruptcy Code, after any bankruptcy or insolvency petition is filed thereunder.

15.3 Additional Expenses. In addition to payments required pursuant to subsections (a) and (b) of Section 15.2 above, Lessee shall compensate Lessor for all reasonable expenses incurred by Lessor in repossessing the Leased Property (including any increase in insurance premiums caused by the vacancy of the Leased Property), all reasonable expenses incurred by Lessor in reletting (including repairs, remodeling, replacements, advertisements and brokerage fees), all reasonable concessions granted to a new tenant upon reletting (including renewal options), all fees and expenses incurred by Lessor as a direct or indirect result of any appropriate action by a Facility Mortgagee, any expenses of Lessor incurred for the installation of separate lines or meters for any public utilities not previously metered separately from adjacent property

of Lessee and a reasonable allowance for Lessor's administrative efforts, salaries and overhead attributable directly or indirectly to Lessee's default and Lessor's pursuing the rights and remedies provided herein and under applicable law.

15.4 **Waiver.** If this Lease is terminated pursuant to law or the provisions of Article 15, Lessee waives, to the extent permitted by applicable law, (a) any right of redemption, reentry or repossession and (b) the benefit of any laws now or hereafter in force exempting property from liability for rent or for debt.

15.5 **Application of Funds.** All payments otherwise payable to Lessee which are received by Lessor under any of the provisions of this Lease during the existence or continuance of any Event of Default shall be applied to Lessee's obligations in the order which Lessor may reasonably determine or as may be prescribed by the laws of the state in which the Facility is located.

15.6 **Notices by Lessor.** The provisions of this Article 15 concerning notices shall be liberally construed insofar as the contents of such notices are concerned, and any such notice shall be sufficient if it shall generally apprise Lessee of the nature and approximate extent of any default.

ARTICLE 16 LESSOR'S RIGHT TO CURE

If Lessee, without the prior written consent of Lessor, shall fail to make any payment, or to perform any act required to be made or performed under this Lease and to cure the same within the relevant time periods provided in Section 15.1, Lessor, without waiving or releasing any obligation or Event of Default, may (but shall be under no obligation to) make such payment or perform such act for the account and at the expense of Lessee, and may, to the extent permitted by law, enter upon the Leased Property for such purpose and take all such action thereon as, in Lessor's opinion, may be necessary or appropriate therefor. No such entry shall be deemed an eviction of Lessee. All sums so paid by Lessor, together with a late charge thereon (to the extent permitted by law) at the Overdue Rate from the date on which such sums or expenses are paid or incurred by Lessor, and all costs and expenses (including reasonable attorneys' fees and expenses, in each case, to the extent permitted by law) so incurred shall be paid by Lessee to Lessor on demand. The obligations of Lessee and rights of Lessor contained in this Article shall survive the expiration or earlier termination of this Lease.

ARTICLE 17 PURCHASE OF THE LEASED PROPERTY

In the event Lessee purchases the Leased Property from Lessor pursuant to any of the terms of this Lease, Lessor shall, upon receipt from Lessee of the applicable purchase price, together with full payment of any unpaid Rent due and payable with respect to any period ending on or before the date of the purchase and any other amounts owing to Lessor hereunder, deliver to Lessee an appropriate special warranty deed and any other documents reasonably requested by Lessee to convey the interest of Lessor in and to the Leased Property (including a conveyance of Lessor's interest in the plans and specifications for the Leased Improvements), subject only to the

Permitted Exceptions, to Lessee, and such other standard documents usually and customarily prepared in connection with such transfers, free and clear of all encumbrances other than (a) those that Lessee has agreed hereunder to pay or discharge, (b) those mortgage liens, if any, which Lessee has agreed in writing to accept and to take title subject to, (c) any other Encumbrances permitted to be imposed on the Leased Property under the provisions of Article 31 which are assumable at no cost to Lessee, and (d) any matters affecting the Leased Property on or as of the Commencement Date. The difference between the applicable purchase price and the total of the encumbrances assigned or taken subject to shall be paid in cash to Lessor, or as Lessor may direct, in federal or other immediately available funds except as otherwise mutually agreed by Lessor and Lessee. The closing of any such sale shall be contingent upon and subject to Lessee obtaining all required governmental consents and approvals for such transfer. If such sale shall fail to be consummated by reason of the inability of Lessee to obtain all such approvals and consents, any options to extend the Term which otherwise would have expired during the period from the date when Lessee elected or became obligated to purchase the Leased Property until Lessee's inability to obtain the approvals and consents is confirmed shall be deemed to remain in effect for thirty days after the end of such period. All expenses of such conveyance, including the cost of title examination and standard coverage title insurance in the amount of the applicable purchase price, reasonable and actual attorneys' fees incurred by Lessor in connection with such conveyance, and transfer taxes, shall be paid by Lessee, unless Lessee's purchase of the Leased Property results from a default by Lessor under Section 29.1 of this Lease (in which case Lessor will pay the expenses of conveyance described herein). Recording fees and similar charges shall be paid for by Lessee.

ARTICLE 18
HOLDING OVER

If Lessee shall for any reason remain in possession of the Leased Property after the expiration of the Term or any earlier termination of the Term hereof, such possession shall be as a tenancy from month to month during which time Lessee shall pay as rental each month, (a) 125% of 1/12th of the aggregate annual Minimum Rent payable during the period immediately before the expiration of the Term; plus (b) all Additional Charges accruing during the month; and plus (c) all other sums, if any, payable pursuant to the provisions of this Lease with respect to the Leased Property. During such period of tenancy, Lessee and Lessor shall be obligated to perform and observe all of the terms, covenants and conditions of this Lease and to continue its occupancy and use of the Leased Property. Nothing contained herein shall constitute the consent, express or implied, of Lessor to the holding over of Lessee after the expiration or earlier termination of this Lease.

ARTICLE 19
ABANDONMENT; OPTIONS TO PURCHASE

19.1 Obsolescence of the Leased Property; Offer to Purchase. So long as no Special Default Event shall have occurred that is continuing, if, in the reasonable good faith judgment of Lessee, the Leased Property becomes uneconomic or Unsuitable for Its Primary Intended Use, all as set forth in written notice delivered to Lessor, Lessee, after the end of the Initial Term, may offer to purchase the Leased Property for a purchase price equal to the

Minimum Purchase Price on the first Payment Date occurring not less than 120 days after the date of such notice.

19.2 Option to Purchase the Leased Property. So long as no Event of Default shall have occurred that is continuing, Lessee shall have the option to purchase the Leased Property at the end of the Initial Term and at the end of each Extended Term upon at least 180 days' prior written notice to Lessor for a purchase price equal to the Minimum Purchase Price. If not sooner exercised, the option to purchase granted hereby will expire and be of no further force and effect upon the expiration of the Initial Term and each Extended Term or the earlier termination of this Lease.

19.3 Conveyance of Leased Property.

(a) In the event Lessee elects to purchase the Leased Property pursuant to Section 19.1, then on the first Payment Date occurring not less than 120 days after the date of the written notice referenced in Section 19.1, Lessor shall, upon receipt from Lessee of the purchase price provided for in Section 19.1 and any Rent or other sums then due and payable under this Lease (excluding the installment of Minimum Rent due on the date of conveyance), convey the Leased Property to Lessee on such date in accordance with the provisions of Article 17 and this Lease shall thereupon terminate as to the Leased Property.

(b) In the event Lessee elects to purchase the Leased Property pursuant to Section 19.2, then on the last day of the Term, or the next Business Day if the last day of the Term is not a Business Day, Lessor shall, upon receipt from Lessee of the purchase price provided for in Section 19.2 and any Rent or other sums then due and payable under this Lease (excluding the installment of Minimum Rent due on the date of conveyance), convey the Leased Property to Lessee on such date in accordance with the provisions of Article 17 and this Lease shall thereupon terminate as to the Leased Property.

ARTICLE 20
SUBSTITUTION OF PROPERTY

20.1 Substitution of Property for the Leased Property.

(a) In the event a right or requirement of substitution of the Leased Property arises as a result of (i) damage or destruction of the Leased Property as set forth in Article 13 hereof or (ii) a Taking of a portion of the Leased Property as set forth in Section 14.3 hereof, Lessee, if no Event of Default shall have occurred and be continuing, shall have the right subject to the conditions set forth below in this Article 20, upon notice to Lessor, to substitute one or more properties (collectively referred to as "**Substitute Properties**" or individually as a "**Substitute Property**") on a monthly Payment Date specified in such notice (the "**Substitution Date**") occurring not less than ninety days after receipt by Lessor of such notice. The notice shall specify the reason(s) for the proposed substitution and the proposed Substitution Date. Notwithstanding anything contained herein to the contrary, any other substitution for the Leased Property shall require the prior written consent of Lessor which shall be within the sole, reasonable discretion of Lessor.

(b) If Lessee gives the notice referred to in Section 20.1(a) above, Lessee shall present to Lessor one or more properties (or groups of properties) each of which property (or groups of properties) shall provide Lessor with a Current Yield that is equivalent to or greater than Lessor's Current Yield from the Leased Property at the time of such proposed substitution (or in the case of substitution because of damage or destruction, the Current Yield immediately prior to such damage or destruction) and as reasonably projected over the remaining Term of this Lease, and shall have a Fair Market Value that is no less than 90% of the Fair Market Value of the Leased Property. Lessor shall have a period of ninety days within which to review such information and either accept or reject the Substitute Properties so presented unless Lessee is required by a court order or administrative action to divest or otherwise dispose of the Leased Property within a shorter time period, in which case the time period shall be shortened appropriately to meet the reasonable needs of Lessee, but in no event shall said period be less than fifteen Business Days after Lessor's receipt of said notice (subject to further extension for any period of time in which Lessor is not timely provided with the information provided for in Section 20.2 and Section 20.3 below); provided that if Lessor shall contend that the Substitute Properties fail to meet all the conditions for substitution set forth in this Article 20, including the provisions of Sections 20.1 (d) and (e) below, the matter shall be submitted to arbitration in accordance with Article 30 and the time periods for Lessor's approval or rejection shall be tolled during the period of such arbitration.

(c) In the event that, on or before the expiration of the applicable time period for Lessor's review, Lessor has rejected all of the Substitute Properties so presented, then Lessee shall, for a period of sixty days after the expiration of such period, have the right to terminate this Lease as to the Leased Property upon notice to Lessor accompanied by an offer to purchase the Leased Property on the first Payment Date occurring at least ninety days after the date of such notice, as specified in such notice, for a purchase price equal to the Fair Market Value Purchase Price, and this Lease shall terminate on the purchase date.

(d) In the event that the equity value of the Substitute Property or group of Substitute Properties (i.e., the Fair Market Value of the Substitute Property or group of Substitute Properties minus the encumbrances subject to which Lessor will take the Substitute Property or group of Substitute Properties) as of the Substitution Date is greater than the equity value of the Leased Property (i.e., the Fair Market Value of the Leased Property minus the encumbrances subject to which Lessee will take the Leased Property) as of the Substitution Date (or in the case of damage or destruction, the Fair Market Value immediately prior to such damage or destruction), Lessor shall pay to Lessee an amount equal to the difference, subject to the limitation set forth below; in the event that said equity value of the Substitute Property or group of Substitute Properties is less than said equity value of the Leased Property, Lessee shall pay to Lessor an amount equal to the difference, subject to the limitation set forth below; provided that neither Lessor nor Lessee shall be obligated to consummate such substitution if such party would be required to make a payment to the other in excess of an amount equal to ten percent of said Fair Market Value of the Leased Property (the amount of cash paid by one party to the other being hereinafter referred to as the "**Cash Adjustment**").

(e) The Rent for such Substitute Property in all respects shall provide Lessor with a substantially equivalent Current Yield at the time of such substitution to the Current Yield (and reasonably expected to be received thereafter throughout the Term of this Lease) from the

Leased Property, taking into account the Cash Adjustment paid or received by Lessor and any other relevant factors.

(f) The Minimum Purchase Price of the Substitute Property shall be an amount equal to the Minimum Purchase Price of the Leased Property (i) increased by any Cash Adjustment paid by Lessor pursuant to paragraph (e) above, or (ii) decreased by any Cash Adjustment paid by Lessee pursuant to paragraph (e) above.

20.2 Conditions to Substitution. On the Substitution Date, the Substitute Property will become the Leased Property hereunder upon delivery by Lessee to Lessor of the following items in form and substance reasonably satisfactory to Lessor:

(a) written notice certifying that (i) the Substitute Property has been accepted by Lessee for all purposes of this Lease and there is no material damage to the improvements located on the Substitute Property as of the Substitution Date nor is any condemnation or eminent domain proceeding pending with respect thereto; (ii) all permits, licenses and certificates (including a permanent, unconditional certificate of occupancy and, to the extent permitted by law, all certificates of need and licenses) which are necessary to permit the use of the Substitute Property in accordance with the provisions of this Lease have been obtained and are in full force and effect; (iii) under applicable zoning and use laws, ordinances, rules and regulations the Substitute Property may be used for the purposes contemplated by Lessee and all necessary subdivision approvals have been obtained; (iv) there are no mechanic's or materialmen's liens outstanding or threatened to the knowledge of Lessee against the Substitute Property arising out of or in connection with the construction of the improvements thereon, other than those being contested by Lessee pursuant to Article 11; (v) any mechanic's or materialmen's liens being contested by Lessee will be promptly paid by Lessee if such contest is resolved in favor of the mechanic or materialman; (vi) to the best knowledge of Lessee, there exists no Event of Default under this Lease, and no defense, offset or claim exists with respect to any sums to be paid by Lessee hereunder; and (vii) any exceptions to Lessor's title to the Substitute Property do not materially interfere with the intended use of the Substitute Property by Lessee;

(b) a special warranty deed with warranties against claims arising under Lessee conveying to Lessor title to the Substitute Property free and clear of any liens and encumbrances except those approved in writing or assumed by Lessor;

(c) a lease duly executed, acknowledged and delivered by Lessee, containing the same terms and conditions as are contained herein except that (i) the legal description of the Land shall refer to the Substitute Property, (ii) the Minimum Purchase Price, Rent and any Additional Charges for the Substitute Property shall be consistent with the requirements of Section 20.1, (iii) the term of the new lease shall mirror the remaining Term hereunder (including Lessee's right to any remaining extension options) and (iv) such other changes therein as may be necessary or appropriate under the circumstances shall be made;

(d) counterparts of a standard owner's or lessee's (as applicable) policy of title insurance covering the Substitute Property (or a valid, binding, unconditional commitment therefor), dated the Substitution Date, in current form and including mechanics' and materialmen's lien coverage, issued to Lessor by a title insurance company reasonably

satisfactory to Lessor. Such policy shall (i) insure (A) Lessor's fee title to the Substitute Property, subject to no liens or encumbrances except those approved or assumed by Lessor, and (B) that any restrictions affecting the Substitute Property have not been violated and that a further violation thereof will not result in a forfeiture or reversion of title, (ii) be in an amount at least equal to the Fair Market Value of the Substitute Property, and (iii) contain such endorsements as may be reasonably requested by Lessor;

(e) certificates of insurance with respect to the Substitute Property fulfilling the requirements of Article 12;

(f) current appraisals or other evidence satisfactory to Lessor, in its sole discretion, as to the current Fair Market Values of such Substitute Property;

(g) all available revenue data relating to the Substitute Property for the period from the date of opening for business of the Facility on such Substitute Property to the date of Lessee's most recent Fiscal-Year end, or for the most recent three years, whichever is less; and

(h) such other certificates, documents, opinions of counsel (which may be in-house counsel), and other instruments as may be reasonably required by Lessor.

20.3 Conveyance to Lessee. On the Substitution Date or the date specified in the notice given pursuant to Section 20.1 Lessor will convey the Leased Property to Lessee in accordance with the provisions of Article 17 (except as to payment of any expenses in connection therewith which shall be governed by Section 20.4 below) upon either (a) payment in cash therefor or (b) conveyance to Lessor of the Substitute Property, as appropriate.

20.4 Expenses. Lessee shall pay or cause to be paid, on demand, all reasonable costs and expenses paid or incurred by Lessor in connection with the substitution and conveyance of the Leased Property and the Substitute Property, including (a) reasonable fees and expenses of Lessor's counsel, (b) the amount of any recording taxes and filing fees, (c) the cost of preparing and recording, if appropriate, a release of the Leased Property from the lien of any mortgage, (d) broker's fees and commissions for Lessee, if any, (e) documentary stamp and transfer taxes, if any, (f) title insurance charges, and (g) escrow fees, if any.

ARTICLE 21 RISK OF LOSS

Except as otherwise provided in this Lease, during the Term of this Lease, the risk of loss or of decrease in the enjoyment and beneficial use of the Leased Property in consequence of the damage or destruction thereof by fire, the elements, casualties, thefts, riots, wars or otherwise, or in consequence of foreclosures, attachments, levies or executions (other than by Lessor and those claiming from, through or under Lessor) is assumed by Lessee and, Lessor shall in no event be answerable or accountable therefor nor shall any of the events mentioned in this Section entitle Lessee to any abatement of Rent except as specifically provided in this Lease.

ARTICLE 22
INDEMNIFICATION

Notwithstanding the existence of any insurance or self insurance provided for in Article 12, and without regard to the policy limits of any such insurance or self insurance, Lessee will protect, indemnify, save harmless and defend Lessor from and against all liabilities, obligations, claims, damages, penalties, causes of action, costs and expenses (including reasonable attorneys' fees and expenses), to the extent permitted by law, imposed upon or incurred by or asserted against Lessor by reason of: (a) any accident, injury to or death of persons or loss to property occurring on or about the Leased Property, including any claims of malpractice, (b) any use, misuse, no use, condition, maintenance or repair by Lessee of the Leased Property, (c) any Impositions (which are the obligations of Lessee to pay pursuant to the applicable provisions of this Lease), (d) any failure on the part of Lessee to perform or comply with any of the terms of this Lease, (e) the non-performance of any of the terms and provisions of any and all existing and future subleases of the Leased Property to be performed by Lessee as landlord thereunder and (f) the violation of any Hazardous Materials Law. Any amounts which become payable by Lessee under this Section shall be paid within thirty days after liability therefor on the part of Lessor is finally determined by litigation or otherwise (including the expiration of any time for appeals) and, if not timely paid, shall bear interest (to the extent permitted by law) at the Overdue Rate from the date of such determination to the date of payment. Lessee, at its expense, shall contest, resist and defend any such claim, action or proceeding asserted or instituted against Lessor or may compromise or otherwise dispose of the same as Lessee sees fit. Lessor shall cooperate with Lessee in a reasonable manner to permit Lessee to satisfy Lessee's obligations hereunder, including the execution of any instruments or documents reasonably requested by Lessee. Nothing herein shall be construed as indemnifying Lessor or its agents for their own negligent acts or omissions or willful misconduct. Lessee's liability for a breach of the provisions of this Article shall survive any termination of this Lease.

ARTICLE 23
SUBLETTING AND ASSIGNMENT

23.1 Subletting and Assignment. Subject to any express conditions or limitations set forth herein, Lessee may, without the consent of Lessor, sublet all or any part of the Leased Property consistently with the Primary Intended Use. Lessor shall not unreasonably withhold its consent to any other or further subletting or assignment; provided that (a) in the case of a subletting, the sublessee shall comply with the provisions of Section 23.2, (b) in the case of an assignment, the assignee shall assume in writing and agree to keep and perform all of the terms of this Lease on the part of Lessee to be kept and performed and shall be and become jointly and severally liable with Lessee for the performance thereof, (c) an original counterpart of each such sublease and assignment and assumption, duly executed by Lessee and such sublessee or assignee, as the case may be, in form and substance reasonably satisfactory to Lessor, shall be delivered promptly to Lessor, and (d) in case of either an assignment or subletting, Lessee shall remain primarily liable, as principal rather than as surety, for the prompt payment of the Rent and for the performance and observance of all of the covenants and conditions to be performed by Lessee hereunder. Notwithstanding anything to the contrary set forth herein, Lessee shall have the right, without having to comply with Section 23.1(c), to sublease up to 25% of the total square footage of the Facility to physicians and other parties in the ordinary course of Lessee's

business. Lessee further shall have the right, upon prior written notice to Lessor but without Lessor's consent, to assign or sublet all of the Leased Property to any Permitted Assignee (as hereinafter defined) so long as, in the event of an assignment, such Permitted Assignee assumes, pursuant to an agreement in form and substance reasonably satisfactory to Lessor, the obligations of Lessee hereunder. As used herein, a "**Permitted Assignee**" shall mean (i) any Affiliate of Lessee or Encompass Health Corporation, (ii) any entity into which Lessee is merged or consolidated so long as all of the Assignment Conditions (as defined below) shall be satisfied prior to such assignment, or (iii) any entity which acquires all or substantially all of the assets of Lessee at the Leased Property so long as all of the Assignment Conditions (as defined below) shall be satisfied prior to such assignment. As used herein, the term "**Assignment Conditions**" shall mean (A) neither an Event of Default nor an event which with the giving of notice or the passage of time thereafter would constitute an Event of Default shall have occurred and be continuing; (B) the proposed assignee shall be experienced in the operation and management of facilities with the same use as the Primary Intended Use; (C) Lessee and the proposed assignee shall have submitted or cause to be submitted all information reasonably requested by Lessor with respect to the proposed transaction, including information regarding the proposed assignee's financial condition and principals, which information must be certified as being true, complete and correct and must indicate that the proposed assignee has the financial ability to perform Lessee's obligations under this Lease; and (D) the proposed assignee must agree with Lessor in writing to perform all the obligations of the "Lessee" hereunder as a condition to the effectiveness of any such assignment.

23.2 **Non-Disturbance, Subordination and Attornment.** Lessee shall insert in each sublease permitted under Section 23.1 provisions to the effect that (a) such sublease is subject and subordinate to all of the terms and provisions of this Lease and to the rights of Lessor hereunder, (b) in the event this Lease shall terminate before the expiration of such sublease, the sublessee thereunder will, at Lessor's option, attorn to Lessor and waive any right the sublessee may have to terminate the sublease or to surrender possession thereunder as a result of the termination of this Lease and (c) in the event the sublessee receives a written notice from Lessor or Lessor's assignees, if any, stating that Lessee is in default under this Lease, the sublessee shall thereafter be obligated to pay all rentals accruing under said sublease directly to the party giving such notice, or as such party may direct. All rentals received from the sublessee by Lessor or Lessor's assignees, if any, as the case may be, shall be credited against amounts owing by Lessee under this Lease. Lessor agrees that notwithstanding any default, termination, expiration, sale, entry or other act or omission of Lessee pursuant to the terms of this Lease, or at law or in equity, any tenant's possession shall not be disturbed unless such possession may otherwise be terminated pursuant to the terms of the applicable sublease. Lessor hereby agrees, upon Lessee's request, to execute a non-disturbance agreement in favor of any tenant or in favor of any sublessee under any sublease permitted under Section 23.1 above; provided that any such sublessee has acknowledged all of the foregoing provisions and executed all documents required by this Section 23.2.

ARTICLE 24

ESTOPPEL CERTIFICATES AND FINANCIAL INFORMATION

24.1 **Estoppel Certificates.** At any time and from time to time within twenty days following written request by Lessor, Lessee will furnish to Lessor written notice certifying that

this Lease is unmodified and in full force and effect (or that this Lease is in full force and effect as modified and setting forth the modifications) and the dates to which the Rent has been paid. Any such written notice furnished pursuant to this Article may be relied upon by Lessor and any prospective purchaser of the Leased Property.

24.2 Financial Information. Unless specifically prohibited at any time by a Legal Requirement, Lessee will furnish, or cause to be furnished, the following information to Lessor within the periods indicated; provided that Lessor shall keep confidential items furnished hereunder which are not generally available to the public:

(i) within thirty days after the end of each calendar quarter, unaudited Facility Financial Statements for such calendar quarter, certified by Lessee to Lessor;

(ii) within 90 days after the end of each Fiscal Year, unaudited Facility Financial Statements for the most recently ended Fiscal Year certified by Lessee to Lessor.

ARTICLE 25 INSPECTION

Lessee shall permit Lessor and its authorized representatives, upon reasonable advance notice to Lessee, to inspect the Leased Property during usual business hours subject to any security, health, safety or confidentiality requirements of Lessee, any Legal Requirements and any Insurance Requirements.

ARTICLE 26 QUIET ENJOYMENT

So long as Lessee shall pay all Rent as the same becomes due and shall fully comply with all of the terms of this Lease and fully perform its obligations hereunder, Lessee shall peaceably and quietly have, hold and enjoy the Leased Property for the Term hereof, free of any claim or other action by Lessor or anyone claiming by, through or under Lessor, but subject to all liens and encumbrances of record as of the date hereof or hereafter consented to by Lessee.

ARTICLE 27 NOTICES

Any notices, demands, approvals and other communications provided for herein shall be in writing and shall be delivered by overnight air courier, personal delivery or registered or certified U.S. Mail with return receipt requested, postage paid, to the appropriate party at its address as follows:

If to Lessor:

Encompass Health Maine Real Estate, LLC
c/o Encompass Health Corporation
9001 Liberty Parkway

Birmingham, Alabama 35242
Attention: Real Estate Department

If to Lessee:

Encompass Health Rehabilitation Hospital of Bangor, LLC
c/o Encompass Health Corporation
9001 Liberty Parkway
Birmingham, Alabama 35242
Attention: Real Estate Department

Addresses for notice may be changed from time to time by written notice to all other parties. Any communication will be effective (i) if given by mail, upon the earlier of (a) five Business Days following deposit in a post office or other official depository under the care and custody of the United States Postal Service or (b) actual receipt, as indicated by the return receipt; and (ii) if given by personal delivery or by overnight air courier, when delivered to the appropriate address set forth above.

ARTICLE 28
APPRAISAL

In the event that it becomes necessary to determine the Fair Market Value, Fair Market Value Purchase Price, the Fair Market Added Value, the Minimum Purchase Price or the Fair Market Rental Value of the Leased Property or a Substitute Property for any purpose of this Lease, the party required or permitted to give notice of such required determination shall include in the notice the name of a person selected to act as an appraiser on its behalf. Within ten days after receipt of any such notice, Lessor (or Lessee, as the case may be) shall by notice to Lessee (or Lessor, as the case may be) appoint a second person as an appraiser on its behalf. The appraisers thus appointed (each of whom must be a member of the American Institute of Real Estate Appraisers or any successor organization thereto and must have at least five years of appraisal expertise with healthcare facilities similar to the Facility) shall, within forty-five days after the date of the notice appointing the first appraiser, proceed to appraise the Leased Property or the Substitute Property, as the case may be, to determine any of the foregoing values as of the relevant date (giving effect to the impact, if any, of inflation from the date of their decision to the relevant date); provided that if only one appraiser shall have been so appointed, or if two appraisers shall have been so appointed but only one such appraiser shall have made such determination within fifty days after the making of Lessee's or Lessor's request, then the determination of such appraiser shall be final and binding upon the parties. If two appraisers shall have been appointed and shall have made their determinations within the respective requisite periods set forth above and if the difference between the amounts so determined shall not exceed ten percent of the lesser of such amounts, then the Fair Market Value or Fair Market Added Value or the Fair Market Rental Value shall be an amount equal to fifty percent of the sum of the amounts so determined. If the difference between the amounts so determined shall exceed ten percent of the lesser of such amounts, then such two appraisers shall have twenty days to appoint a third appraiser, but if such appraisers fail to do so, then either party may

request the American Arbitration Association or any successor organization thereto to appoint an appraiser within twenty days of such request, and both parties shall be bound by any appointment so made within such twenty-day period. If no such appraiser shall have been appointed within such twenty days or within ninety days of the original request for a determination of Fair Market Value or Fair Market Added Value or the Fair Market Rental Value, whichever is earlier, either Lessor or Lessee may apply to any court having jurisdiction to have appointment made by such court. Any appraiser appointed, by the American Arbitration Association or by such court, shall be instructed to determine the Fair Market Value or Fair Market Added Value or the Fair Market Rental Value within thirty days after appointment of such appraiser. The determination of the appraiser which differs most in terms of dollar amount from the determinations of the other two appraisers shall be excluded, and fifty percent of the sum of the remaining two determinations shall be final and binding upon Lessor and Lessee as the Fair Market Value or Fair Market Added Value or the Fair Market Rental Value for such interest. However, in the event that following the appraisal performed by said third appraiser, the dollar amount of two of such appraisals are higher and lower, respectively, than the dollar amount of the remaining appraisal in equal degrees, the determinations of both the highest and lowest appraisal, respectively, shall be rejected and the determination of the remaining appraisal shall be final and binding upon Lessor and Lessee as the Fair Market Value or Fair Market Added Value or the Fair Market Rental Value for such interest. This provision for determination by appraisal shall be specifically enforceable to the extent such remedy is available under applicable law, and any determination hereunder shall be final and binding upon the parties except as otherwise provided by applicable law. Lessor and Lessee shall each pay the fees and expenses of the appraiser appointed by it and each shall pay one-half of the fees and expenses of the third appraiser and one-half of all other costs and expenses incurred in connection with each appraisal.

ARTICLE 29 DEFAULT BY LESSOR

29.1 Default by Lessor. Lessor shall be in default hereunder if Lessor shall fail to observe or perform any term, covenant or condition of this Lease on its part to be performed and such failure shall continue for a period of thirty days after written notice thereof from Lessee, unless such failure cannot with due diligence be cured within a period of thirty days, in which case such failure shall not be deemed to continue if Lessor, within said thirty-day period, proceeds promptly and with due diligence to cure the failure and diligently completes the curing thereof. The time within which Lessor shall be obligated to cure any default of its obligations under this Lease shall also be subject to extension of time due to the occurrence of any Unavoidable Delay. In addition to the self-help remedy afforded Lessee under Section 29.2 of this Lease, upon the occurrence of a Special Lessor Default Event (as defined below), Lessee shall also be permitted to terminate this Lease and purchase the Leased Property from Lessor for a purchase price equal to the Minimum Purchase Price minus an amount equal to the actual out-of-pocket cost to cure incurred by Lessee by reason of such default. In the event Lessee elects to purchase the Leased Property, it shall deliver a notice thereof to Lessor specifying a Payment Date occurring no less than ninety days subsequent to the date of such notice on which it shall purchase the Leased Property, and the same shall be thereupon conveyed in accordance with the provisions of Article 17. Any sums owed Lessee by Lessor hereunder shall bear interest at the Overdue Rate from the date due and payable until the date paid. In addition to the self-help remedy afforded Lessee under Section 29.2 of this Lease, upon the occurrence of a default by

Lessor (other than a Special Lessor Default Event) which remains uncured beyond the notice and cure period set forth above, Lessee, as its sole additional remedy, shall be entitled to sue for Lessee's actual damages arising from such default. As used herein, the term "**Special Lessor Default Event**" means, individually and collectively, (i) the occurrence of a default by Lessor which continues beyond the notice and cure periods pursuant to this Section 29.1, which default arises solely out of an obligation of Lessor hereunder which can be satisfied with the payment of money, or (ii) the failure of Lessor to satisfy any final, unsecured and unappealable judgment arising out of Lessor's obligations under this Lease and which is rendered by a court of competent jurisdiction.

29.2 Lessee's Right to Cure. If a Lessor default shall occur as described in Section 29.1 above, Lessee, after notice to and demand upon Lessor in accordance with Section 29.1, without waiving or releasing any obligation of Lessor hereunder, and in addition to all other remedies available hereunder and at law or in equity to Lessee, may (but shall be under no obligation at any time thereafter to) make (or cause to be made) such payment or perform (or cause to be performed) such act for the account and at the expense of Lessor. All sums so paid by Lessee or its agent and all costs and expenses (including reasonable attorneys' fees) so incurred, together with interest thereon at the Overdue Rate from the date on which such sums or expenses are paid or incurred by Lessee, shall be paid by Lessor to Lessee on demand or set off against the Rent. The rights of Lessee hereunder to cure and to secure payment from Lessor in accordance with this Section 29.2 shall survive the termination of this Lease.

ARTICLE 30 ARBITRATION

30.1 Controversies. Except with respect to the payment of Minimum Rent hereunder, in case any controversy shall arise between the parties hereto as to any of the requirements of this Lease or the performance thereof which controversy the parties shall be unable to settle by agreement or as otherwise provided herein, such controversy shall be determined by arbitration to be initiated and conducted as provided in this Article 30.

30.2 Appointment of Arbitrators. The party or parties requesting arbitration shall serve upon the other a written demand therefor specifying the matter to be submitted to arbitration, and nominating an arbitrator. Within twenty days after receipt of such written demand and notification, the other party shall, in writing, nominate a competent disinterested person and the two arbitrators so designated shall, within ten days thereafter, select a third arbitrator and give immediate written notice of such selection to the parties and shall fix in said notice a time and place for the first meeting of the arbitrators, which meeting shall be held as soon as conveniently possible after the selection of all arbitrators, at which time and place the parties to the controversy may appear and be heard.

30.3 Third Arbitrator. In case the notified party or parties shall fail to make a selection upon notice, as aforesaid, or in case the first two arbitrators selected shall fail to agree upon a third arbitrator within ten days after their selection, then such arbitrator or arbitrators may, upon application made by either of the parties to the controversy, after twenty days' written notice thereof to the other party or parties, have a third arbitrator appointed by any judge of any United States court of record having jurisdiction in the state in which the Leased Property is

located or, if such office shall not then exist, by a judge holding an office most nearly corresponding thereto.

30.4 Arbitration Procedure. Said arbitrators shall give each of the parties not less than ten days' written notice of the time and place of each meeting at which the parties or any of them may appear and be heard and after hearing the parties in regard to the matter in dispute and taking such other testimony and making such other examinations and investigations as justice shall require and as the arbitrators may deem necessary, they shall decide the questions submitted to them. The decision of said arbitrators in writing signed by a majority of them shall be final and binding upon the parties to such controversy. In rendering such decisions and award, the arbitrators shall not add to, subtract from or otherwise modify the provisions of this Lease.

30.5 Expenses. The expenses of such arbitration shall be divided between Lessor and Lessee unless otherwise specified in the decision of the arbitrators. Each party in interest shall pay the fees and expenses of its own counsel.

ARTICLE 31 FINANCING OF THE LEASED PROPERTY

Lessor agrees that it will not grant or create any mortgage, deed of trust, lien, encumbrance or other title retention agreement (each, an "**Encumbrance**") upon the Leased Property unless the holder of each such Encumbrance shall simultaneously with or prior to recording the Encumbrance agree (a) to give Lessee the same notice and cure rights, if any, given to Lessor of any default or acceleration of any obligation underlying any such Encumbrance or any sale in foreclosure of such Encumbrance, (b) to permit Lessee to appear with its representatives and to bid at any public foreclosure sale with respect to any such Encumbrance and (c) to enter into an agreement with Lessee containing the provisions described in Article 32 of this Lease. Lessee agrees to execute and deliver to Lessor or the holder of an Encumbrance any written agreement required by this Article within twenty days of written request thereof by Lessor or the holder of an Encumbrance.

ARTICLE 32 SUBORDINATION, ATTORNMENT AND NON-DISTURBANCE

At the request from time to time by one or more holders of an Encumbrance that may hereafter be placed upon the Leased Property or any part thereof, and any and all renewals, replacements, modifications, consolidations, spreaders and extensions thereof, Lessee will subordinate this Lease and all of Lessee's rights and estate hereunder to each such Encumbrance and agree with each such holder that Lessee will attorn to and recognize such holder (or the purchaser at any foreclosure sale or any sale under a power of sale contained in any such Encumbrance or a holder by a deed in lieu of foreclosure, as the case may be) as Lessor under this Lease for the balance of the Term then remaining, subject to all of the terms and provisions of this Lease so long as each such institutional holder simultaneously with or prior to recording any such Encumbrance executes and delivers a mutually acceptable written agreement in recordable form (a) consenting to this Lease and agreeing that, notwithstanding any such other lease, mortgage, deed of trust, right, title or interest, or any default, expiration, termination,

foreclosure, sale, entry or other act or omission under, pursuant to or affecting any of the foregoing, Lessee shall not be disturbed in peaceful enjoyment of the Leased Property nor shall this Lease be terminated or canceled at any time, except in the event Lessor shall have the right to terminate this Lease under the terms and provisions expressly set forth herein; (b) agreeing that it will be bound by all the terms of this Lease and will perform and observe all of Lessor's obligations set forth herein; and (c) agreeing that all proceeds of the casualty insurance described in Article 13 of this Lease and all Awards described in Article 14 will be made available to Lessee for restoration of the Leased Property as and to the extent required by this Lease, subject only to reasonable regulation regarding the manner of disbursement and application thereof. Lessee agrees to execute and deliver to Lessor or the holder of an Encumbrance any written agreement required by this Article that is in a form reasonably acceptable to Lessee within twenty days of written request thereof by Lessor or the holder of an Encumbrance. Lessee agrees to execute at the request from time to time of Lessor or an institutional investor a certificate setting forth any defaults of Lessor hereunder of which Lessee is aware and the dates through which Rent has been paid and such other reasonable matters as may be requested by such lender or Lessor.

ARTICLE 33
EXTENDED TERMS

33.1 **Options to Extend the Term.** So long as no Event of Default shall have occurred and be continuing, Lessee is hereby granted the right to extend the Term of this Lease for five consecutive five-year periods (each period, an "**Extended Term**"), by giving written notice to Lessor of each such extension by not later than one hundred eighty days prior to the expiration of the Term, subject, however, to the provisions of Section 13.7 hereof. Lessor agrees to use its best efforts to provide Lessee with prior written notice at least ninety days prior to the foregoing dates. Lessee may not exercise its option for more than one Extended Term at a time. During each Extended Term, all of the terms and conditions of this Lease shall continue in full force and effect, except that the Minimum Rent shall be determined in accordance with Section 33.2.

33.2 **Minimum Rent for the First Year of any Extended Term.** The Minimum Rent for the first year of any Extended Term shall be the Fair Market Rental Value on the first day of such Extended Term.

ARTICLE 34
MISCELLANEOUS

34.1 **No Waiver.** No failure by Lessor or Lessee to insist upon the strict performance of any term hereof or to exercise any right, power or remedy consequent upon a breach thereof, and no acceptance of full or partial payment of Rent during the continuance of any such breach, shall constitute a waiver of any such breach or any such term. To the extent permitted by law, no waiver of any breach shall affect or alter this Lease, which shall continue in full force and effect with respect to any other then existing or subsequent breach.

34.2 **Remedies Cumulative.** To the extent permitted by law, each legal, equitable or contractual right, power and remedy of Lessor or Lessee now or hereafter provided either in this

Lease or by statute or otherwise shall be cumulative and concurrent and shall be in addition to every other right, power and remedy and the exercise or beginning of the exercise by Lessor or Lessee of any one or more of such rights, powers and remedies shall not preclude the simultaneous or subsequent exercise by Lessor or Lessee of any or all of such other rights, powers and remedies.

34.3 **Surrender.** No surrender to Lessor of this Lease or of the Leased Property or any part thereof, or of any interest therein, shall be valid or effective unless agreed to and accepted in writing by Lessor, and no act by Lessor or any representative or agent of Lessor, other than such a written acceptance by Lessor, shall constitute an acceptance of any such surrender.

34.4 **No Merger of Title.** There shall be no merger of this Lease or of the leasehold estate created hereby by reason of the fact that the same person, firm, corporation or other entity may acquire, own or hold, directly or indirectly, (a) this Lease or the leasehold estate created hereby or any interest in this Lease or (b) such leasehold estate and the fee estate in the Leased Property.

34.5 **Transfers by Lessor.** If Lessor or any successor owner of the Leased Property shall convey the Leased Property in accordance with the terms hereof, other than as security for a debt, the grantee or transferee of the Leased Property shall expressly assume all obligations of Lessor hereunder arising or accruing from and after the date of such conveyance or transfer, and shall be reasonably capable of performing the obligations of Lessor hereunder and Lessor or such successor owner, as the case may be, shall thereupon be released from all future liabilities and obligations of Lessor under this Lease arising or accruing from and after the date of such conveyance or other transfer and all such future liabilities and obligations shall thereupon be binding upon the new owner.

34.6 **General.** Anything contained in this Lease to the contrary notwithstanding, all claims against, and liabilities of, Lessee and Lessor against the other arising out of or relating to this Lease and arising prior to any date of termination of this Lease shall survive such termination. If any term or provision of this Lease or any application thereof shall be invalid or unenforceable, the remainder of this Lease and any other application of such term or provision shall not be affected thereby. If any late charges provided for in any provision of this Lease are based upon a rate in excess of the maximum rate permitted by applicable law, the parties agree that such charges shall be fixed at the maximum permissible rate. Neither this Lease nor any provision hereof may be changed, waived, discharged or terminated except by an instrument in writing and in recordable form signed by Lessor and Lessee. All the terms and provisions of this Lease shall be binding upon and inure to the benefit of the parties hereto and their respective successors and assigns. The headings in this Lease are for convenience of reference only and shall not limit or otherwise affect the meaning hereof. This Lease shall be governed by and construed in accordance with the laws of the state in which the Leased Property is located. This Lease may be executed in one or more counterparts, each of which shall be an original but, when taken together, shall constitute but one document.

34.7 **Memorandum of Lease.** Lessor and Lessee shall, promptly upon the request of either, enter into a short form memorandum of this Lease in form suitable for recording under the

laws of the state in which the Leased Property is located, the form of which memorandum is attached hereto as Exhibit "C".

34.8 Venue of Actions. The parties agree that any action brought to interpret or enforce any provision of this Lease, or otherwise relating to or arising from this Lease, shall be commenced and maintained only in the federal or state court with appropriate subject matter and amount-in-controversy jurisdiction in the county or other judicial district in which the Leased Property is located.

34.9 Waiver of Right to Trial By Jury. TO THE EXTENT PERMITTED BY APPLICABLE LAW, LESSOR AND LESSEE HEREBY EXPRESSLY WAIVE ANY RIGHT TO TRIAL BY JURY OF ANY CLAIM, DEMAND, ACTION OR CAUSE OF ACTION (i) ARISING UNDER THIS LEASE, OR UNDER ANY GUARANTY PERTAINING HERETO OR ANY OTHER INSTRUMENT, DOCUMENT OR AGREEMENT EXECUTED OR DELIVERED PURSUANT HERETO, OR (ii) RELATED TO THE LEASED PROPERTY, IN PART OR IN WHOLE, OR (iii) RELATED TO THIS LEASE, THE LEASED PROPERTY OR THE TRANSACTION(S) CONTEMPLATED HEREBY, IN EACH CASE WHETHER NOW EXISTING OR HEREAFTER ARISING. LESSOR AND LESSEE FURTHER AGREE THAT ANY SUCH CLAIM, DEMAND, ACTION OR CAUSE OF ACTION SHALL BE DECIDED BY COURT TRIAL WITHOUT A JURY, AND THAT EITHER PARTY MAY FILE AN ORIGINAL COUNTERPART OR A COPY OF THIS SECTION WITH ANY COURT AS WRITTEN EVIDENCE OF THE CONSENT TO THE WAIVER(S) OF TRIAL BY JURY MADE HEREIN.

34.10 Waiver of Certain Damages. Each of the parties hereto recognizes that one of the remedies available to it in any trial may, under certain circumstances, be the right to receive damages in excess of those actually sustained by it. Therefore, each of the parties agrees as follows:

(a) TO THE MAXIMUM EXTENT NOW PERMITTED BY LAW, EACH OF THE PARTIES HERETO KNOWINGLY, VOLUNTARILY AND INTENTIONALLY WAIVES ANY RIGHT IT MAY HAVE TO CLAIM OR RECOVER IN ANY LITIGATION ANY SPECIAL, EXEMPLARY, PUNITIVE, OR CONSEQUENTIAL DAMAGES, OR ANY DAMAGES OTHER THAN, OR IN ADDITION TO, ACTUAL DAMAGES.

(b) EACH OF THE PARTIES ACKNOWLEDGES AND AGREES THAT THE FOREGOING WAIVERS ARE KNOWINGLY, FREELY AND VOLUNTARILY GIVEN, ARE DESIRED BY ALL PARTIES, AND ARE IN THE BEST INTEREST OF ALL PARTIES.

34.11 Entire Agreement. This Lease embodies and constitutes the entire understanding between the parties concerning the leasing of the Leased Property. Neither this Lease nor any provision hereof may be waived, modified, amended, discharged or terminated except by an instrument in writing signed by the party against whom the enforcement of such waiver, modification, amendment, discharge or termination is sought, and then only to the extent set forth in such instrument.

ARTICLE 35
GLOSSARY OF TERMS

For purposes of this Lease, except as otherwise expressly provided or unless the context otherwise requires, (a) the terms defined in this Article 35 have the meanings assigned to them in this Article 35 and include the plural as well as the singular, (b) all accounting terms not otherwise defined herein have the meanings assigned to them in accordance with generally accepted accounting principles as at the time applicable, (c) all references in this Lease to designated "Articles", "Sections" and other subdivisions are to the designated Articles, Sections and other subdivisions of this Lease, and (d) the words "herein", "hereof" and "hereunder" and other words of similar import refer to this Lease as a whole and not to any particular Article, Section or other subdivision and (e) the word "including" shall be deemed to be followed by the phrase "without limitation". For purposes of this Lease, the following terms shall have the meanings indicated:

"Acquisition Costs" means the sum of certain closing costs paid for the Leased Property by Lessor, including purchase price, title, premiums, recording fees and taxes, surveys, appraisals, soils reports and other similar out-of-pocket expenses incurred by Lessor in connection with the acquisition of the Leased Property.

"Additional Charges" has the meaning set forth in Section 2.5 hereof.

"Adjustment Date" means (i) for the Initial Term, the first day of the month following the first anniversary of the Commencement Date and each anniversary thereafter during the Initial Term, unless the Commencement Date occurs on the first day of a calendar month, in which case the Adjustment Date will be the first anniversary of the Commencement Date and each anniversary of the Commencement Date thereafter during the Initial Term, and (ii) for each Extended Term, the first anniversary of the first day of such Extended Term and each anniversary of such day thereafter during such Extended Term.

"Affiliate" means, as to any Person other than a natural person, any Person or entity which directly or indirectly through one or more intermediaries controls, is controlled by or is under common control with a partner, general or limited, of such Person. For purposes hereof, the terms "control", "controlled", or "controlling" shall include, (i) the ownership, control or power to vote ten percent or more of (x) the outstanding shares of any class of voting securities of any Person or (y) any holder of beneficial interests of any Person or any such person or entity, as the case may be, directly or indirectly, or acting through one or more persons or entities, (ii) the control in any manner over a general partner(s) of any Person or the election of more than one manager, director or trustee (or persons exercising similar functions) of such Person or entity, or (iii) the power to exercise, directly or indirectly, control over the management or policies of such Person.

"Assignment Conditions" has the meaning set forth in Section 23.1.

"Award" means all compensation, sums or anything of value awarded, paid or received on a total or partial Condemnation.

"Business Day" means each Monday, Tuesday, Wednesday, Thursday and Friday which is not a day on which national banks in the City of Birmingham, Alabama are closed.

"Capital Additions" means one or more new buildings or one or more additional structures annexed to any portion of any of the Leased Improvements, which are constructed on any parcel or portion of the Land during the Term, including the construction of a new wing or new story.

"Capital Addition Cost" means the cost of any Capital Additions proposed to be made by Lessee. Such cost shall include and be limited to (a) the cost of construction of the Capital Additions, including site preparation and improvement, materials, labor, supervision and certain related design, engineering and architectural services and the cost of any fixtures, construction financing and miscellaneous items, (b) the cost of any land contiguous to the Leased Property purchased for the purpose of placing thereon the Capital Additions or any portion thereof or for providing means of access thereto, or parking facilities therefor, including the cost of surveying the same, (c) the cost of insurance, real estate taxes, water and sewage charges and other carrying charges for such Capital Additions during construction, (d) the cost of title insurance, (e) reasonable fees and expenses of legal counsel and accountants, (f) filing, registration and recording taxes and fees, (g) documentary stamp taxes, if any, and (h) environmental assessments and boundary surveys.

"Cash Adjustment" has the meaning set forth in Section 20.1(d).

"Charge" has the meaning set forth in Article 11 hereof.

"Code" means the Internal Revenue Code of 1986, as amended.

"Commencement Date" has the meaning set forth in Section 1.2.

"Condemnation" means the transfer of all or any part of the Leased Property as a result of (i) the exercise of any governmental power, whether by legal proceedings or otherwise, by a Condemnor or (ii) a voluntary sale or transfer by Lessor to any Condemnor, either under threat of Condemnation or while legal proceedings for Condemnation are pending.

"Condemnor" means any public or quasi-public authority, or private corporation or individual, having the power of Condemnation.

"Consolidated Net Worth" means, at any time, for Lessee, the sum of the following which would appear on a balance sheet of Lessee on a consolidated basis prepared in accordance with generally accepted accounting principles, except as may be allowed under normal purchase accounting:

(i) the amount of capital or stated capital (after deducting the cost of any treasury shares or like interests), plus

(ii) the amount of capital surplus and retained earnings (or, in the case of a capital surplus or retained earnings deficit, minus the amount of such deficit), minus

(iii) the sum of the following (without duplication of deductions in respect of items already deducted in arriving at capital surplus and retained earnings): any write-up in book value of assets resulting from a revaluation thereof subsequent to the most recent financial statement of Lessee prior to the date thereof, except any net write-up in value of foreign currency; any write-up resulting from a reversal of a reserve for bad debts or depreciation; and any write-up resulting from a change in methods of accounting for inventory, minus

(iv) the aggregate book value of Intangible Assets shown on such balance sheet.

"Current Yield" means, as of a specific date, the annual Minimum Rent, as adjusted from time to time pursuant to the terms of this Lease, divided by the Total Project Costs.

"Date of Taking" means the date the Condemnor has the right to possession of the property being condemned.

"Encumbrance" has the meaning set forth in Article 32.

"Event of Default" has the meaning set forth in Section 15.1.

"Extended Term" has the meaning set forth in Section 34.1.

"Facility" means the inpatient rehabilitation hospital to be operated initially on the Leased Property.

"Facility Financial Statements" means for the Facility, as to a specific period, the Detailed Income Statement containing revenue and expenses (in reasonable detail), EBITDA, EBITDAR and operating statistics (to include, at a minimum, inpatient days, discharges, outpatient visits and licensed beds), all presented for the period, quarter-to-date and year-to-date.

"Facility Mortgage" has the meaning set forth in Section 12.1.

"Facility Mortgagee" has the meaning set forth in Section 12.1.

"Fair Market Added Value" means the Fair Market Value (as hereinafter defined) of the Leased Property (including all Capital Additions) less the Fair Market Value of the Leased Property determined as if no Capital Additions paid for by Lessee had been constructed.

"Fair Market Rental Value" means the fair market rental value of the Leased Property or any Substitute Property determined as of the date of the appraisal pursuant to Article 28, (a) assuming the same is unencumbered by this Lease, (b) determined in accordance with the appraisal procedures set forth in Article 28 or in such other manner as shall be mutually acceptable to Lessor and Lessee, (c) not taking into account any reduction in value resulting from an indebtedness to which the Leased Property or Substitute Property may be subject, and (d) not including the value of any Capital Additions to the Leased Property financed by Lessee pursuant to the terms of Article 9.

"Fair Market Value" means the fair market value of the Leased Property or any Substitute Property, including all Capital Additions, (a) assuming the same is unencumbered by this Lease, (b) determined in accordance with the appraisal procedures set forth in Article 28 or in such other manner as shall be mutually acceptable to Lessor and Lessee, and (c) not taking into account any reduction in value resulting from any indebtedness to which the Leased Property or such Substitute Property is subject or which encumbrance Lessee or Lessor is otherwise required to remove pursuant to any provision of this Lease or agrees to remove at or prior to the closing of the transaction as to which such Fair Market Value determination is being made.

"Fair Market Value Purchase Price" means the Fair Market Value less the Fair Market Added Value.

"Fiscal Year" means the 12-month period from January 1 to December 31.

"Fixtures" has the meaning set forth in Section 1.1(c).

"Full Replacement Cost" has the meaning set forth in Section 12.2.

"Hazardous Materials" means any substance, including asbestos or any substance containing asbestos, the group of organic compounds known as polychlorinated biphenyls, flammable explosives, radioactive materials, medical waste, chemicals, pollutants, effluents, contaminants, emissions or related materials and items included in the definition of hazardous or toxic wastes, materials or substances under any Hazardous Materials Law.

"Hazardous Materials Law" means any law, regulation or ordinance relating to environmental conditions, medical waste and industrial hygiene, including the Resource Conservation and Recovery Act of 1976 ("RCRA"), the Comprehensive Environmental Response, Compensation and Liability Act of 1980 ("CERCLA"), as amended by the Superfund Amendments and Reauthorization Act of 1986 ("SARA"), the Hazardous Materials Transportation Act, the Federal Water Pollution Control Act, the Clean Air Act, the Clean Water Act, the Toxic Substances Control Act, the Safe Drinking Water Act, and all similar federal, state and local environmental statutes and ordinances, whether heretofore or hereafter enacted or effective and all regulations, orders, or decrees heretofore or hereafter promulgated thereunder.

"Impositions" means, collectively, all taxes relating to the Leased Property, including all ad valorem, sales and use, gross receipts, action, privilege or similar taxes, assessments (including all assessments for public improvements or benefits, whether or not commenced or completed prior to the date hereof and whether or not to be completed within the Term), water, sewer or other rents and charges, excises, tax levies, fees (including license, permit, inspection, authorization and similar fees), and all other governmental charges, in each case whether general or special, ordinary or extraordinary, or foreseen or unforeseen, of every character in respect of the Leased Property and/or the Rent (including all interest and penalties thereon due to any failure in payment by Lessee), which at any time prior to, during or in respect of the Term hereof may be assessed or imposed on or in respect of or be a lien upon (a) Lessor or Lessor's interest in the Leased Property, (b) the Rent, the Leased Property or any part thereof or any rent therefrom or any estate, right, title or interest therein, or (c) any occupancy, operation, use or possession of,

sales from, or activity conducted on, or in connection with, the Leased Property or use of the Leased Property or any part thereof; provided that nothing contained in this Lease shall be construed to require Lessee to pay (1) any tax based on net income (whether denominated as a franchise or capital stock or other tax) imposed on Lessor, (2) any transfer or net revenue tax of Lessor, (3) any tax imposed with respect to the sale, exchange or other disposition by Lessor of any portion of the Leased Property or the proceeds thereof, or (4) except as expressly provided elsewhere in this Lease, any principal or interest on any Encumbrance on the Leased Property, except to the extent that any tax, assessment, tax levy or charge which Lessee is obligated to pay pursuant to this definition and which is in effect at any time during the Term hereof is totally or partially repealed, and a tax, assessment, tax levy or charge set forth in clause (1), (2) or (3) is levied, assessed or imposed expressly in lieu thereof.

"Initial Term" has the meaning set forth in Section 1.2.

"Insurance Requirements" means all terms of any insurance policy required by this Lease and all requirements of the issuer of any such policy.

"Intangible Assets" means those assets which are (i) deferred assets, other than prepaid insurance and prepaid taxes, (ii) patents, copyrights, trademarks, trade names, franchises, good will, experimental expenses and other similar assets which would be classified as intangible assets on a balance sheet prepared in accordance with generally accepted accounting principles, (iii) unamortized debt discount and expense, and (iv) assets located, and notes and receivables due from obligors domiciled outside of the United States.

"Land" has the meaning set forth in Section 1.1(a).

"Lease" means this Lease.

"Leased Improvements" has the meanings set forth in Section 1.1(b).

"Leased Property" has the meanings set forth in Section 1.1.

"Legal Requirements" means all federal, state, county, municipal and other governmental statutes, laws, rules, orders, regulations, ordinances, judgments, decrees and injunctions affecting the Leased Property or the construction, use or alteration thereof, whether now or hereafter enacted and in force, including any which may (a) require repairs, modifications or alterations of or to the Leased Property, or (b) in any way adversely affect the use and enjoyment thereof, and all permits, licenses, authorizations and regulations relating thereto, and all covenants, agreements, actions and encumbrances contained in any instruments, either of record or known to Lessee (other than encumbrances created by Lessor without the consent of Lessee), at any time in force affecting the Leased Property.

"Lessee" means the entity identified in the initial paragraph hereof as "Lessee," and its successors and assigns.

"Lessor" means the entity identified in the initial paragraph hereof as "Lessor," and its successors and assigns.

"Minimum Rent" has the meaning set forth in Section 2.3(a) hereof.

"Minimum Purchase Price" means the Fair Market Value of the Leased Property determined as of the date of the appraisal pursuant to Article 28, but not including the value of any Capital Additions to the Leased Property financed by Lessee pursuant to the terms of Article 9 and less the net amount of all Awards (after deduction of all reasonable legal fees and other costs and expenses, including expert witness fees, incurred by Lessor in connection with obtaining any such Award) received by Lessor from any Condemnation of the Leased Property.

"Overdue Rate" means as of any date, a rate per annum equal to the Prime Rate as of such date, plus two percent, but in no event greater than the maximum rate then permitted under applicable law.

"Payment Date" means any due date for the payment of the installments of Minimum Rent under this Lease.

"Payment Obligation" has the meaning set forth in Section 15.2(d).

"Permitted Assignee" has the meaning set forth in Section 23.1.

"Permitted Exceptions" has the meaning set forth in Section 1.2.

"Permits" has the meaning set forth in Section 1.1(d).

"Person" means a natural person, corporation, partnership, trust, association, limited liability company or other entity.

"Personal Property" means all machinery, equipment, furniture, furnishings, computers, signage, trade fixtures or other personal property and consumable inventory and supplies used or useful in the operation of the Leased Property for its Primary Intended Use, together with all replacements and substitutions therefor.

"Primary Intended Use" has the meaning set forth in Section 6.2(a).

"Prime Rate" means the annual rate reported by The Wall Street Journal, Eastern Edition (or, if The Wall Street Journal shall no longer be published or shall cease to report such rates, then a publication or journal generally accepted in the financial industry as authoritative evidence of prevailing commercial lending rates), from time to time as being the prevailing prime rate (or, if more than one such rate shall be published in any given edition, the arithmetic mean of such rates). The prime rate is an index rate used by The Wall Street Journal to report prevailing lending rates and may not necessarily be its most favorable lending rate available. Any change in the Prime Rate hereunder shall take effect on the effective date of such change in the prime rate as reported by The Wall Street Journal, without notice to Lessee or any other action by Lessor. Interest shall be computed on the basis that each year contains 360 days, by multiplying the principal amount by the per annum rate set forth above, dividing the product so obtained by 360, and multiplying the quotient thereof by the actual number of days elapsed.

"**Rent**" means, individually and collectively, the Minimum Rent and the Additional Charges.

"**Request**" has the meaning set forth in Section 9.3(a).

"**Special Default Event**" has the meaning set forth in Section 15.2(d).

"**Special Lessor Default Event**" has the meaning set forth in Section 30.1.

"**Substitution Agreement**" has the meaning set forth in Section 29.1.

"**Substitution Date**" has the meaning set forth in Section 20.1.

"**Substitute Properties**" has the meaning set forth in Section 20.1.

"**Taking**" means a taking or voluntary conveyance during the Term hereof of all or part of the Leased Property, or any interest therein or right accruing thereto or use thereof, as the result of, or in settlement of any Condemnation or other eminent domain proceeding affecting the Leased Property whether or not the same shall have actually been commenced.

"**Term**" means the Initial Term and any Extended Term as to which Lessee has exercised its options to extend contained in Section 34.1 hereof unless earlier terminated pursuant to the provisions hereof.

"**Test Rate**" has the meaning set forth in Section 9.2(b)(ii).

"**Total Project Costs**" mean the Acquisition Costs.

"**Unavoidable Delays**" means delays due to strikes, lockouts, inability to procure materials after the exercise of reasonable efforts, power failure, acts of God, governmental restrictions, enemy action, civil commotion, fire, unavoidable casualty or other causes beyond the control of the party responsible for performing an obligation hereunder, provided that lack of funds shall not be deemed a cause beyond the control of either party hereto unless such lack of funds is caused by the failure of the other party hereto to perform any obligations of such other party under this Lease.

"**Unsuitable for Its Primary Intended Use**" as used anywhere in this Lease, shall mean that, by reason of any damage, destruction or partial Taking, in the good faith judgment of Lessee, reasonably exercised, the Facility cannot be profitably operated for its Primary Intended Use, taking into account, among other relevant factors, the number of usable beds affected by such damage, destruction or partial Taking.

[signatures follow]

IN WITNESS WHEREOF, Lessor has caused this Lease to be executed by its officer thereunto duly authorized as of the date first written above.

“Lessor”

Encompass Health Maine Real Estate, LLC

By: _____

Name: _____

Title: _____

“Lessee”

Encompass Health Rehabilitation Hospital of
Bangor, LLC

By: _____

Name: _____

Title: _____

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EXHIBIT "A"
PROPERTY DESCRIPTION

EXHIBIT "B"

LIST OF PERMITTED EXCEPTIONS

1. Taxes and assessments which are not yet due and payable.
2. All other matters of record with respect to the Leased Property as of the date hereof, including those items reflected in the title reports relating thereto.

EXHIBIT "C"

This instrument prepared by:

MEMORANDUM OF LEASE

THIS MEMORANDUM OF LEASE (this "Memorandum") is made as of _____, 20__, by and between _____, a Delaware limited liability company ("Lessor"), and _____, a Delaware limited liability company ("Lessee"), who agree as follows:

1. Leased Property. Lessor hereby leases to Lessee and Lessee hereby leases from Lessor for the consideration and upon and subject to the terms and conditions of the unrecorded Lease Agreement dated as of _____, 20__ (the "Lease") (all of which terms and conditions are hereby incorporated into this Memorandum by reference as though set forth in full herein), that certain real property situated in _____, _____, described on Exhibit A attached hereto and incorporated herein by reference, and all improvements located thereon (the "Leased Property").

2. Initial Term. The initial term of the Lease is ten years commencing on _____, 20__, and ending on _____, 20__.

3. Renewal Terms. Lessor has granted Lessee five successive options to extend the term of the Lease by five years each upon and subject to the terms and conditions of the Lease.

4. Purchase Option. In Section 19.2 of the Lease, Lessee is granted an option to purchase the Leased Property at the end of the initial term of the Lease and at the end of each renewal term, upon the terms and conditions set forth therein.

5. No Modification. This Memorandum has been executed for the purposes of recordation only and shall not modify the provisions of the Lease, including the terms and conditions of any options contained therein. In the event of any inconsistency or conflict between the provisions of this Memorandum and the provisions of the Lease, the provisions of the Lease shall govern and control.

IN WITNESS WHEREOF, the parties have executed this Memorandum as of the day and year first above written.

WITNESS:

[Print Name]

LESSOR:

By: _____
Its: _____

WITNESS:

[Print Name]

LESSEE:

By: _____
Its: _____

STATE OF _____)
) SS
COUNTY OF _____)

On this ___ day of _____, 20___, before me appeared _____, to me personally known, who, being by me duly sworn, did say that he is the _____, a Delaware limited liability company, and that said instrument was signed on behalf of said corporation, and said corporation acknowledged said instrument to be the free act and deed of said corporation.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal in the County and state aforesaid, the day and year first above written.

Notary Public

My commission expires:

STATE OF _____)
) SS
COUNTY OF _____)

On this ____ day of _____, 20__, before me appeared _____, to me personally known, who, being by me duly sworn, did say that he/she is the _____ of _____, a Delaware limited liability company, and that said instrument was signed on behalf of said limited liability company, and said limited liability company acknowledged said instrument to be the free act and deed of said limited liability company.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal in the County and state aforesaid, the day and year first above written.

Notary Public

My commission expires:

Exhibit A



Edmund M. Fay
Senior Vice President & Treasurer
9001 Liberty Parkway
Birmingham, AL 35242

205.970.7875
encompasshealth.com

December 12, 2023

Rich S. Lawrence
Senior Health Care Financial Analyst
Department of Health and Human Services
Division of Licensing and Certification
Healthcare Compliance and Operations
41 Anthony Avenue
11 State House Station
Augusta, ME 04333-0011

RE: Encompass Health Rehabilitation Hospital of Bangor, LLC
CON Application to Establish a New 50-Bed Freestanding Rehabilitation Hospital

Dear Mr. Lawrence:

This letter serves as confirmation that, with respect to the above-mentioned project, Encompass Health Corporation, the parent company of Encompass Health Rehabilitation Hospital of Bangor, LLC and Encompass Health Maine Real Estate, LLC, has available funds and will commit funds for this project. Encompass Health has ample existing cash, cash flow from operations, and funds available under its credit facility to offer more than adequate funds for the proposed project.

In addition to the commitment for the above noted project, Encompass Health Corporation is also committed to providing the necessary working capital for this proposed project. Encompass Health Corporation has designated funds up to \$80 Million for this project. We have sufficient resources to fully fund these expenditures in addition to our other ongoing obligations.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Edmund M. Fay", with a long, sweeping horizontal line extending to the right.

Edmund Fay
Senior Vice President and Treasurer
Encompass Health Corporation

Item 15. Financial Statements

Report of Independent Registered Public Accounting Firm (PCAOB ID 238)	F-2
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Report of Independent Registered Public Accounting Firm

To the Board of Directors and Shareholders of Encompass Health Corporation

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of Encompass Health Corporation and its subsidiaries (the “Company”) as of December 31, 2022 and 2021, and the related consolidated statements of comprehensive income, of shareholders' equity and of cash flows for each of the three years in the period ended December 31, 2022, including the related notes (collectively referred to as the “consolidated financial statements”). We also have audited the Company's internal control over financial reporting as of December 31, 2022, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2022 and 2021, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2022 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2022, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the COSO.

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in Management's Report on Internal Control Over Financial Reporting appearing under Item 9A. Our responsibility is to express opinions on the Company's consolidated financial statements and on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and Limitations of Internal Control over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Critical Audit Matters

The critical audit matters communicated below are matters arising from the current period audit of the consolidated financial statements that were communicated or required to be communicated to the audit committee and that (i) relate to accounts or disclosures that are material to the consolidated financial statements and (ii) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matters below, providing separate opinions on the critical audit matters or on the accounts or disclosures to which they relate.

Valuation of Patient Accounts Receivable - Contractual Allowances and Uncollectible Amounts

As described in Notes 1 and 6 to the consolidated financial statements, revenues are recognized (or measured) using the input method as therapy, nursing, and auxiliary services are provided based on management's estimate of the respective transaction price. Management's estimate of the transaction price includes estimates of price concessions for such items as contractual allowances, potential adjustments that may arise from payment and other reviews, and uncollectible amounts. Revenues recognized are subject to a number of elements which impact both the overall amount of revenue realized as well as the timing of the collection of the related patient accounts receivable. Factors considered by management in determining the estimated transaction price include the patient's total length of stay for in-house patients, each patient's discharge destination, the proportion of patients with secondary insurance coverage and the level of reimbursement under that secondary coverage, and the amount of charges that will be disallowed by payors. Management assumes these factors will remain consistent with the experience for patients discharged in similar time periods for the same payor classes. The Company's consolidated accounts receivable balance is \$610.1 million as of December 31, 2022. Management estimates the allowance for uncollectible amounts based on the aging of accounts receivable, historical collection experience for each type of payor, and other relevant factors. As disclosed by management, changes in general economic conditions are also considered.

The principal considerations for our determination that performing procedures relating to the valuation of patient accounts receivable – contractual allowances and uncollectible amounts is a critical audit matter are the significant judgment by management to estimate patient accounts receivable and the amount that will ultimately be collected under the terms of the third-party payor contracts, which in turn led to significant auditor judgment and effort to evaluate the audit evidence obtained related to the valuation of patient accounts receivable.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to the valuation of patient accounts receivable related to contractual allowances and uncollectible amounts, which included controls over management's process, assumptions, and data used to estimate contractual allowances and uncollectible amounts and determine patient accounts receivable. These procedures also included, among others, i) evaluating management's process for developing the estimate for contractual allowances and uncollectible amounts, ii) testing the completeness and accuracy of underlying data used in the model, iii) evaluating the historical accuracy of management's process for developing the estimate of the amount which will ultimately be collected by comparing actual cash collections to the previously recorded patient accounts receivable, and iv) developing an independent expectation of the amount expected to be collected by management. Developing an independent expectation involved calculating the percentage of cash collections as compared to the recorded patient accounts receivable balance for prior years and comparing that percentage to management's collection expectation used to determine the current year estimate for contractual allowances and uncollectible amounts.

Valuation of Patient Accounts Receivable - Denied Claims

As described in Note 1 to the consolidated financial statements, the Company's Medicare claims have been subject to review by Medicare Administrative Contractors ("MACs") under various programs such as "widespread probes" and the Targeted Probe and Educate initiative. The MACs reviews have resulted in denial of payment for claims billed under certain diagnosis codes. As of December 31, 2022, \$73.6 million of the Company's patient accounts receivable represented denials that were under review or audit. While the Company generally appeals most of the denials of claims by the MACs, the Medicare appeals adjudication process, which is administered by the Office of Medicare Hearings and Appeals ("OMHA"), has been subject to significant delay resulting in a backlog of claims awaiting hearing, the resolution of which may take several years. As disclosed in Note 1, the Company's historical experience and success in the adjudication of these appeals is a component of management's estimate of the transaction price.

The principal considerations for our determination that performing procedures relating to the valuation of patient accounts receivable – denied claims is a critical audit matter are the significant judgment by management to estimate the ultimate expected amount of collectible accounts receivable related to denied claims. This in turn led to a high degree of auditor judgment and effort to evaluate the audit evidence obtained related to the valuation of such denied claims.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to the valuation of patient accounts receivable related to denied claims, which included controls around the identification of denied claims at period-end, as well as controls to assess the reasonableness of the success rate estimates. These procedures also included, among others, i) evaluating management’s process for developing the estimate for collectible amounts related to denied claims, as well as the relevance and use of the historical billing and collection data as an input to the valuation analysis, ii) evaluating the reasonableness of management’s analysis and success rate estimate for denied claims by comparing it to the Company’s adjudicated denied claim results, iii) performing testing over a sample of denied revenue transactions by inspecting evidence that the claim was denied, and iv) performing testing over a sample of cash collections from the historical collection data used in management’s estimation of collectability.

/s/ PricewaterhouseCoopers LLP
Birmingham, Alabama
February 27, 2023

We have served as the Company’s auditor since 2003.

Encompass Health Corporation and Subsidiaries
Consolidated Statements of Comprehensive Income

	For the Year Ended December 31,		
	2022	2021	2020
	(In Millions, Except Per Share Data)		
Net operating revenues	\$ 4,348.6	\$ 4,014.9	\$ 3,566.3
Operating expenses:			
Salaries and benefits	2,393.3	2,127.3	1,903.8
Other operating expenses	670.4	595.9	545.1
Occupancy costs	54.7	59.0	61.4
Supplies	202.1	184.2	171.0
General and administrative expenses	154.3	169.5	151.6
Depreciation and amortization	243.6	219.6	203.0
Government, class action, and related settlements	—	—	2.8
Total operating expenses	3,718.4	3,355.5	3,038.7
Loss on early extinguishment of debt	1.4	1.0	2.3
Interest expense and amortization of debt discounts and fees	175.7	164.3	183.7
Other expense (income)	5.2	(7.5)	(8.4)
Equity in net income of nonconsolidated affiliates	(2.9)	(3.4)	(2.9)
Income from continuing operations before income tax expense	450.8	505.0	352.9
Provision for income tax expense	100.1	101.9	74.7
Income from continuing operations	350.7	403.1	278.2
Income from discontinued operations, net of tax	15.2	114.1	90.6
Net and comprehensive income	365.9	517.2	368.8
Less: Net income attributable to noncontrolling interests included in continuing operations	(93.6)	(103.2)	(83.3)
Less: Net income attributable to noncontrolling interests included in discontinued operations	(1.3)	(1.8)	(1.3)
Less: Net and comprehensive income attributable to noncontrolling interests	(94.9)	(105.0)	(84.6)
Net and comprehensive income attributable to Encompass Health	\$ 271.0	\$ 412.2	\$ 284.2
Weighted average common shares outstanding:			
Basic	99.2	99.0	98.6
Diluted	100.4	100.2	99.8
Earnings per common share:			
Basic earnings per share attributable to Encompass Health common shareholders:			
Continuing operations	\$ 2.58	\$ 3.02	\$ 1.97
Discontinued operations	0.14	1.13	0.90
Net income	\$ 2.72	\$ 4.15	\$ 2.87
Diluted earnings per share attributable to Encompass Health common shareholders:			
Continuing operations	\$ 2.56	\$ 2.99	\$ 1.96
Discontinued operations	0.14	1.12	0.89
Net income	\$ 2.70	\$ 4.11	\$ 2.85
Amounts attributable to Encompass Health:			
Income from continuing operations	\$ 257.1	\$ 299.9	\$ 194.9
Income from discontinued operations, net of tax	13.9	112.3	89.3
Net income attributable to Encompass Health	\$ 271.0	\$ 412.2	\$ 284.2

The accompanying notes to consolidated financial statements are an integral part of these statements.

Encompass Health Corporation and Subsidiaries
Consolidated Balance Sheets

	As of December 31,	
	2022	2021
	(In Millions, Except Share Data)	
Assets		
Current assets:		
Cash and cash equivalents	\$ 21.8	\$ 49.4
Restricted cash	31.6	62.5
Accounts receivable	536.8	515.8
Prepaid expenses and other current assets	127.0	114.9
Current assets of discontinued operations	—	178.8
Total current assets	717.2	921.4
Property and equipment, net	2,939.2	2,581.2
Operating lease right-of-use assets	212.5	193.7
Goodwill	1,263.2	1,237.0
Intangible assets, net	282.3	158.4
Other long-term assets	222.0	230.0
Noncurrent assets of discontinued operations	0.1	1,543.2
Total assets⁽¹⁾	\$ 5,636.5	\$ 6,864.9
Liabilities and Shareholders' Equity		
Current liabilities:		
Current portion of long-term debt	\$ 25.2	\$ 37.8
Current operating lease liabilities	25.6	23.5
Accounts payable	132.9	134.0
Accrued payroll	168.3	199.4
Accrued interest payable	42.8	44.4
Other current liabilities	181.0	177.3
Current liabilities of discontinued operations	0.1	132.4
Total current liabilities	575.9	748.8
Long-term debt, net of current portion	2,741.8	3,240.5
Long-term operating lease liabilities	199.7	179.6
Self-insured risks	128.5	123.8
Deferred income tax liabilities	83.0	23.3
Other long-term liabilities	45.3	48.9
Noncurrent liabilities of discontinued operations	0.4	100.8
	3,774.6	4,465.7
Commitments and contingencies		
Redeemable noncontrolling interests	35.6	42.2
Shareholders' equity:		
Encompass Health shareholders' equity:		
Common stock, \$.01 par value; 200,000,000 shares authorized; issued: 114,775,056 in 2022; 114,211,057 in 2021	1.1	1.1
Capital in excess of par value	1,730.2	2,289.6
Accumulated income	115.7	141.8
Treasury stock, at cost (14,992,125 shares in 2022 and 14,719,662 shares in 2021)	(536.7)	(521.2)
Total Encompass Health shareholders' equity	1,310.3	1,911.3
Noncontrolling interests	516.0	445.7
Total shareholders' equity	1,826.3	2,357.0
Total liabilities⁽¹⁾ and shareholders' equity	\$ 5,636.5	\$ 6,864.9

⁽¹⁾ Our consolidated assets as of December 31, 2022 and December 31, 2021 include total assets of variable interest entities of \$207.8 million and \$226.2 million, respectively, which cannot be used by us to settle the obligations of other entities. Our consolidated liabilities as of December 31, 2022 and December 31, 2021 include total liabilities of the variable interest entities of \$47.9 million and \$38.2 million, respectively. See Note 4, *Variable Interest Entities*.

The accompanying notes to consolidated financial statements are an integral part of these statements.

Encompass Health Corporation and Subsidiaries
Consolidated Statements of Shareholders' Equity

	Encompass Health Common Shareholders						Total
	Number of Common Shares Outstanding	Common Stock	Capital in Excess of Par Value	Accumulated (Deficit) Income	Treasury Stock	Noncontrolling Interests	
	(In Millions)						
December 31, 2019	98.6	\$ 1.1	\$ 2,369.9	\$ (526.5)	\$ (492.3)	\$ 340.9	\$ 1,693.1
Net income	—	—	—	284.2	—	77.2	361.4
Receipt of treasury stock	(0.2)	—	—	—	(15.7)	—	(15.7)
Dividends declared (\$1.12 per share)	—	—	(111.6)	—	—	—	(111.6)
Exchange of Holdings shares	0.6	—	27.1	—	19.2	—	46.3
Stock-based compensation	—	—	29.5	—	—	—	29.5
Stock options exercised	0.1	—	1.1	—	—	—	1.1
Distributions declared	—	—	—	—	—	(72.1)	(72.1)
Repurchases of common stock in open market	(0.1)	—	—	—	(6.1)	—	(6.1)
Capital contributions from consolidated affiliates	—	—	—	—	—	42.8	42.8
Fair value adjustments to redeemable noncontrolling interests	—	—	1.4	—	—	—	1.4
Other	0.4	—	9.2	—	(2.5)	(6.8)	(0.1)
December 31, 2020	99.4	1.1	2,326.6	(242.3)	(497.4)	382.0	1,970.0
Net income	—	—	—	412.2	—	96.0	508.2
Receipt of treasury stock	(0.2)	—	—	—	(16.4)	—	(16.4)
Dividends declared (\$1.12 per share)	—	—	(83.8)	(28.1)	—	—	(111.9)
Stock-based compensation	—	—	32.8	—	—	—	32.8
Distributions declared	—	—	—	—	—	(87.8)	(87.8)
Capital contributions from consolidated affiliates	—	—	—	—	—	72.5	72.5
Other	0.3	—	14.0	—	(7.4)	(17.0)	(10.4)
December 31, 2021	99.5	1.1	2,289.6	141.8	(521.2)	445.7	2,357.0
Net income	—	—	—	271.0	—	87.7	358.7
Receipt of treasury stock	(0.1)	—	—	—	(7.7)	—	(7.7)
Dividends declared (\$0.86 per share)	—	—	(11.1)	(75.2)	—	—	(86.3)
Stock-based compensation	—	—	31.7	—	—	—	31.7
Distributions declared	—	—	—	—	—	(99.5)	(99.5)
Capital contributions from consolidated affiliates	—	—	—	—	—	100.1	100.1
Spin off of Enhabit, Inc.	—	—	(595.7)	(221.9)	—	(28.4)	(846.0)
Other	0.4	—	15.7	—	(7.8)	10.4	18.3
December 31, 2022	99.8	\$ 1.1	\$ 1,730.2	\$ 115.7	\$ (536.7)	\$ 516.0	\$ 1,826.3

The accompanying notes to consolidated financial statements are an integral part of these statements.

Consolidated Statements of Cash Flows

	For the Year Ended December 31,		
	2022	2021	2020
	(In Millions)		
Cash flows from operating activities:			
Net income	\$ 365.9	\$ 517.2	\$ 368.8
Income from discontinued operations, net of tax	(15.2)	(114.1)	(90.6)
Adjustments to reconcile net income to net cash provided by operating activities—			
Provision for government, class action, and related settlements	—	—	2.8
Depreciation and amortization	243.6	219.6	203.0
Amortization of debt-related items	9.7	7.8	7.2
Loss on early extinguishment of debt	1.4	1.0	2.3
Equity in net income of nonconsolidated affiliates	(2.9)	(3.4)	(2.9)
Distributions from nonconsolidated affiliates	4.0	2.6	3.4
Stock-based compensation	29.2	29.1	25.6
Deferred tax expense	27.9	17.4	34.5
Other, net	20.3	(2.6)	6.8
Changes in assets and liabilities, net of acquisitions —			
Accounts receivable	(16.9)	(39.5)	(5.1)
Prepaid expenses and other assets	8.0	(41.8)	(1.2)
Accounts payable	2.3	15.6	14.1
Accrued payroll	(31.2)	(30.4)	79.2
Accrued interest payable	(1.7)	(2.6)	14.7
Other liabilities	9.1	(11.2)	6.3
Net cash provided by operating activities of discontinued operations	52.3	151.1	35.8
Total adjustments	355.1	312.7	426.5
Net cash provided by operating activities	705.8	715.8	704.7
Cash flows from investing activities:			
Acquisition of businesses, net of cash acquired	—	(1.1)	—
Purchases of property and equipment	(564.8)	(524.6)	(392.8)
Additions to capitalized software costs	(9.2)	(14.6)	(8.3)
Purchases of intangible assets	(10.1)	(6.5)	(3.5)
Proceeds from sale of restricted investments	—	—	12.6
Purchases of restricted investments	(35.2)	(9.0)	(8.7)
Other, net	(4.2)	8.7	(3.8)
Net cash used in investing activities of discontinued operations	(3.5)	(119.2)	(3.0)
Net cash used in investing activities	(627.0)	(666.3)	(407.5)

(Continued)

Encompass Health Corporation and Subsidiaries
Consolidated Statements of Cash Flows (Continued)

	For the Year Ended December 31,		
	2022	2021	2020
(In Millions)			
Cash flows from financing activities:			
Proceeds from bond issuance	—	—	992.5
Principal payments on debt, including pre-payments	(345.8)	(214.5)	(717.2)
Principal borrowings on notes	11.8	—	—
Borrowings on revolving credit facility	240.0	300.0	330.0
Payments on revolving credit facility	(385.0)	(100.0)	(375.0)
Principal payments under finance lease obligations	(19.2)	(44.6)	(14.4)
Debt amendment and issuance costs	(24.1)	—	(20.3)
Repurchases of common stock, including fees and expenses	—	—	(6.1)
Dividends paid on common stock	(99.0)	(112.2)	(111.8)
Purchase of equity interests in consolidated affiliates	—	—	(162.3)
Distributions paid to noncontrolling interests of consolidated affiliates	(96.6)	(101.1)	(70.9)
Taxes paid on behalf of employees for shares withheld	(7.3)	(14.6)	(14.7)
Contributions from noncontrolling interests of consolidated affiliates	64.1	57.2	34.9
Other, net	0.3	(0.1)	1.0
Net cash provided by (used in) financing activities of discontinued operations	515.1	(10.2)	(11.6)
Net cash used in financing activities	(145.7)	(240.1)	(145.9)
(Decrease) increase in cash, cash equivalents, and restricted cash	(66.9)	(190.6)	151.3
Cash, cash equivalents, and restricted cash at beginning of year	120.3	310.9	159.6
Cash, cash equivalents, and restricted cash at end of year	\$ 53.4	\$ 120.3	\$ 310.9
Reconciliation of Cash, Cash Equivalents, and Restricted Cash			
Cash and cash equivalents at beginning of period	\$ 49.4	\$ 185.6	\$ 60.0
Restricted cash at beginning of period	62.5	63.9	57.4
Restricted cash included in other long-term assets at beginning of period	0.4	21.5	7.4
Cash, cash equivalents, and restricted cash in discontinued operations at beginning of period	8.0	39.9	34.8
Cash, cash equivalents, and restricted cash at beginning of period	\$ 120.3	\$ 310.9	\$ 159.6
Cash and cash equivalents at end of period	\$ 21.8	\$ 49.4	\$ 185.6
Restricted cash at end of period	31.6	62.5	63.9
Restricted cash included in other long-term assets at end of period	—	0.4	21.5
Cash, cash equivalents, and restricted cash in discontinued operations at end of period	—	8.0	39.9
Cash, cash equivalents, and restricted cash at end of period	\$ 53.4	\$ 120.3	\$ 310.9
Supplemental cash flow information:			
Cash (paid) received during the year for —			
Interest	\$ (178.4)	\$ (168.4)	\$ (168.4)
Income tax refunds	1.0	1.8	1.4
Income tax payments	(51.2)	(131.4)	(34.3)

The accompanying notes to consolidated financial statements are an integral part of these statements.

1. Summary of Significant Accounting Policies:*Organization and Description of Business—*

Encompass Health Corporation, incorporated in Delaware in 1984, including its subsidiaries, is a provider of inpatient rehabilitation services. We operate hospitals in 36 states and Puerto Rico, with concentrations in the eastern half of the United States and Texas. As of December 31, 2022, we operate 153 inpatient rehabilitation hospitals. We are the sole owner of 95 of these hospitals. We retain 50.0% to 97.5% ownership in the remaining 58 jointly owned hospitals.

Basis of Presentation and Consolidation—

The accompanying consolidated financial statements of Encompass Health and its subsidiaries were prepared in accordance with generally accepted accounting principles in the United States of America and include the assets, liabilities, revenues, and expenses of all wholly-owned subsidiaries, majority-owned subsidiaries over which we exercise control, and, when applicable, entities in which we have a controlling financial interest.

We use the equity method to account for our investments in entities we do not control, but where we have the ability to exercise significant influence over operating and financial policies. Consolidated *Net income attributable to Encompass Health* includes our share of the net earnings of these entities. The difference between consolidation and the equity method impacts certain of our financial ratios because of the presentation of the detailed line items reported in the consolidated financial statements for consolidated entities compared to a one line presentation of equity method investments.

We eliminate all significant intercompany accounts and transactions from our financial results.

Variable Interest Entities—

Any entity considered a variable interest entity (“VIE”) is evaluated to determine which party is the primary beneficiary and thus should consolidate the VIE. This analysis is complex, involves uncertainties, and requires significant judgment on various matters. In order to determine if we are the primary beneficiary of a VIE, we must determine what activities most significantly impact the economic performance of the entity, whether we have the power to direct those activities, and if our obligation to absorb losses or receive benefits from the VIE could potentially be significant to the VIE.

Use of Estimates and Assumptions—

The preparation of our consolidated financial statements in conformity with GAAP requires the use of estimates and assumptions that affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities at the date of the consolidated financial statements, and the reported amounts of revenues and expenses during the reporting periods. Significant estimates and assumptions are used for, but not limited to: (1) revenue reserves for contractual adjustments and uncollectible amounts; (2) fair value of acquired assets and assumed liabilities in business combinations; (3) asset impairments, including goodwill; (4) depreciable lives of assets; (5) useful lives of intangible assets; (6) economic lives and fair value of leased assets; (7) income tax valuation allowances; (8) uncertain tax positions; (9) fair value of stock options and restricted stock containing a market condition; (10) fair value of redeemable noncontrolling interests; (11) reserves for self-insured healthcare plans; (12) reserves for professional, workers’ compensation, and comprehensive general insurance liability risks; and (13) contingency and litigation reserves. Future events and their effects cannot be predicted with certainty; accordingly, our accounting estimates require the exercise of judgment. The accounting estimates used in the preparation of our consolidated financial statements will change as new events occur, as more experience is acquired, as additional information is obtained, and as our operating environment changes. We evaluate and update our assumptions and estimates on an ongoing basis and may employ outside experts to assist in our evaluation, as considered necessary. Actual results could differ from those estimates.

Risks and Uncertainties—

As a healthcare provider, we are required to comply with extensive and complex laws and regulations at the federal, state, and local government levels. These laws and regulations relate to, among other things:

- licensure, certification, and accreditation;
- policies, either at the national or local level, delineating what conditions must be met to qualify for reimbursement under Medicare (also referred to as coverage requirements);
- coding and billing for services;
- requirements of the 60% compliance threshold under The Medicare, Medicaid and State Children's Health Insurance Program (SCHIP) Extension Act of 2007;
- relationships with physicians and other referral sources, including physician self-referral and anti-kickback laws;
- quality of medical care;
- use and maintenance of medical supplies and equipment;
- maintenance and security of patient information and medical records;
- acquisition and dispensing of pharmaceuticals and controlled substances; and
- disposal of medical and hazardous waste.

In the future, changes in these laws or regulations or the manner in which they are enforced could subject our current or past practices to allegations of impropriety or illegality or could require us to make changes in our hospitals, equipment, personnel, services, capital expenditure programs, operating procedures, contractual arrangements, and patient admittance practices.

If we fail to comply with applicable laws and regulations, we could be required to return portions of reimbursements deemed after the fact to have not been appropriate. We could also be subjected to liabilities, including (1) criminal penalties, (2) civil penalties, including monetary penalties and the loss of our licenses to operate one or more of our hospitals, and (3) exclusion or suspension of one or more of our hospitals from participation in the Medicare, Medicaid, and other federal and state healthcare programs which, if lengthy in duration and material to us, could potentially trigger a default under our credit agreement. Because Medicare comprises a significant portion of our *Net operating revenues*, failure to comply with the laws and regulations governing the Medicare program and related matters, including anti-kickback and anti-fraud requirements, could materially and adversely affect us. Specifically, reductions in reimbursements, substantial damages, and other remedies assessed against us could have a material adverse effect on our business, financial position, results of operation, and cash flows. Even the assertion of a violation, depending on its nature, could have a material adverse effect upon our stock price or reputation.

Historically, the United States Congress and some state legislatures have periodically proposed significant changes in regulations governing the healthcare system. Many of these changes have resulted in limitations on the increases in and, in some cases, significant roll-backs or reductions in the levels of payments to healthcare providers for services under many government reimbursement programs. There can be no assurance that future governmental initiatives will not result in pricing roll-backs or freezes or reimbursement reductions. Because we receive a significant percentage of our revenues from Medicare, such changes in legislation might have a material adverse effect on our financial position, results of operations, and cash flows.

In addition, there are increasing pressures from many third-party payors to control healthcare costs and to reduce or limit increases in reimbursement rates for medical services. Our relationships with managed care and nongovernmental third-party payors are generally governed by negotiated agreements. These agreements set forth the amounts we are entitled to receive for our services. We could be adversely affected in some of the markets where we operate if we are unable to negotiate and maintain favorable agreements with third-party payors.

Notes to Consolidated Financial Statements

Our third-party payors may also, from time to time, request audits of the amounts paid, or to be paid, to us. We could be adversely affected in some of the markets where we operate if the auditing payor alleges substantial overpayments were made to us due to coding errors or lack of documentation to support medical necessity determinations.

As discussed in Note 18, *Contingencies and Other Commitments*, we are a party to a number of lawsuits. We cannot predict the outcome of litigation filed against us. Substantial damages or other monetary remedies assessed against us could have a material adverse effect on our business, financial position, results of operations, and cash flows.

Net Operating Revenues—

Our *Net operating revenues* disaggregated by payor source are as follows (in millions):

	Year Ended December 31,		
	2022	2021	2020
Medicare	\$ 2,843.1	\$ 2,589.6	\$ 2,375.6
Medicare Advantage	654.6	609.6	544.9
Managed care	505.2	484.5	371.4
Medicaid	183.3	163.1	140.1
Other third-party payors	39.5	46.0	43.0
Workers' compensation	24.7	23.1	21.5
Patients	16.6	19.3	19.2
Other income	81.6	79.7	50.6
Total	\$ 4,348.6	\$ 4,014.9	\$ 3,566.3

We record *Net operating revenues* on an accrual basis using our best estimate of the transaction price for the type of service provided to the patient. Our estimate of the transaction price includes estimates of price concessions for such items as contractual allowances, potential adjustments that may arise from payment and other reviews, and uncollectible amounts. Our accounting systems calculate contractual allowances on a patient-by-patient basis based on the rates in effect for each primary third-party payor. Adjustments related to payment reviews by third-party payors or their agents are based on our historical experience and success rates in the claims adjudication process. Estimates for uncollectible amounts are based on the aging of our accounts receivable, our historical collection experience for each type of payor, and other relevant factors.

Management continually reviews the revenue transaction price estimation process to consider and incorporate updates to laws and regulations and the frequent changes in managed care contractual terms that result from contract renegotiations and renewals. Due to complexities involved in determining amounts ultimately due under reimbursement arrangements with third-party payors, which are often subject to interpretation, we may receive reimbursement for healthcare services authorized and provided that is different from our estimates, and such differences could be material. In addition, laws and regulations governing the Medicare and Medicaid programs are complex, subject to interpretation, and are routinely modified for provider reimbursement. All healthcare providers participating in the Medicare and Medicaid programs are required to meet certain financial reporting requirements. Federal regulations require submission of annual cost reports covering medical costs and expenses associated with the services provided under each hospital provider number to program beneficiaries. Annual cost reports required under the Medicare and Medicaid programs are subject to routine audits, which may result in adjustments to the amounts ultimately determined to be due to Encompass Health under these reimbursement programs. These audits often require several years to reach the final determination of amounts earned under the programs. If actual results are not consistent with our assumptions and judgments, we may be exposed to gains or losses that could be material.

CMS has been granted authority to suspend payments, in whole or in part, to Medicare providers if CMS possesses reliable information an overpayment, fraud, or willful misrepresentation exists. If CMS suspects payments are being made as the result of fraud or misrepresentation, CMS may suspend payment at any time without providing prior notice to us. The initial suspension period is limited to 180 days. However, the payment suspension period can be extended almost indefinitely if the matter is under investigation by the United States Department of Health and Human Services Office of Inspector General (the "HHS-OIG") or the United States Department of Justice (the "DOJ"). Therefore, we are unable to predict if or when we may be

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subject to a suspension of payments by the Medicare and/or Medicaid programs, the possible length of the suspension period, or the potential cash flow impact of a payment suspension. Any such suspension would adversely impact our financial position, results of operations, and cash flows.

Pursuant to legislative directives and authorizations from Congress, CMS has developed and instituted various Medicare audit programs under which CMS contracts with private companies to conduct claims and medical record audits. As a matter of course, we undertake significant efforts through training and education to ensure compliance with Medicare requirements. However, audits may lead to assertions we have been underpaid or overpaid by Medicare or submitted improper claims in some instances, require us to incur additional costs to respond to requests for records and defend the validity of payments and claims, and ultimately require us to refund any amounts determined to have been overpaid. In some circumstances auditors assert the authority to extrapolate denial rationales to large pools of claims not actually audited, which could increase the impact of the audit. We cannot predict when or how these audit programs will affect us.

Medicare Administrative Contractors (“MACs”), under programs known as “widespread probes,” have conducted pre-payment claim reviews of our Medicare billings and in some cases denied payment for certain diagnosis codes. We dispute, or “appeal,” most of these denials. As discussed above, our historical experience and success in the adjudication of these appeals is a component of our estimate of transaction price. The Medicare appeals adjudication process is administered by the Office of Medicare Hearings and Appeals (“OMHA”) and has been subject to significant delay resulting in a backlog of claims awaiting adjudication. Beginning in March 2020, OMHA increased the frequency of hearings and the number of claims set at each hearing, which we believe adds to the substantive and procedural deficiencies in the appeals process. During 2022, the backlog of “widespread probe” claims adjudicated by the administrative law judge (“ALJ”) continued and were substantially completed. This OMHA practice resulted in a reduction in our success in the adjudication of these appeals, but have increased the pace of recovery of these claims. We have appealed certain adverse ALJ rulings to the Department Appeals Boards (“DAB”), the final level of administrative review. As of December 31, 2022, approximately \$52 million in claims are awaiting review at the DAB. In addition, we have appealed approximately \$6 million in claims denied by the DAB to several United States District Courts, all of which are pending review as of December 31, 2022.

In August 2017, CMS announced the Targeted Probe and Educate (“TPE”) initiative. Under the TPE initiative, MACs use data analysis to identify healthcare providers with high claim error rates and items and services that have high national error rates. Once a MAC selects a provider for claims review, the initial volume of claims review is limited to 20 to 40 claims. The TPE initiative includes up to three rounds of claims review if necessary with corresponding provider education and a subsequent period to allow for improvement. If results do not improve sufficiently after three rounds, the MAC may refer the provider to CMS for further action, which may include extrapolation of error rates to a broader universe of claims or referral to a UPIC or RAC (defined below). We cannot predict the impact of the TPE initiative on our ability to collect claims on a timely basis.

In connection with CMS approved and announced Recovery Audit Contractors (“RACs”) audits related to inpatient rehabilitation facilities (“IRFs”), we received requests from 2013 to 2022 to review certain patient files for discharges occurring from 2010 to 2022. These RAC audits are focused on identifying Medicare claims that may contain improper payments. RAC contractors must have CMS approval before conducting these focused reviews which cover issues ranging from billing documentation to medical necessity. Medical necessity is an assessment by an independent physician of a patient’s ability to tolerate and benefit from intensive multi-disciplinary therapy provided in an IRF setting.

CMS has also established Unified Program Integrity Contractors (“UPICs”), previously known as Zone Program Integrity Contractors. These contractors perform fraud, waste, and abuse detection, deterrence and prevention activities for Medicare and Medicaid claims. Like the RACs, the UPICs conduct audits and have the ability to refer matters to the HHS-OIG or the DOJ. Unlike RACs, however, UPICs do not receive a specific financial incentive based on the amount of the error as a result of UPIC audits. We have, from time to time, received UPIC record requests which have resulted in claim denials on paid claims. We have appealed substantially all UPIC denials arising from these audits using the same process we follow for appealing other denials by contractors. In December 2017, we received notice of a UPIC audit at one of our hospitals. The UPIC sampled 100 claims and challenged the propriety of a subset of the sample representing \$1.3 million in previously paid claims. The UPIC extrapolated the alleged error rate to all claims from that hospital during a period of approximately four years, resulting in an alleged overpayment of \$33.9 million. Our MAC later reduced the determination of overpayment to \$30.5 million, which it collected through recoupment of current claims during 2019. We appealed the overpayment determination to an Administrative Law Judge (“ALJ”), who heard the appeal in August 2021. In October 2022, the ALJ

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overtaken \$12.5 million of the overpayment determination. We received payment of this amount, plus \$3.2 million in interest, in December 2022. We have appealed the remaining \$18.0 million of the overpayment determination to the DAB, the next level of administrative appeal, challenging both the denials and the improper use of extrapolation. It is not possible to predict when this matter will be resolved or the ultimate outcome.

To date, the Medicare claims that are subject to these post-payment audit requests represent less than 1% of our Medicare patient discharges from 2010 to 2022. Because we have confidence in the medical judgment of both the referring and admitting physicians who assess the treatment needs of their patients, we have appealed substantially all claim denials arising from these audits using the same process we follow for appealing denials by MACs. Due to the delays announced by CMS in the related adjudication process discussed above, we believe the resolution of any claims that are subsequently denied as a result of these claim audits could take several years. In addition, because we have limited experience with UPICs and RACs in the context of claims reviews of this nature, we cannot provide assurance as to the timing or outcomes of these disputes. As such, we make estimates for these claims based on our historical experience and success rates in the claims adjudication process, which is the same process we follow for denials by MACs. During 2022, 2021, and 2020, our adjustment to *Net operating revenues* for claims that are part of this post-payment claims review process was not material.

Our performance obligations relate to contracts with a duration of less than one year. Therefore, we elected to apply the optional exemption to not disclose the aggregate amount of the transaction price allocated to performance obligations that are unsatisfied or partially unsatisfied at the end of the reporting period. These unsatisfied or partially unsatisfied performance obligations primarily relate to services provided at the end of the reporting period.

We are subject to changes in government legislation that could impact Medicare payment levels and changes in payor patterns that may impact the level and timing of payments for services rendered.

Net operating revenues are recognized over time as the services are provided to the patient. The performance obligation is the rendering of services to the patient during the term of their inpatient stay. Revenues are recognized (or measured) using the input method as therapy, nursing, and auxiliary services are provided based on our estimate of the respective transaction price. Revenues recognized are subject to a number of elements which impact both the overall amount of revenue realized as well as the timing of the collection of the related accounts receivable. Factors considered in determining the estimated transaction price include the patient's total length of stay for in-house patients, each patient's discharge destination, the proportion of patients with secondary insurance coverage and the level of reimbursement under that secondary coverage, and the amount of charges that will be disallowed by payors. Such additional factors are assumed to remain consistent with the experience for patients discharged in similar time periods for the same payor classes.

Cash and Cash Equivalents—

Cash and cash equivalents include highly liquid investments with maturities of three months or less when purchased. Carrying values of *Cash and cash equivalents* approximate fair value due to the short-term nature of these instruments.

We maintain amounts on deposit with various financial institutions, which may, at times, exceed federally insured limits. However, management periodically evaluates the credit-worthiness of those institutions, and we have not experienced any losses on such deposits.

Marketable Securities—

We record all equity securities with readily determinable fair values and for which we do not exercise significant influence at fair value and record the change in fair value for the reporting period in our consolidated statements of comprehensive income.

We record debt securities with readily determinable fair values and for which we do not exercise significant influence as available-for-sale securities. We carry the available-for-sale securities at fair value and report unrealized holding gains or losses, net of income taxes, in *Accumulated other comprehensive loss*, which is a separate component of shareholders' equity. We recognize realized gains and losses in our consolidated statements of comprehensive income using the specific identification method. Unrealized losses are charged against earnings when a decline in fair value was determined to be other than temporary. Management reviews several factors to determine whether a loss is other than temporary, such as the length of

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time a security is in an unrealized loss position, the extent to which fair value is less than cost, the financial condition and near term prospects of the issuer, industry, or geographic area and our ability and intent to hold the security for a period of time sufficient to allow for any anticipated recovery in fair value.

Accounts Receivable—

We report accounts receivable from services rendered at their estimated transaction price which takes into account price concessions from federal and state agencies (under the Medicare and Medicaid programs), managed care health plans, commercial insurance companies, workers' compensation programs, employers, and patients. Our accounts receivable are concentrated by type of payor. The concentration of patient service accounts receivable by payor class, as a percentage of total patient service accounts receivable, is as follows:

	As of December 31,	
	2022	2021
Medicare	57.9 %	57.8 %
Managed care and other discount plans, including Medicare Advantage	31.1 %	31.4 %
Medicaid	4.4 %	4.1 %
Other third-party payors	3.4 %	3.3 %
Workers' compensation	2.2 %	1.9 %
Patients	1.0 %	1.5 %
Total	100.0 %	100.0 %

While revenues and accounts receivable from the Medicare program are significant to our operations, we do not believe there are significant credit risks associated with this government agency. We do not believe there are any other significant concentrations of revenues from any particular payor that would subject us to any significant credit risks in the collection of our accounts receivable.

Accounts requiring collection efforts are reviewed via system-generated work queues that automatically stage (based on age and size of outstanding balance) accounts requiring collection efforts for patient account representatives. Collection efforts include contacting the applicable party (both in writing and by telephone), providing information (both financial and clinical) to allow for payment or to overturn payor decisions to deny payment, and arranging payment plans with self-pay patients, among other techniques. When we determine all in-house efforts have been exhausted or it is a more prudent use of resources, accounts may be turned over to a collection agency.

The collection of outstanding receivables from Medicare, managed care payors, other third-party payors, and patients is our primary source of cash and is critical to our operating performance. While it is our policy to verify insurance prior to a patient being admitted, there are various exceptions that can occur. Such exceptions include instances where we are (1) unable to obtain verification because the patient's insurance company was unable to be reached or contacted, (2) a determination is made that a patient may be eligible for benefits under various government programs, such as Medicaid, and it takes several days, weeks, or months before qualification for such benefits is confirmed or denied, and (3) the patient is transferred to our hospital from an acute care hospital without having access to a credit card, cash, or check to pay the applicable patient responsibility amounts (i.e., deductibles and co-payments).

Our primary collection risks relate to patient responsibility amounts and claims reviews conducted by MACs or other contractors. Patient responsibility amounts include accounts for which the patient was the primary payor or the primary insurance carrier has paid the amounts covered by the applicable agreement, but patient co-payment amounts remain outstanding. Changes in the economy, such as increased unemployment rates or periods of recession, can further exacerbate our ability to collect patient responsibility amounts.

If actual results are not consistent with our assumptions and judgments, we may be exposed to gains or losses that could be material. Changes in general economic conditions, business office operations, payor mix, or trends in federal or state

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governmental and private employer healthcare coverage could affect our collection of accounts receivable, financial position, results of operations, and cash flows.

Property and Equipment—

We report land, buildings, improvements, vehicles, and equipment at cost, net of accumulated depreciation and amortization and any asset impairments. We depreciate our assets using the straight-line method over the shorter of the estimated useful life of the assets or life of the underlying leases. Useful lives are generally as follows:

	Years
Buildings	10 to 30
Leasehold improvements	2 to 15
Vehicles	5
Furniture, fixtures, and equipment	3 to 10

Maintenance and repairs of property and equipment are expensed as incurred. We capitalize replacements and betterments that increase the estimated useful life of an asset. We capitalize pre-acquisition costs when they are directly identifiable with a specific property, the costs would be capitalizable if the property were already acquired, and acquisition of the property is probable. We capitalize interest expense on major construction and development projects while in progress.

We retain fully depreciated assets in property and accumulated depreciation accounts until we remove them from service. In the case of sale, retirement, or disposal, the asset cost and related accumulated depreciation balances are removed from the respective accounts, and the resulting net amount, less any proceeds, is included as a component of income from continuing operations in the consolidated statements of comprehensive income. However, if the sale, retirement, or disposal involves a discontinued operation, the resulting net amount, less any proceeds, is included in the results of discontinued operations.

Leases—

We determine if an arrangement is a lease or contains a lease at inception and perform an analysis to determine whether the lease is an operating lease or a finance lease. We measure right-of-use assets and lease liabilities at the lease commencement date based on the present value of the remaining lease payments. As most of our leases do not provide a readily determinable implicit rate, we estimate an incremental borrowing rate based on the credit quality of the Company and by comparing interest rates available in the market for similar borrowings, and adjusting this amount based on the impact of collateral over the term of each lease. We use this rate to discount the remaining lease payments in measuring the right-of-use asset and lease liability. We use the implicit rate when readily determinable. We recognize lease expense for operating leases on a straight-line basis over the lease term. For our finance leases, we recognize amortization expense from the amortization of the right-of-use asset and interest expense on the related lease liability. Certain of our lease agreements contain annual escalation clauses based on changes in the Consumer Price Index. The changes to the Consumer Price Index, as compared to our initial estimate at the lease commencement date, are treated as variable lease payments and recognized in the period in which the obligation for those payments was incurred. In general, we do not account for lease and non-lease components separately for purposes of establishing right-of-use assets and lease liabilities.

Leases with an initial term of twelve months or less are not recorded on the consolidated balance sheet. We recognize lease expense for these leases on a straight-line basis over the lease term.

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Goodwill and Other Intangible Assets—

We are required to test our goodwill and indefinite-lived intangible asset for impairment at least annually, absent some triggering event that would accelerate an impairment assessment. Absent any impairment indicators, we perform this impairment testing as of October 1st of each year. We recognize an impairment charge for any amount by which the carrying amount of the asset exceeds its implied fair value. We present an impairment charge as a separate line item within income from continuing operations in the consolidated statements of comprehensive income, unless the impairment is associated with a discontinued operation. In that case, we include the impairment charge, on a net-of-tax basis, within the results of discontinued operations.

We assess qualitative factors in our single reporting unit to determine whether it is necessary to perform the quantitative impairment test. If, based on this qualitative assessment, we were to believe we must perform the quantitative impairment test, we would determine the fair value of our reporting unit using generally accepted valuation techniques including the income approach and the market approach. The income approach includes the use of our reporting unit's discounted projected operating results and cash flows. This approach includes many assumptions related to pricing and volume, operating expenses, capital expenditures, discount factors, tax rates, etc. Changes in economic and operating conditions impacting these assumptions could result in goodwill impairment in future periods. We reconcile the estimated fair value of our reporting unit to our market capitalization. When we dispose of a hospital, goodwill is allocated to the gain or loss on disposition using the relative fair value methodology.

We assess qualitative factors related to our indefinite-lived intangible asset to determine whether it is necessary to perform the quantitative impairment test. If, based on this qualitative assessment, we were to believe we must perform the quantitative impairment test, we would determine the fair value of our indefinite-lived intangible asset using generally accepted valuation techniques including the relief-from-royalty method. This method is a form of the income approach in which value is equated to a series of cash flows and discounted at a risk-adjusted rate. It is based on a hypothetical royalty, calculated as a percentage of forecasted revenue, that we would otherwise be willing to pay to use the asset, assuming it were not already owned. This approach includes assumptions related to pricing and volume, as well as a royalty rate a hypothetical third party would be willing to pay for use of the asset. When making our royalty rate assumption, we consider rates paid in arms-length licensing transactions for assets comparable to our asset.

We amortize the cost of intangible assets with finite useful lives over their respective estimated useful lives to their estimated residual value. As of December 31, 2022, none of our finite useful lived intangible assets has an estimated residual value. We also review these assets for impairment whenever events or changes in circumstances indicate we may not be able to recover the asset's carrying amount.

The range of estimated useful lives and the amortization basis for our intangible assets, excluding goodwill, are generally as follows:

	Estimated Useful Life and Amortization Basis
Certificates of need	10 to 30 years using straight-line basis
Licenses	10 to 20 years using straight-line basis
Noncompete agreements	1 to 18 years using straight-line basis
Trade names:	
Encompass	indefinite-lived asset
All other	10 to 20 years using straight-line basis
Internal-use software	3 to 7 years using straight-line basis
Market access assets	20 years using accelerated basis

We capitalize the costs of obtaining or developing internal-use software, including external direct costs of material and services and certain directly related payroll costs. Amortization begins when the internal-use software is ready for its intended

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use. Costs incurred during the preliminary project and post-implementation stages, as well as maintenance and training costs, are expensed as incurred.

Our market access assets are valued using discounted cash flows under the income approach. The value of the market access assets is attributable to our ability to gain access to and penetrate an acquired facility's historical market patient base. To determine this value, we first develop a debt-free net cash flow forecast under various patient volume scenarios. The debt-free net cash flow is then discounted back to present value using a discount factor, which includes an adjustment for company-specific risk. As noted in the above table, we amortize these assets over 20 years using an accelerated basis that reflects the pattern in which we believe the economic benefits of the market access will be consumed.

Impairment of Long-Lived Assets and Other Intangible Assets—

We assess the recoverability of long-lived assets (excluding goodwill and our indefinite-lived asset) and identifiable acquired intangible assets with finite useful lives, whenever events or changes in circumstances indicate we may not be able to recover the asset's carrying amount. We measure the recoverability of assets to be held and used by a comparison of the carrying amount of the asset to the expected net future cash flows to be generated by that asset, or, for identifiable intangibles with finite useful lives, by determining whether the amortization of the intangible asset balance over its remaining life can be recovered through undiscounted future cash flows. The amount of impairment of identifiable intangible assets with finite useful lives, if any, to be recognized is measured based on projected discounted future cash flows. We measure the amount of impairment of other long-lived assets (excluding goodwill) as the amount by which the carrying value of the asset exceeds the fair market value of the asset, which is generally determined based on projected discounted future cash flows or appraised values. We classify long-lived assets to be disposed of other than by sale as held and used until they are disposed. We report long-lived assets to be disposed of by sale as held for sale and recognize those assets in the balance sheet at the lower of carrying amount or fair value less cost to sell, and we cease depreciation.

Financing Costs—

We amortize financing costs using the effective interest method over the expected life of the related debt. Excluding financing costs related to our revolving line of credit (which are included in *Other long-term assets*), financing costs are presented as a direct deduction from the face amount of the financings. The related expense is included in *Interest expense and amortization of debt discounts and fees* in our consolidated statements of comprehensive income.

We accrete discounts and amortize premiums using the effective interest method over the expected life of the related debt, and we report discounts or premiums as a direct deduction from, or addition to, the face amount of the financing. The related income or expense is included in *Interest expense and amortization of debt discounts and fees* in our consolidated statements of comprehensive income.

Fair Value Measurements—

Fair value is an exit price, representing the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants. As such, fair value is a market-based measurement that should be determined based on assumptions market participants would use in pricing an asset or liability.

The basis for these assumptions establishes a three-tier fair value hierarchy, which prioritizes the inputs used in measuring fair value as follows:

- *Level 1* – Observable inputs such as quoted prices in active markets;
- *Level 2* – Inputs, other than quoted prices in active markets, that are observable either directly or indirectly; and
- *Level 3* – Unobservable inputs in which there is little or no market data, which require the reporting entity to develop its own assumptions.

Notes to Consolidated Financial Statements

Assets and liabilities measured at fair value are based on one or more of three valuation techniques. The three valuation techniques are as follows:

- *Market approach* – Prices and other relevant information generated by market transactions involving identical or comparable assets or liabilities;
- *Cost approach* – Amount that would be required to replace the service capacity of an asset (i.e., replacement cost); and
- *Income approach* – Techniques to convert future cash flows to a single present amount based on market expectations (including present value techniques, option-pricing models, and lattice models).

Our financial instruments consist mainly of cash and cash equivalents, restricted cash, restricted marketable securities, accounts receivable, accounts payable, letters of credit, and long-term debt. The carrying amounts of cash and cash equivalents, restricted cash, accounts receivable, and accounts payable approximate fair value because of the short-term maturity of these instruments. The fair value of our letters of credit is deemed to be the amount of payment guaranteed on our behalf by third-party financial institutions. We determine the fair value of our long-term debt using quoted market prices, when available, or discounted cash flows based on various factors, including maturity schedules, call features, and current market rates.

On a recurring basis, we are required to report our restricted marketable securities at fair value. The fair values of our restricted marketable securities are determined based on quoted market prices in active markets or quoted prices, dealer quotations, or alternative pricing sources supported by observable inputs in markets that are not considered to be active.

In addition, there are assets and liabilities that are not required to be reported at fair value on a recurring basis. However, these assets may be recorded at fair value as a result of impairment charges or other adjustments made to the carrying value of the applicable assets. The fair value of our property and equipment is determined using discounted cash flows and significant unobservable inputs, unless there is an offer to purchase such assets, which could be the basis for determining fair value. The fair value of our intangible assets, excluding goodwill, is determined using discounted cash flows and significant unobservable inputs. The fair value of our investments in nonconsolidated affiliates is determined using quoted prices in private markets, discounted cash flows or earnings, or market multiples derived from a set of comparables. The fair value of our assets and liabilities of discontinued operations is determined using discounted cash flows and significant unobservable inputs unless there is an offer to purchase such assets and liabilities, which would be the basis for determining fair value. The fair value of our goodwill is determined using discounted projected operating results and cash flows, which involve significant unobservable inputs.

See also the “Redeemable Noncontrolling Interests” section of this note.

Noncontrolling Interests in Consolidated Affiliates—

The consolidated financial statements include all assets, liabilities, revenues, and expenses of less-than-100%-owned affiliates we control. Accordingly, we have recorded noncontrolling interests in the earnings and equity of such entities. We record adjustments to noncontrolling interests for the allocable portion of income or loss to which the noncontrolling interests holders are entitled based upon their portion of the subsidiaries they own. Distributions to holders of noncontrolling interests are adjusted to the respective noncontrolling interests holders’ balance.

Redeemable Noncontrolling Interests—

Certain of our joint venture agreements contain provisions that allow our partners to require us to purchase their interests in the joint venture at fair value at certain points in the future. Likewise, certain members of the home health and hospice management team held similar put rights regarding their interests in our home health and hospice business, as discussed in Note 12, *Redeemable Noncontrolling Interests*. Because these noncontrolling interests provide for redemption features that are not solely within our control, we classify them as *Redeemable noncontrolling interests* outside of permanent equity in our consolidated balance sheets. At the end of each reporting period, we compare the carrying value of the *Redeemable noncontrolling interests* to their estimated redemption value. If the estimated redemption value is greater than the current carrying value, the carrying value is adjusted to the estimated redemption value, with the adjustments recorded through equity in the line item *Capital in excess of par value*.

Notes to Consolidated Financial Statements

The fair value of the *Redeemable noncontrolling interests* related to certain members of the home health and hospice management team's put rights regarding their interests in our home health and hospice business was determined using the product of a 12-month specified performance measure and a specified median market price multiple based on a basket of public health companies and publicly disclosed home health acquisitions with a value of \$400 million or more. The fair value of our *Redeemable noncontrolling interests* in our joint venture entities is determined primarily using the income approach. The income approach includes the use of the joint venture entities' projected operating results and cash flows discounted using a rate that reflects market participant assumptions for the applicable joint venture entity, or *Level 3* inputs. The projected operating results use management's best estimates of economic and market conditions over the forecasted periods including assumptions for pricing and volume, operating expenses, and capital expenditures.

Share-Based Payments—

Encompass Health has shareholder-approved stock-based compensation plans that provide for the granting of stock-based compensation to certain employees and directors. All share-based payments to employees are recognized in the financial statements based on their estimated grant-date fair value and amortized on a straight-line basis over the applicable requisite service period.

Litigation Reserves—

We accrue for loss contingencies associated with outstanding litigation for which management has determined it is probable a loss contingency exists and the amount of loss can be reasonably estimated. If the accrued amount associated with a loss contingency is greater than \$5.0 million, we also accrue estimated future legal fees associated with the loss contingency. This requires management to estimate the amount of legal fees that will be incurred in the defense of the litigation. These estimates are based on our expectations of the scope, length to complete, and complexity of the claims. In the future, additional adjustments may be recorded as the scope, length to complete, or complexity of outstanding litigation changes.

Advertising Costs—

We expense costs of print, radio, television, and other advertisements as incurred. Advertising expenses, primarily included in *Other operating expenses* within the accompanying consolidated statements of comprehensive income, were \$6.3 million, \$5.6 million, and \$4.6 million in each of the years ended December 31, 2022, 2021, and 2020, respectively.

Income Taxes—

We provide for income taxes using the asset and liability method. This approach recognizes the amount of income taxes payable or refundable for the current year, as well as deferred tax assets and liabilities for the future tax consequence of events recognized in the consolidated financial statements and income tax returns. Deferred income tax assets and liabilities are adjusted to recognize the effects of changes in tax laws or enacted tax rates.

A valuation allowance is required when it is more likely than not some portion of the deferred tax assets will not be realized. Realization is dependent on generating sufficient future taxable income in the applicable tax jurisdiction. On a quarterly basis, we assess the likelihood of realization of our deferred tax assets considering all available evidence, both positive and negative. Our most recent operating performance, the scheduled reversal of temporary differences, our forecast of taxable income in future periods by jurisdiction, our ability to sustain a core level of earnings, and the availability of prudent tax planning strategies are important considerations in our assessment.

We evaluate our tax positions and establish assets and liabilities in accordance with the applicable accounting guidance on uncertainty in income taxes. We review these tax uncertainties in light of changing facts and circumstances, such as the progress of tax audits, and adjust them accordingly. We have used the with-and-without method to determine when we will recognize excess tax benefits from stock-based compensation.

Encompass Health and its corporate subsidiaries file a consolidated federal income tax return. Some subsidiaries consolidated for financial reporting purposes are not part of the consolidated group for federal income tax purposes and file separate federal income tax returns. State income tax returns are filed on a separate, combined, or consolidated basis in accordance with relevant state laws and regulations. Partnerships, limited liability companies, and other pass-through entities we consolidate or account for using the equity method of accounting file separate federal and state income tax returns. We

Notes to Consolidated Financial Statements

include the allocable portion of each pass-through entity's income or loss in our federal income tax return. We allocate the remaining income or loss of each pass-through entity to the other partners or members who are responsible for their portion of the taxes. We include the activity of Enhabit, Inc. and its subsidiaries in our consolidated and combined tax filings for 2022 up through the date of the Spin Off, which is defined and described in Note 2, *Spin Off of Home Health and Hospice Business*. Subsequent to the Spin Off, Enhabit, Inc. and its subsidiaries will no longer be included in our consolidated and combined filings.

Assets and Liabilities in and Results of Discontinued Operations—

We report the disposal of the component, or group of components, as discontinued operations only when it represents a strategic shift that has, or will have, a major effect on our operations and financial results. In the period a component of an entity has been disposed of or classified as held for sale, we reclassify the results of operations for current and prior periods into a single caption titled *Income from discontinued operations, net of tax*. In addition, we classify the assets and liabilities of those components as current and noncurrent assets and liabilities within *Current assets of discontinued operations*, *Noncurrent assets of discontinued operations*, *Current liabilities of discontinued operations*, and *Noncurrent liabilities of discontinued operations* in our consolidated balance sheets. We also classify cash flows related to discontinued operations as one line item within each category of cash flows in our consolidated statements of cash flows.

Earnings per Common Share—

The calculation of earnings per common share is based on the weighted-average number of our common shares outstanding during the applicable period. The calculation for diluted earnings per common share recognizes the effect of all potential dilutive common shares that were outstanding during the respective periods, unless their impact would be antidilutive. The calculation of earnings per common share also considers the effect of participating securities. Stock-based compensation awards that contain nonforfeitable rights to dividends and dividend equivalents, such as our restricted stock units, are considered participating securities and are included in the computation of earnings per common share pursuant to the two-class method. In applying the two-class method, earnings are allocated to both common stock shares and participating securities based on their respective weighted-average shares outstanding for the period.

Treasury Stock—

Shares of common stock repurchased by us are recorded at cost as treasury stock. When shares are reissued, we use an average cost method to determine cost. The difference between the cost of the shares and the re-issuance price is added to or deducted from *Capital in excess of par value*. We account for the retirement of treasury stock as a reduction of retained earnings.

Comprehensive Income—

Comprehensive income is comprised of *Net income* and changes in unrealized gains or losses on available-for-sale securities and is included in the consolidated statements of comprehensive income.

Recent Accounting Pronouncements—

We do not believe any recently issued, but not yet effective, accounting standards will have a material effect on our consolidated financial position, results of operations, or cash flows.

2. Spin Off of Home Health and Hospice Business

On July 1, 2022, we completed the previously announced separation of our home health and hospice business through the distribution (the "Spin Off") of all of the outstanding shares of common stock, par value \$0.01 per share, of Enhabit, Inc. ("Enhabit") to the stockholders of record of Encompass Health as of the close of business on June 24, 2022 (the "Record Date"). The Spin Off was effective at 12:01 a.m., Eastern Time, on July 1, 2022. The Spin Off was structured as a pro rata distribution of one share of Enhabit common stock for every two shares of Encompass Health common stock held of record as of the Record Date. No fractional shares were distributed. A cash payment was made in lieu of any fractional shares. As a result of the Spin Off, Enhabit is now an independent public company and its common stock is listed under the symbol "EHAB" on the New York Stock Exchange.

Notes to Consolidated Financial Statements

In accordance with applicable accounting guidance, the historical results of Enhabit have been presented as discontinued operations and, as such, have been excluded from continuing operations for all periods presented. Our presentation of discontinued operations excludes any allocation of general corporate and overhead costs as well as interest expense. Prior to July 1, 2022, we operated under two reporting segments. We now operate under a single reporting segment. In anticipation of the Spin Off, Enhabit transferred the “Encompass” trade name (net book value of \$104.2 million) to us during the second quarter of 2022.

In connection with the Spin Off, on June 30, 2022, we entered into several agreements with Enhabit that govern the relationship of the parties following the Spin Off, including a Separation and Distribution Agreement, a Transition Services Agreement, a Tax Matters Agreement and an Employee Matters Agreement.

We will provide transition services to Enhabit predominately consisting of certain finance, information technology, human resources, employee benefits and other administrative services for a period of up to two years after the Spin Off. For the year ended December 31, 2022, income related to these transition services of \$2.1 million were reflected as reductions to *General and administrative expenses* in our consolidated statements of comprehensive income.

The following table presents the results of operations of Enhabit as discontinued operations (in millions):

	For the Year Ended December 31,		
	2022 ⁽¹⁾	2021	2020
Net operating revenue	\$ 542.3	\$ 1,106.6	\$ 1,078.4
Operating expenses:			
Salaries and benefits	376.4	759.2	778.0
Other operating expenses	47.5	89.7	89.6
Occupancy costs	11.0	21.2	19.8
Supplies	11.7	25.1	29.5
General and administrative expenses	59.3	27.9	3.9
Depreciation and amortization	16.7	36.9	40.0
Total operating expenses	522.6	960.0	960.8
Interest expense and amortization of debt discounts and fees	0.2	0.3	0.5
Other income	—	(4.8)	(2.2)
Equity in net income of nonconsolidated affiliates	—	(0.6)	(0.5)
Income from discontinued operations before income taxes	19.5	151.7	119.8
Provision for income tax expense	4.3	37.6	29.2
Income from discontinued operations, net of tax	15.2	114.1	90.6
Less: Net income attributable to noncontrolling interests included in discontinued operations	(1.3)	(1.8)	(1.3)
Net income attributable to Encompass Health included in discontinued operations	\$ 13.9	\$ 112.3	\$ 89.3

⁽¹⁾ Reflects amounts through the July 1, 2022 Spin Off date.

Transaction costs of \$56.7 million and \$22.9 million incurred during the years ended December 31, 2022 and 2021, respectively, are included in general and administrative expenses in the table above and in *Income from discontinued operations, net of tax*, in the consolidated statements of comprehensive income. These charges primarily relate to third-party advisory, consulting, legal and professional services, that are associated with the Spin Off.

The following table presents the carrying amounts of the assets and liabilities of the discontinued operations of Enhabit (in millions):

	<u>As of December 31, 2021</u>
Assets	
Current assets:	
Cash and cash equivalents	\$ 5.4
Restricted cash	2.6
Accounts receivable	164.5
Prepaid expenses and other current assets	6.3
Total current assets of discontinued operations	178.8
Property and equipment, net	20.4
Operating lease right-of-use assets	48.4
Goodwill	1,190.9
Intangible assets, net	259.1
Other long-term assets	24.4
Total noncurrent assets of discontinued operations	1,543.2
Total assets of discontinued operations	\$ 1,722.0
Liabilities	
Current liabilities:	
Current portion of long-term debt	\$ 5.0
Current operating lease liabilities	14.9
Accounts payable	3.5
Accrued payroll	66.4
Other current liabilities	42.6
Total current liabilities of discontinued operations	132.4
Long-term debt, net of current portion	3.5
Long-term operating lease liabilities	33.5
Deferred income tax liabilities	63.4
Other long-term liabilities	0.4
Total noncurrent liabilities of discontinued operations	100.8
Total liabilities of discontinued operations	\$ 233.2

See also Note 10, *Long-term Debt*.

3. Business Combinations:

2022 Acquisitions

During 2022, we completed the following inpatient rehabilitation acquisitions, none of which were individually material to our financial position, results of operations, or cash flows. Each acquisition was made to enhance our position and ability to provide inpatient rehabilitation services to patients in the applicable geographic areas.

- In August 2022, we acquired 60% of the operations of a 23-bed inpatient rehabilitation unit in Grand Forks, North Dakota when Altru Health System contributed those operations to our existing joint venture.
- In August 2022, we acquired 50% of the operations of a 22-bed inpatient rehabilitation unit in Moline, Illinois when Trinity Medical Center contributed those operations to our existing joint venture.

Notes to Consolidated Financial Statements

- In December 2022, we acquired 50% of the operations of a 54-bed inpatient rehabilitation unit in Naples, Florida when NCH Healthcare System contributed those operations to our joint venture.

We accounted for these transactions under the acquisition method of accounting and reported the results of operations of the acquired hospitals from the respective dates of acquisition. Assets acquired were recorded at their estimated fair values as of the acquisition date. Estimated fair values were based on an income approach using discounted cash flow techniques for the noncompete intangible assets. The aforementioned income method utilizes management's estimates of future operating results and cash flows discounted using a weighted-average cost of capital. The excess of the fair value of the consideration conveyed over the fair value of the assets acquired was recorded as goodwill. The goodwill reflects our expectations of our ability to gain access to and penetrate the acquired hospitals' historical patient base and the benefits of being able to leverage operational efficiencies with favorable growth opportunities based on positive demographic trends in these markets. None of the goodwill recorded as a result from these transactions is deductible for federal income tax purposes.

The fair value of the assets acquired at the acquisition dates were as follows (in millions):

Identifiable intangible assets:	
Noncompete agreements (useful lives of 2 to 3 years)	\$ 0.9
Goodwill	26.2
Total assets acquired	<u>\$ 27.1</u>

Information regarding the net cash paid for the acquisitions during 2022 is as follows (in millions):

Fair value of assets acquired	\$ 0.9
Goodwill	26.2
Fair value of noncontrolling interest owned by joint venture partner	(27.1)
Net cash paid for acquisitions	<u>\$ —</u>

Pro Forma Results of Operations

The following table summarizes the results of operations of the above-mentioned acquisitions from the dates of acquisitions included in our consolidated results of operations and the unaudited pro forma results of operations of the combined entity had the dates of the acquisitions been January 1, 2021 (in millions):

	Net Operating Revenues	Net Income Attributable to Encompass Health
Acquired entities only: Actual from acquisition date to December 31, 2022	\$ —	\$ —
Combined entity: Supplemental pro forma from 01/01/2022-12/31/2022 (unaudited)	4,369.0	273.7
Combined entity: Supplemental pro forma from 01/01/2021-12/31/2021 (unaudited)	4,039.8	415.3

The information presented above is for illustrative purposes only and is not necessarily indicative of results that would have been achieved if the acquisitions had occurred as of the beginning of our 2021 period.

2021 Acquisitions

During 2021, we completed the following inpatient rehabilitation acquisitions, none of which were individually material to our financial position, results of operations, or cash flows. Each acquisition was made to enhance our position and ability to provide inpatient rehabilitation services to patients in the applicable geographic areas.

- In April 2021, we acquired 51% of the operations of a 14-bed inpatient rehabilitation unit in San Angelo, Texas when Shannon Medical contributed those operations to our existing joint venture entity.

Notes to Consolidated Financial Statements

- In June 2021, we acquired 75% of the operations of a 16-bed inpatient rehabilitation unit in McKees Rocks, Pennsylvania through our existing joint venture with Heritage Valley Health System, Inc. The acquisition was funded using cash on hand.
- In July 2021, we acquired 65% of the operations of a 22-bed inpatient rehabilitation unit in Odessa, Texas when ECHD Ventures contributed those operations to our existing joint venture entity.

We accounted for these transactions under the acquisition method of accounting and reported the results of operations of the acquired hospitals from its respective date of acquisition. Assets acquired were recorded at their estimated fair values as of the acquisition date. Estimated fair values were based on various valuation methodologies including: an income approach using primarily discounted cash flow techniques for the noncompete intangible assets and an income approach utilizing the relief from royalty method for the trade name intangible asset. The aforementioned income methods utilize management’s estimates of future operating results and cash flows discounted using a weighted-average cost of capital that reflects market participant assumptions. The excess of the fair value of the consideration conveyed over the fair value of the assets acquired was recorded as goodwill. The goodwill reflects our expectations of our ability to gain access to and penetrate the acquired hospital’s historical patient base and the benefits of being able to leverage operational efficiencies with favorable growth opportunities based on positive demographic trends in this market. None of the goodwill recorded as a result from these transactions is deductible for federal income tax purposes.

The fair value of the assets acquired at the acquisition dates were as follows (in millions):

Identifiable intangible assets:	
Noncompete agreements (useful lives of 3 to 5 years)	\$ 1.0
Trade name (useful life of 20 years)	0.3
Goodwill	8.8
Other long-term assets	0.1
Total assets acquired	\$ 10.2

Information regarding the net cash paid for the acquisitions during 2021 is as follows (in millions):

Fair value of assets acquired	\$ 1.4
Goodwill	8.8
Fair value of noncontrolling interest owned by joint venture partner	(9.1)
Net cash paid for acquisitions	\$ 1.1

2021 Pro Forma Results of Operations

The following table summarizes the results of operations of the above mentioned-acquisitions from their respective dates of acquisition included in our consolidated results of operations and the unaudited pro forma results of operations of the combined entity had the date of the acquisitions been January 1, 2020 (in millions):

	Net Operating Revenues	Net Income Attributable to Encompass Health
Acquired entities only: Actual from acquisition date to December 31, 2021	\$ —	\$ —
Combined entity: Supplemental pro forma from 01/01/2021-12/31/2021 (unaudited)	4,021.1	412.5
Combined entity: Supplemental pro forma from 01/01/2020-12/31/2020 (unaudited)	3,581.3	285.0

The information presented above is for illustrative purposes only and is not necessarily indicative of results that would have been achieved if the acquisitions had occurred as of the beginning of our 2020 period.

Notes to Consolidated Financial Statements

2020 Acquisitions

During 2020, we completed the following inpatient rehabilitation acquisitions, none of which were individually material to our financial position, results of operations, or cash flows. Each acquisition was made to enhance our position and ability to provide inpatient rehabilitation services to patients in the applicable geographic areas.

- In January 2020, we acquired 68% of the operations of a 13-bed inpatient rehabilitation unit in Denver, Colorado through a joint venture with Portercare Adventist Health System. The acquisition was funded through a contribution of our existing 40-bed inpatient rehabilitation hospital in Littleton, Colorado and through contributions of funds which were utilized by the consolidated joint venture to build a 20-bed expansion to the Littleton hospital.
- In May 2020, we acquired 51% of the operations of a 45-bed inpatient rehabilitation unit in Dayton, Ohio through a joint venture with Premier Health Partners. The acquisition was funded through contributions of funds which were utilized by the consolidated joint venture to build a 60-bed de novo inpatient rehabilitation hospital.

We accounted for these transactions under the acquisition method of accounting and reported the results of operations of the acquired hospitals from its respective date of acquisition. Assets acquired were recorded at their estimated fair values as of the acquisition date. Estimated fair values were based on various valuation methodologies including an income approach using primarily discounted cash flow techniques for the noncompete intangible assets and an income approach utilizing the relief from royalty method for the trade name intangible asset. The aforementioned income methods utilize management's estimates of future operating results and cash flows discounted using a weighted-average cost of capital that reflects market participant assumptions. The excess of the fair value of the consideration conveyed over the fair value of the assets acquired was recorded as goodwill. The goodwill reflects our expectations of our ability to gain access to and penetrate the acquired hospital's historical patient base and the benefits of being able to leverage operational efficiencies with favorable growth opportunities based on positive demographic trends in this market. None of the goodwill recorded as a result from these transactions are deductible for federal income tax purposes.

The fair value of the assets acquired at the acquisition date were as follows (in millions):

Identifiable intangible assets:	
Noncompete agreements (useful lives of 2 to 3 years)	\$ 0.7
Trade name (useful life of 20 years)	0.9
Goodwill	9.3
Total assets acquired	<u>\$ 10.9</u>

Information regarding the net cash paid for the inpatient rehabilitation acquisitions during 2020 is as follows (in millions):

Fair value of assets acquired	\$ 1.6
Goodwill	9.3
Fair value of noncontrolling interest owned by joint venture partner	(10.9)
Net cash paid for acquisitions	<u>\$ —</u>

Notes to Consolidated Financial Statements

2020 Pro Forma Results of Operations

The following table summarizes the results of operations of the above-mentioned acquisitions from their respective dates of acquisition included in our consolidated results of operations and the unaudited pro forma results of operations of the combined entity had the date of the acquisitions been January 1, 2020 (in millions):

	Net Operating Revenues	Net Income Attributable to Encompass Health
Acquired entities only: Actual from acquisition date to December 31, 2020	\$ —	\$ —
Combined entity: Supplemental pro forma from 01/01/2020-12/31/2020 (unaudited)	3,571.9	284.8

The information presented above is for illustrative purposes only and is not necessarily indicative of results that would have been achieved if the acquisitions had occurred as of the beginning of our 2020 reporting period.

4. Variable Interest Entities:

As of December 31, 2022 and December 31, 2021, we consolidated eight and ten, respectively, limited partnership-like entities that are VIEs and of which we are the primary beneficiary. Our ownership percentages in these entities range from 50.0% to 75.0% as of December 31, 2022. Through partnership and management agreements with or governing each of these entities, we manage all of these entities and handle all day-to-day operating decisions. Accordingly, we have the decision-making power over the activities that most significantly impact the economic performance of our VIEs and an obligation to absorb losses or receive benefits from the VIE that could potentially be significant to the VIE. These decisions and significant activities include, but are not limited to, marketing efforts, oversight of patient admissions, medical training, nurse and therapist scheduling, provision of healthcare services, billing, collections and creation and maintenance of medical records. The terms of the agreements governing each of our VIEs prohibit us from using the assets of each VIE to satisfy the obligations of other entities.

Notes to Consolidated Financial Statements

The carrying amounts and classifications of the consolidated VIEs' assets and liabilities, which are included in our consolidated balance sheets, are as follows (in millions):

	As of December 31,	
	2022	2021
Assets		
Current assets:		
Cash and cash equivalents	\$ 0.2	\$ —
Accounts receivable	34.0	33.6
Other current assets	6.7	5.9
Current assets of discontinued operations	—	4.5
Total current assets	40.9	44.0
Property and equipment, net	129.0	116.3
Operating lease right-of-use assets	1.7	3.2
Goodwill	15.9	15.9
Intangible assets, net	1.5	2.0
Other long-term assets	18.8	31.1
Long-term assets of discontinued operations	—	13.7
Total assets	\$ 207.8	\$ 226.2
Liabilities		
Current liabilities:		
Current portion of long-term debt	\$ 0.8	\$ 1.0
Current operating lease liabilities	0.4	1.5
Accounts payable	7.0	5.9
Accrued payroll	8.2	10.0
Other current liabilities	15.7	9.0
Current liabilities of discontinued operations	—	0.4
Total current liabilities	32.1	27.8
Long-term debt, net of current portion	14.5	8.6
Long-term operating lease liabilities	1.3	1.8
Total liabilities	\$ 47.9	\$ 38.2

5. Cash and Marketable Securities:

The components of our investments as of December 31, 2022 are as follows (in millions):

	Cash & Cash Equivalents	Restricted Cash	Restricted Marketable Securities	Total
Cash	\$ 21.8	\$ 31.6	\$ —	\$ 53.4
Equity securities	—	—	110.0	110.0
Total	\$ 21.8	\$ 31.6	\$ 110.0	\$ 163.4

Notes to Consolidated Financial Statements

The components of our investments as of December 31, 2021 are as follows (in millions):

	Cash & Cash Equivalents	Restricted Cash	Restricted Marketable Securities	Total
Cash	\$ 49.4	\$ 62.9	\$ —	\$ 112.3
Equity securities	—	—	82.2	82.2
Total	<u>\$ 49.4</u>	<u>\$ 62.9</u>	<u>\$ 82.2</u>	<u>\$ 194.5</u>

Restricted Cash—

Restricted cash consisted of the following (in millions):

	As of December 31,	
	2022	2021
Current:		
Affiliate cash	\$ 12.9	\$ 14.7
Self-insured captive funds	17.3	47.8
Other	1.4	—
	<u>31.6</u>	<u>62.5</u>
Noncurrent:		
Self-insured captive funds	—	0.4
Total restricted cash	<u>\$ 31.6</u>	<u>\$ 62.9</u>

Affiliate cash represents cash accounts maintained by joint ventures in which we participate where one or more of our external partners requested, and we agreed, that the joint venture's cash not be commingled with other corporate cash accounts and be used only to fund the operations of those joint ventures. Self-insured captive funds represent cash held at our wholly owned insurance captive, HCS, Ltd., as discussed in Note 11, *Self-Insured Risks*. These funds are committed to pay third-party administrators for claims incurred and are restricted by insurance regulations and requirements. These funds cannot be used for purposes outside HCS without the permission of the Cayman Islands Monetary Authority.

The classification of restricted cash held by HCS as current or noncurrent depends on the classification of the corresponding claims liability.

Marketable Securities—

Restricted marketable securities at both balance sheet dates represent restricted assets held at HCS. HCS insures a substantial portion of Encompass Health's professional liability, workers' compensation, and other insurance claims. These funds are committed for payment of claims incurred, and the classification of these marketable securities as current or noncurrent depends on the classification of the corresponding claims liability. As of December 31, 2022 and 2021, \$79.1 million and \$82.2 million, respectively, of restricted marketable securities are included in *Other long-term assets* in our consolidated balance sheets. During the years ended December 31, 2022, 2021, and 2020, \$(7.4) million, \$0.6 million, and \$0.4 million, respectively, of unrealized net (losses) gains were recognized in our consolidated statements of comprehensive income on marketable securities still held at the reporting date.

Investing information related to our available-for-sale marketable securities is as follows (in millions):

	For the Year Ended December 31,		
	2022	2021	2020
Proceeds from sales and maturities of available-for-sale marketable securities	\$ —	\$ —	\$ 12.6

Notes to Consolidated Financial Statements

Our portfolio of marketable securities is comprised of investments in mutual funds that hold investments in a variety of industries and geographies. As discussed in Note 1, *Summary of Significant Accounting Policies*, “Marketable Securities,” when our portfolio included marketable securities with unrealized losses that are not deemed to be other-than-temporarily impaired, we examined the severity and duration of the impairments in relation to the cost of the individual investments. We also considered the industry and geography in which each investment is held and the near-term prospects for a recovery in each.

6. Accounts Receivable:

Accounts receivable consists of the following (in millions):

	As of December 31,	
	2022	2021
Current:		
Patient accounts receivable	\$ 524.8	\$ 502.1
Other accounts receivable	12.0	13.7
	536.8	515.8
Noncurrent patient accounts receivable	73.3	77.4
Accounts receivable	\$ 610.1	\$ 593.2

Because the resolution of claims that are part of Medicare audit programs can take several years, we review the patient receivables that are part of this adjudication process to determine their appropriate classification as either current or noncurrent. Amounts considered noncurrent are included in *Other long-term assets* in our consolidated balance sheet. See Note 1, *Summary of Significant Accounting Policies*, “Net Operating Revenues,” for additional information.

7. Property and Equipment:

Property and equipment consists of the following (in millions):

	As of December 31,	
	2022	2021
Land	\$ 286.1	\$ 259.8
Buildings	3,019.8	2,632.8
Leasehold improvements	281.5	251.1
Vehicles	4.5	3.8
Furniture, fixtures, and equipment	647.2	571.0
	4,239.1	3,718.5
Less: Accumulated depreciation and amortization	(1,659.4)	(1,490.5)
	2,579.7	2,228.0
Construction in progress	359.5	353.2
Property and equipment, net	\$ 2,939.2	\$ 2,581.2

As of December 31, 2022, approximately 68% of our consolidated *Property and equipment, net* held by Encompass Health Corporation and its guarantor subsidiaries was pledged to the lenders under our credit agreement. See Note 10, *Long-term Debt*, and Item 7, *Management’s Discussion and Analysis of Financial Condition and Results of Operations*, “Liquidity and Capital Resources.”

Notes to Consolidated Financial Statements

The amount of depreciation expense and interest capitalized is as follows (in millions):

	For the Year Ended December 31,		
	2022	2021	2020
Depreciation expense	\$ 187.3	\$ 160.4	\$ 145.1
Interest capitalized	\$ 10.5	\$ 8.9	\$ 6.0

8. Leases:

We lease real estate, vehicles, and equipment under operating and finance leases with non-cancelable terms generally expiring at various dates through 2037. Our operating and finance leases generally have 1- to 25-year terms, with one or more renewal options, primarily relating to our real estate leases, with terms to be determined at the time of renewal. The exercise of such lease renewal options is at our sole discretion, and to the extent we are reasonably certain we will exercise a renewal option, the years related to that option are included in our determination of the lease term for purposes of classifying and measuring a given lease. Certain leases also include options to purchase the leased property.

The components of lease costs are as follows (in millions):

	For the Year Ended December 31,		
	2022	2021	2020
Operating lease cost	\$ 38.7	\$ 46.7	\$ 50.2
Finance lease cost:			
Amortization of right-of-use assets	27.5	28.0	25.0
Interest on lease liabilities	29.0	30.7	28.8
Total finance lease cost	56.5	58.7	53.8
Short-term and variable lease cost	5.2	3.1	3.7
Sublease income	(2.9)	(3.1)	(3.2)
Total lease cost	\$ 97.5	\$ 105.4	\$ 104.5

Notes to Consolidated Financial Statements

Supplemental consolidated balance sheet information related to leases is as follows (in millions):

	Classification	As of December 31,	
		2022	2021
Assets			
Operating lease	Operating lease right-of-use assets	\$ 212.5	\$ 193.7
Finance lease ⁽¹⁾	Property and equipment, net	272.9	299.3
Total leased assets		\$ 485.4	\$ 493.0
Liabilities			
Current liabilities:			
Operating lease	Current operating lease liabilities	\$ 25.6	\$ 23.5
Finance lease	Current portion of long-term debt	19.5	19.1
Noncurrent liabilities:			
Operating lease	Long-term operating lease liabilities	199.7	179.6
Finance lease	Long-term debt, net of current portion	340.3	361.2
Total leased liabilities		\$ 585.1	\$ 583.4

⁽¹⁾ Finance lease assets are recorded net of accumulated amortization of \$145.8 million and \$126.9 million as of December 31, 2022 and 2021, respectively.

	As of December 31,	
	2022	2021
Weighted Average Remaining Lease Term		
Operating lease	9.3 years	9.4 years
Finance lease	11.6 years	12.0 years
Weighted Average Discount Rate		
Operating lease	6.2 %	6.1 %
Finance lease	7.7 %	8.0 %

Maturities of lease liabilities as of December 31, 2022 are as follows (in millions):

Year Ending December 31,	Operating Leases	Finance Leases
2023	\$ 38.4	\$ 45.6
2024	40.3	46.5
2025	37.5	47.0
2026	34.3	47.9
2027	32.4	47.4
2028 and thereafter	119.5	316.6
Total lease payments	302.4	551.0
Less: Interest portion	(77.1)	(191.2)
Total lease liabilities	\$ 225.3	\$ 359.8

Supplemental cash flow information related to our leases is as follows (in millions):

	For the Year Ended December 31,		
	2022	2021	2020
Cash paid for amounts included in the measurement of lease liabilities:			
Operating cash flows from operating leases	\$ 40.5	\$ 45.0	\$ 50.6
Operating cash flows from finance leases	29.7	31.0	29.2
Financing cash flows from finance leases	19.2	44.6	14.4
Right-of-use assets obtained in exchange for lease obligations:			
Operating leases	\$ 48.7	\$ 26.9	\$ 26.2
Finance leases	1.0	46.4	24.2

9. Goodwill and Other Intangible Assets:

The following table shows changes in the carrying amount of *Goodwill* (in millions):

	Amount
Goodwill as of December 31, 2019	\$ 1,218.9
Acquisitions	9.3
Goodwill as of December 31, 2020	1,228.2
Acquisitions	8.8
Goodwill as of December 31, 2021	1,237.0
Acquisitions	26.2
Goodwill as of December 31, 2022	\$ 1,263.2

Goodwill increased in 2020, 2021 and 2022 as a result of our acquisitions of inpatient rehabilitation operations. For additional information on these acquisitions, see Note 3, *Business Combinations*.

We performed impairment reviews as of October 1, 2022, 2021, and 2020 and concluded no *Goodwill* impairment existed. As of December 31, 2022, we had no accumulated impairment losses related to *Goodwill*.

Notes to Consolidated Financial Statements

The following table provides information regarding our other intangible assets (in millions):

	Gross Carrying Amount		Accumulated Amortization		Net
Certificates of need:					
2022	\$ 120.4	\$	(41.5)	\$	78.9
2021	115.3		(36.0)		79.3
Licenses:					
2022	\$ 65.7	\$	(54.3)	\$	11.4
2021	65.7		(53.2)		12.5
Noncompete agreements:					
2022	\$ 66.2	\$	(60.2)	\$	6.0
2021	65.3		(58.4)		6.9
Trade name - Encompass:					
2022	\$ 135.2	\$	—	\$	135.2
2021	—		—		—
Trade names - all other:					
2022	\$ 37.5	\$	(20.8)	\$	16.7
2021	37.5		(19.5)		18.0
Internal-use software:					
2022	\$ 183.2	\$	(150.3)	\$	32.9
2021	182.8		(142.6)		40.2
Market access assets:					
2022	\$ 13.2	\$	(12.0)	\$	1.2
2021	13.2		(11.7)		1.5
Total intangible assets:					
2022	\$ 621.4	\$	(339.1)	\$	282.3
2021	479.8		(321.4)		158.4

Amortization expense for other intangible assets is as follows (in millions):

	For the Year Ended December 31,		
	2022	2021	2020
Amortization expense	\$ 28.8	\$ 31.2	\$ 32.9

Total estimated amortization expense for our other intangible assets for the next five years is as follows (in millions):

Year Ending December 31,	Estimated Amortization Expense
2023	\$ 25.0
2024	17.2
2025	11.6
2026	10.4
2027	10.0

Notes to Consolidated Financial Statements
10. Long-term Debt:

Our long-term debt outstanding consists of the following (in millions):

	As of December 31,	
	2022	2021
Credit Agreement—		
Advances under revolving credit facility	\$ 55.0	\$ 200.0
Term loan facilities	—	238.5
Bonds payable—		
5.125% Senior Notes due 2023	—	99.6
5.75% Senior Notes due 2025	347.7	347.0
4.50% Senior Notes due 2028	781.8	786.8
4.75% Senior Notes due 2030	779.0	784.7
4.625% Senior Notes due 2031	390.6	393.7
Other notes payable	53.1	47.7
Finance lease obligations	359.8	380.3
	<u>2,767.0</u>	<u>3,278.3</u>
Less: Current portion	(25.2)	(37.8)
Long-term debt, net of current portion	<u>\$ 2,741.8</u>	<u>\$ 3,240.5</u>

The following chart shows scheduled principal payments due on long-term debt for the next five years and thereafter (in millions):

Year Ending December 31,	Face Amount	Net Amount
2023	\$ 25.2	\$ 25.2
2024	39.2	39.2
2025	381.8	379.5
2026	27.6	27.6
2027	96.6	96.6
Thereafter	2,247.5	2,198.9
Total	<u>\$ 2,817.9</u>	<u>\$ 2,767.0</u>

As a result of the redemptions discussed below, we recorded a \$1.4 million, \$1.0 million, and \$2.3 million *Loss on early extinguishment of debt* in 2022, 2021, and 2020, respectively.

Senior Secured Credit Agreement—

The credit agreement provides for a \$1 billion revolving credit facility, with a \$260 million letter of credit subfacility and a swingline loan subfacility, all of which mature in October 2027. The credit agreement previously provided for a \$270 million term loan commitment, the outstanding amount of which was repaid in June 2022.

Amounts drawn on the revolving credit facility bear interest at a rate per annum of, at our option, (1) secured overnight financing rate (“SOFR”) or (2) the higher of (a) Barclays Bank PLC’s prime rate and (b) the federal funds rate plus 0.5%, in each case, plus, in each case, an applicable margin that varies depending upon our leverage ratio. We are also subject to a commitment fee of 0.25% or 0.30%, depending on our leverage ratio, per annum on the daily amount of the unutilized commitments under the revolving credit facility. The current interest rate on SOFR borrowings under the credit agreement includes a credit spread of 1.50%.

Notes to Consolidated Financial Statements

The credit agreement contains affirmative and negative covenants and default and acceleration provisions, including a minimum interest coverage ratio and a maximum leverage ratio. Under one such negative covenant, we are restricted from paying common stock dividends, prepaying certain senior notes, making certain investments, and repurchasing preferred and common equity unless (1) we are not in default under the terms of the credit agreement and (2) our senior secured leverage ratio, as defined in the credit agreement, does not exceed 2x. In the event the senior secured leverage ratio exceeds 2x, these payments are subject to a limit of \$200 million plus the Available Amount, as defined in the credit agreement. Our obligations under the credit agreement are secured by the current and future personal property of the Company and its subsidiary guarantors.

In April 2020, we amended our existing credit agreement and the amendments included the following material provisions:

1. Amendment of the financial covenants to update the applicable interest coverage ratio and leverage ratio included in that covenant. The revised applicable

Fiscal Quarters Ending	Interest Coverage Ratio
December 31, 2019 and March 31, 2020	3.00 to 1.00
June 30, 2020, September 30, 2020, December 31, 2020, March 31, 2021, June 30, 2021, September 30, 2021 and December 31, 2021	2.00 to 1.00
March 31, 2022 and thereafter	3.00 to 1.00

ratios are set forth below.

Fiscal Quarters Ending	Leverage Ratio
December 31, 2019 and March 31, 2020	4.50 to 1.00
June 30, 2020	4.75 to 1.00
September 30, 2020	5.50 to 1.00
December 31, 2020	6.50 to 1.00
March 31, 2021	6.50 to 1.00
June 30, 2021	6.00 to 1.00
September 30, 2021	5.50 to 1.00
December 31, 2021	5.00 to 1.00
March 31, 2022 and thereafter	4.25 to 1.00

2. Amendment of the definition of “Material Adverse Effect” to carve out the direct and indirect impacts of pandemic and the related legislative, regulatory and executive actions on us from that definition for a period of 364 days; and
3. Amendment of the investment limitation covenant and the restricted payment limitation covenant, to add to each a leverage ratio condition (not in excess of 4.50x) to the provisions allowing unlimited investments and restricted payments in the event certain conditions are met including a senior secured leverage ratio (not in excess of 2.00x) and the existence of no events of default in addition to the new leverage ratio condition.

In June 2022, we further amended our existing credit agreement and the amendments included the following material provisions:

1. Amendment of definition of “Consolidated Net Income” to exclude from the calculation thereof, at Encompass Health’s option, net income or loss from disposed, abandoned, transferred, closed or discontinued operations until such disposition, abandonment, transfer, closure of discontinuance of operations shall have been consummated.
2. Addition of Section 1.08, “SpinCo Credit Facilities Transactions,” to provide that the Loan Documents will not prevent the consummation of the SpinCo Credit Facilities Transactions and that the SpinCo Credit Facilities Transactions will not give rise to any Default or constitute a utilization of any basket under any Loan Document.

Notes to Consolidated Financial Statements

3. Amendment of Section 2.11(e) to provide that a Prepayment Notice may be conditioned upon the effectiveness of other credit facilities, indentures or similar agreements or other transactions.
4. Addition of Section 5.18, “SpinCo Distribution,” to provide that within three (3) Business Days following the incurrence of indebtedness under the SpinCo Credit Facilities, Encompass will have consummated the SpinCo Distribution in compliance with the Restricted Payments covenants of the Credit Agreement, and following the consummation of the SpinCo Distribution, no obligors in respect of the SpinCo Credit Facilities will be Restricted Subsidiaries.
5. Amendment of the definition of “Senior Notes” to include Encompass’ 4.625% Senior Notes due 2031 and the definition of “Consolidated Total Indebtedness” to exclude Indebtedness under any Senior Note for which an irrevocable notice of redemption has been issued in connection with or incidental to any SpinCo Distribution.

In October 2022, we further amended our existing credit agreement and the amendments included the following material provisions:

1. Amendment of the definition of “Maturity Date” for the revolving borrowings to October 7, 2027.
2. Change the reference rate for borrowings from LIBOR to SOFR.
3. Reduction of the fee for the undrawn portion of the revolving loan commitment from 37.5 basis points to a maximum of 30 basis points and a minimum of 25 basis points, with such rate to be determined based on the Leverage Ratio as of the most recently ended four quarter period.
4. Restatement of the Leverage Ratio maintenance covenant in Section 6.01(b) to the following:

On the last day of each fiscal quarter, the Borrower will not permit the Leverage Ratio, calculated as of the end of each such fiscal quarter occurring during the time periods set forth below on a pro forma basis, to exceed the ratio set forth below opposite the time period during which such fiscal quarter ends; provided, however, that the Borrower may elect (the “Step-Up Election”) at any time after the Effective Date to increase the maximum Leverage Ratio permitted hereunder by 0.50 to 1.00 for the 4 immediately succeeding fiscal quarters as of and immediately following the consummation of any Significant Acquisition, in each case, by providing a written notice to the Administrative Agent of such Step-Up Election prior to the last day of the first fiscal quarter for which the Step-Up Election is to take effect (this sentence, the “Leverage Covenant”). Upon the expiration of the Step-Up Election, the maximum Leverage Ratio permitted under the Leverage Covenant shall revert to the Leverage Ratio set forth below for at least two consecutive fiscal quarters before the Borrower may make another Step-Up Election.

Fiscal Quarters Ending	Leverage Ratio
September 30, 2022 – September 30, 2024	4.75 to 1.00
December 31, 2024 and thereafter	4.50 to 1.00

5. Insertion of an add back of certain restructuring charges and synergies in calculating Adjusted Consolidated EBITDA under the credit agreement.
6. Amendment of definition of “Available Amount” to include a \$900 million “starter amount” and a “grower component” tied to 50% of cumulative Consolidated Net Income.
7. Amendment of certain negative covenant baskets to include a “grower component” tied to a percentage of Adjusted Consolidated EBITDA for a trailing 12-month period.

In June 2022, Enhabit distributed \$566.6 million to Encompass Health who used it to fully repay both the \$250 million outstanding balance of the Encompass Health revolving credit facility and approximately \$236 million of the Encompass Health term loan. Currently, there are no term loan commitments under the credit agreement.

Notes to Consolidated Financial Statements

As of December 31, 2022, \$55 million were drawn under the revolving credit facility with an interest rate of 7.0%. As of December 31, 2021, \$200 million were drawn under the revolving credit facility with an interest rate of 2.6%. As of December 31, 2022 and 2021, \$32.7 million and \$38.2 million, respectively, were being utilized under the letter of credit subfacility, which were being used in the ordinary course of business to secure workers' compensation and other insurance coverages and for general corporate purposes.

Bonds Payable—Senior Notes

The Company's 5.125% Senior Notes due 2023 ("the 2023 Notes"), 5.75% Senior Notes due 2025 (the "2025 Notes"), 4.50% Senior Notes due 2028 (the "2028 Notes"), 4.75% Senior Notes due 2030 (the "2030 Notes"), and 4.625% Senior Notes due 2031 (the "2031 Notes" and collectively the "Senior Notes") were issued pursuant to an indenture (the "Base Indenture") dated as of December 1, 2009, as supplemented by each Senior Notes' respective supplemental indenture (together with the Base Indenture, the "Indenture"). Pursuant to the terms of the Indenture, the Senior Notes are jointly and severally guaranteed on a senior, unsecured basis by all of our existing and future subsidiaries that guarantee borrowings under our credit agreement and other capital markets debt. The Senior Notes are senior, unsecured obligations of Encompass Health and rank equally with our other senior indebtedness, senior to any of our subordinated indebtedness, and effectively junior to our secured indebtedness to the extent of the value of the collateral securing such indebtedness.

Upon the occurrence of a change in control (as defined in the Indenture), each holder of the Senior Notes may require us to repurchase all or a portion of the notes in cash at a price equal to 101% of the principal amount of the Senior Notes to be repurchased, plus accrued and unpaid interest.

The Senior Notes contain covenants and default and acceleration provisions, that, among other things, limit our and certain of our subsidiaries' ability to (1) incur additional debt, (2) make certain restricted payments, (3) consummate specified asset sales, (4) incur liens, and (5) merge or consolidate with another person.

On December 9, 2021, we announced the commencement of a consent solicitation of holders of the 2025 Notes, 2028 Notes, 2030 Notes, and 2031 Notes (collectively the "Notes") for the adoption of certain amendments to the Indenture, which provided us with greater flexibility in effecting the Spin Off discussed in Note 2, *Spin Off of Home Health and Hospice Business*. Each Indenture contains restrictive covenants that, among other things, limit our ability and the ability of certain of our subsidiaries to make certain asset dispositions, investments, and distributions to holders of our capital stock. The amendments to the Indentures permit us, subject to the leverage ratio condition set forth below, to distribute to our equity holders in one or more transactions (a "Distribution") some or all of the common stock of a subsidiary that holds substantially all of the assets of our home health and hospice business. We may make any such distribution so long as the Leverage Ratio (as defined in each Indenture) is no more than 3.5 to 1.0 on a pro forma basis after giving effect thereto. The amendments also reduce the capacity under our restricted payments builder basket under each existing Indenture for the 2028 Notes, 2030 Notes, and 2031 Notes by \$200 million and amends the definition of "Consolidated Net Income" to allow us to exclude from Consolidated Net Income (a component of the Leverage Ratio) any fees, expenses or charges related to any Distribution and the solicitation of consents from the holders of the Notes. In December 2021 and January 2022, we received the requisite consents for the adoption of these amendments. Under the terms of the amendments, we agreed to pay the holders of the Notes a total of \$40.5 million, excluding fees. We paid \$20.0 million and \$20.5 million in January and June 2022, respectively.

Notes to Consolidated Financial Statements

2023 Notes

In March 2015, we issued \$300 million of the 2023 Notes at par. In both April and June 2021, we redeemed \$100 million in outstanding principal amount of the 2023 Notes using cash on hand and capacity under our revolving credit facility. Pursuant to the terms of the 2023 Notes, these optional redemptions were made at a price of par. In March 2022, we redeemed the remaining \$100 million in outstanding principal amount of the 2023 Notes using capacity under our revolving credit facility. Pursuant to the terms of the 2023 Notes, this optional redemption was made at a price of par. The 2023 Notes would have matured on March 15, 2023. Inclusive of financing costs, the effective interest rate on the 2023 Notes was 5.4%. Interest on the 2023 Notes was payable semiannually in arrears on March 15 and September 15.

2025 Notes

In September 2015, we issued \$350 million of the 2025 Notes at par. The 2025 Notes mature on September 15, 2025 and bear interest at a per annum rate of 5.75%. Inclusive of financing costs, the effective interest rate on the 2025 Notes is 6.0%. Interest on the 2025 Notes is payable semiannually in arrears on March 15 and September 15.

We may redeem the 2025 Notes, in whole or in part, at any time on or after September 15, 2022, at the redemption prices set forth below:

Period	Redemption Price*
2022	100.958 %
September 15, 2023 and thereafter	100.000 %

* Expressed in percentage of principal amount

2028 and 2030 Notes

In September 2019, we issued \$500 million of the 2028 Notes at par and \$500 million of the 2030 Notes at par. Certain of the proceeds from this offering were used to fund the purchase of equity rights from management investors of our former home health and hospice business discussed in Note 12, *Redeemable Noncontrolling Interests*.

In May 2020, we issued an additional \$300 million of the 2028 Notes at a price of 99.0% of the principal amount and an additional \$300 million of the 2030 Notes at a price of 98.5% of the principal amount, which resulted in approximately \$583 million in net proceeds. We used a portion of the net proceeds from this borrowing, together with cash on hand, to repay borrowings under our revolving credit facility.

The 2028 Notes mature on February 1, 2028. Inclusive of financing costs, the effective interest rate on the 2028 Notes is 4.8%. Interest on the 2028 Notes is payable semiannually in arrears on February 1 and August 1. We may redeem the 2028 Notes, in whole or in part, at any time on or after February 1, 2023 at the redemption prices set forth below:

Period	Redemption Price*
2023	102.250 %
2024	101.125 %
2025 and thereafter	100.000 %

* Expressed in percentage of principal amount

Notes to Consolidated Financial Statements

The 2030 Notes mature on February 1, 2030. Inclusive of financing costs, the effective interest rate on the 2030 Notes is 5.2%. Interest on the 2030 Notes is payable semiannually in arrears on February 1 and August 1. We may redeem the 2030 Notes, in whole or in part, at any time on or after February 1, 2025 at the redemption prices set forth below:

Period	Redemption Price*
2025	102.375 %
2026	101.583 %
2027	100.792 %
2028 and thereafter	100.000 %

* Expressed in percentage of principal amount

2031 Notes

In October 2020, we issued \$400 million of the 2031 Notes at par. The 2031 Notes mature on April 1, 2031 and bear interest at a per annum rate of 4.625%. Inclusive of financing costs, the effective interest rate on the 2031 Notes is 5.0%. Interest is payable semiannually in arrears on April 1 and October 1 of each year. We may redeem the 2031 Notes, in whole or in part, at any time on or after April 1, 2026 at the redemption prices set forth below:

Period	Redemption Price*
2026	102.313 %
2027	101.542 %
2028	100.771 %
2029 and thereafter	100.000 %

* Expressed in percentage of principal amount

Former 2024 Notes

In November 2020, we redeemed the remaining \$700 million of outstanding principal amount of the 5.75% Senior Notes due 2024 (“the Former 2024 Notes”). Pursuant to the terms of the Former 2024 Notes, this full redemption was made at a price of par. We used the net proceeds from the 2031 Notes offering, discussed above, together with approximately \$300 million of cash on hand to fund the redemption. The Former 2024 Notes would have matured on November 1, 2024. Inclusive of premiums and financing costs, the effective interest rate on the Former 2024 Notes was 5.8%. Interest was payable semiannually in arrears on May 1 and November 1 of each year.

Other Notes Payable—

Our notes payable consist of the following (in millions):

	As of December 31,		Interest Rates
	2022	2021	
Sale/leaseback transactions involving real estate accounted for as financings	\$ 28.0	\$ 28.0	6.1% to 11.2%
Construction of a new hospital	20.7	11.0	5.0% to 5.5%
Software contracts	4.4	8.7	2.8%
Other notes payable	\$ 53.1	\$ 47.7	

Notes to Consolidated Financial Statements

11. Self-Insured Risks:

We insure a substantial portion of our professional liability, general liability, and workers' compensation risks through a self-insured retention program ("SIR") underwritten by our consolidated wholly owned offshore captive insurance subsidiary, HCS, Ltd., which we fund via regularly scheduled premium payments. HCS is an insurance company licensed by the Cayman Island Monetary Authority. We use HCS to fund the first \$45 million for annual aggregate losses associated with general and professional liability risks. Workers' compensation exposures are capped on a per claim basis. Risks in excess of specified limits per claim and in excess of our aggregate SIR amount are covered by unrelated commercial carriers.

The following table presents the changes in our self-insurance reserves (in millions):

	2022	2021	2020
Balance at beginning of period, gross	\$ 169.4	\$ 165.2	\$ 157.3
Less: Reinsurance receivables	(30.0)	(28.3)	(26.4)
Balance at beginning of period, net	139.4	136.9	130.9
Increase for the provision of current year claims	50.5	46.9	52.5
Decrease for the provision of prior year claims	(8.2)	(6.8)	(15.0)
Expenses related to discontinued operations	—	(0.2)	(0.2)
Payments related to current year claims	(7.1)	(7.0)	(8.4)
Payments related to prior year claims	(31.8)	(30.4)	(22.9)
Balance at end of period, net	142.8	139.4	136.9
Add: Reinsurance receivables	32.3	30.0	28.3
Balance at end of period, gross	\$ 175.1	\$ 169.4	\$ 165.2

As of December 31, 2022 and 2021, \$46.6 million and \$45.6 million, respectively, of these reserves are included in *Other current liabilities* in our consolidated balance sheets.

Provisions for these risks are based primarily upon actuarially determined estimates. These reserves represent the unpaid portion of the estimated ultimate cost of all reported and unreported losses incurred through the respective consolidated balance sheet dates. The reserves are estimated using individual case-basis valuations and actuarial analyses. Those estimates are subject to the effects of trends in loss severity and frequency. The estimates are continually reviewed and adjustments are recorded as experience develops or new information becomes known. The changes to the estimated ultimate loss amounts are included in current operating results.

The reserves for these self-insured risks cover approximately 1,100 and 1,200 individual claims at December 31, 2022 and 2021, respectively, and estimates for potential unreported claims. The time period required to resolve these claims can vary depending upon the jurisdiction, the nature, and the form of resolution of the claims. The estimation of the timing of payments beyond a year can vary significantly. Although considerable variability is inherent in reserve estimates, management believes the reserves for losses and loss expenses are adequate; however, there can be no assurance the ultimate liability will not exceed management's estimates.

12. Redeemable Noncontrolling Interests:

The following is a summary of the activity related to our *Redeemable noncontrolling interests* (in millions):

	For the Year Ended December 31,		
	2022	2021	2020
Balance at beginning of period	\$ 42.2	\$ 31.6	\$ 239.6
Net income attributable to noncontrolling interests	7.2	9.0	7.4
Distributions declared	(5.3)	(8.0)	(8.5)
Contribution to joint ventures	—	—	3.1
Purchase of redeemable noncontrolling interests	—	—	(162.3)
Exchange transaction	—	—	(46.3)
Change in fair value	(3.4)	4.5	(1.4)
Other	0.1	5.1	—
Spin off of Enhabit, Inc.	(5.2)	—	—
Balance at end of period	<u>\$ 35.6</u>	<u>\$ 42.2</u>	<u>\$ 31.6</u>

The following table reconciles the net income attributable to nonredeemable *Noncontrolling interests*, as recorded in the shareholders' equity section of the consolidated balance sheets, and the net income attributable to *Redeemable noncontrolling interests*, as recorded in the mezzanine section of the consolidated balance sheets, to the *Net income attributable to noncontrolling interests* presented in the consolidated statements of comprehensive income (in millions):

	For the Year Ended December 31,		
	2022	2021	2020
Net income attributable to nonredeemable noncontrolling interests	\$ 87.7	\$ 96.0	\$ 77.2
Net income attributable to redeemable noncontrolling interests	7.2	9.0	7.4
Net income attributable to noncontrolling interests	<u>\$ 94.9</u>	<u>\$ 105.0</u>	<u>\$ 84.6</u>

On December 31, 2014, we acquired 83.3% of our former home health and hospice business when we purchased EHHI Holdings, Inc. ("EHHI"). In the acquisition, we acquired all of the issued and outstanding equity interests of EHHI, other than equity interests contributed to Encompass Health Home Health Holdings, Inc. ("Holdings"), a subsidiary of Encompass Health and an indirect parent of EHHI, by certain sellers in exchange for shares of common stock of Holdings. Those sellers were members of EHHI management, and they contributed a portion of their shares of common stock of EHHI, valued at approximately \$64 million on the acquisition date, in exchange for approximately 16.7% of the outstanding shares of common stock of Holdings. At any time after December 31, 2017, each management investor had the right (but not the obligation) to have his or her shares of Holdings stock repurchased by Encompass Health for a cash purchase price per share equal to the fair value. In February 2018, each management investor exercised the right to sell one-third of his or her shares of Holdings stock to Encompass Health, representing approximately 5.6% of the outstanding shares of the common stock of Holdings. On February 21, 2018, Encompass Health settled the acquisition of those shares upon payment of approximately \$65 million in cash. In July 2019, we received additional exercise notices, representing approximately 5.6% of the outstanding shares of the common stock of Holdings. In September 2019, Encompass Health settled the acquisition of those shares upon payment of approximately \$163 million in cash. In January 2020, we received additional exercise notices, representing approximately 4.3% of the outstanding shares of the common stock of Holdings. On February 18, 2020, Encompass Health settled the acquisition of those shares upon payment of approximately \$162 million in cash. Upon settlement of these exercises, approximately \$46 million of the shares of Holdings held by two management investors remained outstanding.

On February 20, 2020, Encompass Health entered into exchange agreements (each, an "Exchange Agreement") with these two management investors, pursuant to which they had the right to exchange all of the remaining shares of Holdings held by them for shares of common stock of Encompass Health (the "EHC Shares"). Each of the Exchange Agreements provided that the management investor must deliver a written exchange notice (an "Exchange Notice") to Encompass Health in order to

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exchange his or her remaining shares of Holdings for EHC Shares. Each Exchange Agreement further provided that the number of EHC Shares to be delivered to the management investor was to be determined by dividing the fair value of the shares of Holdings held by the management investor on the date of the Exchange Agreement by the last reported sales price of Encompass Health's common stock on the New York Stock Exchange (the "NYSE") on the date of delivery of the Exchange Notice.

On February 20, 2020, Encompass Health received an Exchange Notice from each of the management investors. Based on the last sales price of Encompass Health's common stock on the NYSE on February 20, 2020, Encompass Health delivered an aggregate 560,957 EHC Shares to the management investors. The total number of EHC Shares issued pursuant to the exchange agreements on March 6, 2020 represented less than 0.6% of the outstanding shares of Encompass Health common stock. Encompass Health issued the EHC Shares from its treasury shares.

13. Fair Value Measurements:

Our financial assets and liabilities that are measured at fair value on a recurring basis are as follows (in millions):

	Fair Value Measurements at Reporting Date Using					Valuation Technique ⁽¹⁾
	Fair Value	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)		
As of December 31, 2022						
Equity securities ⁽²⁾	\$ 110.0	\$ 3.7	\$ 106.3	\$ —		M
Redeemable noncontrolling interests	35.6	—	—	35.6		I
As of December 31, 2021						
Equity securities ⁽²⁾	\$ 82.2	\$ 4.1	\$ 78.1	\$ —		M
Redeemable noncontrolling interests	42.2	—	—	42.2		I

⁽¹⁾ The three valuation techniques are: market approach (M), cost approach (C), and income approach (I).

⁽²⁾ As of December 31, 2022, \$30.9 million are included in *Other current assets* and \$79.1 million are included in *Other long-term assets* in the consolidated balance sheet. As of December 31, 2021, \$82.2 million are included in *Other long-term assets* in the consolidated balance sheet.

There are assets and liabilities that are not required to be measured at fair value on a recurring basis. However, these assets may be recorded at fair value as a result of impairment charges or other adjustments made to the carrying value of the applicable assets. During the years ended December 31, 2022, 2021, and 2020, we did not record any material gains or losses related to these assets.

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As discussed in Note 1, *Summary of Significant Accounting Policies*, “Fair Value Measurements,” the carrying value equals fair value for our financial instruments that are not included in the table below and are classified as current in our consolidated balance sheets. The carrying amounts and estimated fair values for our other financial instruments are presented in the following table (in millions):

	As of December 31, 2022		As of December 31, 2021	
	Carrying Amount	Estimated Fair Value	Carrying Amount	Estimated Fair Value
Long-term debt:				
Advances under revolving credit facility	\$ 55.0	\$ 55.0	\$ 200.0	\$ 200.0
Term loan facilities	—	—	238.5	239.6
5.125% Senior Notes due 2023	—	—	99.6	100.2
5.75% Senior Notes due 2025	347.7	347.7	347.0	357.9
4.50% Senior Notes due 2028	781.8	726.7	786.8	823.0
4.75% Senior Notes due 2030	779.0	703.7	784.7	824.0
4.625% Senior Notes due 2031	390.6	342.2	393.7	407.0
Other notes payable	53.1	53.1	47.7	47.7
Financial commitments:				
Letters of credit	—	32.7	—	38.2

Fair values for our long-term debt and financial commitments are determined using inputs, including quoted prices in nonactive markets, that are observable either directly or indirectly, or *Level 2* inputs within the fair value hierarchy. See Note 1, *Summary of Significant Accounting Policies*, “Fair Value Measurements” and “Redeemable Noncontrolling Interests.”

14. Share-Based Payments:

The Company has awarded employee stock-based compensation in the form of stock options and restricted stock awards (“RSAs”) under the terms of share-based incentive plans designed to align employee and executive interests to those of its stockholders. All employee stock-based compensation awarded during 2022, 2021, and 2020 was issued under the 2016 Omnibus Performance Incentive Plan, a stockholder-approved plan that reserves and provides for the grant of up to 16,860,765 shares of common stock after adjustment for the effect of the Spin Off. This plan allows for the grants of nonqualified stock options, incentive stock options, restricted stock, stock appreciate rights, performance shares, performance share units, dividend equivalents, restricted stock units (“RSUs”), and/or other stock-based awards. Stock-based compensation expense recognized in continuing operations was \$29.2 million, \$29.1 million, and \$25.6 million during 2022, 2021, and 2020, respectively. Stock-based compensation expense classified as discontinued operations was \$2.5 million, \$3.6 million, and \$3.9 million during 2022, 2021, and 2020, respectively.

Stock Options—

Under our share-based incentive plans, officers and employees are given the right to purchase shares of Encompass Health common stock at a fixed grant price determined on the day the options are granted. The terms and conditions of the options, including exercise prices and the periods in which options are exercisable, are generally at the discretion of the compensation and human capital committee of our board of directors. However, no options are exercisable beyond ten years from the date of grant. Granted options vest over the awards’ requisite service periods, which are generally three years.

Notes to Consolidated Financial Statements

The fair values of the options granted during the years ended December 31, 2022, 2021, and 2020 have been estimated at the grant date using the Black-Scholes option-pricing model with the following weighted-average assumptions:

	For the Year Ended December 31,		
	2022	2021	2020
Expected volatility	28.3 %	28.4 %	24.8 %
Risk-free interest rate	1.7 %	1.1 %	1.0 %
Expected life (years)	7.8	7.1	7.1
Dividend yield	1.9 %	1.9 %	2.0 %

The Black-Scholes option-pricing model was developed for use in estimating the fair value of traded options which have no vesting restrictions and are fully transferable. In addition, the Black-Scholes option-pricing model requires the input of highly subjective assumptions, including the expected stock price volatility. We estimate our expected term through an analysis of actual, historical post-vesting exercise, cancellation, and expiration behavior by our officers and employees and projected post-vesting activity of outstanding options. We calculate volatility based on the historical volatility of our common stock over the period commensurate with the expected term of the options. The risk-free interest rate is the implied daily yield currently available on U.S. Treasury issues with a remaining term closely approximating the expected term used as the input to the Black-Scholes option-pricing model. We estimated our dividend yield based on our annual dividend rate and our stock price on the dividend payment dates. Under the Black-Scholes option-pricing model, the weighted-average grant date fair value per share of employee stock options granted during the years ended December 31, 2022, 2021, and 2020 was \$17.29, \$19.21, and \$15.48, respectively.

A summary of our stock option activity and related information is as follows:

	Shares (In Thousands)	Weighted- Average Exercise Price per Share	Weighted- Average Remaining Life (Years)	Aggregate Intrinsic Value (In Millions)
Outstanding, December 31, 2021	711	\$ 54.33		
Granted ⁽¹⁾	117	66.39		
Exercised ⁽¹⁾	(47)	20.60		
Enhabit spin-off adjustment ⁽²⁾	55	51.65		
Outstanding, December 31, 2022	<u>836</u>	47.12	5.6	\$ 11.7
Exercisable, December 31, 2022	<u>621</u>	42.65	4.6	11.2

⁽¹⁾ Options activity represents historical grant values prior to the Spin Off.

⁽²⁾ In connection with the Spin Off, all outstanding Encompass Health stock options (whether vested or unvested) were converted into adjusted Encompass Health awards for current and former Encompass Health employees or Enhabit awards for Enhabit employees. Such adjusted awards preserved the same intrinsic value and general terms and conditions (including vesting) as were in place immediately prior to the adjustments.

We recognized approximately \$1.2 million, \$2.2 million, and \$1.5 million of compensation expense related to our stock options for the years ended December 31, 2022, 2021, and 2020, respectively. As of December 31, 2022, there was \$1.5 million of unrecognized compensation cost related to unvested stock options. This cost is expected to be recognized over a weighted-average period of 23 months. The total intrinsic value of options exercised during the years ended December 31, 2022, 2021, and 2020 was \$1.8 million, \$0.1 million, and \$2.3 million, respectively.

Restricted Stock—

The RSAs granted in 2022, 2021, and 2020 included service-based awards and performance-based awards (that also included a service requirement). These awards generally vest over a three-year requisite service period. For RSAs with a service and/or performance requirement, the fair value of the RSA is determined by the closing price of our common stock on the grant date.

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A summary of our issued restricted stock awards is as follows (share information in thousands):

	Shares	Weighted-Average Grant Date Fair Value
Nonvested shares at December 31, 2021	454	\$ 74.46
Granted ⁽¹⁾	425	74.08
Vested ⁽¹⁾	(306)	70.92
Forfeited ⁽²⁾	(31)	71.35
Enhabit spin-off adjustment ⁽³⁾	(16)	62.87
Nonvested shares at December 31, 2022	<u>526</u>	<u>63.35</u>

⁽¹⁾ RSA activity represents historical grant values prior to the Spin Off.

⁽²⁾ Forfeiture activity prior to the Spin Off represents historical grant values, while the post-spin forfeitures reflects the impact of Spin Off.

⁽³⁾ In connection with the Spin Off, all outstanding RSAs (whether vested or unvested) were converted into adjusted Encompass Health awards for current Encompass Health employees or Enhabit awards for Enhabit employees. Such adjusted awards preserved the same intrinsic value and general terms and conditions (including vesting) as were in place immediately prior to the adjustments.

The weighted-average grant-date fair value of restricted stock granted during the years ended December 31, 2021 and 2020 was \$73.89 and \$61.81 per share, respectively. We recognized approximately \$26.4 million, \$24.9 million, and \$22.0 million of compensation expense related to our restricted stock awards for the years ended December 31, 2022, 2021, and 2020, respectively. As of December 31, 2022, there was \$30.0 million of unrecognized compensation expense related to unvested restricted stock. This cost is expected to be recognized over a weighted-average period of 20 months. The remaining unrecognized compensation expense for the performance-based awards may vary each reporting period based on changes in the expected achievement of performance measures. The total fair value of shares vested during the years ended December 31, 2022, 2021, and 2020 was \$20.0 million, \$32.6 million, and \$41.4 million, respectively. We accrue dividends on outstanding RSAs, which are paid upon vesting.

Nonemployee Stock-Based Compensation Plans—

During the years ended December 31, 2022, 2021, and 2020, we provided incentives to our nonemployee members of our board of directors through the issuance of RSUs out of our share-based incentive plans. RSUs are fully vested when awarded and receive dividend equivalents in the form of additional RSUs upon the payment of a cash dividend on our common stock. During the years ended December 31, 2022, 2021, and 2020, we issued 22,469, 24,043, and 32,196 RSUs, respectively, with a fair value of \$67.42, \$84.83, and \$65.39, respectively, per unit. We recognized approximately \$1.5 million, \$2.0 million, and \$2.1 million, respectively, of compensation expense upon their issuance in 2022, 2021, and 2020. There was no unrecognized compensation related to unvested shares as of December 31, 2022. During the years ended 2022, 2021, and 2020, we issued an additional 11,976, 8,577, and 8,987, respectively, of RSUs as dividend equivalents. As of December 31, 2022, 775,312 RSUs were outstanding. In addition to the above, we issued 130,406 additional RSUs to current and former members of our board of directors in connection with the Spin Off. Such adjusted awards preserved the same intrinsic value and general terms and conditions (including vesting) as were in place immediately prior to the adjustments.

15. Employee Benefit Plans:

Substantially all Encompass Health employees are eligible to enroll in Encompass Health-sponsored healthcare plans, including coverage for medical and dental benefits. Our primary healthcare plans are national plans administered by third-party administrators. We are self-insured for these plans. During 2022, 2021, and 2020, costs associated with these plans, net of amounts paid by employees, approximated \$174.5 million, \$166.0 million, and \$145.4 million, respectively.

The Encompass Health Retirement Investment Plan (the “RIP”) is a qualified 401(k) savings plan. The RIP allows eligible employees to contribute up to 100% of their pay on a pre-tax basis into their individual retirement account in the plan subject to the normal maximum limits set annually by the Internal Revenue Service. Encompass Health employees who are at least 21 years of age are eligible to participate in the RIP and all contributions to the plan are in the form of cash.

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Health's employer matching contribution under the RIP is 50% of the first 6% of each participant's elective deferrals, which vest 100% after three years of service. Participants are always fully vested in their own contributions.

Employer contributions to the RIP approximated \$28.7 million, \$26.4 million, and \$23.3 million in 2022, 2021, and 2020, respectively. In 2022, 2021, and 2020, approximately \$1.4 million, \$1.1 million, and \$1.3 million, respectively, from forfeited accounts were used to fund the matching contributions in accordance with the terms of the RIP.

Senior Management Bonus Program—

We maintain a Senior Management Bonus Program to reward senior management for performance based on a combination of corporate or regional goals for all periods presented. The corporate and regional goals are approved on an annual basis by our board of directors as part of our routine budgeting and financial planning process. The program applies to persons who join the Company in, or are promoted to, senior management positions. In 2023, we expect to pay approximately \$14.8 million under the program for the year ended December 31, 2022. In March 2022 and 2021, we paid \$23.4 million and \$14.1 million, respectively, under the program for the years ended December 31, 2021 and 2020.

16. Income Taxes:

The significant components of the *Provision for income tax expense* related to continuing operations are as follows (in millions):

	For the Year Ended December 31,		
	2022	2021	2020
Current:			
Federal	\$ 58.7	\$ 63.7	\$ 29.8
State and other	13.5	20.8	10.4
Total current expense	72.2	84.5	40.2
Deferred:			
Federal	17.9	14.4	23.0
State and other	10.0	3.0	11.5
Total deferred expense	27.9	17.4	34.5
Total income tax expense related to continuing operations	\$ 100.1	\$ 101.9	\$ 74.7

A reconciliation of differences between the federal income tax at statutory rates and our actual income tax expense on our income from continuing operations, which include federal, state, and other income taxes, is presented below:

	For the Year Ended December 31,		
	2022	2021	2020
Tax expense at statutory rate	21.0 %	21.0 %	21.0 %
Increase (decrease) in tax rate resulting from:			
State and other income taxes, net of federal tax benefit	4.0 %	4.0 %	4.4 %
Increase (decrease) in valuation allowance	0.6 %	(0.6)%	2.2 %
Noncontrolling interests	(4.4)%	(4.3)%	(4.9)%
Share-based windfall tax benefits	— %	(0.6)%	(1.2)%
Other, net	1.0 %	0.7 %	(0.3)%
Income tax expense	22.2 %	20.2 %	21.2 %

The *Provision for income tax expense* in 2022 was greater than the federal statutory rate primarily due to state and other income tax expense and the increase in valuation allowance, offset by the impact of noncontrolling interests. The

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Provision for income tax expense in 2021 was less than the federal statutory rate primarily due to the impact of noncontrolling interests, the decrease in valuation allowance and share-based windfall tax benefits, offset by state and other income tax expense. The *Provision for income tax expense* in 2020 was greater than the federal statutory rate primarily due to state and other income tax expense and the increase in valuation allowance, offset by the impact of noncontrolling interests and share-based windfall tax benefits. See Note 1, *Summary of Significant Accounting Policies*, “Income Taxes,” for a discussion of the allocation of income or loss related to pass-through entities, which is referred to as the impact of noncontrolling interests in this discussion.

The Coronavirus Aid, Relief, and Economic Security Act of 2020 (the “CARES Act”) included provisions relating to net operating loss carryback periods, alternative minimum tax credit refunds, modifications to the net interest deduction limitations, technical corrections to tax depreciation methods for qualified improvement property and deferral of employer payroll taxes. The CARES Act did not materially impact our effective tax rate for the years ended December 31, 2022, 2021 and 2020, although it has impacted the timing of cash payments for taxes.

Deferred income taxes recognize the net tax effects of temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and amounts used for income tax purposes and the impact of available NOLs. The significant components of our deferred tax assets and liabilities are presented in the following table (in millions):

	As of December 31,	
	2022	2021
Deferred income tax assets:		
Net operating loss	\$ 36.9	\$ 50.4
Insurance reserve	19.1	18.4
Stock-based compensation	16.1	14.3
Operating lease liabilities	6.6	6.5
Other accruals	24.8	23.0
Tax credits	12.4	10.9
Total deferred income tax assets	115.9	123.5
Less: Valuation allowance	(35.8)	(43.1)
Net deferred income tax assets	80.1	80.4
Deferred income tax liabilities:		
Revenue reserves	—	(1.0)
Intangibles	(61.2)	(30.1)
Operating lease right-of-use assets	(5.5)	(6.0)
Property, net	(15.9)	(0.1)
Carrying value of partnerships	(80.2)	(66.2)
Other	(0.3)	(0.3)
Total deferred income tax liabilities	(163.1)	(103.7)
Net deferred income tax liabilities	\$ (83.0)	\$ (23.3)

We have state NOLs of \$35.3 million that expire in various amounts at varying times through 2031. For the years ended December 31, 2022 and 2021, the net decrease in our valuation allowance was \$7.3 million and \$3.1 million, respectively. The decrease in our valuation allowance in 2022 related primarily to the expiration of state NOLs. The decrease in our valuation allowance in 2021 related primarily to changes in forecasted income.

As of December 31, 2022, we have a remaining valuation allowance of \$35.8 million. This valuation allowance remains recorded due to uncertainties regarding our ability to utilize a portion of our state NOLs and other credits before they expire. The amount of the valuation allowance has been determined for each tax jurisdiction based on the weight of all available evidence including management’s estimates of taxable income for each jurisdiction in which we operate over the periods in

which the related deferred tax assets will be recoverable. It is possible we may be required to increase or decrease our valuation allowance at some future time if our forecast of future earnings varies from actual results on a consolidated basis or in the applicable state tax jurisdictions, if the timing of future tax deductions differs from our expectations, or pursuant to changes in state tax laws and rates.

Our continuing practice is to recognize interest and penalties related to income tax matters in income tax expense. Interest recorded as part of our income tax provision during 2022, 2021, and 2020 was not material. Accrued interest income related to income taxes as of December 31, 2022 and 2021 was not material.

In December 2016, we signed an agreement with the IRS to participate in their Compliance Assurance Process (“CAP”) for the 2017 tax year and have renewed this agreement each year since. CAP is a program in which we and the IRS endeavor to agree on the treatment of significant tax positions prior to the filing of our federal income tax returns. The IRS is currently examining the 2021 and 2022 tax years. In June 2022, the IRS issued a no change letter effectively closing our 2020 tax year audit. The statute of limitations has expired or we have settled federal income tax examinations with the IRS for all tax years through 2020. Our state income tax returns are also periodically examined by various regulatory taxing authorities. We are currently under audit by one state for tax years ranging from 2017 - 2019.

For the tax years that remain open under the applicable statutes of limitations, management considered potential unrecognized tax benefits and determined there are no material unrecognized tax benefits that would impact prior years’ income taxes.

17. Earnings per Common Share:

The following table sets forth the computation of basic and diluted earnings per common share (in millions, except per share amounts):

	For the Year Ended December 31,		
	2022	2021	2020
Basic:			
<i>Numerator:</i>			
Income from continuing operations	\$ 350.7	\$ 403.1	\$ 278.2
Less: Net income attributable to noncontrolling interests included in continuing operations	(93.6)	(103.2)	(83.3)
Less: Income from continuing operations allocated to participating securities	(1.1)	(1.1)	(0.5)
Income from continuing operations attributable to Encompass Health common shareholders	<u>256.0</u>	<u>298.8</u>	<u>194.4</u>
Income from discontinued operations, net of tax	15.2	114.1	90.6
Less: Net income attributable to noncontrolling interests included in discontinued operations	(1.3)	(1.8)	(1.3)
Less: Income from discontinued operations allocated to participating securities	(0.1)	(0.7)	(0.5)
Income from discontinued operations attributable to Encompass Health common shareholders	<u>13.8</u>	<u>111.6</u>	<u>88.8</u>
Net income attributable to Encompass Health common shareholders	<u>\$ 269.8</u>	<u>\$ 410.4</u>	<u>\$ 283.2</u>
<i>Denominator:</i>			
Basic weighted average common shares outstanding	<u>99.2</u>	<u>99.0</u>	<u>98.6</u>
<i>Basic earnings per share attributable to Encompass Health common shareholders:</i>			
Continuing operations	\$ 2.58	\$ 3.02	\$ 1.97
Discontinued operations	0.14	1.13	0.90
Net income	<u>\$ 2.72</u>	<u>\$ 4.15</u>	<u>\$ 2.87</u>
Diluted:			
<i>Numerator:</i>			
Income from continuing operations	\$ 350.7	\$ 403.1	\$ 278.2
Less: Net income attributable to noncontrolling interests included in continuing operations	(93.6)	(103.2)	(83.3)
Income from continuing operations attributable to Encompass Health common shareholders	<u>257.1</u>	<u>299.9</u>	<u>194.9</u>
Income from discontinued operations, net of tax	15.2	114.1	90.6
Less: Net income attributable to noncontrolling interests included in discontinued operations	(1.3)	(1.8)	(1.3)
Income from discontinued operations attributable to Encompass Health common shareholders	<u>13.9</u>	<u>112.3</u>	<u>89.3</u>
Net income attributable to Encompass Health common shareholders	<u>\$ 271.0</u>	<u>\$ 412.2</u>	<u>\$ 284.2</u>
<i>Denominator:</i>			
Diluted weighted average common shares outstanding	<u>100.4</u>	<u>100.2</u>	<u>99.8</u>
<i>Diluted earnings per share attributable to Encompass Health common shareholders:</i>			
Continuing operations	\$ 2.56	\$ 2.99	\$ 1.96
Discontinued operations	0.14	1.12	0.89
Net income	<u>\$ 2.70</u>	<u>\$ 4.11</u>	<u>\$ 2.85</u>

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The following table sets forth the reconciliation between basic weighted average common shares outstanding and diluted weighted average common shares outstanding (in millions):

	For the Year Ended December 31,		
	2022	2021	2020
Basic weighted average common shares outstanding	99.2	99.0	98.6
Restricted stock awards, dilutive stock options, and restricted stock units	1.2	1.2	1.2
Diluted weighted average common shares outstanding	100.4	100.2	99.8

Options to purchase approximately 0.4 million, 0.2 million, and 0.2 million shares of common stock were outstanding during December 31, 2022, 2021, and 2020, respectively, but were not included in the computation of diluted weighted-average shares because to do so would have been antidilutive.

In February 2014, our board of directors approved an increase in our common stock repurchase authorization from \$200 million to \$250 million. The repurchase authorization does not require the repurchase of a specific number of shares, has an indefinite term, and is subject to termination at any time by our board of directors. On July 24, 2018, the Company's board approved resetting the aggregate common stock repurchase authorization to \$250 million. There were no repurchases of our common stock during 2022 or 2021. During 2020, we repurchased 0.1 million shares of our common stock in the open market for \$6.1 million.

In July 2019, our board of directors approved an increase in our quarterly dividend and declared a cash dividend of \$0.28 per share. The cash dividend of \$0.28 per common share was declared and paid in each quarter through July 2022. In July 2022, our board of directors revised our quarterly dividend in response to the Spin Off and declared a cash dividend of \$0.15 per share that was paid in October 2022. Also in October 2022, our board of directors declared cash dividends of \$0.15 per share that was paid in January 2023. Future dividend payments are subject to declaration by our board of directors.

18. Contingencies and Other Commitments:

We operate in a highly regulated industry in which healthcare providers are routinely subject to litigation. As a result, various lawsuits, claims, and legal and regulatory proceedings have been and can be expected to be instituted or asserted against us. The resolution of any such lawsuits, claims, or legal and regulatory proceedings could materially and adversely affect our financial position, results of operations, and cash flows in a given period.

The False Claims Act allows private citizens, called "relators," to institute civil proceedings on behalf of the United States alleging violations of the False Claims Act. These lawsuits, also known as "whistleblower" or "*qui tam*" actions, can involve significant monetary damages, fines, attorneys' fees and the award of bounties to the relators who successfully prosecute or bring these suits to the government. *Qui tam* cases are sealed at the time of filing, which means knowledge of the information contained in the complaint typically is limited to the relator, the federal government, and the presiding court. The defendant in a *qui tam* action may remain unaware of the existence of a sealed complaint for years. While the complaint is under seal, the government reviews the merits of the case and may conduct a broad investigation and seek discovery from the defendant and other parties before deciding whether to intervene in the case and take the lead on litigating the claims. The court lifts the seal when the government makes its decision on whether to intervene. If the government decides not to intervene, the relator may elect to continue to pursue the lawsuit individually on behalf of the government. It is possible that *qui tam* lawsuits have been filed against us, which suits remain under seal, or that we are unaware of such filings or precluded by existing law or court order from discussing or disclosing the filing of such suits. We may be subject to liability under one or more undisclosed *qui tam* cases brought pursuant to the False Claims Act.

It is our obligation as a participant in Medicare and other federal healthcare programs to routinely conduct audits and reviews of the accuracy of our billing systems and other regulatory compliance matters. As a result of these reviews, we have made, and will continue to make, disclosures to the HHS-OIG and CMS relating to amounts we suspect represent over-payments from these programs, whether due to inaccurate billing or otherwise. Some of these disclosures have resulted in, or may result in, Encompass Health refunding amounts to Medicare or other federal healthcare programs.

Other Commitments—

We are a party to service and other contracts in connection with conducting our business. Minimum amounts due under these agreements are \$29.6 million in 2023, \$21.0 million in 2024, \$12.5 million in 2025, \$9.8 million in 2026, \$9.2 million in 2027, and \$9.6 million thereafter. These contracts primarily relate to software licensing and support.

19. Quarterly Data (Unaudited):

The Spin Off of Enhabit was completed during 2022 and the historical results of Enhabit are now reported as discontinued operations. The quarterly results presented below have been reclassified to conform to this presentation. For additional information, see Note 2, *Spin Off of Home Health and Hospice Business*.

	2022				
	First	Second	Third	Fourth	Total
	(In Millions, Except Per Share Data)				
Net operating revenues	\$ 1,059.3	\$ 1,062.5	\$ 1,089.5	\$ 1,137.3	\$ 4,348.6
Operating earnings ^(a)	131.5	128.6	127.5	151.9	539.5
Provision for income tax expense	23.6	22.8	21.8	31.9	100.1
Income from continuing operations	86.4	59.8	85.5	119.0	350.7
Income (loss) from discontinued operations, net of tax	23.7	11.5	(18.5)	(1.5)	15.2
Net income	110.1	71.3	67.0	117.5	365.9
Less: Net income attributable to noncontrolling interests	(22.6)	(22.6)	(21.6)	(28.1)	(94.9)
Net income attributable to Encompass Health	\$ 87.5	\$ 48.7	\$ 45.4	\$ 89.4	\$ 271.0
Earnings per common share:					
Basic earnings per share attributable to Encompass Health common shareholders: ^(b)					
Continuing operations	\$ 0.65	\$ 0.38	\$ 0.64	\$ 0.91	\$ 2.58
Discontinued operations	0.23	0.11	(0.19)	(0.02)	0.14
Net income	\$ 0.88	\$ 0.49	\$ 0.45	\$ 0.89	\$ 2.72
Diluted earnings per share attributable to Encompass Health common shareholders: ^(b)					
Continuing operations	\$ 0.64	\$ 0.38	\$ 0.63	\$ 0.90	\$ 2.56
Discontinued operations	0.23	0.11	(0.18)	(0.01)	0.14
Net income	\$ 0.87	\$ 0.49	\$ 0.45	\$ 0.89	\$ 2.70

^(a) We define operating earnings as income from continuing operations attributable to Encompass Health before (1) loss on early extinguishment of debt; (2) interest expense and amortization of debt discounts and fees; (3) other income; and (4) income tax expense.

^(b) Per share amounts may not sum due to the weighted average common shares outstanding during each quarter compared to the weighted average common shares outstanding during the entire year.

Notes to Consolidated Financial Statements

	2021				
	First	Second	Third	Fourth	Total
	(In Millions, Except Per Share Data)				
Net operating revenues	\$ 959.9	\$ 1,001.7	\$ 1,010.8	\$ 1,042.5	\$ 4,014.9
Operating earnings ^(a)	143.0	146.8	141.4	128.4	559.6
Provision for income tax expense	25.0	28.2	26.2	22.5	101.9
Income from continuing operations	101.8	107.0	102.1	92.2	403.1
Income from discontinued operations, net of tax	31.0	35.0	24.6	23.5	114.1
Net income	132.8	142.0	126.7	115.7	517.2
Less: Net income attributable to noncontrolling interests	(25.5)	(28.7)	(26.7)	(24.1)	(105.0)
Net income attributable to Encompass Health	\$ 107.3	\$ 113.3	\$ 100.0	\$ 91.6	\$ 412.2
Earnings per common share:					
Basic earnings per share attributable to Encompass Health common shareholders: ^(b)					
Continuing operations	\$ 0.77	\$ 0.79	\$ 0.76	\$ 0.69	\$ 3.02
Discontinued operations	0.31	0.35	0.24	0.23	1.13
Net income	\$ 1.08	\$ 1.14	\$ 1.00	\$ 0.92	\$ 4.15
Diluted earnings per share attributable to Encompass Health common shareholders: ^(b)					
Continuing operations	\$ 0.76	\$ 0.79	\$ 0.76	\$ 0.68	\$ 2.99
Discontinued operations	0.31	0.34	0.24	0.23	1.12
Net income	\$ 1.07	\$ 1.13	\$ 1.00	\$ 0.91	\$ 4.11

^(a) We define operating earnings as income from continuing operations attributable to Encompass Health before (1) loss on early extinguishment of debt; (2) interest expense and amortization of debt discounts and fees; (3) other income; and (4) income tax expense.

^(b) Per share amounts may not sum due to the weighted average common shares outstanding during each quarter compared to the weighted average common shares outstanding during the entire year.

Attachment G

Research Articles/Studies on Effectiveness of IRF Services

Rehabilitation Hospitals Deliver Higher Quality Care, Better Results

Patients who need medical rehabilitation often must choose between receiving care at a rehabilitation hospital and nursing home. Although these two settings serve similar patients, rehabilitation hospitals provide a far higher level of care that leads to better outcomes.

Rehabilitation Hospitals

Nursing Homes



Close medical supervision by a physician with specialized training in rehabilitation

Required

Not Required



Multidisciplinary team approach that includes 24-hour rehabilitation nursing

Required

Not Required



Three hours of intensive therapy daily

Required

Not Required



Licensed and accredited for hospital level rehabilitation care

Required

Not Required

Study Shows Improved Outcomes and Quality of Life

A new study shows that patients treated in rehabilitation hospitals and units have better clinical outcomes and quality of life than those treated in nursing homes. The study compared clinically similar patients over a two year period following discharge from rehabilitation hospitals or nursing homes.

Go Home Earlier

Similar patients treated in rehabilitation hospitals return home **14 DAYS** sooner than those in nursing homes.



Remain Home Longer

Rehabilitation hospital patients also are able to be at home **51 DAYS** longer and had fewer hospital readmissions.



Live Longer

Patients who receive early, intense, coordinated treatment in a rehabilitation hospital live **52 DAYS** longer.

Patients who experience a brain injury or stroke live more than 3 months longer



Every day matters.
Make the right choice.

Assessment of Patient Outcomes of Rehabilitative Care Provided in Inpatient Rehabilitation Facilities and After Discharge

Study Highlights

Authors: Joan E. DaVanzo, Ph.D., M.S.W., Al Dobson, Ph.D., Audrey El-Gamil, Justin W. Li, Nikolay Manolov, Ph.D.
 Contact: Joan E. DaVanzo, joan.davanzo@dobsondavanzo.com; 703-260-1761

Synopsis of Key Findings

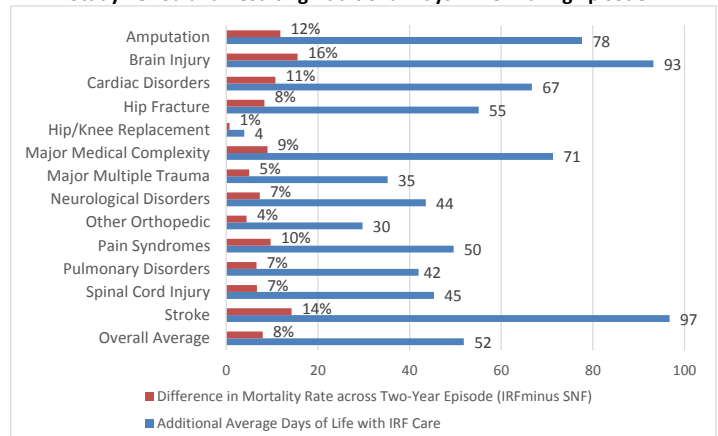
We found that patients treated in IRFs had better long-term clinical outcomes than those treated in SNFs following the implementation of the revised 60% Rule. We used Medicare fee-for-service claims data to compare the clinical outcomes and Medicare payments for patients who received rehabilitation in an inpatient rehabilitation facility (IRF) to clinically similar matched patients who received services in a skilled nursing facility (SNF).

- Over a two-year study period, IRF patients who were clinically comparable to SNF patients, on average:¹
 - Returned home from their initial stay **two weeks earlier**
 - Remained home nearly **two months longer**
 - Stayed alive nearly **two months longer**
- Of matched patients treated:²
 - IRF patients experienced an **8% lower mortality rate** during the two-year study period than SNF patients
 - IRF patients experienced **5% fewer emergency room (ER) visits per year** than SNF patients
 - For five of the 13 conditions, IRF patients experienced **significantly fewer hospital readmissions per year** than SNF patients
- Better clinical outcomes could be achieved by treating patients in an IRF with an additional cost to Medicare of \$12.59 per day (while patients are alive during the two-year study period), across all conditions.¹

- This study serves as the most comprehensive national analysis to date examining the long-term clinical outcomes of clinically similar patient populations treated in IRFs and SNFs, utilizing a sample size of more than 100,000 matched pairs drawn from Medicare administrative claims.
- The focused, intense, and standardized rehabilitation led by physicians in IRFs is consistent with patients achieving significantly better outcomes in a shorter amount of time than patients treated in SNFs.

When patients are matched on demographic and clinical characteristics, rehabilitation in IRFs leads to lower mortality, fewer readmissions and ER visits, and more days at home (not in a hospital, IRF, SNF, or LTCH) than rehabilitation in SNFs for the same condition. This suggests that the care delivered is not the same between IRFs and SNFs. Therefore, different post-acute care settings affect patient outcomes.

Matched IRF and SNF Patients: Difference in Mortality Rate¹ across Two-Year Study Period and Resulting Additional Days Alive³ During Episode*

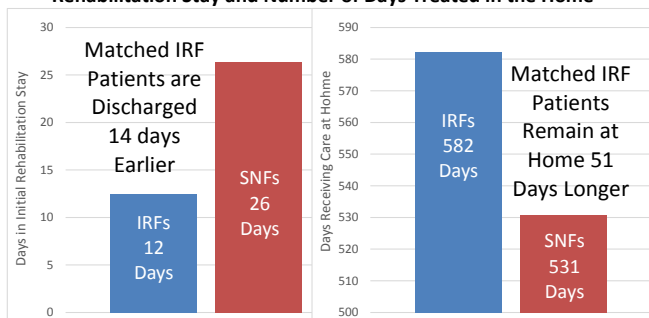


*Difference in the mortality rate of matched IRF patients to matched SNF patients over the two-year study period. As a result of the lower mortality rate, additional average days of life represent the difference in the average episode length (after accounting for mortality) across groups (IRF average episode length in days minus SNF).

¹ Differences are statistically significant at p<0.0001.
² Differences are statistically significant at p<0.0001 with the exception of the number of readmissions per year, which are significant at p<0.01 for five of the 13 conditions.
³ Differences are statistically significant at p<0.0001 with the exception of major multiple trauma, which is significant at p< 0.01.

Source: Dobson | DaVanzo analysis of research identifiable 20% sample of Medicare beneficiaries, 2005-2009.

Matched IRF and SNF Patients: Number of Days during Initial Rehabilitation Stay and Number of Days Treated in the Home*¹



*Days treated in the home represents the average number of days per patient over two-year study period not spent in a hospital, IRF, SNF, or LTCH.

The Issue

To qualify for Medicare payment under the IRF prospective payment system (PPS) at least 60% of an IRF's admissions in a single cost reporting period must be in one or more of 13 CMS specified clinical conditions ("known as the "60% Rule").¹ As a result of this policy, some Medicare beneficiaries with certain conditions previously treated in the IRF are now treated in an alternative setting, such as a SNF. The Medicare Payment Advisory Commission (MedPAC) found, for instance, that the proportion of IRF patients treated for lower joint replacements decreased by 16%, while SNF admissions of this diagnosis increased by the same rate between 2004 and 2011.²

There is a significant difference in medical rehabilitation care practices between the two settings.³ Treatment provided in IRFs is under the direction of a physician and specialized nursing staff.⁴ Care plans are structured, focused, and time sensitive to reflect the pathophysiology of recovery, avoid patient deconditioning, and maximize potential functional gain. On the other hand, SNFs exhibit greater diversity in practice patterns with lower intensity rehabilitation,⁵ possibly due to limited presence of an onsite physician and no regulatory rehabilitation standards.

The implication of the 60% Rule on long-term beneficiary health outcomes and health care utilization has not been thoroughly investigated.

Despite limited information concerning the rule's effect on beneficiaries, policymakers are considering revisions to IRF payment policy. One revision would raise the current compliance threshold from 60% to 75%, a more restrictive standard. Under a second proposal, MedPAC is developing a recommendation to reduce the difference in Medicare payments between IRFs and SNFs by reimbursing IRFs the SNF payment rate for three specific clinical conditions, some of which are included in the 13 conditions under the 60% Rule: major joint replacement without complications or comorbidities (CC), hip fracture with CC, and stroke with CC.

About the Study

The ARA Research Institute (an affiliate of the American Medical Rehabilitation Providers Association – AMRPA) commissioned Dobson DaVanzo & Associates, LLC to conduct a retrospective study of IRF patients and clinically similar SNF patients to examine the downstream comparative

Conclusions in Brief:

- The care provided in IRFs and SNFs differs, as patients treated in IRFs experienced different outcomes than matched patients treated in SNFs.
- Patients treated in a SNF as a result of the 60% Rule who could have otherwise been treated in an IRF might be adversely affected by an increased risk of death, increased use of facility-based care, and more ER visits and hospital readmissions.
- Continuation or expansion of the 60% Rule or aligning the payment across the SNF and IRF PPSs without understanding the impact on patient outcomes is ill advised and could negatively impact Medicare beneficiaries.

utilization and effectiveness of post-acute care pathways, as well as total cost of treatment for the five years following implementation of the 60% Rule.

Using a 20% sample of Medicare beneficiaries, this study analyzed all Medicare Parts A and B claims across all care settings (excluding physicians and durable medical equipment) from 2005 through 2009. Patient episodes were created to track all health care utilization and payments following discharge from a post-acute rehabilitation stay in an IRF and a SNF. Patients admitted to an IRF following an acute care hospital stay were matched to clinically and demographically similar SNF patients. Patient outcomes were tracked for two years following discharge from the rehabilitation stay. This study period allowed us to capture the long-term impact of the rehabilitation, including meaningful differences in mortality, use of downstream facility-based care, and patients' ability to remain at home.

To aid in the interpretation and clinical validation of this analysis, the Dobson | DaVanzo team worked with a clinical expert panel comprised of practicing post-acute care clinicians.

Study Limitations

Medicare fee-for-service claims do not include care covered and reimbursed by Medicaid and third-parties or detailed clinical information. Therefore, non-Medicare services, such as long-term nursing home stays, are not captured in this analysis. This omission may have overestimated the calculated number of days a patient remained at home, and underestimated the cost of their health care to the federal and state governments.

Additionally, the results of this study are not generalizable to the universe of SNF patients within the studied clinical conditions. Analyses suggest that SNF patients who are clinically similar and matched to IRF patients have different health care utilization and Medicare payments than those who were not matched.

¹ The compliance threshold was originally set at 75% and was to be phased in over a three-year period, but compliance was capped at 60% following the Medicare, Medicaid, and SCHIP Extension Act of 2007. While the policy has retained its namesake at the "75% Rule" despite the cap at 60%, this study refers to it as the "60% Rule".

² Medicare Payment Advisory Commission (MedPAC). 2013. *Report to Congress: Medicare Payment Policy*. Washington, D.C.

³ Keith RA. (1997). Treatment strength in rehabilitation. *Arch Phys Med Rehabil*: 90; 1269-1283.

⁴ Harvey RL. (2010, January). Inpatient rehab facilities benefit post-stroke care. *Managed Care*.

⁵ DeJong G, Hsieh C, Gassaway J, et al. (2009). Characterizing rehabilitation services for patients with knee and hip replacement in skilled nursing facilities and inpatient rehabilitation facilities. *Arch Phys Med Rehabil*: 90; 1269-1283.

Assessment of Patient Outcomes of Rehabilitative Care Provided in Inpatient Rehabilitation Facilities (IRFs) and After Discharge

Dobson | DaVanzo

Dobson DaVanzo & Associates, LLC Vienna, VA 703.260.1760 www.dobsondavanzo.com

Assessment of Patient Outcomes of Rehabilitative Care Provided in Inpatient Rehabilitation Facilities (IRFs) and After Discharge

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Thursday, July 10, 2014 — *Final Report*

Acknowledgements

This report was prepared with the assistance of a clinical advisory panel, whose thoughtful insights throughout the study contributed significantly to the final product. The efforts of the panel are greatly appreciated.

The clinical advisory panel consisted of AMRPA staff and post-acute care clinicians and researchers from Bacharach Institute for Rehabilitation, Burke Rehabilitation Hospital, Good Shepherd Rehabilitation Network, Kessler Institute for Rehabilitation, Madonna Rehabilitation Hospital, and Sunnyview Rehabilitation Hospital.

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Executive Summary

To qualify for Medicare payment under the inpatient rehabilitation facility (IRF) prospective payment system (PPS) at least 60 percent of an IRF's admissions in a single cost reporting period must be in one or more of 13 clinical conditions specified by the Centers of Medicare & Medicaid Services (CMS) (known as the "60 Percent Rule").¹ As a result of this policy, some Medicare beneficiaries with certain conditions previously treated in the IRF are now treated in an alternative setting, such as a skilled nursing facility (SNF). However, the implication of the 60 Percent Rule on long-term beneficiary health outcomes and health care utilization has not been thoroughly investigated.

The medical rehabilitation care practices between IRFs and SNFs differ significantly.² Treatment provided in IRFs is under the direction of a physician trained in rehabilitation medicine and specialized nursing staff.³ Care plans are structured, focused, and time sensitive to reflect the pathophysiology of recovery, avoid patient deconditioning, and maximize potential functional gain. On the other hand, possibly due to limited presence of an onsite physician and no regulatory rehabilitation standards, SNFs exhibit greater diversity in practice patterns with lower intensity rehabilitation.⁴

Despite clear differences in the Medicare Conditions of Participation and classification criteria between IRFs and SNFs, there have been proposals among policymakers about site-neutral payment that aligns IRF payments with those in SNFs for specific clinical conditions. Some of these are included in the 13 conditions under the 60 Percent Rule, such as major lower extremity joint replacement without complications or comorbidities

When patients are matched on demographic and clinical characteristics, rehabilitation in IRFs leads to lower mortality, fewer readmissions and ER visits, and more days at home (not in a hospital, IRF, SNF, or LTCH) than rehabilitation in SNFs for the same condition. This suggests that the care delivered is not the same between IRFs and SNFs. Therefore, different post-acute care settings affect patient outcomes.

¹ The compliance threshold was originally set at 75 percent and was to be phased in over a three-year period, but compliance was capped at 60 percent following the Medicare, Medicaid, and SCHIP Extension Act of 2007. While the policy has retained its namesake at the "75 Percent Rule" despite the cap at 60 percent, this study refers to it as the "60 Percent Rule".

² Keith RA. (1997). Treatment strength in rehabilitation. *Arch Phys Med Rehabil*: 90; 1269-1283.

³ Harvey RL. (2010, January). Inpatient rehab facilities benefit post-stroke care. *Managed Care*.

⁴ DeJong G, Hsieh C, Gassaway J, et al. (2009). Characterizing rehabilitation services for patients with knee and hip replacement in skilled nursing facilities and inpatient rehabilitation facilities. *Arch Phys Med Rehabil*: 90; 1269-1283.

Executive Summary

(CC), hip fracture with CC, and stroke with CC.⁵ Another policy revision discussed would raise the current compliance threshold for IRFs from 60 percent to 75 percent, a more restrictive standard.

Study Purpose

The ARA Research Institute, an affiliate of the American Medical Rehabilitation Providers Association (AMRPA), commissioned Dobson DaVanzo & Associates, LLC (Dobson | DaVanzo) to investigate the possible impact of the 60 Percent Rule on clinical outcomes and Medicare payment for post-acute care (PAC) beneficiaries during the years immediately following the Rule's implementation.

Dobson | DaVanzo conducted two types of analyses of Medicare beneficiaries: 1) a cross-sectional analysis examining the relative distribution of conditions for patients receiving post-acute care between the years 2005 and 2009, and 2) a longitudinal analysis comparing the long-term (two-year) clinical and Medicare payment outcomes of clinically and demographically similar beneficiaries who received care in either an IRF or a SNF during those years.

Using a 20 percent sample of Medicare beneficiaries (augmented with a 100 percent sample of IRF and LTCH beneficiaries), this study analyzed all Medicare Parts A and B claims across all care settings (excluding physicians and durable medical equipment) from 2005 through 2009.⁶ Clinical condition categories were defined to capture all conditions treated within IRFs, based on the Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI) Training Manual. While all clinical condition categories were defined, only those with: 1) adequate sample size and 2) well-defined clinical algorithms to confidently identify patients with these conditions in other PAC settings were included in the cross-sectional and longitudinal analyses. Therefore, the results presented in this report focus on a subset of conditions. Within the longitudinal analysis, we focus on 13 conditions, some of which are conditions included in the 60 Percent Rule.

For the cross-sectional analysis, the change in the proportion of patients by clinical condition category was compared across PAC settings (IRFs, SNFs, long-term care hospitals – LTCHs, and home health agencies – HHAs) and years.

For the longitudinal analysis, patient episodes were created to track all Medicare services and payments following discharge from a post-acute rehabilitation stay in an IRF and a SNF. Patients admitted to a SNF following an acute care hospital stay were matched to

The implication of the 60% Rule on long-term beneficiary health outcomes and health care utilization has not been thoroughly investigated.

⁵ The FY 2007 President's Budget included a proposal to reduce the excessive difference in payment between IRFs and SNFs for total knee and hip replacements.

⁶ Data was obtained through CMS under DUA #25720.

Executive Summary

clinically and demographically similar IRF patients using a one-to-one propensity score match. Patient outcomes were tracked for two years following discharge from the rehabilitation stay. This study period allowed us to capture the long-term impact of the rehabilitation, including meaningful differences in mortality, use of downstream facility-based care, and patients' ability to remain at home for matched IRF-SNF patients.

This study serves as the most comprehensive national analysis to date examining the long-term clinical outcomes of clinically and demographically similar patient populations treated in IRFs and SNFs, utilizing a sample size of more than 100,000 matched pairs drawn from Medicare administrative claims.

Summary of Findings

Results of the cross-sectional analysis confirmed that the proportion of patients treated in IRFs by clinical condition category shifted significantly between 2005 and 2009. The most significant change in proportion was among lower extremity major joint (hip/knee) replacement patients, which decreased from 25.4 percent of patients treated in IRFs in 2005 to 14.5 percent in 2009. According to the Medicare Payment Advisory Commission (MedPAC), this trend continued through 2013.⁷ This decrease was offset by an increase in the proportion of patients treated for hip/knee replacements in SNFs over the same time period.

Results of the longitudinal analysis demonstrated that matched patients treated in IRFs had better long-term clinical outcomes than those treated in SNFs following the implementation of the revised 60 Percent Rule. Over a two-year study period, IRF patients who were clinically comparable to SNF patients, on average:

- Returned home from their initial stay **two weeks earlier** (p<0.0001)
- Remained home nearly **two months longer** (p<0.0001)
- Stayed alive nearly **two months longer** (p<0.0001)

Furthermore, of matched patients treated:

- IRF patients experienced an **8 percentage point lower mortality rate** during the two-year study period than SNF patients (p<0.0001)
- IRF patients experienced **5 percent fewer emergency room (ER) visits per year** than SNF patients (p<0.0001)
- For five of the 13 conditions, IRF patients experienced **significantly fewer hospital readmissions per year** than SNF patients (p<0.01)

⁷ Medicare Payment Advisory Commission (Report to the Congress). Medicare Payment Policy. March 2014.

Executive Summary

These improved clinical outcomes could be achieved by treating patients in an IRF with an additional cost to Medicare of \$12.59 per day (while patients are alive during the two-year study period), across all conditions ($p < 0.0001$).

Executive Summary

Study Limitations

First, administrative claims do not contain detailed, medical record-level clinical information. Given this general limitation, our interpretation of beneficiaries' clinical outcomes relied upon outcomes observable in the claims data (e.g., comorbidities, mortality, emergency room utilization, etc.) that may not fully indicate patients' health or functional outcomes as a result of receiving post-acute care.

Second, Medicare fee-for-service claims do not include care covered and reimbursed by Medicaid and third-parties or detailed clinical information. Therefore, non-Medicare services, such as long-term nursing home stays, are not captured in this analysis. This factor may have resulted in an overestimation of the number of days a patient remained at home, and underestimated the cost of their health care to the federal and state governments.

Additionally, the results of this study are not generalizable to the universe of SNF patients within the studied clinical conditions. Analyses suggest that SNF patients who are clinically similar and matched to IRF patients have different health care utilization and Medicare payments than those who were not matched.

Conclusions in Brief:

- **The care provided in IRFs and SNFs differs, as patients treated in IRFs experienced different outcomes than matched patients treated in SNFs.**
- **Patients treated in a SNF as a result of the 60 Percent Rule who could have otherwise been treated in an IRF might be adversely affected by an increased risk of mortality and more ER visits and hospital readmissions.**
- **Continuation or expansion of the 60 Percent Rule or aligning the Medicare payment across the SNF and IRF-PPSs without understanding the impact on patient outcomes could negatively impact Medicare beneficiaries.**

Introduction

Post-acute care (PAC) refers to a wide range of health care services delivered to patients recently discharged from an acute hospital stay. Unlike patients who return directly to the community following an acute hospitalization, PAC patients require additional treatment that supports either continued recuperation (i.e., as an extension of acute care) or a restoration of functional capabilities that facilitate independent living (i.e., rehabilitation) or both.^{8,9}

The Medicare PAC sector grew rapidly after the implementation of the inpatient prospective payment system (IPPS) in 1983. In 2011, the four major PAC providers – inpatient rehabilitation facilities (IRF), skilled nursing facilities (SNFs), home health agencies (HHAs), and long-term care hospitals (LTCHs) – treated 43 percent of Medicare fee-for-service (FFS) patients discharged from acute care hospitals at an estimated cost to Medicare of \$61.8 billion (compared to \$26.6 billion in 2000).¹⁰ In May 2004, the Centers for Medicare & Medicaid Services (CMS) introduced a revised classification criterion for IRFs treating Medicare beneficiaries. To qualify as an IRF and therefore receive payment under the IRF-PPS, at least 60 percent of a given IRF’s Medicare patients in a single cost reporting period must meet one of 13 clinical conditions upon admission to the IRF. The intent of this provision, also referred to as the “60 Percent Rule”, was to curtail the volume of less severe patients receiving rehabilitation in IRFs by shifting these cases to lower intensity, lower cost PAC settings, such as SNFs and HHAs.¹¹

During the five years immediately following implementation of the new classification criterion and the 60 Percent Rule, patient volume in IRFs decreased by 26.5 percent, spending levels decreased by 8.4 percent, and

“The goal of the Medicare program and these new payment systems is to encourage effective, high-quality care that delivers good clinical outcomes at the lowest cost to society. Without knowing how outcomes are affected by these payment changes it is difficult to judge whether they represent improvements in efficiency or harmful limitations on Medicare beneficiaries’ access to PAC”

- Buntin MB, 2007

⁸ Buntin MB. Access to postacute rehabilitation. *Arch Phys Med Rehabil.* 2007; 88:1488-93.

⁹ Kane RL. Assessing the effectiveness of postacute care rehabilitation. *Arch Phys Med Rehabil.* 2007; 88:1500-4.

¹⁰ Medicare Payment Advisory Commission (Testimony). Medicare post-acute care reforms. June 2013.

¹¹ Medicare Payment Advisory Commission (Report to the Congress). Medicare Payment Policy. March 2014.

average payments per case increased by nearly one-quarter (24.5 percent).¹² The relative mix of patient conditions over this period also appeared to shift, with the most marked change seen in the proportion of lower extremity joint (hip or knee) replacement IRF admissions. Under the new criteria, compliant lower extremity joint replacement cases were restricted to more severe and narrowly defined diagnoses, a change that likely caused these admissions to fall from 28 percent of IRF cases in 2004 to 14 percent in 2008. Not surprisingly, average case severity over this period increased, presumably as IRFs began to limit admission of less severe cases.¹³ What was not known, however, was the clinical impact on the patients who were diverted to less intense PAC settings from IRFs during the years following the implementation of the 60 Percent Rule.

Study Purpose

Although the degree to which these trends were driven by the new criterion is not entirely clear (i.e., several other PAC payment reforms were also implemented in the late 1990s and early 2000s), researchers and policymakers monitoring these data generally agree that the observed decline in overall patient volume and change in case-mix reflected a provider response to the 60 Percent Rule.^{14,15,16} As noted above, there is little understanding of the Rule's impact on patient clinical outcomes. Specifically, there is little research on whether shifting beneficiaries, who in the absence of the Rule would have been admitted to an IRF but were treated in alternative PAC settings, experienced different clinical outcomes.

The ARA Research Institute, an affiliate of the American Medical Rehabilitation Providers Association (AMRPA), commissioned Dobson DaVanzo & Associates, LLC (Dobson | DaVanzo) – an independent health economics and policy consulting firm – to investigate the possible impact of the new criteria on clinical outcomes and Medicare payment for PAC beneficiaries during the years immediately following the Rule's implementation.

Dobson | DaVanzo conducted two types of analyses of Medicare beneficiaries: 1) a cross-sectional analysis examining the relative distribution of conditions for patients receiving post-acute care between the years 2005 and 2009, and 2) a longitudinal analysis comparing the long-term (two-year) clinical and Medicare payment outcomes of

¹² Medicare Payment Advisory Commission (Report to the Congress). Medicare Payment Policy. March 2014.

¹³ Medicare Payment Advisory Commission (Report to the Congress). Medicare Payment Policy. March 2014.

¹⁴ Snood N, Huckfeldt PJ, Grabowski DC, et al. The effect of prospective payment on admission and treatment policy: Evidence from inpatient rehabilitation facilities. *J Health Econ.* 2013; 32:965-79.

¹⁵ Grabowski DC, Huckfeldt PJ, Snood N, et al. Medicare postacute care payment reforms have potential to improve efficiency, but may need changes to cut costs. *Health Aff (Milwood).* 2012; 31(9):1941-50.

¹⁶ Huckfeldt PJ, Sood N, Romley JA, et al. Medicare payment reform and provider entry and exit in the post-acute care market. *Health Serv Res.* 2013; 48(5): 1557-80.

clinically and demographically similar cohorts of beneficiaries who received care in either an IRF or a SNF during those years.

Results from these analyses are intended to provide a better understanding of the impact of the new criterion and Rule on clinical outcomes and Medicare costs. In light of recent discussions around introducing additional payment reform in the PAC sector, this study is also intended to inform policymakers of the potential for adverse beneficiary health outcomes when payment regulations alter certain patient populations' trajectories of care and/or site(s) of service. Disentangling differences in patient outcomes due to the treatment provided in the various PAC settings (as opposed to difference in patient characteristics) requires a statistical methodology that can control for clinical and demographic differences of patient populations.

Study Objectives:

- **Cross-sectional analysis: To identify the patient groups most affected by Medicare policy changes that have shifted patients from IRFs to other PAC settings during the five years following implementation of the revised IRF-PPS (between the years 2005 and 2009).**
- **Longitudinal analysis: To explore the long-term (two-year) clinical and payment outcomes of clinically and demographically similar IRF and SNF patients following implementation of the 60 Percent Rule (between the years 2005 and 2009).**

Differences in Conditions of Participations and Classification Criteria for SNF and IRFs

In considering the extent to which patients were shifted out of IRFs into other PAC settings, the Medicare Conditions of Participation and classification criteria, as well as the services provided in these settings should be noted. Each PAC provider must meet specific Conditions of Participation, and, in some cases, specific additional criteria, in order to be reimbursed by the Medicare program. IRFs must meet the hospital Conditions of Participation plus additional criteria referred to by CMS as classification criteria. As discussed below, these Conditions of Participation and criteria for providing care in an IRF are not the same as for the care provided in a SNF.

Medicare beneficiaries admitted to an IRF must be able to tolerate and benefit from at least three hours of rehabilitative therapy per day. A physician trained in rehabilitative medicine must establish a plan of care before the IRF initiates any treatment (42 C.F.R. §485.58(b)). At a minimum, a coordinated rehabilitation program must include physicians' services, physical therapy services, and social or psychological services.

The services in an IRF must be furnished by personnel who meet the qualifications of 42 C.F.R. §485.70 and the number of qualified (licensed) personnel must be adequate for the volume and diversity of services offered. Personnel who do not meet these qualifications may be used by the facility in assisting qualified staff; however, a qualified individual must be on the premises and must instruct these individuals in appropriate patient care techniques and retain responsibility for their activities.¹⁷ Physicians with specialized training in rehabilitation medicine see patients throughout their stay in an IRF, often every day.

The regulations for SNF care are very different from those regulating IRFs.¹⁸ In a SNF, “staff” is defined as licensed nurses (registered nurses – RNs and/or licensed practical/vocational nurses – LPNs/LVNs) and nurse aides. These licensed personnel and nurse aides (who are required to have some training and competency) are able to provide services prior to (or without) the consultation or formal care plan of a rehabilitation physician, as required in an IRF. SNF residents must be seen by a physician at least once every 30 days for the first 90 days after admission, and at least once every 60 days thereafter.¹⁹ RN services must be available in a SNF eight consecutive hours per day, seven days a week (unless this requirement has been waived). “Supervising the medical care of residents” in a SNF refers to a physician providing consultation or treatment when requested by the facility.

The presence of multiple coverage criteria and definitional standards regarding either the types of patients or processes of care provided in each of the PAC settings has raised concerns among policymakers. Despite clear differences in the Medicare Conditions of Participation and classification criteria between IRFs and SNFs in terms of staffing requirements and the type of care provided, recent policy discussions in reforming PAC have included site-neutral payment proposals to align IRF payments with those paid to a SNF.²⁰

Impact of Site of Service on Patient Outcomes

While the Conditions of Participation, classification criteria, treatment protocols, and staffing requirements differ across PAC settings, targeted research has been conducted to compare the outcomes for patients treated in an IRF to those treated in a SNF. While evidence for differences in patient outcomes based on the PAC rehabilitation setting is mixed for some patient conditions, it is more conclusive for others.

¹⁷ 48 FR 56293, Dec. 15, 1982, as amended at 56 FR 8852, Mar. 1, 1991; 57 FR 7137, Feb. 28, 1992; 73 FR 69941, Nov. 19, 2008

¹⁸ Buntin MB. Access to postacute rehabilitation. *Arch Phys Med Rehabil.* 2007; 88:1488-93.

¹⁹ State Operations Manual, Appendix PP. Guidance to Surveyors for Long Term Care Facilities.

²⁰ The FY 2007 President’s Budget included a proposal to reduce the excessive difference in payment between Inpatient Rehabilitation Facilities (IRFs) and Skilled Nursing Facilities for total knee and hip replacements.

For lower extremity joint replacement patients, several studies examining the setting effects between IRF and SNF care observe minimal or no differences in functional independence gains between rehabilitated patients despite differences in length of stay and cost.^{21,22,23,24} Other studies of improvement in several functional independence metrics indicate differences in long-term outcomes that favored IRF over SNF rehabilitation, but the benefits based on other metrics were not consistently observed.^{25,26,27}

The effect of PAC placement on outcomes for stroke and hip fracture patients is clearer. Several comparative studies indicate better recovery, lower mortality, and higher likelihood of returning home for stroke patients that received IRF rehabilitation compared to nursing home care and SNF rehabilitation.^{28,29,30} Similarly, in a study of hip fracture patients, IRF rehabilitated patients were nearly two times more likely to be discharged home and four and a half times less likely to require extended nursing home care than comparable SNF hip fracture patients.^{31,32}

Where there appears to be evidence of setting effects driving differences in patient outcomes, two general explanations have been offered: 1) differences in PAC patient-level characteristics (i.e., demographic and clinical characteristics); and 2) differences in provider-level factors, such as variation in the intensity of therapy delivered (i.e., frequency and duration of rehabilitation sessions and physician-led care) are leading to differences in outcomes. The contribution of this study is that the propensity score matching of IRF and SNF patients controls for observed differences in patient characteristics, thereby isolating the impact of the PAC setting.

²¹ Tian W, DeJong G, Horn SD, et al. Efficient rehabilitation care for joint replacement patients: skilled nursing facility or inpatient rehabilitation facility? *Med Decis Making*. 2012; 32:176-87.

²² Mallinson T, Deutsch A, Bateman J, et al. A comparison of discharge functional status after rehabilitation in skilled nursing, home health, and medical rehabilitation settings for patients after lower-extremity joint replacement surgery. *Arch Phys Med Rehabil*. 2011; 92:712-20.

²³ Tribe KL, Lapsley HM, Cross MJ, et al. Selection of patients for inpatient rehabilitation or direct home discharge following total joint replacement surgery: a comparison of health status and out-of-pocket expenditure of patients undergoing hip and knee arthroplasty for osteoarthritis. *Chronic Illness*. 2005; 1:289-302.

²⁴ Buntin MB, Deb P, Escarce J, et al. Comparison of Medicare spending and outcomes for beneficiaries with lower extremity joint replacements. RAND Health. June 2005.

²⁵ Herbold JA, Bonistall K, Walsh MB. Rehabilitation following total knee replacement, total hip replacement, and hip fracture: A case-controlled comparison. *J Geriatr Phys Ther*. 2011; 34:155-60.

²⁶ Dejong G, Hsieh CH, Gassaway J, et al. Characterizing rehabilitation services for patients with knee and hip replacement in skilled nursing facilities and inpatient rehabilitation facilities. *Arch Phys Med Rehabil*. 2009; 90:1269-83.

²⁷ Munin MC, Seligman K, Dew MA, et al. Effect of rehabilitation site on functional recovery after hip fracture. *Arch Phys Med Rehabil*. 2005; 86:367-72.

²⁸ Chan L, Sandel ME, Jette AM, et al. Does postacute care site matter? A longitudinal study assessing functional recovery after a stroke. *Arch Phys Med Rehabil*. 2013; 94:622-9.

²⁹ Kramer AM, Steiner JF, Schlenker RE, et al. Outcomes and costs after hip fracture and stroke. *JAMA*. 1997; 277(5):369-404.

³⁰ Kane RL, Chen Q, Finch M, et al. Functional outcomes of post-hospital care for stroke and hip fracture patients under Medicare. *J Am Geriatr Soc*. 1998; 46:1525-33.

³¹ Deutsch A, Granger CV, Fiedler RC, et al. Outcomes and reimbursement of inpatient rehabilitation facilities and subacute rehabilitation programs for Medicare beneficiaries with hip fracture. *Med Care*. 2005; 43(9):892-901.

³² Munin MC, Seligman K, Dew MA, et al. Effect of rehabilitation site on functional recovery after hip fracture. *Arch Phys Med Rehabil*. 2005; 86:367-72.

Report Structure

This report presents the methodology and results of both the cross-sectional and longitudinal analyses. The methodology for both analyses, as well as a description of the data sources and algorithms used to construct clinical condition categories across PAC settings, are presented in the next chapter. We then present the results of the cross-sectional analysis, followed by the results of the longitudinal analysis. The report concludes with a discussion of the impact of the 60 Percent Rule on Medicare beneficiaries during the years 2005 through 2009.

Additional research studying patient outcomes for the years 2010 through 2012 is planned.

Methodology

This study consisted of two separate analyses: 1) analysis of the distribution of clinical conditions across settings in the years following the implementation of the 60 Percent Rule (“cross-sectional analysis”), and 2) a retrospective cohort study of the long-term clinical outcomes and total Medicare payments for patients who received rehabilitation services in the IRF compared to those who received rehabilitation in the SNF (“longitudinal analysis”).

Both analyses were completed using Medicare fee-for-service claims for Part A and Part B services obtained from CMS through a data use agreement (DUA).³³ All claims from 2005 through 2009 were received from CMS for a representative 20 percent sample of Medicare beneficiaries. An additional file was employed that included all claims from 2005 through 2009 for 100 percent of beneficiaries who received care in an IRF or LTCH (anytime between 2005 and 2009). This time period was selected for the study because it covers the period immediately following the implementation of the 60 Percent Rule,³⁴ allowing us to examine its immediate effects on clinical outcomes and payments. The care settings in the datasets included inpatient hospitals, outpatient hospitals, IRFs, SNFs, LTCHs, and HHAs. Physician and durable medical equipment (DME) claims were not included in this analysis.

A clinical advisory panel consisting of practicing post-acute care clinicians and clinical researchers was convened at study initiation to aid in the interpretation and clinical validation of this analysis. The panel’s role was to provide clinical input, feedback, and validation throughout the analyses.

³³ Claims data were received through CMS under DUA #25720.

³⁴ An additional study is currently underway that extends the study period for both analyses through 2012.

Identification of Clinical Condition Categories

Both the cross-sectional and longitudinal analyses required consistent classification of clinical conditions across multiple care settings. The IRF-PAI Training Manual³⁵ identifies the MS-DRGs, ICD-9, CPT, and HCPCS used by CMS to determine the assignment of UDS_{MR}TM Impairment Group Codes and RIC for each IRF patient. Since SNFs, LTCHs, and HHAs do not use RICs or impairment group codes, the criteria for identifying each condition needed to be deconstructed so it could be applied to patients in alternate settings in a consistent way. In many instances, the algorithms to identify the clinical condition categories rely on a patient's historical diagnostic information or care that he/she received prior to admission to the post-acute care settings (i.e., prior to or during the preceding acute care hospital stay). Since the IRF-PAI Training Manual only classifies conditions treated in IRFs, conditions that may be unique to SNFs, LTCHs, and HHAs, were excluded from both the cross-sectional and longitudinal analyses. While most condition categories were easily identified using the ICD-9s contained in the IRF-PAI Training Manual, the classification of cases that qualified under multiple condition groups required clinical expertise from the advisory panel to interpret secondary and tertiary ICD-9 information in order to accurately classify these cases.

The definition for each clinical condition category is contained in Appendix A. Some of the conditions included were ones specified in the 60 Percent Rule (e.g., hip/knee replacements, stroke, brain injury), and others were not (e.g., cardiac disorders, major medical complexity). While all clinical condition categories were defined, only those with: 1) adequate sample size and 2) well defined clinical algorithms that allowed us to confidently identify patients with these conditions in other settings were included in the cross-sectional and longitudinal analyses. Therefore, the results presented in this report focus on a subset of conditions. Within the longitudinal analysis, we focus on 13 conditions, many of which are contained in the 13 conditions specified in the 60 Percent Rule. The conditions included in the longitudinal analysis are shown in Exhibit 2.1, including their inclusion or exclusion in the 60 Percent Rule.

The clinical advisory panel was heavily involved in the development and validation of the algorithms used to identify the clinical condition categories. Clinical advisory panel members with first-hand experience in identifying patient's RICs or impairment codes were consulted to confirm the logic used to identify patients across settings. Additionally, the relationship between each of the clinical condition categories was reviewed to ensure

³⁵ IRF-PAI Training Manual, Appendix B: ICD-9-CM Codes Related to Specific Impairment Groups.

Methodology

patients were classified by the most accurate condition (in the event a patient presented with more than one clinical condition category).

Exhibit 2.1: Clinical Condition Categories included in Longitudinal Analysis

Clinical Condition Category	RIC	Impairment Group	Included in 60 Percent Rule?*
Amputation	AMPNLE (11) AMPLE (10)	Amputation of Limb	Yes
Brain Injury	TBI (02), NTBI (03)	Brain Dysfunction	Yes
Cardiac Disorder	Cardiac (14)	Cardiac Disorders	No
Hip Fracture	FracLE (07)	Orthopedic Conditions	Yes
Hip/Knee Replacement	ReplLE (08), Ortho (09)	Orthopedic Conditions	Yes
Major Medical Complexity	Misc (20)	Medically Complex Conditions	No
Major Multiple Trauma	MMT-BSCI (18), MMT-NBSCI (17)	Major Multiple Trauma	Yes
Neurological Disorders	Neuro (06)	Neurological Conditions	Yes
Other Orthopedic	Ortho (09)	Orthopedic Conditions	No
Pain Syndromes	Pain (16)	Pain Syndromes	No
Pulmonary Disorders	Pulmonary (16)	Pulmonary Disorders	No
Spinal Cord Injuries	NTSCI (05), TSCI (04)	Spinal Cord Dysfunction	Yes
Stroke	Stroke (01)	Stroke	Yes
Other Conditions not Included in Analyses			
Osteoarthritis	OsteoA (12), RheumA (13)	Arthritis	Yes
Debility	Debility (16)	Debility	No
Neurological Conditions (Guillain-Barre Syndrome)	GB (19)	Neurological Condition (Guillain-Barre Syndrome)	No
Congenital Deformities	Misc (20)	Congenital Deformities	Yes
Developmental Disability	Misc (20)	Developmental Disability	No
Other Disabling Conditions	Misc (20)	Other Disabling Conditions	No
Systemic Vasculidities	Misc (20)	Medically Complex Conditions	Yes
Burns	Burns (21)	Burns	Yes

* The indicator for whether the condition is included in the 60 Percent Rule does not imply that every patient within that condition meets 60 Percent Rule eligibility. For example, while hip/knee replacement is a condition included in the 60 Percent Rule, only patients who meet specific clinical criteria (i.e., over 85 years old, received bilateral replacement surgery, or patient with BMI >50) are included towards a provider's 60 percent threshold. Two of the 13 conditions contained within the 60 Percent Rule are included within the Arthritis Impairment Group, therefore the chart only identifies 12 impairment groups with a "Yes" indicator.

Cross-Sectional Analysis

Cross sectional analyses compare the distribution of clinical conditions across PAC settings, years, and geographic areas following the implementation of the 60 Percent Rule. The goal of this analysis is to determine the extent to which the 60 Percent Rule shifted patients treated in IRFs with certain conditions to alternative care settings, including SNFs, LTCHs, or HHAs. This analysis is conducted for each year between 2005 and 2009 using a 100 percent sample of IRF and LTCH patients,³⁶ and a representative 20 percent sample of SNF and HHA patients.

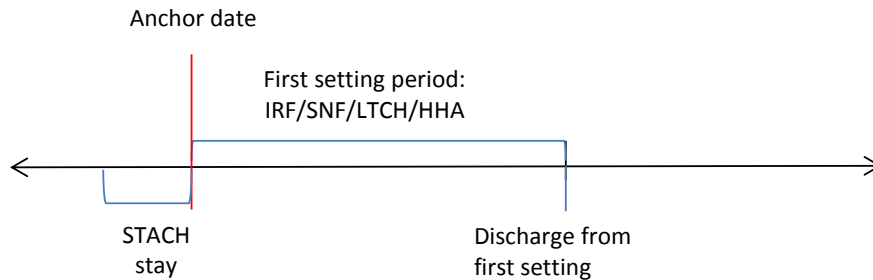
Developing Patient Episodes for Cross-Sectional Analysis

In conducting this analysis, episodes of care were developed for all patients identified using the clinical condition category algorithms. Only patients who were discharged from the short term acute care hospital (STACH) and admitted to one of the post-acute care settings within three days of hospital discharge were included in the analysis, ensuring that patients were at a similar stage in their rehabilitation care. This analysis does not control for patient risk within or across settings; rather, it determines the change in the proportion of patients treated in each setting by condition category, by year.

Exhibit 2.2 below shows the framework of the cross-sectional patient episodes. Patients who fit this framework were included in the analysis regardless of the care they received prior to their STACH stay (referred to as the “look back period”). The anchor date refers to the patient’s admission to an IRF, SNF, LTCH, or HHA. At the time of the anchor date, the patient episode is defined either by the clinical condition category identified for which admission to the PAC is required or by the clinical diagnosis that initiated the preceding STACH admission. In the event that the clinical condition that initiated the acute care hospital admission differed from the clinical condition driving the need for post-acute care, the condition for which the patient is treated in the PAC setting is used to clinically define him/her.

³⁶ 100 percent of patients treated in either an IRF or LTCH was included in this analysis due to their relative low volume among Medicare beneficiaries, compared to SNF and HHA patients.

Exhibit 2.2: Patient Episode Framework for Cross-Sectional Analysis



Conducting Cross-Sectional Analysis

Using the patient episodes, defined by clinical condition categories, we determined the proportion of patients by condition by year for each setting (IRF, SNF, LTCH, and HHA). The analysis then compared the changes in the proportions over time within and across settings. Further sub-analyses were conducted that compared the changes in the distribution of conditions by geographic area, using the four census regions (i.e., Northeast, South, Midwest, and West).

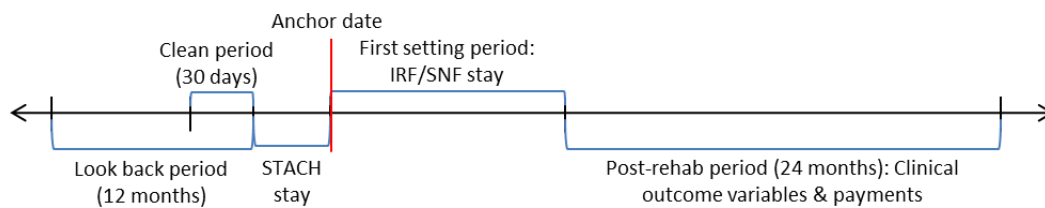
Longitudinal Analysis

The longitudinal analysis compares the long-term clinical outcomes and Medicare payments for patients who received rehabilitation services in the IRF compared to those who received rehabilitation in the SNF. Through the development of patient episodes using Medicare claims data for a 100 percent sample of IRF patients and a 20 percent sample of SNF patients from 2005 through 2009, we were able to risk-adjust the patients treated in each setting and compared their long-term clinical outcomes and Medicare payments.

Developing Patient Episodes for Longitudinal Analysis

Episodes of care were developed for all patients treated in either an IRF or SNF that could be identified using the clinical condition category algorithms. Exhibit 2.3 below shows the framework of the longitudinal patient episodes.

Exhibit 2.3: Patient Episode Framework for Longitudinal Analysis



All patient episodes contained the following key features:

- **STACH stay:** The STACH stay represents the acute care hospital admission that results in the need for post-acute care. Diagnostic and MS-DRG information was used to define each patient’s clinical condition category and to risk-adjust the two patient populations. Similar to the cross-sectional analysis, only patients who were discharged from a STACH and admitted to an IRF or SNF within three days were included in the analysis, ensuring that patients were at a similar stage in their rehabilitation care (i.e., the time between the discharge from the acute care hospital and the anchor date is three or fewer days).
- **Anchor date:** The anchor date refers to the patient’s admission to the IRF or SNF following discharge from the STACH. The patient episode is defined by the clinical condition category for which the patient was treated in the preceding acute care hospital admission or the category in the PAC setting.
- **Look back period:** The look back period captures health care utilization and clinical characteristics for one year (12 months) prior to admission to the acute care hospital. During the look back period, acute care hospitalizations or medical events related to the patient’s clinical condition were used during the propensity score matching process to control for patient severity across the two settings (discussed further below). Diagnostic information (ICD-9s), procedural information (CPT and HCPCS from outpatient claims), and prior stays in facility-based settings are examples of the variables captured during the look back period.
- **Clean period:** Only patients with no facility-based care (STACH, IRF, SNF, or LTCH) within the 30 days immediately preceding the patient’s admission to the STACH were considered for this analysis (referred to as the “clean period”). The purpose of the clean period is to ensure that the STACH admission is not a readmission from a prior admission and to ensure that the patient was not receiving facility-based care prior to the hospitalization. This is an important component of the episode as it better ensures appropriate attribution of outcomes to the rehabilitation care that follows hospital discharge.
- **First setting period:** The intervening days between admission to the IRF and SNF and discharge to another PAC setting or the community describe an episode’s “first setting period.” The length of the first setting period will vary by patient and setting. We examined the claims that occurred during this period in order to understand the care that the patient received during the first setting and its impact on clinical outcomes and Medicare payment.

- **Post-rehabilitation period:** The post-rehabilitation period is initiated by discharge from the IRF or SNF setting, and extends for 24 months. Claims during this period are examined to determine outcomes and Medicare episode payment. In order to be included in the analysis, each patient must have the opportunity for 24 months of claims to be available. That is, even if a patient expired during the two-year study period there needed to have been an opportunity for two years of service use if the patient had survived.

Based on this episode framework, we developed patient episodes for IRF and SNF first setting patients for each of the clinical condition categories. In the next section, we discuss how we controlled for patient demographics and severity and how we matched SNF to IRF patients.

Developing Patient Cohorts

Based on the patient episode framework described above, we identified two patient cohorts for each clinical condition category: 1) those who received care in an IRF as their first setting (i.e., the study group), and 2) those who received care in a SNF as their first setting (i.e., the comparison group). The comparison group was matched to the study group through propensity score matching techniques based on patient characteristics, comorbidities, and historical health care utilization one year prior to the admission to the acute care hospital stay.

Propensity score matching techniques are widely used in observational studies when randomized controlled trials (RCTs) are not possible or able to be generalized to the population, or are unethical or impractical to administer.³⁷ Literature suggests that applying these techniques to observational studies removes observable selection bias among treatment and comparison groups and can replicate findings produced by RCTs.^{38,39,40,41}

We used propensity scores to create a one-to-one match across study group and comparison group patients within each clinical condition. We used an optimized “nearest neighbor” method that iteratively increased the caliper width used to identify patient matches. Consistent with the methods traditionally used in the literature, any matched pair with a difference in propensity scores beyond 0.2 standard deviations of the logit

³⁷ Trojano M, Pellegrini F, Paolicelli D, Fuiani A, Di Renzo V: Observational studies: propensity score analysis of non-randomized data. *International MS Journal*. 2009; 16:90-7.

³⁸ Austin PC: An introduction to propensity score methods for reducing the effects of confounding in observational studies. *Multivariate Behavioral Research*. 2011; 46:399-424.

³⁹ Kuss O, Legler T, Borgermann J: Treatments effects from randomized trials and propensity score analyses were similar in similar populations in an example from cardiac surgery. *J Clin Epidemiol*. 2011; 64(10):1076-84.

⁴⁰ Dehejia R, Wahba S: Propensity score-matching methods for nonexperimental causal studies. *The Review of Economics and Statistics*. 2002; 84(1):151-61.

⁴¹ Rosenbaum PR, Rubin DB: The central role of the propensity score in observational studies for causal effects. *Biometrika*. 1983; 70(1):41-55.

function was excluded from the analysis.⁴² The rigor of the matching techniques isolated the effect of site of service from other correlated observable effects. Patients who were not able to be matched were excluded from the analysis.

The variables used to determine the propensity score are presented in Exhibit 2.4. These variables were collected during the look back period or during the acute care hospitalization. Each clinical condition category used a slightly different equation to determine the propensity score based on the clinical algorithms, but all condition categories used the same variables in the claims to determine the patient matches (to the extent that a given variable was significant in determining the propensity score). Mortality was not used in the matching process to control for patient severity across settings because it was used as a clinical outcome.

Exhibit 2.4: Variables Used to Determine Propensity Score for Each Clinical Condition Category

Covariates
Age
Gender
Race
Hierarchical Condition Categories (HCC) and Community, Institutional, and New Enrollee Scores
Specific HCC Categories
e.g., Major complications of medical care and trauma; Schizophrenia; Seizure disorders and convulsions
Berenson-Eggers Type of Service (BETOS) Code (clustering of procedure codes – CPTs & HCPCS)
e.g., Standard imaging; Laboratory tests; Minor procedures
Clinical Classification Software (CCS) Code (clinical clustering of ICD-9s)
e.g., Diabetes mellitus without complication; Essential hypertension; Coronary atherosclerosis
Charges by Revenue Center
e.g., Pharmacy; Operating room; Imaging; Therapy (Physical, Occupational, and Speech)

Generally, due to the difference in volume of patients treated in IRFs and SNFs, SNF patients within each clinical condition category were able to be matched to IRF patients with the same demographic or clinical characteristics (i.e., there were enough SNF patients to find a match for each IRF patient). However, additional restrictions were made during the matching process, as appropriate. For example, within the brain injury condition category, a patient treated in an SNF for *traumatic* brain injury was matched only to a patient treated in an IRF for a traumatic brain injury (as opposed to a *non-traumatic* brain injury). In the example of the lower extremity major joint replacement condition category, hip replacement patients were only matched to other hip replacement patients, as opposed to knee replacement patients.

⁴² Austin PC: Optimal caliper widths for propensity-score matching when estimating differences in means and differences in proportions in observational studies. *Pharm Stat.* 2011; 10:150-161.

Methodology

Since a one-to-one match was used, the number of matched pairs was limited by the number of IRF patients. As IRFs are the smaller of the two PAC settings, this did not allow for all clinically-similar SNF patients to be included in the analysis.

Exhibit 2.5 below shows the number of IRF and SNF patients by clinical condition category before and after matching. Across all condition categories, 100,491 matched pairs were created, which represents 89.6 percent of all IRF patients and 19.6 percent of SNF patients contained within the 20 percent sample of Medicare beneficiaries. Across clinical condition categories, the percent of SNF patients able to be matched to clinically and demographically similar IRF patients ranged between 71.5 percent (neurological disorders and pain syndromes) and 100 percent (cardiac disorders and major medical complexity). However, due to the volume of SNF patients, between 3.2 percent (major medical complexity) and 50.9 percent (major multiple trauma) of SNF patients contained within the 20 percent sample of beneficiaries were able to be matched to clinically and demographically similar IRF patients.

Exhibit 2.5: Distribution of Matched Pairs by Clinical Condition Category and Percent of IRF Universe and SNF Sample of Patients

Condition	Unmatched (Total Patients)		Matched Pairs	Matched Pairs as a % of Unmatched	
	IRF	SNF		IRF	SNF
Amputation	1,971	6,234	1,756	89.1%	28.2%
Brain Injury	6,231	19,459	5,364	86.1%	27.6%
Cardiac Disorder	5,197	89,219	5,195	100.0%	5.8%
Hip Fracture	21,190	59,884	20,970	99.0%	35.0%
Hip/Knee Replacement	22,744	46,650	21,485	94.5%	46.1%
Major Medical Complexity	5,675	177,835	5,675	100.0%	3.2%
Major Multiple Trauma	1,681	3,142	1,600	95.2%	50.9%
Neurological Disorders	6,676	10,552	4,771	71.5%	45.2%
Other Orthopedic	6,311	11,949	6,030	95.5%	50.5%
Pain Syndromes	6,676	10,552	4,771	71.5%	45.2%
Pulmonary Disorders	1,827	34,107	1,821	99.7%	5.3%
Spinal Cord Injuries	4,669	8,594	4,068	87.1%	47.3%
Stroke	21,268	35,379	16,985	79.9%	48.0%
Overall	112,116	513,556	100,491	89.6%	19.6%

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Notes: In the IRF-PAI training Manual, Hip Fracture and Hip/Knee Replacement are sub-categories within Orthopedic Conditions, and Major Medical Complexity is referred to as "Medically Complex Conditions."

Calculating Descriptive Statistics and Analyzing Overall Patient Medicare Expenditures

Descriptive statistics were calculated for the study and comparison cohorts after the propensity score matching. Long-term health care utilization and outcomes were compared across the IRF and SNF patient cohorts and clinical condition categories, and the differences were tested for statistical significance. The study and comparison groups were compared on two types of outcomes. First, clinical indicators were used, which included mortality rate, average number of days in the home/community and facility-based care days, prevalence of falls with injuries, pressure ulcers, and emergency room and hospital admissions.

Second, the groups were compared on utilization and per-member-per-month (PMPM) Medicare payments, as well as the average Medicare episode payment per day.

The outcome variables are defined in Exhibit 2.6.

Exhibit 2.6: Outcomes used to Compare Long-Term Impact of IRF Compared to SNF Care

Outcome	Definition
Mortality rate	Percent of patients who died within two-year study period
Average additional days of life	Average days of life per person over two-year study period, including patients who died
Length of stay during first setting	Average length of stay in initial IRF/SNF stay
Number of facility-based days	Average number of days per patient over two-year episode spent in a hospital, IRF, SNF, or LTCH
Number of community-based days (days at home)	Average number of days per patient over two-year episode <u>not</u> spent in a hospital, IRF, SNF, or LTCH. (Lack of nursing home claims in the data may overestimate the calculated number of days at home)
Emergency room and hospital admissions per 1,000 beneficiaries per year	Average number of emergency room visits and hospital admissions per 1,000 beneficiaries per year
Per-member-per-month (PMPM) payment by setting	Sum of the payments divided by the sum of the member months
Average Medicare episode payment per day	Total Medicare payment across all settings (including the anchor) divided by total number of patient days

Data Limitations

Our analyses have several key limitations that may affect the interpretation of our results. First, while administrative claims data offer a robust and representative study population, these data do not contain detailed, medical record-level clinical information. Given this general limitation, our interpretation of beneficiaries' clinical outcomes relied upon outcomes observable in the claims data (e.g., comorbidities, mortality, emergency room

utilization, etc.) that may not fully indicate patients' health or functional outcomes as a result of receiving post-acute care. Although we used rigorous propensity matching techniques to control for patient demographic characteristics and severity, the lack of clinical information may exclude or may bias certain characteristics that are not observed within the claims.

Second, the data files used in this analysis could not be augmented with the PAC assessment data, which could have allowed us to compare beneficiaries' functional independence changes (during and/or) following rehabilitation. For instance, using claims data we were unable to identify beneficiaries' live-alone status, which is a social characteristic that studies have shown to correlate with patients' PAC discharge destination.⁴³

Lastly, Medicare fee-for-service claims do not include care covered and reimbursed by Medicare Advantage plans, Medicaid, or third-party payers. Thus, non-Medicare services, such as long-term nursing home care, were not captured in this analysis. This omission may have overestimated the calculated number of days a patient remained at home, and underestimated the cost of their health care to the federal and state governments.

In the next chapters, we present the results of our cross-sectional and longitudinal analysis.

⁴³ Pablo PD, Losina E, Phillips CB, et al. Determinants of discharge destination following elective total hip replacement. *Arthritis Rheum* 2004; 51(6):1009-14.

Cross-Sectional Analysis Results

The purpose of the cross-sectional analysis is to determine the distribution of clinical condition categories within IRFs and other PAC settings, and to identify any trends or changes in this distribution during the five years following implementation of the 60 Percent Rule. This analysis serves as the first analytic step towards the broader study goal of understanding the differences in long-term patient outcomes based on where patients receive rehabilitative care. A shift in the distribution of clinical condition categories within and across PAC settings following the implementation of the 60 Percent Rule would provide insight into how PAC providers changed practice patterns to adhere with the revised IRF-PPS.

This analysis was performed across the four PAC settings (IRFs, SNF, LTCHs, and HHA). Only the clinical condition categories with algorithms that could accurately be applied to non-IRF settings were included in this analysis. Therefore, the proportions presented do not reflect all patient cases treated in SNFs, LTCHs, and HHAs, but are representative of IRF conditions.

Distribution of Clinical Condition Categories among IRFs

The distribution of IRF clinical condition categories between 2005 and 2009 is shown in Exhibit 3.1. In 2005, the three largest clinical condition categories – lower extremity joint replacement (hip/knee replacement), stroke, and fracture of lower extremity (hip fracture) – represented 60.4 percent of all IRF admissions. Hip/knee replacement patients represented 25.4 percent, while stroke and hip fracture patients represented 18.3 percent and 16.7 percent of total IRF admissions in 2005, respectively. All other condition categories represent less than 6 percent of all IRF patients with clinical condition categories included in this analysis.

The relative proportion of the three largest condition categories steadily decreased, and by 2009 represented only 52.4 percent of all IRF patients. This trend was driven by the

Cross-Sectional Analysis Results

marked 10.9 percentage point decrease in the proportion of patients treated for hip/knee replacements. While the proportion of other conditions fluctuated over the study period, no other condition category experienced such a large change.

Appendix B presents results for the other individual PAC setting – SNFs, HHAs, and LTCHs.

Exhibit 3.1: Distribution of Clinical Condition Categories among IRFs (2005-2009) (Ranked by Proportion in 2005)

Clinical Condition Category	2005	2006	2007	2008	2009	Percentage Point Change (2005-2009)
Hip/Knee Replacement (Lower Extremity Joint Replacement)	25.4%	21.1%	18.1%	15.5%	14.5%	-10.9%
Stroke	18.3%	20.0%	20.3%	20.5%	20.3%	2.0%
Hip Fracture (Fracture of Lower Extremity)	16.7%	17.9%	18.5%	18.1%	17.5%	0.8%
Major Medical Complexity	5.6%	5.7%	6.2%	7.2%	7.5%	1.9%
Cardiac Disorder	5.6%	5.2%	5.4%	6.0%	6.3%	0.7%
Neurological Disorders	5.5%	6.3%	6.8%	7.2%	7.9%	2.3%
Other Orthopedic	5.3%	5.6%	5.8%	6.4%	6.6%	1.3%
Brain Injury	4.9%	5.8%	6.5%	6.8%	7.1%	2.1%
Spinal Cord Injury	4.3%	4.4%	4.4%	4.1%	4.3%	0.0%
Amputation	2.6%	2.6%	2.5%	2.5%	2.5%	-0.2%
Pulmonary Disorders	2.1%	2.0%	2.0%	2.2%	2.2%	0.1%
Pain Syndromes	1.9%	1.8%	1.6%	1.6%	1.4%	-0.6%
Major Multiple Trauma	1.3%	1.5%	1.6%	1.7%	1.8%	0.5%
Debility	0.3%	0.2%	0.2%	0.2%	0.2%	-0.1%
All Other	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%

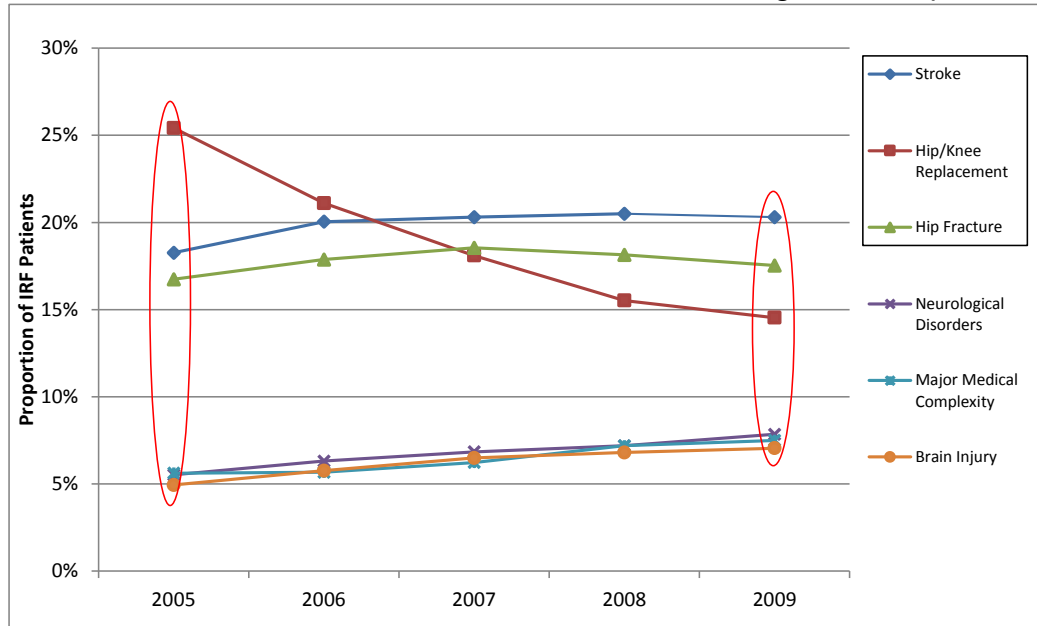
Percentages may not total 100 percent due to rounding.

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

The large decrease in lower extremity joint replacement cases is offset by smaller proportional increases in other condition categories (Exhibit 3.2). Between 2005 and 2009, stroke, major medical complexity, neurological disorders, and brain injury condition categories each increased by approximately two percentage points. This produced a more even distribution of clinical condition categories each year following the implementation of the 60 Percent Rule.

Cross-Sectional Analysis Results

Exhibit 3.2: Trends in the Distribution of Select Clinical Condition Categories in IRFs (2005-2009)



Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Comparison of the Distribution of Clinical Condition Categories between IRFs and SNFs

Researchers and policymakers anticipated that the implementation of the 60 Percent Rule would lead to a relative decrease in patients with certain conditions in IRFs, offset by an increase in corresponding patient conditions in SNFs. Exhibit 3.3 presents the distribution of clinical condition categories in IRFs and SNFs by year.

Similar to the distribution of clinical condition categories in IRFs, three condition categories represented almost two-thirds of SNF admissions in a given year. In 2005, major medical complexity (33.8 percent), cardiac conditions (18.1 percent), and hip fractures (10.2 percent) collectively represented 62.1 percent of all SNF admissions. By 2009, the proportion of SNF admissions representing these conditions increased to 64 percent.

Across all years, major medical complexities was the largest clinical condition category treated in SNFs, representing at least one third of all admissions across each year. The proportion of SNF admissions for this condition category increased from 33.8 percent in 2005 to 37.5 percent in 2009. Although major medical complexities represented a significantly smaller proportion of IRF admissions, the relative proportion of this condition also increased, from 5.6 percent to 7.5 percent.

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However, the relative change in proportion among SNF patients treated for cardiac conditions may be related to the 60 Percent Rule. As a condition not included in the Rule, the decrease in proportion of cardiac patients treated in SNFs from 2005 to 2009 (a change from 18.1 percent in 2005 to 16.7 percent in 2009) coincided with an increase in IRFs (from 5.6 percent to 6.3 percent). A similar trend was evident among stroke patients. The increased proportion of patients treated in IRFs for stroke (a condition included in the 60 Percent Rule) was accompanied by a decrease in the proportion of patients treated in SNFs, which decreased from 7.1 percent in 2005 to 6.2 percent in 2009.

The significant decrease in the proportion of hip/knee replacement patients in IRFs from 2005 through 2009 was not accompanied by a comparable increase in the proportion of these conditions in SNFs over the same period. From 2005 through 2009, the proportion of patients treated for hip/knee replacements among SNFs only increased from 7.4 percent to 8.0 percent, while the proportion of these patients treated in IRFs decreased from 25.4 percent to 14.5 percent. Our analysis of HHAs, however, shows the distribution of hip/knee replacement cases increased from 10.4 percent in 2005 to 12.8 percent in 2009 (see Appendix B).

Cross-Sectional Analysis Results

Exhibit 3.3: Comparison of IRF and SNF Distribution of Clinical Condition Categories (2005-2009) (Ranked by IRF Proportion in 2005)

Clinical Condition Category	2005		2006		2007		2008		2009		Percentage Point Change (2005-2009)	
	IRF	SNF	IRF	SNF	IRF	SNF	IRF	SNF	IRF	SNF	IRF	SNF
Stroke	18.3%	7.1%	20.0%	6.7%	20.3%	6.5%	20.5%	6.3%	20.3%	6.2%	2.0%	-0.9%
Hip Fracture	16.7%	10.2%	17.9%	10.1%	18.5%	10.1%	18.1%	9.9%	17.5%	9.8%	0.8%	-0.4%
Hip/Knee Replacement	25.4%	7.4%	21.1%	7.3%	18.1%	7.5%	15.5%	7.6%	14.5%	8.0%	-10.9%	0.6%
Neurological Disorders	5.5%	1.9%	6.3%	2.0%	6.8%	2.0%	7.2%	2.0%	7.9%	1.9%	2.4%	0.0%
Brain Injury	4.9%	3.5%	5.8%	3.5%	6.5%	3.5%	6.8%	3.5%	7.1%	3.3%	2.2%	-0.2%
Other Orthopedic	5.3%	1.9%	5.6%	2.0%	5.8%	2.2%	6.4%	2.3%	6.6%	2.3%	1.3%	0.4%
Cardiac Disorder	5.6%	18.1%	5.2%	17.8%	5.4%	17.2%	6.0%	17.0%	6.3%	16.7%	0.7%	-1.4%
Spinal Cord Injury	4.3%	1.5%	4.4%	1.5%	4.4%	1.6%	4.1%	1.6%	4.3%	1.6%	0.0%	0.1%
Debility	0.3%	1.9%	0.2%	1.8%	0.2%	1.8%	0.2%	1.8%	0.2%	1.7%	-0.1%	-0.2%
Major Medical Complexity	5.6%	33.8%	5.7%	35.3%	6.2%	36.6%	7.2%	36.9%	7.5%	37.5%	1.9%	3.7%
Amputation	2.6%	2.1%	2.6%	1.7%	2.5%	1.0%	2.5%	0.9%	2.5%	0.9%	-0.1%	-1.2%
Pulmonary Disorders	2.1%	7.5%	2.0%	7.0%	2.0%	6.8%	2.2%	7.0%	2.2%	6.8%	0.1%	-0.7%
Major Multiple Trauma	1.3%	0.5%	1.5%	0.6%	1.6%	0.6%	1.7%	0.6%	1.8%	0.6%	0.5%	0.1%
Pain Syndromes	1.9%	2.4%	1.8%	2.5%	1.6%	2.5%	1.6%	2.5%	1.4%	2.5%	-0.5%	0.1%
All Other	0.1%	0.3%	0.2%	0.3%	0.1%	0.3%	0.1%	0.1%	0.2%	0.2%	-0.5%	0.1%

Percentages may not total 100 percent due to rounding.

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Cross-Sectional Analysis Results

Comparison of Results to MedPAC Published Estimates

Results from our cross-sectional analysis of the distribution of IRF admissions by clinical condition category are consistent with published MedPAC analyses for the 10 most common IRF conditions (Exhibit 3.4). While the absolute proportions of each clinical condition do not align perfectly, directionally, the results appear consistent, validating the algorithms we used to define each clinical condition category.

The major trends identified in our analysis – the significant decline in the proportion of hip/knee replacements and the increase in the proportion of stroke patients, neurological disorders, and brain injury cases – are also observed in MedPAC’s analyses (Exhibit 3.4).

A notable discrepancy across all study years is the difference in the observed proportion of beneficiaries admitted with debility. This large difference is likely due to difficulty defining debility without using the RIC or impairment group codes contained in IRF claims. In our methodology, admissions are classified into clinical condition categories using diagnostic information, not IRF payment classifications. This is a methodological prerequisite, as the conditions needed to be consistently classified in the other PAC settings. Thus, our cross-sectional results do not accurately capture the relative proportion of debility cases across PAC settings. In each setting, the proportion of debility cases is likely underestimated, possibly slightly effecting the relative proportions of all other conditions.

Cross-Sectional Analysis Results

Exhibit 3.4: Comparison of the Distribution of Clinical Condition Categories in Dobson | DaVanzo and MedPAC Analyses (2005-2009)

Clinical Condition Category	2005		2006		2007		2008		2009	
	D D	MedPAC	D D	MedPAC	D D	MedPAC	D D	MedPAC	D D	MedPAC ¹
Stroke	18.3%	19.0%	20.0%	20.3%	20.3%	20.8%	20.5%	20.5%	20.3%	20.6%
Hip Fracture	16.7%	15.0%	17.9%	16.1%	18.5%	16.4%	18.1%	16.3%	17.5%	15.5%
Hip/Knee Replacement	25.4%	21.3%	21.1%	17.8%	18.1%	15.0%	15.5%	13.2%	14.5%	11.4%
Neurological Disorders	5.5%	6.2%	6.3%	7.0%	6.8%	7.8%	7.2%	7.9%	7.9%	9.0%
Brain Injury	4.9%	5.2%	5.8%	6.0%	6.5%	6.7%	6.8%	6.9%	7.1%	7.3%
Other Orthopedic	5.3%	5.1%	5.6%	5.2%	5.8%	5.5%	6.4%	5.8%	6.6%	6.3%
Cardiac Conditions	5.6%	4.2%	5.2%	4.0%	5.4%	4.2%	6.0%	4.6%	6.3%	4.9%
Spinal Cord Injury	4.3%	4.5%	4.4%	4.6%	4.4%	4.6%	4.1%	4.3%	4.3%	4.3%
Debility*	0.3%	5.8%	0.2%	6.2%	0.2%	7.7%	0.2%	9.1%	0.2%	9.2%
Other**	13.7%	13.8%	13.5%	12.8%	14.0%	11.3%	15.2%	11.4%	15.4%	11.5%

Percentages may not total 100 percent due to rounding.

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Medicare Payment Advisory Commission (Report to the Congress). Medicare Payment Policy. March 2012.

¹ Represents data taken from January through June 2009.

*Defined by the presence of the following ICD-9 codes: 728.2, 728.9, 780.71, 780.79. Due to the difficulty in consistently defining debility using administrative claims across settings, this definition underestimates this patient population, potentially impacting the proportion of patients across all conditions.

**Dobson | DaVanzo column: includes amputation, major multiple trauma, pain syndrome, major medical complexity, pulmonary disorders, rheumatoid arthritis, burns, congenital deformities, and developmental disorders. MedPAC: includes amputations, major multiple trauma, and pain syndrome, but possibly may include additional categories that are not explicitly identified.

This report focuses on the time period immediately following the implementation of the 60 Percent Rule (2005 and 2009). However, distribution of clinical condition categories both within and across PAC settings continues to change following the Rule. MedPAC has continued to track the distribution of clinical condition categories through the first six months of 2013 (Exhibit 3.5). The relative proportion of the three largest clinical condition categories (stroke, hip fracture, and hip/knee replacement) continued to change in proportion from 45.9 percent of total IRF admissions in 2010 to 40.8 percent in 2013. All three condition categories have demonstrated decreases in their proportion of IRF admissions between 2010 and 2013, despite the trends evidenced between 2005 and 2009.

Of these three conditions, hip/knee replacement was the only clinical condition category that decreased in proportion from 2005 through 2009. This trend continued from 2010 through 2013 (from 11.5 percent to 8.8 percent).

Cross-Sectional Analysis Results

The proportion of patients treated for hip fractures and strokes declined from 2010 through 2013, despite the increase in the proportions of these condition categories from 2005 through 2009.

Exhibit 3.5: MedPAC Analysis of Most Common IRF Cases (2010-2013)

Clinical Condition Category	2010	2011	2012	2013 ¹	Percentage Point Change (2010-2013)
Stroke	20.1%	19.6%	19.4%	19.4%	-0.7%
Hip Fracture	14.3%	13.8%	13.0%	12.6%	-1.7%
Hip/Knee Replacement	11.5%	10.7%	10.1%	8.8%	-2.7%
Neurological Disorders	9.8%	10.3%	11.6%	12.5%	2.7%
Brain Injury	7.3%	7.6%	7.9%	8.1%	0.8%
Other Orthopedic	6.7%	7.1%	7.5%	7.6%	0.9%
Cardiac Conditions	4.9%	5.1%	5.3%	5.4%	0.5%
Spinal Cord Injury	4.3%	4.5%	4.6%	4.5%	0.2%
Debility	10.0%	10.3%	10.0%	10.3%	0.3%
Other*	11.1%	10.9%	10.6%	10.7%	-0.4%

Percentages may not total 100 percent due to rounding.

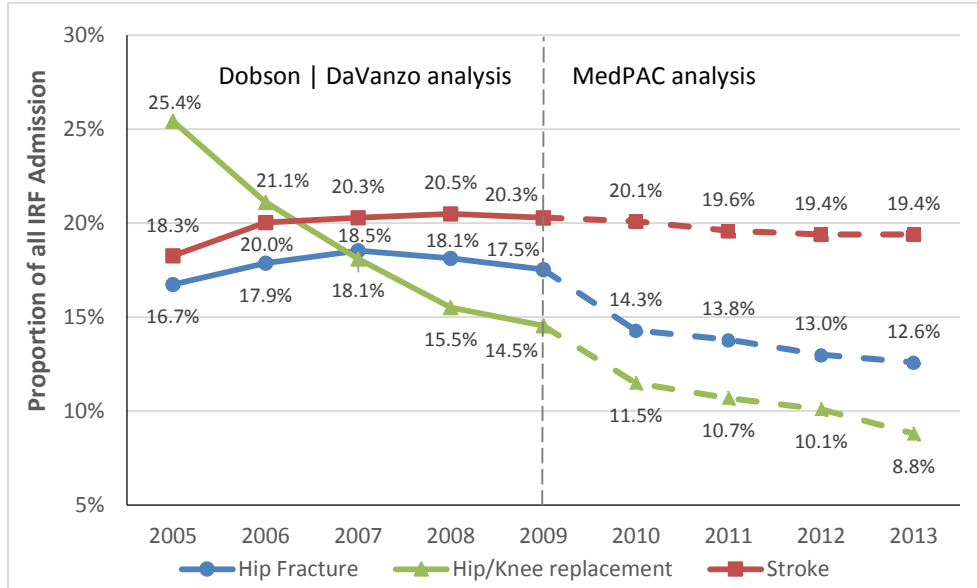
Source: Medicare Payment Advisory Commission (Report to the Congress). Medicare Payment Policy. March 2014.

*Includes conditions such as: amputations, MMT, and pain syndrome.

For illustrative purposes, we combine our cross-sectional results of 2005 through 2009 IRF data for hip/knee replacement, stroke, and hip fracture cases with MedPAC's analyses of the same conditions from 2010 through 2013 (Exhibit 3.6). Despite our results being approximately two percentage points above MedPAC's results for hip fractures and hip/knee replacements due to methodological differences, this graph shows the general trends of these conditions through 2013.

Cross-Sectional Analysis Results

Exhibit 3.6: Change in Distribution of Clinical Condition Categories among IRFs – Dobson | DaVanzo (2005-2009) and MedPAC (2010-2013) Estimates for Select Conditions



Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Medicare Payment Advisory Commission (Report to the Congress). Medicare Payment Policy. March 2014.

Note: MedPAC estimates for hip fractures and hip/knee replacements are generally lower than Dobson | DaVanzo's estimates by about two percentage points due to methodology differences. Therefore, a portion of the decrease between 2009 and 2010 may not reflect true decreases in volume in these conditions.

Comparison of the Distribution of IRF Clinical Condition Categories by Geographic Region

To determine if the overall IRF provider response to the 60 Percent Rule was a national trend or driven by select geographic regions, we examined the distribution of IRF conditions by the four census regions: Northeast, South, Midwest, and West. Detailed results of this analysis are presented in Appendix B. These data show that the relative proportion of IRF patients by clinical condition category across census regions reflect the nationwide distribution for each study year. In each region, hip/knee replacement, stroke, and hip fracture conditions represented the greatest relative proportion of IRF cases. The marked decline in the proportion of hip/knee replacements is also observed across census regions, although this change appears somewhat less pronounced in the Northeast (a reduction in proportion of 6.5 percent) compared to the Midwest, South, and West, with a reduction in proportions of 11.5 percent, 12.6 percent, and 11.6 percent, respectively.

Cross-Sectional Analysis Results

Cross-Sectional Analysis Summary and Discussion

Our analysis of the Medicare claims data following implementation of the 60 Percent Rule (2005 through 2009) shows the relative change in the distribution of clinical condition categories across settings. The most notable trend is the significant decrease in the relative proportion in the hip/knee replacement clinical condition category among IRFs, which is offset by smaller proportional increases in stroke, major medical complexity, neurological disorder, and brain injury in the same condition category among SNFs. Additionally, as the proportion decreases within IRFs, other condition categories show a modest relative increase from 2005 through 2009. Despite the relative decline in lower extremity joint replacement cases, the three most common conditions – hip/knee replacement, stroke, and hip fractures – continued to represent the majority of all IRF admissions during the study period.

In extending our analyses using MedPAC's published estimates, the results suggest that the trends evidenced from 2005 through 2009 continued through 2013. As noted above, the strongest evidence for patient shifting from IRFs to other PAC settings is seen among the hip/knee replacement clinical condition category. While our analysis and MedPAC's data appear to show declining volume of IRF hip fracture cases from 2007 through 2013, corresponding changes are not observed in other PAC settings.

Longitudinal Analysis

Results

The goal of our longitudinal analysis is to compare the long-term clinical outcomes and Medicare payments for patients who received rehabilitation services in the IRF to those who are clinically and demographically similar but received rehabilitation in the SNF. In this analysis, we compare the length of the initial rehabilitation stay of these two patient populations, but focus on the examination of longer-term outcomes during the two-year study period following discharge from the initial rehabilitation stay.

Differences in Length of Stay during the Initial Rehabilitation Stay

The focus of the longitudinal analysis is to compare selected patient outcomes and Medicare spending for the two-year study period after discharge from the initial rehabilitation stay (IRF versus SNF). However, the care that is provided during the initial rehabilitation stay positions the patient for the continued rehabilitation progress upon discharge. Exhibit 4.1 shows the average length of stay by clinical condition category for patients treated in an IRF as compared to a SNF. On average across all conditions, patients treated in an IRF have a length of stay that is less than half as long as those treated in a SNF (12.4 days for IRF patients compared to 26.4 days for SNF patients). The shorter average length of rehabilitation stay observed in this study is consistent with published literature that notes shorter average stays for IRF hip/knee replacement^{44,45,46} and hip fracture^{47,48}

⁴⁴ DeJong G, Tian W, Smout RJ, et al. Long-term outcomes of joint replacement rehabilitation patients discharged from skilled nursing and inpatient rehabilitation facilities. *Arch Phys Med Rehabil.* 2009; 90:1306-16.

⁴⁵ Tian W, DeJong G, Horn SD, et al. Efficient rehabilitation care for joint replacement patients: skilled nursing facility or inpatient rehabilitation facility? *Med Decis Making.* 2012; 32:176-87.

⁴⁶ Walsh MB, Herbold J. Outcome after rehabilitation for total joint replacement at IRF and SNF: A case controlled comparison. *Am J Phys Med Rehabil.* 2006; 85(1):1-5.

⁴⁷ Munin MC, Seligman K, Dew MA, et al. Effect of rehabilitation site on functional recovery after hip fracture. *Arch Phys Med Rehabil.* 2005; 86:367-72.

⁴⁸ Herbold JA, Bonistall K, Walsh MB. Rehabilitation following total knee replacement, total hip replacement, and hip fracture: A case-controlled comparison. *J Geriatr Phys Ther.* 2011; 34:155-60.

Longitudinal Analysis Results

patients than comparable SNF patients' stays. These investigators suggest that this two-week shorter length of stay (13.9 days; $p < 0.0001$) may be attributable to more intensive rehabilitation provided in IRFs compared to that provided in SNFs. The longer length of stay within the SNF may be due, in part, to per diem payments in addition to patient copayments commencing on day 21 of the SNF stay.

This trend is consistent within all clinical condition categories. The differences in the average length of stay ranges from 5.3 fewer days for IRF patients treated for hip/knee replacements to 23.1 fewer days for patients treated in IRFs for multiple medical complexity. These differences are statistically significant for every condition category.

Exhibit 4.1: Difference in Average Length of Stay for Initial IRF/SNF Rehabilitation
Stay: Matched IRF and SNF Patients

Clinical Condition Category			Difference	P-value
	IRF	SNF	(IRF minus SNF)	
Amputation	14.0	29.6	-15.7	<.0001
Brain Injury	13.7	30.7	-16.9	<.0001
Cardiac Disorder	11.2	23.1	-11.9	<.0001
Hip Fracture	13.3	32.7	-19.4	<.0001
Hip/Knee Replacement	9.3	14.7	-5.3	<.0001
Major Medical Complexity	12.0	24.9	-12.9	<.0001
Major Multiple Trauma	14.5	37.7	-23.1	<.0001
Neurological Disorders	13.0	32.2	-19.2	<.0001
Other Orthopedic	11.8	26.2	-14.3	<.0001
Pain Syndromes	10.7	25.2	-14.5	<.0001
Pulmonary Disorders	11.3	24.3	-13.0	<.0001
Spinal Cord Injuries	13.5	22.2	-8.7	<.0001
Stroke	15.5	32.1	-16.5	<.0001
Overall Average	12.4	26.4	-13.9	<.0001

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Differences in Clinical Outcomes during the Post-Rehabilitation Period

The longitudinal analysis primarily focuses on longer term patient outcomes for matched cohorts of clinically and demographically comparable IRF and SNF patients following discharge from the initial rehabilitation stay. Since results indicate that patients who are treated in an IRF are discharged nearly two weeks earlier than patients treated in a SNF, the post-rehabilitation period starts at different times in the patients' recovery. Generally, results suggest that patients treated in IRFs had better long-term clinical outcomes (over the two-year study period) on a series of validated outcome measures than those treated in SNFs following the implementation of the 60 Percent Rule.

Longitudinal Analysis Results

Mortality Rates and Additional Days Preserved

Risk of mortality and the additional days of life are two measures used to compare the long-term outcomes of patients treated in IRFs to clinically and demographically comparable patients treated in SNFs. As shown in Exhibit 4.2, patients who were treated in an IRF experienced a 7.9 percentage point lower mortality rate during the two-year study period than SNF patients ($p < 0.0001$). Again, the results are directionally consistent across all clinical condition categories, with significantly lower mortality rates among IRF patients than SNF patients.

The largest difference in mortality rates was among brain injury patients, in which 35.1 percent of patients died within two years after discharge from the IRF, while 50.7 percent of patients died after discharge from the SNF (a difference of 15.5 percentage points). As patients were matched based on demographics and clinical severity, the severity level of the patients was highly comparable.

Another large difference in mortality rates was among stroke patients, in which 34.2 percent of patients died within two years of discharge from the IRF, while 48.4 percent of patients died within discharge from the SNF (a difference of 14.3 percentage points).

Other conditions had smaller, yet significant differences in mortality rates, such as patients treated for hip/knee replacements, other orthopedic conditions, and major multiple trauma.

Exhibit 4.2: Mortality Rate across Two-Year Study Period: Matched IRF and SNF Patients

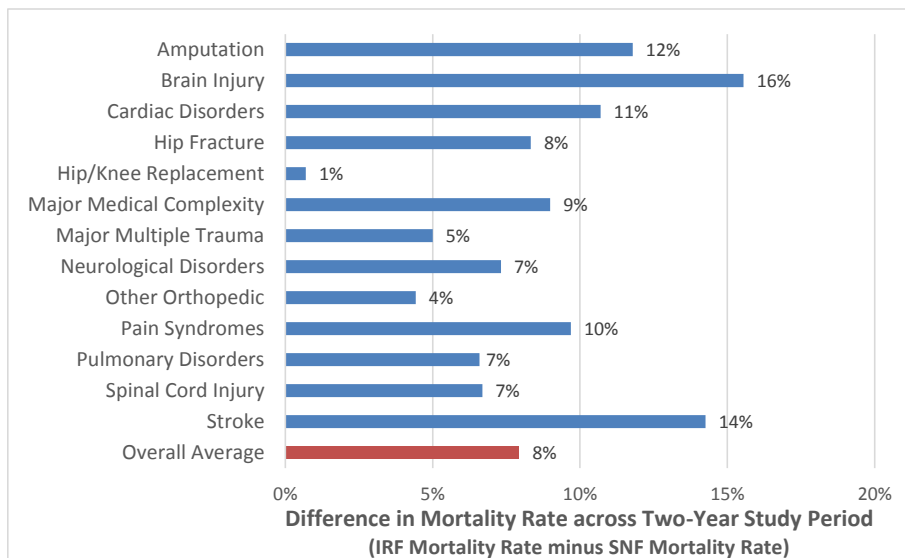
Clinical Condition Category	IRF	SNF	Difference (IRF minus SNF)	P value
Amputation	36.6%	48.4%	-11.8%	<0.0001
Brain Injury	35.1%	50.7%	-15.5%	<0.0001
Cardiac Disorder	34.1%	44.9%	-10.7%	<0.0001
Hip Fracture	25.4%	33.7%	-8.3%	<0.0001
Hip/Knee Replacement	5.2%	5.9%	-0.7%	0.0016
Major Medical Complexity	42.8%	51.8%	-9.0%	<0.0001
Major Multiple Trauma	19.1%	24.1%	-5.0%	0.0006
Neurological Disorders	32.3%	39.6%	-7.3%	<0.0001
Other Orthopedic	18.1%	22.6%	-4.4%	<0.0001
Pain Syndromes	19.8%	29.5%	-9.7%	<0.0001
Pulmonary Disorders	45.3%	51.9%	-6.6%	<0.0001
Spinal Cord Injuries	19.4%	26.1%	-6.7%	<0.0001
Stroke	34.2%	48.4%	-14.3%	<0.0001
Overall Average	24.3%	32.3%	-7.9%	<0.0001

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

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Overall, four conditions had a difference in mortality rate of more than 10 percentage points – amputations, brain injury, cardiac disorders, and stroke (Exhibit 4.3).

Exhibit 4.3: Percentage Point Difference in Mortality Rate* across Two-Year Study Period: Matched IRF and SNF Patients



Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

*All differences are statistically significant at $p < 0.001$.

Consistent with the reduced mortality rate of patients treated in an IRF, IRF patients survived nearly two months longer (51.9 days) than comparable patients treated in a SNF over the two-year period (Exhibit 4.4).⁴⁹ On average, IRF patients survive 621.0 days (about 20.7 months) after discharge from the initial rehabilitation stay while SNF patients survive 569.1 days (18.9 months).

It is important to note that this analysis only compares the number of days alive during the two-year study period. Therefore, if the study period were to be extended, the differences between the settings could change. This was an important outcome measure to compare, as a large average difference in the number of days alive between the settings may indicate a systematic difference in the timing of the patients' death (i.e., death later, as opposed to earlier, in the study period).

The results are directionally consistent for each clinical condition category, but values vary significantly. By clinical condition category, IRF patients treated for hip/knee replacements are alive an average of 3.9 days longer than SNF patients, while IRF

⁴⁹ This algorithm calculates the average days alive for each patient (including those who survived the entire episode), then calculates an average within each clinical condition category.

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patients treated for strokes are alive an average of 96.8 days longer than SNF patients during the two-year study period. The results across all clinical condition categories are significant ($p < 0.001$).

Exhibit 4.4: Average Days Alive Following Discharge from Initial Rehabilitation Stay: Matched IRF and SNF Patients

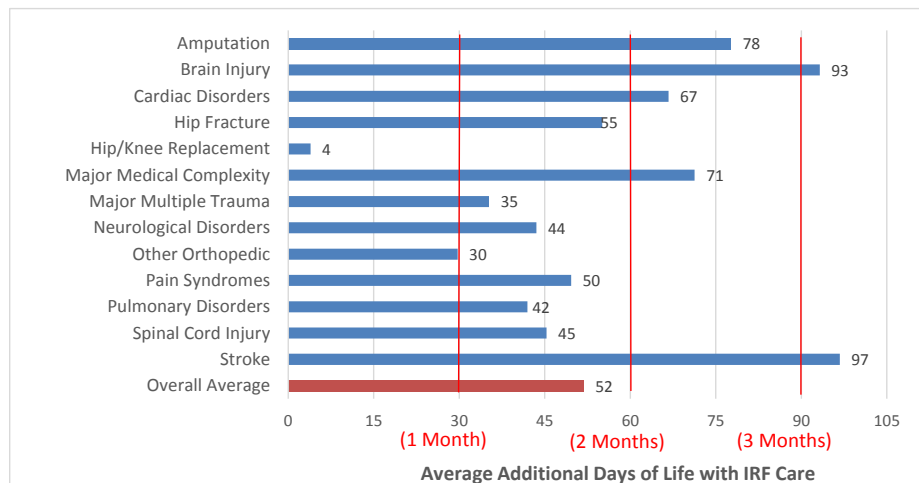
Clinical Condition Category	IRF	SNF	Difference (IRF minus SNF)	P value
Amputation	562.9	485.3	77.7	<.0001
Brain Injury	561.5	468.3	93.2	<.0001
Cardiac Disorder	568.4	501.7	66.7	<.0001
Hip Fracture	622.4	567.3	55.1	<.0001
Hip/Knee Replacement	712.2	708.3	3.9	<.0001
Major Medical Complexity	527.0	455.7	71.3	<.0001
Major Multiple Trauma	648.5	613.2	35.2	0.0036
Neurological Disorders	585.6	542.1	43.5	<.0001
Other Orthopedic	653.0	623.3	29.7	<.0001
Pain Syndromes	646.4	596.8	49.6	<.0001
Pulmonary Disorders	515.0	473.0	42.0	<.0001
Spinal Cord Injuries	637.8	592.5	45.3	<.0001
Stroke	572.2	475.5	96.8	<.0001
Overall Average	621.0	569.1	51.9	<.0001

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Patients treated in IRFs for two clinical condition categories – brain injury and stroke – stayed alive more than three months longer on average than those treated in SNFs (Exhibit 4.5). Patients treated in IRFs for three additional clinical condition categories – amputations, cardiac disorders, and major medical complexity – stay alive over two months longer on average than those treated in SNFs.

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Exhibit 4.5: Average Additional Days of Life when Receiving IRF Care: Matched IRF and SNF Patients



Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Ability to Remain at Home

One measure used to determine the long-term impact of the rehabilitative care was the length of time patients were able to reside in their homes without facility-based care. Over the two-year study period, IRF patients who were clinically comparable to SNF patients remained home, on average, almost two months longer (51.5 days) than patients treated in SNFs (Exhibit 4.6). Days at home represent the average number of days per patient not spent in a hospital, IRF, SNF, or LTCH over a two-year episode.⁵⁰ These days may not necessarily be continuous; rather, they are the average total number of days throughout the episode. On average, IRF patients remained at home 582.3 days (about 19.4 months), while SNF patients remained at home 530.8 days (about 17.6 months).

While all clinical condition categories showed directionally the same results – patients treated in the IRFs had more days at home – the range of days and statistical significance varied. For three clinical condition categories – amputations, brain injury, and stroke – IRF patients remained at home on average three months (90.8 days) longer than SNF patients ($p < 0.0001$). For several conditions – hip/knee replacements, major multiple trauma, and other orthopedic conditions – the difference in the number of days at home was not statistically significant.

However, as discussed in the Methodology section, the claims data used in these analyses only contain services covered by fee-for-service Medicare. Therefore, Medicaid services,

⁵⁰ This algorithm factors in patient death, in that the number of days at home is calculated for each patient based on the number of days alive within the two-year episode, then averaged across all patients within the clinical condition category.

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such as nursing home services, are not considered in the calculation of facility-based care days. To the extent that SNF patients convert and receive nursing home services, the number of days a patient remained at home may be overestimated for the patients.

Exhibit 4.6: Difference in Number of Days at Home:* Matched IRF and SNF Patients

Clinical Condition Category	Difference			P value
	IRF	SNF	(IRF minus SNF)	
Amputation	510.6	425.2	85.4	<.0001
Brain Injury	517.0	422.0	95.0	<.0001
Cardiac Disorder	529.5	457.4	72.1	<.0001
Hip Fracture	581.2	528.4	52.8	<.0001
Hip/Knee Replacement	698.0	693.9	4.1	0.5188
Major Medical Complexity	478.7	405.9	72.8	<.0001
Major Multiple Trauma	611.2	576.4	34.8	0.0626
Neurological Disorders	533.0	487.6	45.4	<.0001
Other Orthopedic	616.3	587.5	28.8	0.0707
Pain Syndromes	602.9	546.0	56.9	<.0001
Pulmonary Disorders	464.0	416.2	47.7	<.0001
Spinal Cord Injuries	597.9	556.8	41.0	<.0001
Stroke	518.4	426.4	92.0	<.0001
Overall Average	582.3	530.8	51.5	<.0001

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

*Days in the home represents the average number of days per patient over two-year episode not spent in a hospital, IRF, SNF, or LTCH.

When factoring in the average days alive by condition for the two patient cohorts, results suggest that patients treated in both settings have comparable use of facility-based care and the additional days at home is a function of remaining alive a larger portion of the two-year study period. As shown in Exhibit 4.4, patients treated in IRFs are alive 621.0 days, of which 582.3 days are spent at home (Exhibit 4.6). Therefore, on average, IRF patients reside in facility-based care 38.7 days over their post-rehabilitation episode. Similarly, patients treated in SNFs are alive 569.1 days, of which 530.8 days are spent at home. Therefore, these patients are in facility-based care for about 38.3 days.

The average difference in the number of facility-based care days varies by clinical condition category (data not shown). For example, patients treated for an amputation in an IRF have about 52.3 facility-based care days, compared to 60.0 facility-based care days for patients treated in a SNF. On the other hand, patients treated for spinal cord injuries or stroke in the IRF have slightly more facility-based care days over the two-year study period than patients treated in a SNF (4.3 and 4.7 more facility-based care days, respectively).

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Emergency Room and Readmission Rates

Emergency room (ER) and readmission rates are sometimes used as a proxy for unsuccessful patient recovery. The rate of emergency room visits per 1,000 patients per year was compared for matched patients treated in IRFs and SNFs. Across all clinical condition categories, IRF patients experienced 642.7 emergency visits per 1,000 patients per year (Exhibit 4.7). That is, about 64 percent of IRF patients visited the ER each year during the two years following their initial rehabilitation stay. SNF patients averaged 688.2 ER visits per 1,000 patients per year – or about 69 percent of SNF patients visiting an ER each year during the study window. These results indicate that, on average, patients treated in an IRF experienced 4.5 percent fewer ER visits per year (or avoided 45.5 visits per 1,000 patients per year) than SNF patients ($p < 0.0001$).

We note that ER visits captured in this analysis do not result in hospital admissions. Therefore, these are outpatient visits for acute issues or trauma. The presence of ER visits is not unexpected among rehabilitation patients, as ER visits due to falls or injury may be an indicator of greater patient ambulation.

Exhibit 4.7: Number of ER Visits per 1,000 Patients per Year: Matched IRF and SNF Patients

Clinical Condition Category			Difference	
	IRF	SNF	(IRF minus SNF)	P value
Amputation	861.3	1016.7	-155.4	0.0473
Brain Injury	782.0	825.9	-43.9	0.0024
Cardiac Disorder	753.6	807.0	-53.3	0.1268
Hip Fracture	576.5	613.3	-36.8	0.1247
Hip/Knee Replacement	413.1	432.3	-19.3	0.3124
Major Medical Complexity	796.2	872.3	-76.1	0.1094
Major Multiple Trauma	680.4	643.6	36.8	0.6101
Neurological Disorders	772.0	868.9	-96.9	0.8629
Other Orthopedic	609.3	645.8	-36.6	0.8490
Pain Syndromes	745.0	836.6	-91.6	0.0687
Pulmonary Disorders	881.7	966.3	-84.6	0.1255
Spinal Cord Injuries	621.3	701.6	-80.3	0.0051
Stroke	785.9	823.0	-37.1	<.0001
Overall Average	642.7	688.2	-45.5	<.0001

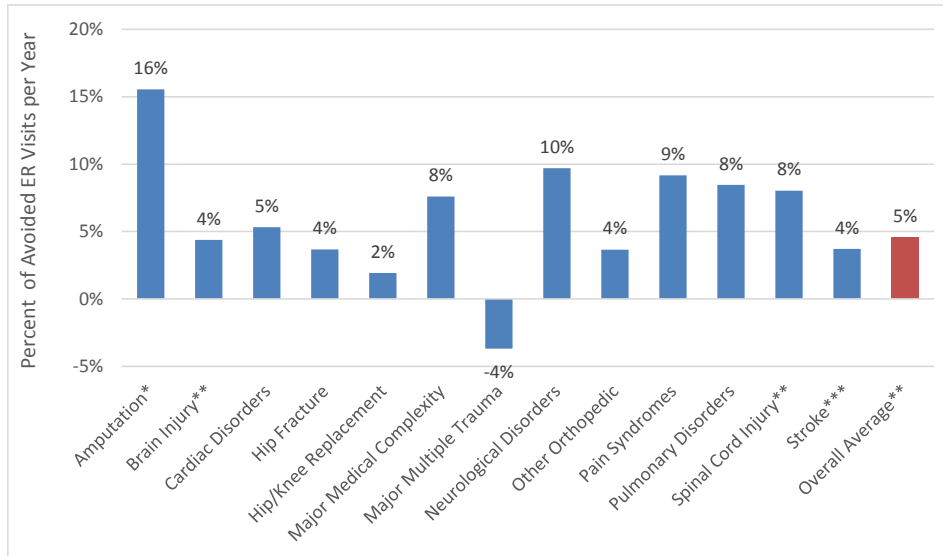
Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

While the overall difference in the number of ER visits per 1,000 patients per year is statistically significant, indicating that IRF patient experience fewer ER visits per year, the results and statistical significance by clinical condition category is varied (Exhibit 4.8). IRF patients have statistically lower ER rates for four conditions – amputation, brain injury,

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spinal cord injury, and stroke ($p < 0.05$). IRF patients treated for major multiple trauma appear to have higher rates of ER visits, but the difference is not statistically significant.

Exhibit 4.8: Average Percent Difference in Number of ER Visits per Year: Matched IRF and SNF Patients



Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

* = Differences are statistically significant at p -value < 0.05 ; ** = Differences are statistically significant at p -value < 0.01 ; *** = Differences are statistically significant at p -value < 0.0001

A hospital readmission indicates a severe or sudden change in a patient’s medical stability. While there is no significant difference in the overall hospital readmission rate of patients treated in IRFs compared to SNFs across all conditions (957.7 readmissions per 1,000 patients per year for IRF patients compared to 1,008.1 readmissions per 1,000 patients per year for SNF patients), there are several clinical condition categories that have a significant difference in the hospital readmission rate (Exhibit 4.9).

For five of the 13 conditions, IRF patients experienced significantly fewer hospital readmissions per year than SNF patients – amputation, brain injury, hip fracture, major medical complexity, and pain syndrome (Exhibit 4.10). Patients treated for amputations had the largest difference in hospital readmission rates with IRF patients experiencing 428.3 (or about 43 percent) fewer readmissions per 1,000 patients per year than patients treated in SNFs ($p < 0.0001$). Patients treated for pain syndrome in IRFs also had a 10.6 percent lower rate of readmissions per 1,000 patients per year than patients treated in SNFs (a difference of 106.9 readmissions per 1,000 patients per year; $p < 0.01$).

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Patients treated for neurological disorders and pulmonary disorders in IRFs experienced significantly higher hospital readmissions than patients treated in the SNFs ($p < 0.01$).

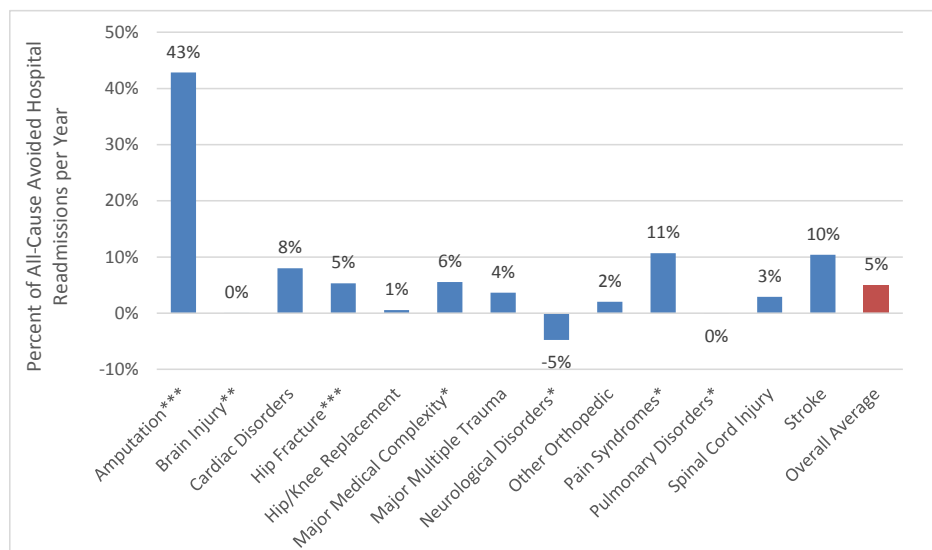
Exhibit 4.9: Number of Hospital Readmissions per 1,000 Patients per Year: Matched IRF and SNF Patients

Clinical Condition Category	IRF	SNF	Difference (IRF minus SNF)	P value
Amputation	1538.3	1966.6	-428.3	<.0001
Brain Injury	1094.4	1094.7	-0.3	0.0009
Cardiac Disorder	1351.5	1431.6	-80.1	0.5519
Hip Fracture	838.1	891.1	-53.1	<.0001
Hip/Knee Replacement	499.9	505.2	-5.4	0.0775
Major Medical Complexity	1587.4	1643.1	-55.7	0.0017
Major Multiple Trauma	778.9	815.5	-36.6	0.3360
Neurological Disorders	1234.8	1187.0	47.8	0.0041
Other Orthopedic	866.0	886.4	-20.5	0.9868
Pain Syndromes	1034.8	1141.7	-106.9	0.0053
Pulmonary Disorders	1798.8	1797.6	1.2	0.0058
Spinal Cord Injuries	904.5	933.6	-29.1	0.8471
Stroke	1123.1	1227.1	-104.1	0.9040
Overall Average	957.7	1008.1	-50.4	0.8931

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

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Exhibit 4.10: Average Percent Difference in Number of Hospital Readmissions per Year: Matched IRF and SNF Patients



Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

* = Differences are statistically significant at p-value < 0.01; ** = Differences are statistically significant at p-value < 0.001; *** = Differences are statistically significant at p-value < 0.0001

Differences in Medicare Payment during the Initial Rehabilitation Stay

In addition to comparing the clinical outcomes of patients treated in an IRF to those treated in a SNF, we compared the Medicare payments on a PMPM basis for the initial rehabilitation stay and the two-year post-rehabilitation period. The care settings included in the PMPM Medicare payments are: inpatient hospital; outpatient hospital; IRF; SNF; HHA; and LTCH.

Despite the shorter length of stay for the initial rehabilitation stay in an IRF compared to a SNF, the Medicare payments are significantly different. Across all clinical condition categories, Medicare payment for patients treated in an IRF is, on average, about \$5,975 higher than the payment for patients treated in a SNF ($p < 0.0001$) (Exhibit 4.11). This difference in payment could be due to differences in treatment protocols, clinician staffing, and intensity of rehabilitation services. However, it is possible that the intensity of services provided during the rehabilitation stay leads to the significantly better patient outcomes observed in this study.

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Exhibit 4.11: Average Medicare Payment for Initial Rehabilitation Stay: Matched IRF and SNF Patients

Clinical Condition Category	Difference			P value
	IRF	SNF	(IRF minus SNF)	
Amputation	\$17,387	\$9,051	\$8,335	<.0001
Brain Injury	\$17,390	\$9,012	\$8,378	<.0001
Cardiac Disorder	\$13,627	\$7,568	\$6,059	<.0001
Hip Fracture	\$15,183	\$11,019	\$4,164	<.0001
Hip/Knee Replacement	\$10,716	\$6,056	\$4,660	<.0001
Major Medical Complexity	\$14,951	\$7,802	\$7,150	<.0001
Major Multiple Trauma	\$16,805	\$12,279	\$4,527	<.0001
Neurological Disorders	\$15,423	\$9,707	\$5,716	<.0001
Other Orthopedic	\$13,619	\$9,034	\$4,585	<.0001
Pain Syndromes	\$12,522	\$8,047	\$4,475	<.0001
Pulmonary Disorders	\$14,763	\$7,400	\$7,363	<.0001
Spinal Cord Injuries	\$16,802	\$7,660	\$9,142	<.0001
Stroke	\$19,149	\$10,482	\$8,667	<.0001
Overall Average	\$14,836	\$8,861	\$5,975	<.0001

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Differences in Medicare Payment during the Post-Rehabilitation Period

Exhibit 4.12 shows the average PMPM Medicare payment for patients treated in both settings by clinical condition category. While patients treated in an IRF generally have higher PMPM Medicare payments than patients treated in a SNF, the magnitude of the difference and its statistical significance varies by clinical condition category. For example, patients treated for hip/knee replacements have very similar PMPM Medicare payments, with a difference of \$43 per month, which is not statistically significant. This suggests that hip/knee replacement patients treated in an IRF have comparable Medicare payments for the two years following the initial rehabilitation stay, and are still able to achieve better clinical outcomes, as described above. However, the difference in PMPM Medicare payment for patients treated for brain injury is greater (\$234 PMPM) and is statistically significant. It should be noted that we did find that patients treated for brain injury in an IRF had better outcomes on all measures analyzed than patients treated in SNFs, including lower risk of mortality, more days at home, and fewer ER visits and hospital readmissions.

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**Exhibit 4.12: Average Medicare Payment PMPM for Post-Rehabilitation Period:
Matched IRF and SNF Patients**

Clinical Condition Category	Difference			P value
	IRF	SNF	(IRF minus SNF)	
Amputation	\$3,313	\$3,693	-\$380	0.0114
Brain Injury	\$2,199	\$1,965	\$234	<.0001
Cardiac Disorder	\$2,162	\$2,186	-\$24	0.1889
Hip Fracture	\$1,679	\$1,598	\$80	<.0001
Hip/Knee Replacement	\$887	\$844	\$43	0.3236
Major Medical Complexity	\$2,847	\$2,696	\$151	<.0001
Major Multiple Trauma	\$1,609	\$1,509	\$101	0.0484
Neurological Disorders	\$2,401	\$2,102	\$299	<.0001
Other Orthopedic	\$1,639	\$1,578	\$61	0.0072
Pain Syndromes	\$1,794	\$1,868	-\$74	0.0247
Pulmonary Disorders	\$2,918	\$2,649	\$269	<.0001
Spinal Cord Injuries	\$1,848	\$1,644	\$204	0.0037
Stroke	\$2,227	\$2,162	\$65	<.0001
Overall Average	\$1,815	\$1,736	\$79	N/A*

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

* Calculated as weighted average across all conditions based on volume (number of matched pairs). Therefore, significance of the difference is not available.

Two additional analyses were conducted to better explain the difference in the PMPM Medicare payments between the two patient cohorts. First, we compared the distribution of PMPM Medicare payments by site of service to determine if the differences in total PMPM payments could be attributed to different utilization patterns (using more or fewer services) or different treatment protocols (using different services). Second, we compared the PMPM Medicare payments over time to see if there are systematic changes in care during the post-rehabilitation period.

The results of the first analysis suggested that patients treated in IRFs consistently used more home health care than the clinically and demographically similar matched patients treated in SNFs. The difference in HHA PMPM payments ranged from \$12 more PMPM for hip/knee replacement patients treated in IRFs to \$127 more PMPM for neurological disorder patients treated in IRFs ($p < 0.0001$). It is interesting to note that patients treated in a SNF consistently had higher use of hospice services, ranging from \$4 more PMPM payments for hip/knee replacement patients ($p < 0.001$) to \$99 more PMPM payments for brain injury patients ($p < 0.0001$). Trends in utilization of care across the other settings varied by clinical condition.

Results of the second analysis indicated that after the first month following discharge from the initial rehabilitation stay, the average PMPM payment by month for each patient cohort

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(within each clinical condition category) was comparable. That is, in the month following discharge from the IRF or SNF, the average Medicare payment per month is consistent across patient groups. The driver of the difference in overall PMPM Medicare payments is due to the increased services IRF patients receive immediately (within one month) upon discharge from the initial rehabilitation stay.

Average Medicare Payment per Day

With differences in the average length of stay during the initial rehabilitation stay and the average days alive during the post-rehabilitation period between IRF and SNF patients, we calculated the average difference in Medicare payment per day for the entire episode of care (initial rehabilitation stay plus the post-rehabilitation period). Across all clinical condition categories, patients treated in an IRF experience their significantly improved patient outcomes at an additional cost to Medicare of \$12.59 per day while patients are alive over the two-year study window. That is, IRF patients have an average Medicare payment per day of \$82.65, compared to \$70.06 for patients treated in SNFs (Exhibit 4.13). The average Medicare payment per day is calculated for each individual patient, then averaged across all patients within a clinical condition category. The overall average is calculated as the weighted average payment across all clinical condition categories.

Exhibit 4.13: Average Medicare Payment per Day for Initial Rehabilitation Stay and Post-Rehabilitation Period: Matched IRF and SNF Patients

Clinical Condition Category	Difference			P value
	IRF	SNF	(IRF minus SNF)	
Amputation	\$137.27	\$133.53	\$3.74	0.1732
Brain Injury	\$101.36	\$79.50	\$21.86	<.0001
Cardiac Disorder	\$93.75	\$83.92	\$9.83	0.0683
Hip Fracture	\$78.17	\$68.40	\$9.77	<.0001
Hip/Knee Replacement	\$43.64	\$35.55	\$8.09	<.0001
Major Medical Complexity	\$120.27	\$101.52	\$18.75	<.0001
Major Multiple Trauma	\$77.26	\$65.78	\$11.48	<.0001
Neurological Disorders	\$103.51	\$82.74	\$20.77	<.0001
Other Orthopedic	\$73.57	\$63.88	\$9.69	<.0001
Pain Syndromes	\$77.26	\$72.22	\$5.04	0.4849
Pulmonary Disorders	\$123.05	\$98.82	\$24.23	<.0001
Spinal Cord Injuries	\$85.49	\$64.83	\$20.66	<.0001
Stroke	\$104.41	\$88.08	\$16.33	0.0008
Overall Average	\$82.65	\$70.06	\$12.59	<.0001

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

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The difference in the average Medicare payment per day varies greatly across conditions. Patients treated for an amputation or pain syndromes in an IRF have an additional cost to Medicare of \$3.74 and \$5.04 per day, respectively, which are not statistically significant. However, patients treated in IRFs for pulmonary disorders have an average additional Medicare payment of \$24.23 per day, which is significant ($p < 0.0001$) (Exhibit 4.14).

Exhibit 4.14: Average Additional Medicare Payment per Day for IRF Care Compared to SNF Care: Matched IRF and SNF Patients



Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

* = Differences are statistically significant at p -value < 0.001

Longitudinal Analysis Summary and Discussion

The results of this longitudinal study suggest that when patients are matched on demographic and clinical characteristics, rehabilitation in IRFs leads to lower mortality, longer life, fewer ER visits and, in some instances, fewer readmissions than rehabilitation in SNFs for the same condition. However, these improved patient outcomes are often associated with statistically greater PMPM or per-day costs to Medicare. The literature and regulations indicate that the care delivered in an IRF is not the same as care delivered in a SNF. Our results suggest that different PAC settings affect patient outcomes.

Exhibit 4.15 summarizes the differences in outcomes for two key clinical condition categories - stroke and cardiac, as well as all conditions overall. Patients with cardiac conditions were discharged significantly sooner from IRFs than patients treated in SNFs (11.9 days earlier). During the post-rehabilitation period, the IRF patients have significantly lower mortality rates, survive their episode longer, and remain in the home longer. While the Medicare payment for their initial rehabilitation stay is higher than

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comparable patients treated in a SNF, there is no significant difference in the average PMPM payment during the post-rehabilitation period. Furthermore, in considering the total payment for the initial rehabilitation stay and post-rehabilitation period, there is no significant difference in the Medicare payment per day. Together, these results suggest that patients treated in the SNF (as opposed to the IRF) are likely to experience worse clinical outcomes at a comparable cost to Medicare.

Stroke patients treated in IRFs are also discharged significantly sooner than patients treated in SNFs (16.5 days earlier). During the post-rehabilitation period, these patients have lower mortality rates, remain in the home longer, and have significantly fewer ER visits. While the Medicare payment for their initial rehabilitation stay and post-rehabilitation period are higher than comparable patients treated in a SNF, these outcomes can be achieved with an additional cost to Medicare of \$16.33 per day (over the two-year study period while alive) ($p < 0.001$).

Exhibit 4.15: Difference in Outcomes for Patients Treated in IRFs as Compared to SNFs during Two-Year Study Period – Cardiac Conditions, Stroke, and Overall Average (All Conditions)

Difference in Patient Outcomes (Compared to SNF Patients)	IRF Patients had:	Cardiac		Overall	
		Conditions	Stroke	Average	
Discharge from Initial Rehabilitation Stay		11.9**	16.5**	13.9**	days earlier discharge
Mortality Rate		10.7%**	14.3%**	7.9%**	lower mortality
Additional Days Alive		66.7**	96.8**	51.9**	additional days alive
Additional Days at Home		72.1**	92.0**	51.5**	additional days at home
ER Visits per 1,000 beneficiaries per Year		5.3%	3.7%**	4.5%**	fewer ER visits
Hospital Readmissions per 1,000 beneficiaries per Year		8.0%	10.4%	5.0%	fewer readmissions
Medicare Payment during Initial Rehabilitation Stay for IRF Care		\$6,059**	\$8,335**	\$5,975**	higher Medicare payment
Medicare PMPM Payment during Post-Rehabilitation Period for IRF Care		-\$24	\$65**	\$79	higher Medicare payment PMPM
Medicare Payment per Day for IRF Care (Initial Rehabilitation Plus Post-Rehabilitation)		\$9.83	\$16.33*	\$12.59**	higher Medicare payment per day

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

* = Differences are statistically significance at $p < 0.001$; ** = Differences are statistically significance at $p < 0.0001$.

Discussion

One purpose of this research was to determine how the distribution of clinical condition categories changed within and across PAC settings following the implementation of the 60 Percent Rule. Once these trends had been identified, we examined the long-term impact on patient outcomes for receiving rehabilitative care in SNFs as opposed to IRFs for a variety of clinical condition categories. This study serves as the most comprehensive national analysis to date examining the long-term clinical outcomes of clinically similar patient populations treated in IRFs and SNFs, utilizing a sample size of more than 100,000 matched pairs drawn from Medicare administrative claims.

The implementation of the 60 Percent Rule led to an overall decrease in the number of patients treated in IRFs.⁵¹ This impact is consistent with policymakers' goal of redirecting lower severity patients receiving rehabilitation in IRFs into lower cost setting such as SNFs and HHAs.⁵² While the proportion of patients treated in IRFs for hip/knee replacements showed the most significant change (a decrease from 25.4 percent of all IRF patients in 2005 to 14.5 percent in 2009), the distribution of other conditions changed as well.

The long-term impact on Medicare beneficiaries for such policies must be considered. Providing rehabilitation in an IRF is generally associated with higher Medicare payments than providing rehabilitation for a comparable patient in a SNF, likely due to differences in cost structures, staffing arrangements, and treatment protocols. However, policies that may incentivize patients to receive care in SNFs as opposed to IRFs may have unintended consequences.

When patients are matched on demographic and clinical characteristics, rehabilitation in IRFs leads to lower mortality, fewer readmissions and ER visits, and more days at home (not in a hospital, IRF, SNF, or LTCH) than rehabilitation in SNFs for the same condition.

This suggests that the care delivered in an IRF is not the same as care delivered in a SNF.

Our results suggest that different PAC settings affect patient outcomes.

⁵¹ Utilization Trends in Inpatient Rehabilitation: Update Through Q2: 2011. (2011). The Moran Company.

⁵² Medicare Payment Advisory Commission (Report to the Congress). Medicare Payment Policy. March 2014.

This study demonstrated that for many clinical condition categories, patients treated in IRFs experienced improved patient outcomes including but not limited to lower risk of mortality, more days at home, and lower ER visits and readmission rates. Furthermore, patients with some of these conditions are able to experience these superior outcomes without a negative impact on Medicare payments (considering the Medicare cost for the initial rehabilitation stay and two-year post-rehabilitation period). Therefore, patients redirected from the IRF to the SNF in an attempt to reduce Medicare payments for the initial rehabilitation stay may suffer diminished patient outcomes that impact their quality of life and, in some cases, with comparable long-term Medicare payments.

Through rigorous propensity score matching techniques, patient demographic and clinical characteristics were controlled in order to isolate the impact of the setting in which the patient received care – an IRF or a SNF. There is a notable difference in medical rehabilitation care practices between the two settings.⁵³ Treatment provided in IRFs is under the direction of a physician and specialized nursing staff.⁵⁴ On the other hand, SNFs exhibit greater diversity in practice patterns and lower intensity rehabilitation.⁵⁵

MedPAC and other policymakers are currently considering payment policies that could greatly impact the site of service in which Medicare beneficiaries receive rehabilitation. For instance, under the site-neutral payment policy, Medicare would reimburse IRFs and SNFs the same payment rate for patients treated for strokes, hip fractures, and hip/knee replacements. In the 2014 IRF-PPS Final Rule, CMS noted that “the 13 medical conditions that are listed in [the 60 Percent Rule] are conditions that “typically” require the level of intensive rehabilitation that provide the basis of need to differentiate the services offered in IRFs from those offered in other care settings.”⁵⁶ Despite the acknowledgement that medical rehabilitative services differ in SNFs and IRFs, stroke is included in the site-neutral payment proposals and is one of the 13 conditions within the 60 Percent Rule. Therefore, based on the results of our analyses, stroke patients treated in SNFs as opposed to IRFs could be harmed. Furthermore, across other clinical conditions, a “pure” site-neutral payment might not adequately compensate IRF providers for certain cases and may contribute the shifting of patients into SNF. (Some proposals, however, provide higher payments to IRFs based on IRF-SNF cost differences).

While our analysis focuses on the immediate implementation of the 60 Percent Rule (2005 through 2009), MedPAC suggests that these trends have continued through 2013, and literature suggests that the outcomes are different between IRFs and SNFs for select

⁵³ Keith RA. Treatment strength in rehabilitation. *Arch Phys Med Rehabil.* 1997; 90:1269-83.

⁵⁴ Harvey RL. Inpatient rehab facilities benefit post-stroke care. *Manag Care.* 2010; 19(1):39-41.

⁵⁵ DeJong G, Hsieh C, Gassaway J, et al. Characterizing rehabilitation services for patients with knee and hip replacement in skilled nursing facilities and inpatient rehabilitation facilities. *Arch Phys Med Rehabil.* 2009; 90:1269-83.

⁵⁶ 2014 IRF-PPS Final Rule, Federal Register, Volume 78, pg 47844.

Discussion

conditions. Therefore, if our longitudinal results are indicative of the current disparity in clinical outcomes between SNFs and IRFs, payment reforms that lead to shifting sites of services for Medicare beneficiaries could adversely and quite significantly affect Medicare beneficiaries' health outcomes.

Appendix A: Algorithms to Define Clinical Condition Categories

Exhibit A-1: Algorithms for Identifying Clinical Condition Categories across All PAC Settings

Clinical Condition Category	Criteria	ICD-9
Stroke	Presence of Stroke (ICD-9s)	430, 431, 432.0-432.9, 433.x1, 434.x1, 436
	or Effects of Stroke (ICD-9s)	438.0-438.9 (late effects of cerebrovascular disease)
Congenital Deformities	Presence of Congenital Deformities (ICD-9s)	741.00-741.03, 741.90-741.93, 728.3, 742.0-742.8, 754.1-754.89, 755.0-755.9, 756.0-756.9
Spinal Cord Injury	Presence of Spinal Cord Injury (ICD-9s)	0.150, 170.2, 192.2-192.3, 198.3, 198.4, 225.3, 225.4, 237.5, 237.6, 239.7, 323.9, 324.1, 441.00-441.03, 441.1, 441.3, 441.5, 441.6, 721.1, 721.41, 721.42, 721.91, 722.71-722.73, 723.0, 724.00-724.09, 806.00-806.9, 953.0-953.8, 952.00-952.8
	or Effects of Spinal Cord Injury (ICD-9s)	907.2 (late effect of spinal cord injury)
	or NTSCI/TSCI RIC	04.110-04.130, 04.210-04.230 NTSCI RIC: 05; TSCI: 04
Amputation	Presence of Amputation (ICD-9s)	ICD 9 Procedure code :- 84.00 – 84.19 or DRG codes :- 474, 475, 476
Brain Injury	Presence of Brain Injury (ICD-9s)	036.0, 0.36.1, 049.0-049.9, 191.0-191.9, 192.1, 198.3, 225.0, 225.1, 225.2, 237.5, 237.6, 239.6, 323.0-323.9, 324.0, 331.0, 331.2, 331.3, 348.1, 800.60-800.99, 801.60-801.99, 803.60-803.99, 851.10-851.19, 851.30-851.39, 851.50-851.59, 851.70-851.79, 851.90-851.99, 852.10-852.19, 852.30-852.39, 852.50-852.59, 853.00-853.09, 853.10-853.19, 854.10-854.19, 800.10-800.49, 801.10-801.49, 803.10-803.49, 850.0-850.9, 851.00-851.09, 851.20-851.29, 851.40-851.49, 851.60-851.69, 851.80-851.89, 852.00-852.09, 852.20-852.29, 852.40-852.49, 854.00-854.09
	or Effects of Brain Injury (ICD-9s)	905.0 (late effect of fracture of skull and face bones)907.0 (late effect of intracranial injury without mention of skull fracture)
Knee/Hip Replacement	Hip Replacement(s) or Knee Replacement(s)	696.0, 711.0, 714-714.2, 714.30-714.33, 714.4, 715.x5, 715.x6, 716.x5, 716.x6, 720.0; MS-DRG 469-470; ICD-9 procedure code: 81.51-81.55 Note: if admission is following revision of implant, use: 996.4, 996.66, 996.67, 996.77-996.79

Appendix A

Clinical Condition Category	Criteria	ICD-9
	Other Orthopedic	170.2-170.8, 198.5, 719.5, 719.00-719.89, 733.11-733.19, 754.2, 823.00-823.91; MS-DRG 466-468
Major Multiple Trauma	2 or More: TBI, TSCI, or Multiple Fractures	2 or more ICD-9-CM codes for traumatic impairment codes 2 or more ICD-9-CM codes for trauma to multiple systems or sites, but not brain or spinal cord 823-828 (all)
Hip Fracture	Presence of Hip Fracture (ICD-9s), femur, pelvis	820.00-820.9, 821.00-821.11, 821.20-821.39, 808
Burns	Presence of Burns (ICD-9s)	941.00-941.59, 942.00-942.59, 943.00-943.59, 944.00-944.58, 945.00-945.59, 946.0-946.5
Neurological Disorders	Presence of Neurological Disorders (ICD-9s)	340, 332.0-332.1, 356.0-356.8, 357.5-357.8, 343.0-343.8, 335.20-335.9, 358.0, 359.0-359.4, 333.0-333.7, 333.80-333.99, 334.0-334.3, 334.8, 337.0, 337.20-337.29, 337.3, 337.9, 341.0-341.8, 357.0
	or Effects of Neurological Disorders (ICD-9s)	(Very low volume)
Rheumatoid and Other Arthritis (likely secondary condition)	Presence of Rheumatoid and Other Arthritis (ICD-9s)	714.0-714.2, 714.30-714.33, 714.4, , 696.0, 710.0, 710.1, 710.3, 710.4, 711.0, 716.00-716.99, 720.0
	and Significant Functional Impairment of ambulation	Reduced performance on ADLs
	and Therapy Preceding IRF Admission	Revenue center: 420, 421, 422, 423, 424, 429, (430-434, 439,) 530, 531, 539
Osteoarthritis	2 or more joints – elbow, hip, knee, shoulder – not with prosthetic	
	Joint deformity	
	Substantial loss of range of motion, atrophy, significant functional impairment	
	Osteoarthrosis and allied disorders	
		(Very low volume)
		715.00 – 715.99
Systemic Vasculidities	Presence of Systemic Vasculidities (ICD-9s)	446, 446.0, 446.1, 446.2, 446.20, 446.21, 446.29, 446.3, 446.4, 446.5, 446.6, 446.7
	and Significant Functional Impairment	(Very low volume)
	and Therapy Preceding IRF Admission (Revenue Centers)	0118, 0128, 0138, 0148, 0158 420, 421, 422, 423, 424, 429, (430-434, 439)
Pain Syndromes	Presence of pain (ICD-9s)	721.0-721.91, 722.0-722.93, 723.0-723.8, 724.00-724.9, 729.0-729.5, 846.0-846.9, 847.0-847.4
Cardiac Disorders	Presence of cardiac disorders (ICD-9s)	410.00-410.92, 411.0-411.89, 414.00-414.07, 414.10-414.9, 427.0-427.9, 428.0-428.9
Pulmonary Disorders	Presence of pulmonary disorders (ICD-9s)	491.0-491.8, 492.0-492.8, 493.00-493.92, 494.0-494.1, 496
Other Disabling Impairments	Presence of other disabling impairments “not elsewhere defined”	
Developmental Disability	Presence of developmental disorders (ICD-9s)	317, 318.0-318.2, 319
Debility	Presence of debility (ICD-9s)	728.2, 728.9, 780.71, 780.79 (“code specific medical condition primarily responsible for the patient’s debility”)

Appendix A

Clinical Condition Category	Criteria	ICD-9
Medically Complex Conditions	Presence of infections (ICD-9s)	0.13.0-013.9, 0.38.0-038.9, 041.00-041.09, 041.10-041.19, 041.81-041.9, 042
	Presence of neoplasms (ICD-9s)	Two or more of: 140.0-149.9, 150.0-159.9, 160.0-165.9, 170.0-170.9, 171.0-171.9, 172.0-172.9, 173.0-173.9, 174.0-174.9, 175.0-175.9, 176.0-176.9, 179-189.9, 200.00-200.88, 201.00-201.98, 202.00-202.98, 203.00-203.81, 204.00-204.91, 205.00-205.91, 206.00-206.91, 207.00-208.91, V58.0, V58.1
	Presence of nutrition (ICD-9s)	250.00-250.93, 276.0-276.9
	Presence of circulatory disorders (ICD-9s)	403.00-403.91, 404.00-404.93, 414.00-414.07, 428.0-428.9, 443.0-443.9, 453.0-453.9
	Presence of respiratory disorders (ICD-9s)	480.0-480.9, 481.0-486, 507.0-507.8, 518.0-518.89
	Presence of terminal care (ICD-9s)	“End-stage conditions –e.g., cancer, Alzheimer’s disease, renal failure, congestive heart failure, stroke, acquired immunodeficiency syndrome (AIDS), Parkinsonism, emphysema”
	Presence of skin disorders (ICD-9s)	681.10-681.11, 682.0-682.8, 707.0, 707.10-707.8, 870.0-879.9, 890.0-894.2
	Presence of medical/surgical complications (ICD-9s)	996.00-996.79, 996.80-996.89, 996.90-996.99, 997.00-997.99, 998.0-998.9
	Presence of other medically complex conditions (ICD-9s)	584.5-584.9, 585.x, 595.0-595.89, 597.0-597.89

Appendix B: Cross-Sectional Results in Other PAC Settings

Exhibit B.1 presents the distribution of clinical condition categories among SNFs between 2005 and 2009. Across all years, major medical complexities was the largest clinical condition category, representing at least one third of all admissions each year. The proportion of this condition increased from 33.8 percent in 2005 to 37.5 percent in 2009. The proportion of patients treated for hip/knee replacements in SNFs had a modest increase from 2005 to 2009, while hip fractures and cardiac disorders all decreased as a proportion of all patients.

Exhibit B.1: Distribution of Clinical Condition Categories among SNFs (2005-2009)

Clinical Condition Category	2005	2006	2007	2008	2009	Percentage Point Change (2005-2009)
Hip/Knee Replacement	7.4%	7.3%	7.5%	7.6%	8.0%	0.6%
Stroke	7.1%	6.7%	6.5%	6.3%	6.2%	-1.0%
Hip Fracture	10.2%	10.1%	10.1%	9.9%	9.8%	-0.4%
Major Medical Complexity	33.8%	35.3%	36.6%	36.9%	37.5%	3.7%
Cardiac Disorders	18.1%	17.8%	17.2%	17.0%	16.7%	-1.4%
Neurological Disorders	1.9%	2.0%	2.0%	2.0%	1.9%	0.0%
Other Orthopedic	1.9%	2.0%	2.2%	2.3%	2.3%	0.5%
Brain Injury	3.5%	3.5%	3.5%	3.5%	3.3%	-0.2%
Spinal Cord Injury	1.5%	1.5%	1.6%	1.6%	1.6%	0.1%
Amputation	2.1%	1.7%	1.0%	0.9%	0.9%	-1.2%
Pulmonary Disorders	7.5%	7.0%	6.8%	7.0%	6.8%	-0.7%
Pain Syndromes	2.4%	2.5%	2.5%	2.5%	2.5%	0.0%
Major Multiple Trauma	0.5%	0.6%	0.6%	0.6%	0.6%	0.1%
Debility	1.9%	1.8%	1.8%	1.8%	1.7%	-0.2%
All Other	0.3%	0.3%	0.3%	0.2%	0.2%	0.0%

Percentages may not total 100 percent due to rounding.

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Appendix B

Exhibit B.2 presents the distribution of clinical condition categories among HHAs between 2005 and 2009. The proportion of major medical complexity and cardiac disorders represented the majority of admissions each year. The proportion of patients treated for major medical complexities increased by 1.4 percentage points, while the proportion for cardiac disorders decreased by 2.7 percentage points over this period. The proportion of hip/knee replacements increased from 10.4 percent in 2005 to 12.8 percent in 2009. This suggest that as the proportion of patients treated for hip/knee replacements decreased significantly among IRFs, the proportion among SNFs and HHAs increased.

Exhibit B.2: Distribution of Clinical Condition Categories among HHAs (2005-2009)

Clinical Condition Category	2005	2006	2007	2008	2009	Percentage Point Change (2005-2009)
Hip/Knee Replacement	10.4%	10.6%	11.4%	11.5%	12.8%	2.4%
Stroke	4.0%	3.9%	3.8%	4.1%	4.0%	0.0%
Hip Fracture	1.5%	1.5%	1.5%	1.4%	1.3%	-0.2%
Major Medical Complexity	34.2%	35.3%	36.1%	35.8%	35.6%	1.4%
Cardiac Disorders	27.3%	26.6%	25.5%	24.9%	24.6%	-2.7%
Neurological Disorders	1.4%	1.4%	1.5%	1.5%	1.4%	0.0%
Other Orthopedic	2.1%	2.2%	2.4%	2.4%	2.5%	0.4%
Brain Injury	1.9%	1.9%	1.9%	1.8%	1.8%	-0.1%
Spinal Cord Injury	1.6%	1.7%	1.7%	1.7%	1.7%	0.1%
Amputation	1.7%	1.4%	0.8%	0.7%	0.7%	-1.0%
Pulmonary Disorders	10.7%	10.1%	10.1%	10.9%	10.6%	-0.1%
Pain Syndromes	2.2%	2.2%	2.2%	2.2%	2.0%	-0.1%
Major Multiple Trauma	0.2%	0.2%	0.2%	0.2%	0.2%	0.0%
Debility	0.6%	0.8%	0.8%	0.6%	0.6%	0.0%
All Other	0.3%	0.3%	0.3%	0.2%	0.2%	0.0%

Percentages may not total 100 percent due to rounding.

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Appendix B

Exhibit B.3 presents the distribution of clinical condition categories among LTCHs between 2005 and 2009. Major medical complexity represented the largest proportion of LTCH admission each year, with an increasing proportion between 2005 and 2008. This proportion increased markedly from 55.9 percent in 2005 to 67.1 percent in 2009. The increase in major medical complexity proportions appeared to be offset by smaller proportional decreases in amputation, cardiac disorder, stroke, and hip fracture cases.

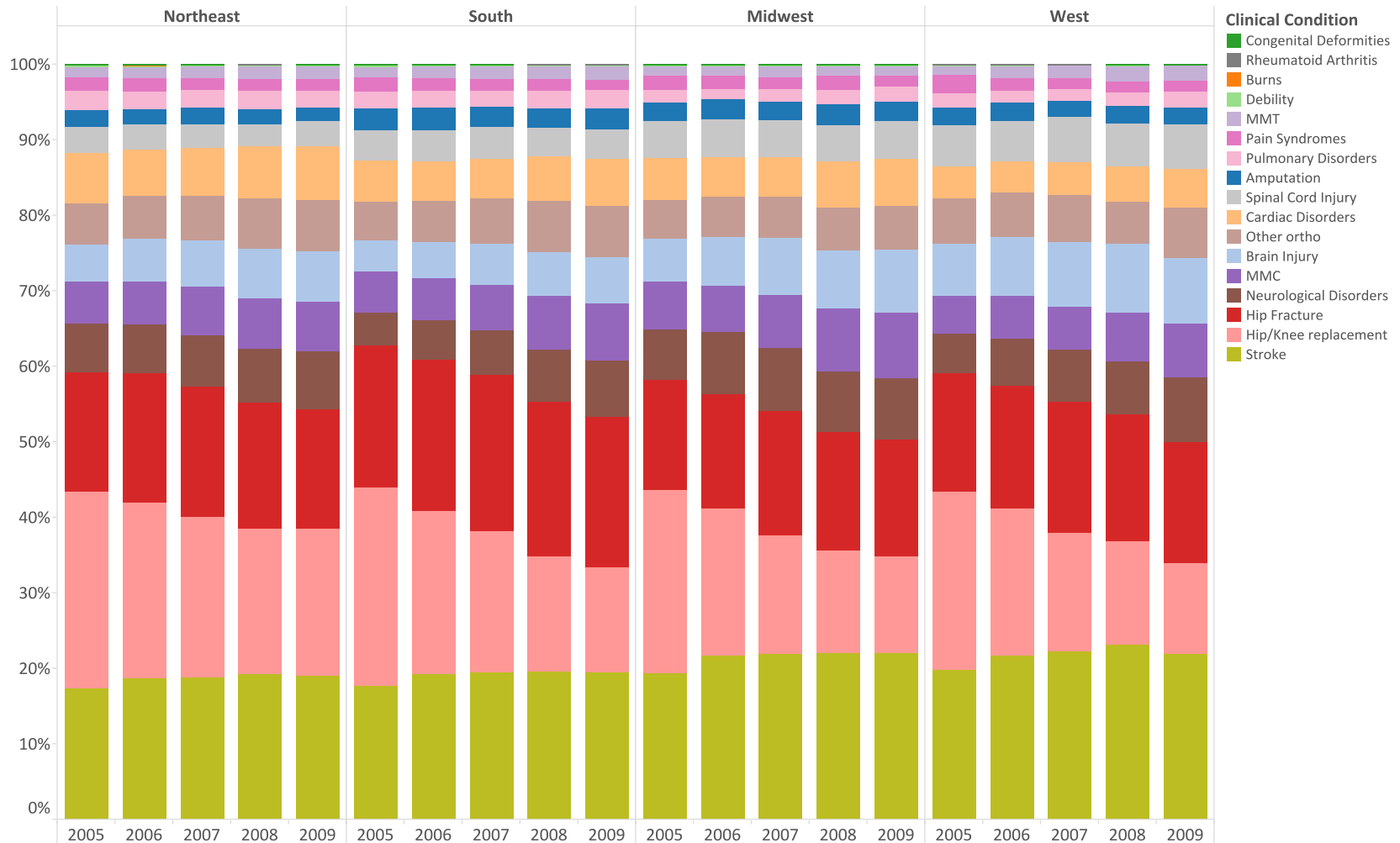
Exhibit B.3: Distribution of Clinical Condition Categories among LTCHs (2005-2009)

Clinical Condition Category	2005	2006	2007	2008	2009	Percentage Point Change (2005-2009)
Hip/Knee Replacement	1.6%	1.1%	0.9%	0.6%	0.4%	-1.2%
Stroke	6.2%	5.7%	4.9%	4.8%	4.2%	-2.0%
Hip Fracture	3.8%	3.2%	2.9%	2.2%	2.0%	-1.8%
Major Medical Complexity	55.9%	59.9%	64.8%	66.6%	67.1%	11.2%
Cardiac Disorders	11.4%	10.9%	10.0%	9.1%	9.0%	-2.4%
Neurological Disorders	0.8%	0.7%	0.7%	0.6%	0.7%	-0.1%
Other Orthopedic	1.5%	1.5%	1.4%	1.3%	1.6%	0.2%
Brain Injury	1.7%	2.0%	1.8%	1.9%	1.9%	0.1%
Spinal Cord Injury	1.4%	1.4%	1.2%	1.3%	1.2%	-0.2%
Amputation	6.7%	5.7%	2.7%	2.6%	3.0%	-3.7%
Pulmonary Disorders	7.2%	6.5%	7.0%	7.1%	7.3%	0.0%
Pain Syndromes	0.6%	0.5%	0.6%	0.6%	0.5%	-0.1%
Major Multiple Trauma	0.5%	0.5%	0.5%	0.5%	0.5%	0.0%
Debility	0.2%	0.1%	0.1%	0.1%	0.1%	-0.1%
All Other	0.5%	0.5%	0.6%	0.6%	0.7%	0.2%

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Exhibit B.4 shows that the relative proportion of IRF patients by clinical condition category across four census regions (i.e., Northeast, South, Midwest, and West) reflect the nationwide distribution for each study year. In each region, hip/knee replacement, stroke, and hip fracture conditions represented the greatest relative proportion of IRF cases. The marked decline in the proportion of hip/knee replacements is also observed across census regions, although this change appears somewhat less pronounced in the Northeast (a reduction in proportion of 6.5 percent) compared to the Midwest, South, and West, with a reduction in proportions of 11.5 percent, 12.6 percent, and 11.6 percent, respectively.

Exhibit B.4: Distribution of Clinical Condition Categories among IRFs by Census Region (2005-2009)



Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Guidelines for Adult Stroke Rehabilitation and Recovery A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

Endorsed by the American Academy of Physical Medicine and Rehabilitation and the American Society of Neurorehabilitation

The American Academy of Neurology affirms the value of this guideline as an educational tool for neurologists and the American Congress of Rehabilitation Medicine also affirms the educational value of these guidelines for its members

Accepted by the American Speech-Language-Hearing Association

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Richard D. Zorowitz, MD; on behalf of the American Heart Association Stroke Council, Council on Cardiovascular and Stroke Nursing, Council on Clinical Cardiology, and Council on Quality of Care and Outcomes Research

Purpose—The aim of this guideline is to provide a synopsis of best clinical practices in the rehabilitative care of adults recovering from stroke.

Methods—Writing group members were nominated by the committee chair on the basis of their previous work in relevant topic areas and were approved by the American Heart Association (AHA) Stroke Council's Scientific Statement Oversight Committee and the AHA's Manuscript Oversight Committee. The panel reviewed relevant articles on adults using computerized searches of the medical literature through 2014. The evidence is organized within the context of the AHA framework and is classified according to the joint AHA/American College of Cardiology and supplementary AHA methods of classifying the level of certainty and the class and level of evidence. The document underwent extensive AHA internal and external peer review, Stroke Council Leadership review, and Scientific Statements Oversight Committee review before consideration and approval by the AHA Science Advisory and Coordinating Committee.

Results—Stroke rehabilitation requires a sustained and coordinated effort from a large team, including the patient and his or her goals, family and friends, other caregivers (eg, personal care attendants), physicians, nurses, physical and occupational therapists, speech-language pathologists, recreation therapists, psychologists, nutritionists, social workers, and others. Communication and coordination among these team members are paramount in maximizing the effectiveness

The American Heart Association makes every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest.

This guideline was approved by the American Heart Association Science Advisory and Coordinating Committee on January 4, 2016, and the American Heart Association Executive Committee on February 23, 2016. A copy of the document is available at <http://professional.heart.org/statements> by using either "Search for Guidelines & Statements" or the "Browse by Topic" area. To purchase additional reprints, call 843-216-2533 or e-mail kelle.ramsay@wolterskluwer.com.

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DOI: 10.1161/STR.0000000000000098

and efficiency of rehabilitation and underlie this entire guideline. Without communication and coordination, isolated efforts to rehabilitate the stroke survivor are unlikely to achieve their full potential.

Conclusions—As systems of care evolve in response to healthcare reform efforts, postacute care and rehabilitation are often considered a costly area of care to be trimmed but without recognition of their clinical impact and ability to reduce the risk of downstream medical morbidity resulting from immobility, depression, loss of autonomy, and reduced functional independence. The provision of comprehensive rehabilitation programs with adequate resources, dose, and duration is an essential aspect of stroke care and should be a priority in these redesign efforts. (*Stroke*. 2016;47:e98-e169. DOI: 10.1161/STR.000000000000098.)

Key Words: AHA Scientific Statements ■ exercise ■ paresis ■ recovery of function ■ rehabilitation ■ stroke

Between 2000 and 2010, the relative rate of stroke deaths dropped by 35.8% in the United States.¹ However, each year stroke affects nearly 800 000 individuals, with many survivors experiencing persistent difficulty with daily tasks as a direct consequence. More than two thirds of stroke survivors receive rehabilitation services after hospitalization.² Despite the development of stroke center designation and improved systems to recognize stroke symptoms and deliver care promptly, only a minority of patients with acute stroke receive thrombolytic therapy, and many of them remain with residual functional deficits. Thus, the need for effective stroke rehabilitation is likely to remain an essential part of the continuum of stroke care for the foreseeable future.

Despite the extensive resources devoted to stroke rehabilitation and aftercare, large-scale, rigorous, clinical trials in this field have been few and have been conducted only in the past decade or so. Thus, many gaps continue to be seen in the evidence base for stroke rehabilitation, for which smaller trials of less rigorous design provide the only available data, and in some cases, even these are not yet available. Certain aspects of stroke rehabilitation care are well established in clinical practice and constitute a standard of care that is unlikely to be directly tested in a randomized, clinical trial, for example, the provision of physical therapy (PT) to early stroke survivors with impaired walking ability. Thus, practice guidelines such as this one will likely rely on a mixture of evidence and consensus. It is hoped that the relative proportion of recommendations based on rigorous evidence will grow over time.

This guideline uses the framework established by the American Heart Association (AHA) concerning classes and levels of evidence for use in guidelines, as shown in Tables 1 and 2.

We have organized this guideline into 5 major sections: (1) The Rehabilitation Program, which includes system-level sections (eg, organization, levels of care); (2) Prevention and Medical Management of Comorbidities, in which reference is made to other published guidelines (eg, hypertension); (3) Assessment, focused on the body function/structure level of the *International Classification of Functioning, Disability, and Health (ICF)*³; (4) Sensorimotor Impairments and Activities (treatment/interventions), focused on the activity level of the *ICF*; and (5) Transitions in Care and Community Rehabilitation, focused primarily on the participation level of the *ICF*.

Published guidelines are, by their very nature, a reflection of clinical practice at a particular point in time and the evidence base available. As new information becomes available, best practice can change quickly, and it is incumbent on the users of these guidelines to keep the ever-changing nature of clinical knowledge in mind. Equally important, no guideline can substitute for the careful evaluation of the individual patient by an

experienced clinician, in which the art and science of medicine intersect. Guidelines that are correct in the aggregate may not represent the best care for any specific individual, and careful individualization is needed at the point of care.

We have benefited from the published Veterans Affairs/Department of Defense stroke rehabilitation guidelines⁴ and several of the prior AHA stroke-related guidelines.^{4a} Although the current guideline is a fundamentally new work, it certainly reflects the insights and judgments of these prior guidelines.

Because stroke is fundamentally a chronic condition, we have attempted to span the entire course of rehabilitation, from the early actions taken in the acute care hospital through reintegration into the community. The end of formal rehabilitation (commonly by 3–4 months after stroke) should not mean the end of the restorative process. In many respects, stroke has been managed medically as a temporary or transient condition instead of a chronic condition that warrants monitoring after the acute event. Currently, unmet needs persist in many domains, including social reintegration, health-related quality of life, maintenance of activity, and self-efficacy (ie, belief in one's capability to carry out a behavior). Apathy is manifested in >50% of survivors at 1 year after stroke⁵; fatigue is a common and debilitating symptom in chronic stroke⁶; daily physical activity of community-living stroke survivors is low⁷; and depressive symptomology is high.⁸ By 4 years after onset, >30% of stroke survivors report persistent participation restrictions (eg, difficulty with autonomy, engagement, or fulfilling societal roles).⁹

The Rehabilitation Program

Organization of Poststroke Rehabilitation Care (Levels of Care)

Rehabilitation services are the primary mechanism by which functional recovery and the achievement of independence are promoted in patients with acute stroke. The array of rehabilitation services delivered to stroke patients in the United States is broad and highly heterogeneous, varying in the type of care settings used; in the duration, intensity, and type of interventions delivered; and in the degree of involvement of specific medical, nursing, and other rehabilitation specialists. The nature and organization of rehabilitation stroke services in the United States have changed considerably over time in response to various forces, including the increasing integration of hospital and outpatient care delivery systems (at both local and regional levels), the organization of medical and other specialty rehabilitation groups, and most important, repeated changes to the federal reimbursement fee structure (specifically, Centers for Medicare & Medicaid Services), which is

Table 1. Applying Classification of Recommendations and Level of Evidence

		SIZE OF TREATMENT EFFECT			
		CLASS I <i>Benefit >>> Risk</i> Procedure/Treatment SHOULD be performed/administered	CLASS IIa <i>Benefit >> Risk</i> Additional studies with focused objectives needed IT IS REASONABLE to perform procedure/administer treatment	CLASS IIb <i>Benefit ≥ Risk</i> Additional studies with broad objectives needed; additional registry data would be helpful Procedure/Treatment MAY BE CONSIDERED	CLASS III No Benefit or CLASS III Harm
					Procedure/Test Treatment
					COR III: No Benefit Not Helpful No Proven Benefit
					COR III: Harm Excess Cost w/o Benefit or Harmful Harmful to Patients
ESTIMATE OF CERTAINTY (PRECISION) OF TREATMENT EFFECT	LEVEL A Multiple populations evaluated* Data derived from multiple randomized clinical trials or meta-analyses	<ul style="list-style-type: none"> Recommendation that procedure or treatment is useful/effective Sufficient evidence from multiple randomized trials or meta-analyses 	<ul style="list-style-type: none"> Recommendation in favor of treatment or procedure being useful/effective Some conflicting evidence from multiple randomized trials or meta-analyses 	<ul style="list-style-type: none"> Recommendation's usefulness/efficacy less well established Greater conflicting evidence from multiple randomized trials or meta-analyses 	<ul style="list-style-type: none"> Recommendation that procedure or treatment is not useful/effective and may be harmful Sufficient evidence from multiple randomized trials or meta-analyses
	LEVEL B Limited populations evaluated* Data derived from a single randomized trial or nonrandomized studies	<ul style="list-style-type: none"> Recommendation that procedure or treatment is useful/effective Evidence from single randomized trial or nonrandomized studies 	<ul style="list-style-type: none"> Recommendation in favor of treatment or procedure being useful/effective Some conflicting evidence from single randomized trial or nonrandomized studies 	<ul style="list-style-type: none"> Recommendation's usefulness/efficacy less well established Greater conflicting evidence from single randomized trial or nonrandomized studies 	<ul style="list-style-type: none"> Recommendation that procedure or treatment is not useful/effective and may be harmful Evidence from single randomized trial or nonrandomized studies
	LEVEL C Very limited populations evaluated* Only consensus opinion of experts, case studies, or standard of care	<ul style="list-style-type: none"> Recommendation that procedure or treatment is useful/effective Only expert opinion, case studies, or standard of care 	<ul style="list-style-type: none"> Recommendation in favor of treatment or procedure being useful/effective Only diverging expert opinion, case studies, or standard of care 	<ul style="list-style-type: none"> Recommendation's usefulness/efficacy less well established Only diverging expert opinion, case studies, or standard of care 	<ul style="list-style-type: none"> Recommendation that procedure or treatment is not useful/effective and may be harmful Only expert opinion, case studies, or standard of care
Suggested phrases for writing recommendations		should is recommended is indicated is useful/effective/beneficial	is reasonable can be useful/effective/beneficial is probably recommended or indicated	may/might be considered may/might be reasonable usefulness/effectiveness is unknown/unclear/uncertain or not well established	COR III: No Benefit is not recommended is not indicated should not be performed/administered/other
Comparative effectiveness phrases†		treatment/strategy A is recommended/indicated in preference to treatment B treatment A should be chosen over treatment B	treatment/strategy A is probably recommended/indicated in preference to treatment B it is reasonable to choose treatment A over treatment B		COR III: Harm potentially harmful causes harm associated with excess morbidity/mortality should not be performed/administered/other is not useful/beneficial/effective

A recommendation with Level of Evidence B or C does not imply that the recommendation is weak. Many important clinical questions addressed in the guidelines do not lend themselves to clinical trials. Although randomized trials are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

*Data available from clinical trials or registries about the usefulness/efficacy in different subpopulations, such as sex, age, history of diabetes, history of prior myocardial infarction, history of heart failure, and prior aspirin use.

†For comparative effectiveness recommendations (Class I and IIa; Level of Evidence A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.

the central driver of much of the system's organization and structure. Further systems-level changes are inevitable, given the ongoing federal changes to the healthcare system and the recent focus on "episodes of care," which promises to result in wholesale changes to the organization of medical care delivery in the United States.¹⁰

The highly heterogeneous organizational structure of stroke rehabilitation care in the United States brings with it challenges in terms of determining the quality of care delivered by the system (ie, timeliness, effectiveness, efficiency, safety, fairness, and patient-centeredness). The unique and somewhat idiosyncratic nature of the stroke rehabilitation system in the United

States also presents challenges in terms of assessment of which research findings, among the expanding evidence base of stroke rehabilitation care, are applicable to the system. For example, much of the research documenting the benefits of stroke units and other aspects of organized integrated interprofessional models of stroke care was developed in Europe and elsewhere, and the degree to which these findings are directly applicable to the US system of stroke care is often debated.

Organization of Acute and Postacute Rehabilitation Care in the United States

An excellent review of the current organizational structure of stroke rehabilitation care in the United States can be found in

Table 2. Definition of Classes and Levels of Evidence Used in AHA/ASA Recommendations

Class I	Conditions for which there is evidence for and/or general agreement that the procedure or treatment is useful and effective
Class II	Conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of a procedure or treatment
Class IIa	The weight of evidence or opinion is in favor of the procedure or treatment
Class IIb	Usefulness/efficacy is less well established by evidence or opinion
Class III	Conditions for which there is evidence and/or general agreement that the procedure or treatment is not useful/effective and in some cases may be harmful
Therapeutic recommendations	
Level of Evidence A	Data derived from multiple randomized, clinical trials or meta-analyses
Level of Evidence B	Data derived from a single randomized trial or nonrandomized studies
Level of Evidence C	Consensus opinion of experts, case studies, or standard of care
Diagnostic recommendations	
Level of Evidence A	Data derived from multiple prospective cohort studies using a reference standard applied by a masked evaluator
Level of Evidence B	Data derived from a single grade A study, ≥1 case-control studies, or studies using a reference standard applied by an unmasked evaluator
Level of Evidence C	Consensus opinion of experts

AHA/ASA indicates American Heart Association/American Stroke Association.

the 2010 AHA scientific statement “Comprehensive Overview of Nursing and Interdisciplinary Rehabilitation Care of the Stroke Patient.”¹¹ We briefly review the different stroke neurology, rehabilitation care settings that are essential components of this system (Appendix 1).

Ideally, rehabilitation services are delivered by a multidisciplinary team of healthcare providers with training in neurology, rehabilitation nursing, occupational therapy (OT), PT, and speech and language therapy (SLT). Such teams are directed under the leadership of physicians trained in physical medicine and rehabilitation (physiatrist) or by neurologists who have specialized training or board certification in rehabilitation medicine. Other health professionals who play an essential role in the process include social workers, psychologists, psychiatrists, and counselors.¹¹

Health care provided during the acute hospital stay is focused primarily on the acute stabilization of the patient, the delivery of acute stroke treatments, and the initiation of prophylactic and preventive measures. Although the delivery of rehabilitation therapies (OT/PT/SLT) is generally not the first priority, data strongly suggest that there are benefits to starting rehabilitation as soon as the patient is ready and can tolerate it.¹¹

The cardinal feature of acute inpatient care for stroke patients in the United States is its brevity; the median length of stay for patients with ischemic stroke is only 4 days. Regardless of whether rehabilitation is started during the inpatient stay, all patients should undergo a formal assessment (often conducted by the OT/PT/SLT services) of the patient’s rehabilitation needs before discharge.¹² The discharge process may also involve rehabilitation nursing case managers and social workers who can assess psychosocial issues that may influence the transition.

Healthcare services provided after hospital discharge are referred to as postacute care services and are designed to support patients in their transition from the hospital to home and in their pursuit of achieving the highest level of functioning possible. In addition to the rehabilitation care provided by OT/PT/SLT, care may include physiatrists or other physicians, rehabilitation nurses, and nursing aides. The intensity of rehabilitation care varies widely, depending on the setting, with the most intensive rehabilitation care provided in inpatient rehabilitation facilities (IRFs), followed by skilled nursing facilities (SNFs), which provide “subacute” rehabilitation.

IRFs provide hospital-level care to stroke survivors who need intensive, 24-hour-a-day, interdisciplinary rehabilitation care that is provided under the direct supervision of a physician. Medicare (Centers for Medicare & Medicaid Services) regulations specify that admission to IRFs should be limited to patients for whom significant improvement is expected within a reasonable length of time and who are likely to return to a community setting (rather than being transferred to another setting such as a SNF or long-term care facility). Medicare regulations also generally dictate that IRFs provide at least 3 hours of rehabilitation therapy (defined as PT, OT, and SLT) per day for at least 5 d/wk.¹¹ Physicians are expected to have training or experience in rehabilitation, and daily physician visits are typical. Registered nurses are present on a continuous basis and commonly have specialty certification in rehabilitation nursing. An IRF can be located as a geographically distinct unit within an acute care hospital or as a free-standing facility.

SNFs (also known as subacute rehabilitation) provide rehabilitation care to stroke survivors who need daily skilled nursing or rehabilitation services. Admission to SNFs may be requested for patients who the rehabilitation team determines may not reach full or partial recovery or if skilled nursing services are required to maintain or prevent deterioration of the patient. SNFs are required to have rehabilitation nursing on site for a minimum of 8 h/d, and care must still follow a physician’s plan, although there is no requirement for direct daily supervision by a physician.¹³ SNFs can be stand-alone facilities, but when located within an existing nursing home or hospital, they must be physically distinguishable from the larger institution (eg, a separate designated wing, ward, or building).

Nursing homes provide long-term residential care for individuals who are unable to live in the community. Many individuals who reside in nursing homes initially enter the facility under their Medicare short-term SNF benefit and then transition to long-term care once the needs for skilled nursing are no longer present. Medicare will provide insurance coverage for up to 100 days in an SNF but does not cover long-term nursing home care, which is generally paid out of pocket, by long-term care insurance, or through the Medicaid program.

Long-term acute care hospitals are another inpatient setting that delivers postacute rehabilitation care. Long-term acute care hospitals provide extended medical and rehabilitative care to stroke patients with complex medical needs resulting from a combination of acute and chronic conditions (eg, ventilator-dependent care, pain management). As a consequence of this high-needs patient population, facilities must demonstrate an average length of stay of at least 25 days.^{14,15} Because of these requirements, long-term acute care hospitals provide care to a relatively small but growing minority of stroke patients.¹⁴

For stroke patients who go home after an acute hospitalization, rehabilitation care can be provided in the community either by a home healthcare agency (HHCA) or through outpatient offices and clinics. The intensity of rehabilitation care can vary tremendously across these 2 settings. For patients in the Medicare program to be eligible for HHCA services, they must be certified as being homebound by a physician (defined by the Centers for Medicare & Medicaid Services as unable to leave the home except to receive medical care or to have occasional nonmedical trips). HHCA focus on delivering skilled nursing care and rehabilitation therapy (eg, OT, PT, SLT), as well as some limited assistance with daily tasks provided by home health aides supervised by nurses. Care encompasses medical and social needs and services that are designed to assist the patient in living in his or her own home.¹³ Currently, home healthcare services are reimbursed under a prospective payment system that covers up to 60 days of services. These services may be extended if they can be clinically justified. Home healthcare services may also be performed in assisted living facilities or other group homes but are not reimbursed if the services are duplicative of the services of another facility or agency.

Appropriateness of Early Supported Discharge Rehabilitation Services

For selected stroke patients, early discharge to a community setting for ongoing rehabilitation may provide outcomes similar to those achieved in an inpatient rehabilitation unit. This early supported discharge (ESD) model of care links inpatient care with community services and allows certain patients to be discharged home sooner with support of the rehabilitation team.

The efficacy of ESD for patients with acute stroke was evaluated in the ESD Trialists' systematic review.¹⁶ This 2012 review concluded that "appropriately resourced ESD services provided for a selected group of stroke patients can reduce long-term dependency and admission to institutional care as well as reducing the length of hospital stay." No adverse impacts were identified on either mood or the subjective health status of patients or caregivers with ESD. ESD has been studied primarily in Europe and Australia/New Zealand, where systems of care are different than in the United States and where the average acute care hospitalization length of stay for stroke is longer than in the United States. Extrapolation of these results to the United States should take these distinctions into account.

A meta-analysis conducted by Langhorne et al¹⁷ and updated by Langhorne and Holmqvist¹⁸ found that ESD services reduce inpatient length of stay and adverse events (eg, readmission rates) while increasing the likelihood of independence and living at home. Several recent systematic reviews have also reported that ESD after stroke was associated with shorter hospital lengths of

stay, lower overall costs of care, lower risk of institutionalization, and no adverse effects on functional recovery.¹⁹⁻²¹

To be effective, ESD should be considered for patients with mild to moderate stroke when adequate community services for both rehabilitation and caregiver support are available and can provide the level of intensity of rehabilitation service needed.²² Patients should remain in an inpatient setting for their rehabilitation care if they are in need of skilled nursing services, regular contact by a physician, and multiple therapeutic interventions.

Examples for need of skilled nursing services include (but are not limited to) the following:

- Bowel and bladder impairment
- Skin breakdown or high risk for skin breakdown
- Impaired bed mobility
- Dependence for activities of daily living (ADLs)
- Inability to manage medications
- High risk for nutritional deficits

Examples for need of regular contact by a physician include (but are not limited to) the following:

- Medical comorbidities not optimally managed (eg, diabetes mellitus and hypertension)
- Complex rehabilitation issues (eg, orthotics, spasticity, and bowel/bladder)
- Acute illness (but not severe enough to prevent rehabilitation care)
- Pain management issues

Examples for need of multiple therapeutic interventions include (but are not limited to) the following:

- Moderate to severe motor/sensory deficits, and/or
- Cognitive deficits, and/or
- Communication deficits

Outpatient therapies require patients to travel from their home to obtain care at hospital-based or free-standing facilities. All outpatient OT, PT, and SLT services must be certified by a physician who is responsible for establishing a planned set of therapy services. These therapies must be complex enough that they can be performed only by a qualified healthcare professional. Treatment plans need to be reviewed and recertified every 30 days.

Multiple transitions in care are typical for individuals recovering from stroke and pose particular challenges for healthcare providers, stroke survivors, and their caregivers in terms of maintaining continuity of care and avoiding undesirable lapses in the rehabilitation program of care. Moreover, stroke survivors need to navigate the transition from a medical model of treatment to a more community-based model that includes return to work (for some), leisure activities, and exercise for fitness. The Transitions in Care and Community Rehabilitation section addresses transitions to the community after discharge.

Trends in the Use of Acute and Postacute Stroke Rehabilitation in the United States

The organization of rehabilitation stroke services in the United States has changed considerably over time in response to the frequent changes to the federal reimbursement fee structure for both acute (inpatient) and postacute

care. Currently, ≈70% of Medicare beneficiaries discharged for acute stroke use Medicare-covered postacute care,²³ with most receiving rehabilitation care from multiple providers in several different settings.^{24,25} Considering the first setting after the acute hospitalization, the largest proportion of stroke patients are referred for rehabilitation to an SNF (32%), followed by an IRF (22%) and then HHCA (15%).²⁶ Major changes in the Medicare postacute care reimbursement policies starting in the 1990s dramatically affected use patterns,²⁶ particularly for HHCAs, after the introduction of an interim payment system in 1997 with extensive changes to its rules and regulations in 2000. The introduction of prospective payment systems for SNFs (1998), IRFs (2002), and long-term acute care hospitals (2002) also affected their use.^{13,27} Between 1996 and 2003, the proportion of Medicare stroke patients who received care from HHCAs declined by >25% during this period (from 20% to 15%),²⁶ whereas the proportion who received SNF or IRF care remained relatively unchanged. However, the proportion of stroke patients not referred to any postacute care increased from 26% to 31% during this period,²⁶ and an analysis of 2006 Medicare data found that this proportion had increased to 42%.²⁸ Although legislated payment changes have had major influences on where rehabilitation services are provided, several other nonclinical factors affect the use of postacute care rehabilitation services. There is considerable geographic variability in the use of these services in the United States,²⁹ which is driven in part by local differences in the availability of postacute care settings and regulatory practices.^{29–33} Factors such as the daily census, case mix, teaching status, ownership, and urbanicity of the hospital and the percentage of patients served by Medicare have been shown to influence use patterns of postacute services.^{30,34,35} At the patient level, sociodemographic factors such as age, income, race, and living circumstances have also been shown to affect the use and type of rehabilitation services provided.^{30–33,36–38}

Of central interest to researchers and policy makers is the need for a better understanding of the impact of rehabilitation care at these different rehabilitation settings on patient outcomes, especially relative to resource use and costs. The studies that have compared outcomes in hospitalized stroke patients first discharged to an IRF, an SNF, or a nursing home have generally shown that IRF patients have higher rates of return to community living^{39,40} and greater functional recovery,^{39–42} whereas patients discharged to an SNF or a nursing home have higher rehospitalization rates⁴³ and substantially poorer survival.^{44,45} However, all of these studies have limitations resulting from their observational designs, which rely on administrative data^{39–41} or data from a limited number of facilities.⁴² Importantly, most of these studies demonstrate substantial baseline differences in patient case mix between settings, with IRF patients having a more favorable prognostic outlook because of their younger age, lower prestroke disability, fewer comorbidities, and greater caregiver/family support and because they have been selected for their potential to return to the community.^{39–41,45} These differences serve to illustrate that the decision to refer a stroke patient to a particular setting after discharge is dictated by a complex set of demographic, clinical, and nonclinical factors that are also inevitably related

to patient outcomes. This inherent confounding or channeling bias⁴⁶ has been addressed by these studies through the application of complex statistical methods.^{39–41} However, uncertainty remains about how much of the final difference in outcome is attributable to residual confounding resulting from unmeasured factors (particularly stroke severity and prestroke disability). Despite these concerns, the consistency of the findings in favor of IRF referral suggests that stroke survivors who qualify for IRF services should receive this care in preference to SNF-based care.

Recommendations: Organization of Poststroke Rehabilitation Care (Levels of Care)	Class	Level of Evidence
It is recommended that stroke patients who are candidates for postacute rehabilitation receive organized, coordinated, interprofessional care.	I	A
It is recommended that stroke survivors who qualify for and have access to IRF care receive treatment in an IRF in preference to a SNF.	I	B
Organized community-based and coordinated interprofessional rehabilitation care is recommended in the outpatient or home-based settings.	I	C
ESD services may be reasonable for people with mild to moderate disability.	I b	B

Rehabilitation Interventions in the Inpatient Hospital Setting

There is strong evidence that organized, interprofessional stroke care not only reduces mortality rates and the likelihood of institutional care and long-term disability but also enhances recovery and increases independence in ADLs.^{47–50} Although many small, randomized, clinical trials have studied interventions in the acute rehabilitation phase, the only large, randomized, clinical trials in stroke recovery and rehabilitation have focused on the chronic recovery phase.^{51,52} This section updates the scientific statement on the comprehensive overview of nursing and interprofessional rehabilitation care of the stroke patient and previously summarized recommendations for care of the stroke survivor in the inpatient rehabilitation phase.¹¹

Although acute stroke units have higher levels of nurse staffing, earlier assessments of stroke type and treatment, and more intensive physiological monitoring, rehabilitation units (including comprehensive stroke units in Europe) emphasize recovery and rehabilitation, involving rehabilitation physicians and allied health professionals, increased interprofessional staff education and training, greater patient and caregiver participation in rehabilitation, and early mobilization protocols.⁵³ Age, cognition, functional level after stroke, and to a lesser extent continence have shown consistent associations with poststroke outcomes, and stroke severity is associated with acute discharge disposition, final discharge disposition, and functional level.⁵⁴ In recent years, lengths of stay in IRFs have decreased significantly, but in survivors with mild to moderate stroke, patient satisfaction does not appear to be diminished, and recovery actually may be faster.⁵⁵ In the United States, data after the initiation of prospective payment for rehabilitation in 2002 suggest that discharges from IRFs to institutional settings have increased.⁵⁶

Timing and intensity of acute rehabilitation also are important issues in poststroke functional outcomes but remain controversial. Overall, a 2009 meta-analysis demonstrated insufficient evidence to support or refute the efficacy of routine very early mobilization after stroke compared with conventional care.⁵⁷ In the recently completed randomized, controlled trial (RCT) of the efficacy and safety of very early mobilization within 24 hours of stroke onset (A Very Early Rehabilitation Trial [AVERT]), the high-dose, very early mobilization protocol was associated with a reduction in the odds of a favorable outcome at 3 months.⁵⁸ Early mobilization after stroke is recommended in many clinical practice guidelines worldwide. The AVERT findings should affect clinical practice by refining present guidelines, but clinical recommendations should be informed by future analyses of dose-response associations.

The only evidence assessing the intensity of stroke rehabilitation comes from literature comparing IRFs with subacute rehabilitation. In a study of 222 subjects, Chan et al⁵⁹ reported that subjects whose care included an IRF stay experienced functional scores at least 8 points higher (twice the minimally detectable change) on the Activity Measure for Post-Acute Care than those who went to SNFs or received home health/outpatient care. A retrospective cohort study of 360 subjects demonstrated that subjects who received >3.0 hours of therapy daily made significantly more functional gains than those receiving <3.0 hours daily, although hemorrhagic stroke, left-sided brain injury, earlier IRF admission, and longer IRF stay also were associated with total functional improvement.⁶⁰

Finally, the efficacy of complementary medicine techniques has been studied in the IRF environment. In a randomized, clinical trial of 274 subjects receiving acupuncture, PT, or both, no synergistic effect was found when acupuncture was added to PT, although all subjects exhibited functional gains.⁶¹ An RCT of 53 subjects receiving whole-body somatosensory stimulation or exercise therapy in addition to conventional rehabilitation demonstrated no significant increases in the recovery of balance and ADLs.⁶²

For evidence pertaining to dysphagia; interventions for upper limb rehabilitation, including upper extremity activities (ie, ADLs, instrumental ADLs [IADLs]), touch, and proprioception; lower extremity rehabilitation, including mobility (eg, locomotion) and balance/vestibular rehabilitation; and therapies for cognitive impairments and hemi-spatial neglect, the reader is directed to those subsections in The Rehabilitation Program section.

Recommendations: Rehabilitation Interventions in the Inpatient Hospital Setting	Class	Level of Evidence
It is recommended that early rehabilitation for hospitalized stroke patients be provided in environments with organized, interprofessional stroke care.	I	A
It is recommended that stroke survivors receive rehabilitation at an intensity commensurate with anticipated benefit and tolerance.	I	B
High-dose, very early mobilization within 24 hours of stroke onset can reduce the odds of a favorable outcome at 3 months and is not recommended.	III	A

Prevention and Medical Management of Comorbidities

Prevention of Skin Breakdown and Contractures

Hemiparesis, sensory changes, and altered levels of consciousness place the patient with stroke at risk for joint and muscle contractures and skin breakdown. Pressure ulcers are also associated with impaired circulation, older age, and incontinence. Regular assessment of skin and the use of objective scales of risk such as the Braden scale are valuable in the prevention of skin injury and should be followed by regular skin inspection with documentation.⁶³ Agency for Healthcare Research and Quality (AHRQ) guidelines recommend minimizing or eliminating friction, minimizing pressure, providing appropriate support surfaces, avoiding excessive moisture, and maintaining adequate nutrition and hydration.⁶³ Specific measures include regular turning (at least every 2 hours), good hygiene, and the use of special mattresses and proper wheelchair seating to prevent skin injury.¹¹

After stroke with hemiparesis, 60% of patients will develop joint contracture on the affected side within the first year, with wrist contractures occurring most commonly in patients who do not recover functional hand use.^{65,66} The occurrence of elbow contractures within the first year after stroke is associated with the presence of spasticity within the first 4 months.⁶⁷ These contractures can cause pain and make self-care, including dressing and hygiene, difficult. Many clinicians recommend daily stretching of the hemiplegic limbs to avoid contractures, and patients and families should be taught proper stretching techniques to avoid injury and to maximize effectiveness. Resting hand splints are often applied to prevent contractures in hemiplegic wrist and fingers, but their effectiveness is not well established.^{68,69} There is controversy over the benefit of resting hand splints such that the Royal College of Physicians National Institute for Clinical Excellence guidelines recommend against the use of resting hand splints but the Veterans Affairs/Department of Defense clinical practice guidelines recommend their use.^{4,70,71} Application of resting hand splints combined with other treatments, including early botulinum toxin injection to wrist and finger flexors, may be beneficial.⁷² Early after stroke, positioning of the hemiplegic shoulder in maximum external rotation for 30 minutes each day either in bed or in a chair can be useful for preventing shoulder contracture.^{73,74} Applying serial casting or static adjustable splints may be beneficial in preventing elbow or wrist contractures, although data are conflicting.^{4,72,75,76} Surgical release of the brachialis, brachioradialis, and biceps muscles is a reasonable option to treat pain and range-of-motion limitations in patients with substantial established elbow flexor contractures.⁷⁷

Ankle plantarflexion contractures after stroke can affect gait quality and safety. The use of an ankle-foot orthosis (AFO) can improve gait in patients with active plantarflexion during the swing phase of gait but also may be beneficial in preventing ankle contracture.⁷⁸ For nonambulatory patients, the use of a resting ankle splint at night, set in the plantigrade position (ankle at 90° and subtalar neutral), or

standing on a tilt table for 30 min/d is probably useful in preventing contracture.⁷⁸

Recommendations: Prevention of Skin Breakdown and Contractures	Class	Level of Evidence
During hospitalization and inpatient rehabilitation, regular skin assessments are recommended with objective scales of risk such as the Braden scale.	I	C
It is recommended to minimize or eliminate skin friction, to minimize skin pressure, to provide appropriate support surfaces, to avoid excessive moisture, and to maintain adequate nutrition and hydration to prevent skin breakdown. Regular turning, good skin hygiene, and use of specialized mattresses, wheelchair cushions, and seating are recommended until mobility returns.	I	C
Patients, staff, and caregivers should be educated about the prevention of skin breakdown.	I	C
Positioning of hemiplegic shoulder in maximum external rotation while the patient is either sitting or in bed for 30 minutes daily is probably indicated.	Ila	B
Resting hand/wrist splints, along with regular stretching and spasticity management in patients lacking active hand movement, may be considered.	Ilb	C
Use of serial casting or static adjustable splints may be considered to reduce mild to moderate elbow and wrist contractures.	Ilb	C
Surgical release of brachialis, brachioradialis, and biceps muscles may be considered for substantial elbow contractures and associated pain.	Ilb	B
Resting ankle splints used at night and during assisted standing may be considered for prevention of ankle contracture in the hemiplegic limb.	Ilb	B

Prevention of Deep Venous Thrombosis

Survivors of acute stroke are at high risk of deep venous thrombosis (DVT) and pulmonary embolism (PE) as a result of a combination of limb immobility and reduced activity level.⁷⁹ Prevention of DVT and PE can be divided into pharmacological and mechanical methods in both ischemic and hemorrhage strokes. Prophylactic treatment is initiated depending on the type of stroke and use of thrombolytic therapy. Therapy usually is continued throughout the rehabilitation stay or until the stroke survivor regains mobility, with few studies examining the optimal duration of prophylaxis. For patients with mild motor impairments who are discharged directly home from the hospital, DVT prophylaxis may not be needed. For patients discharged to an SNF with a stay that extends beyond the active rehabilitation program, the duration of prophylactic treatment remains at the discretion of the treating physician.

Recommendations for the prevention of DVT and PE in ischemic stroke are delineated in great detail in the American College of Chest Physicians' "Antithrombotic Therapy and Prevention of Thrombosis, 9th edition."⁸⁰ One meta-analysis

of 16 trials involving 23043 patients with acute ischemic stroke compared stroke survivors receiving varying amounts of unfractionated heparin (UFH) with control subjects.⁸¹ The use of high-dose UFH (>15000 U/d) was associated with a reduction in PE (odds ratio [OR], 0.49; 95% confidence interval [CI], 0.29–0.83) but also with an increased risk of intracerebral hemorrhage (ICH; OR, 3.86; 95% CI, 2.41–6.19) and extracerebral hemorrhage (ECH; OR, 4.74; 95% CI, 2.88–7.78). Low-dose UFH (<15000 U/D) decreased the thrombosis risk (OR, 0.17; 95% CI, 0.11–0.26) but had no influence on the risk of PE (OR, 0.83; 95% CI, 0.53–1.31). The risk of ICH or ECH was not significantly increased (OR, 1.67; 95% CI, 0.97–2.87 for ICH; OR, 1.58; 95% CI, 0.89–2.81 for ECH) with prophylactic-dose UFH.

Adjusted-dose low-molecular-weight heparin (LMWH) decreased the risk of both DVT (OR, 0.07; 95% CI, 0.02–0.29) and PE (0.44; 95% CI, 0.18–1.11), but this benefit was offset by an increased risk of ICH (OR, 2.01; 95% CI, 1.02–3.96) and ECH (OR, 1.78; 95% CI, 0.99–3.17). Prophylactic-dose LMWH (defined as 3000–6000 IU/d) reduced the incidence of both DVT (OR, 0.34; 95% CI, 0.19–0.59) and PE (OR, 0.36; 95% CI, 0.15–0.87) without an increased risk of ICH (OR, 1.39; 95% CI, 0.53–3.67) or ECH (OR, 1.44; 95% CI, 0.13–16). For prophylactic-dose LMWH, the number needed to treat to avoid 1 event was 7 for DVT and 38 for PE.

Overall, the guidelines of the American College of Chest Physicians (9th edition) found an estimated reduction in overall mortality of 12 deaths per 1000 individuals receiving either UFH or LMWH compared with no anticoagulation⁸⁰; no form of prophylaxis is 100% effective in preventing venous thromboembolism in this population, however.

A meta-analysis⁸² and a Cochrane systematic review of 9 trials involving 3137 subjects confirmed the superiority of LMWH over UFH.⁸³ Only 1 high-quality cost-effectiveness analysis comparing LMWH with UFH in acutely ill medical subjects (not stroke) demonstrated fewer complications with LMWH at a lower overall cost.⁸⁴

Intermittent pneumatic compression or sequential compression devices are designed to spur blood flow by intermittently applying pressure on the calf muscles and vasculature. One Cochrane systematic review of 2 small studies including 177 subjects demonstrated a nonsignificant trend toward a lower risk of DVT (OR, 0.45; 95% CI, 0.19–1.10) with no significant effect on mortality (OR, 1.04; 95% CI, 0.37–2.89).⁸⁵

Elastic compression stockings, also referred to as graduated compression stockings, are designed to promote venous blood flow by applying a pressure gradient from the ankle more proximally. One large, randomized, clinical trial involving 2518 subjects failed to demonstrate a positive or negative effect on the occurrence of symptomatic proximal DVT or PE.⁸⁶ However, subjects using elastic compression stockings had an increase in skin complications (relative risk [RR], 4.18; 95% CI, 2.4–7.3). One Cochrane systematic review of 2 trials including 2615 subjects demonstrated no significant reduction in DVT (OR, 0.88; 95% CI, 0.72–1.08) or death (OR, 1.13; 95% CI, 0.87–1.47).⁸⁵

The addition of elastic compression stockings to intermittent pneumatic compression has been studied in a few small studies but has failed to demonstrate a positive or negative effect.⁸⁷ Studies in other patient populations have demonstrated

that the combination of elastic compression stockings and pharmacological prophylaxis significantly reduced the incidence of symptomatic or asymptomatic DVT (OR, 0.40; 95% CI, 0.25–0.65). However, the benefit of treatment should be weighed against the increase in skin complications observed with the use of elastic compression stockings.⁸⁸

With respect to hemorrhagic stroke, prophylactic-dose heparin does not increase the risk of recurrent intracranial bleeding significantly, although the overall quality of the evidence is low.⁸⁰ In 1 small study comparing the initiation of prophylactic heparin on the second and fourth hospital days, there were no harmful or beneficial effects on any outcomes.⁸⁹ This study provides very low-quality evidence that early use of prophylactic-dose heparin is safe in stroke survivors with primary ICH.

Comparisons of the effects between UFH and LMWH and the effects of intermittent pneumatic compression and elastic compression stockings have not been done in stroke survivors with primary ICH. Therefore, recommendations are consistent with those of ischemic stroke.⁸⁰

Recommendations: Prevention of DVT	Class	Level of Evidence
In ischemic stroke, prophylactic-dose subcutaneous heparin (UFH or LMWH) should be used for the duration of the acute and rehabilitation hospital stay or until the stroke survivor regains mobility.	I	A
In ischemic stroke, it is reasonable to use prophylactic-dose LMWH over prophylactic-dose UFH for prevention of DVT.	IIa	A
In ischemic stroke, it may be reasonable to use intermittent pneumatic compression over no prophylaxis during the acute hospitalization.	IIb	B
In ICH, it may be reasonable to use prophylactic-dose subcutaneous heparin (UFH or LMWH) started between days 2 and 4 over no prophylaxis.	IIb	C
In ICH, it may be reasonable to use prophylactic-dose LMWH over prophylactic-dose UFH.	IIb	C
In ICH, it may be reasonable to use intermittent pneumatic compression devices over no prophylaxis.	IIb	C
In ischemic stroke, it is not useful to use elastic compression stockings.	III	B
In ICH, it is not useful to use elastic compression stockings.	III	C

Treatment of Bowel and Bladder Incontinence

Urinary incontinence and fecal incontinence are common problems after stroke. Approximately 40% to 60% of stroke patients have urinary incontinence during their acute admission for stroke, falling to 25% by hospital discharge. At 1 year, 15% will remain incontinent of urine.⁹⁰ Age, cognition, and motor impairments are risk factors for bladder incontinence. Fecal incontinence prevalence is ≈40% acutely but diminishes to 20% by discharge from rehabilitation. Age and functional impairment are risk factors for fecal incontinence on admission for stroke.⁹¹ Impaired awareness of

urinary incontinence is correlated with mortality⁹² and the need for nursing home care 3 months after stroke.⁹³ On a positive note, many patients recover continence after stroke. Because of the risk of skin breakdown, the social stigma, and the burden of care associated with incontinence, management of bowel and bladder continence is an essential part of the rehabilitation process.

Although considerable data on the rate of urinary incontinence exist, there is a paucity of published studies on therapeutic interventions to improve rates of continence. The recommendation to remove indwelling urinary catheters within 24 hours is based on the Centers for Disease Control and Prevention recommendations for all hospitalized patients to prevent catheter-associated urinary tract infections and is not specific to stroke.⁹⁴

The studies reported by Pettersen et al⁹² and Myint et al⁹⁵ combined multiple recommendations representing “best practice” for bladder management and applied them to a modest-sized population of stroke patients. Their studies showed success but limited generalizability because of study design. It is impossible to ascertain which of the multiple interventions were responsible for the improvements seen.

Cognitive awareness plays a role in continence and ultimately in overall stroke outcome. There are many types and causes of incontinence, ranging from impaired awareness of the need to void to difficulty with mobility in reaching the bathroom to communication difficulties resulting from aphasia.

We were unable to identify any high-quality studies of treatment for fecal incontinence after stroke, and recommendations are based on the general population of adults.⁹⁶

Recommendations: Treatment of Bowel and Bladder Incontinence	Class	Level of Evidence
Assessment of bladder function in acutely hospitalized stroke patients is recommended.		
A history of urological issues before stroke should be obtained.	I	B
Assessment of urinary retention through bladder scanning or intermittent catheterizations after voiding while recording volumes is recommended for patients with urinary incontinence or retention.	I	B
Assessment of cognitive awareness of need to void or having voided is reasonable.	IIa	B
Removal of the Foley catheter (if any) within 24 hours after admission for acute stroke is recommended.	I	B
It is reasonable to use the following treatment interventions to improve bladder incontinence in stroke patients:	IIa	B
Prompted voiding		
Pelvic floor muscle training (after discharge home)		
It may be reasonable to assess prior bowel function in acutely hospitalized stroke patients and include the following:	IIb	C
Stool consistency, frequency, and timing (before stroke)		
Bowel care practices before stroke		

Assessment, Prevention, and Treatment of Hemiplegic Shoulder Pain

Shoulder pain is common after stroke, with an incidence during the first year of 1% to 22%.^{97,98} The reported prevalence of shoulder pain varies between 5% and 84%, depending on the acuity and definition of shoulder pain used.⁹⁹ The development of shoulder pain after stroke is associated with shoulder subluxation and motor weakness. Importantly, these 2 factors have strong covariance, suggesting that motor impairment may be the more important predictive factor.¹⁰⁰ However, motor weakness is not predictive of pain severity in the hemiplegic shoulder. Spasticity is believed to contribute to the genesis of shoulder pain in some patients, although a causal relationship has not been confirmed. Other predictors of shoulder pain include older age, left hemiplegia, the presence of tactile extinction and reduced proprioception in the painful limb, early complaints of pain, reduced passive shoulder abduction and external rotation of glenohumeral joint, a positive Neer impingement sign (shoulder pain with passive abduction of the internally rotated arm), and tenderness to palpation over the biceps tendon and supraspinatus.^{101–105}

Hemiplegic shoulder pain is multifactorial. Pain is associated with shoulder tissue injury, abnormal joint mechanics, and central nociceptive hypersensitivity. About one third of patients with acute stroke have abnormal ultrasound findings in the hemiplegic shoulder when studied at the time of admission to acute inpatient rehabilitation, including effusion in biceps tendon or subacromial bursa; tendinopathy of biceps, supraspinatus, or subscapularis; and rotator cuff tear.^{106,107} Such findings are more prevalent in the hemiplegic shoulder than in the non-hemiplegic shoulder and in those with more severe hemiplegia, subluxation, spasticity, limited joint range, and shoulder pain.¹⁰⁶ The frequency of abnormal ultrasound findings in the hemiplegic shoulder increases over the course of rehabilitation in patients with more severe motor impairment.^{106,107} Although there is an association between abnormal findings on shoulder ultrasound and hemiplegic shoulder pain in patients with acute stroke, a causal association has not been established. Among patients with acute and chronic stroke with hemiplegic shoulder pain, the presence of shoulder tissue injury on imaging is not associated with the severity of pain.^{108,109}

Patients with stroke-related hemiplegia demonstrate altered movement patterns at certain stages of recovery. In the acute phase of stroke, shoulder subluxation is associated with pain. In those with chronic stroke and hemiplegic shoulder pain, there is capsular stiffness and altered resting position of the scapula in lateral rotation.^{103,110} Compared with those without voluntary movement, patients with some movement in the painful hemiparetic shoulder have a higher rate of shoulder joint tissue injury on magnetic resonance imaging, suggesting that more physical activity promotes injury.¹⁰⁹ However, the relationship between altered kinematics and pain in the hemiparetic shoulder has not been established. For example, shoulder joint kinematics are altered with spasticity, yet there are no clear correlations between reductions in Ashworth and pain scores or reductions in subluxation and pain.¹¹¹ Thus, the exclusive role of peripheral nociceptive pain in the mechanically altered hemiplegic shoulder has been questioned.¹¹²

There is recent evidence supporting both a peripheral and a central neuropathic role for shoulder pain.^{112–114} Patients with

hemiplegic shoulder pain have a higher prevalence of altered somatosensory function with reduced sensory thresholds and decreased kinesthesia than patients without pain and normal control subjects.^{105,115–117} In addition, patients with shoulder pain have higher rates of allodynia and hyperpathia on both the affected and less affected sides than stroke patients without pain.^{116,117} Patients with painful shoulders also have higher heat pain thresholds and lower pain pressure thresholds.^{117,118} Soo Hoo and colleagues¹¹⁸ found lower pain pressure thresholds on the affected and less affected sides in patients with shoulder pain. Somatosensory evoked responses from the affected upper limb differ between stroke patients with and those without shoulder pain.¹¹⁹ Although diagnostically distinct from hemiplegic shoulder pain, complex regional pain syndrome (also called shoulder-hand syndrome) is characterized by allodynia and hyperpathia and includes shoulder pain as a key component. Thus, there is growing recognition that hemiplegic shoulder pain is a syndrome with biomechanical and central nervous system components and overlaps with complex regional pain syndrome.

Interventions to prevent the onset of and to treat shoulder pain in patients with stroke-related hemiplegia include proper positioning, maintenance of shoulder range of motion, and motor retraining. For people in wheelchairs, lap trays and arm troughs might be useful positioning devices to reduce shoulder pain and subluxation. Some suggest that consistent performance of aggressive passive range-of-motion exercises may reduce or prevent later shoulder problems, but the evidence in support of or against this suggestion is missing. Aggressive range of motion of the complex shoulder joint, if done improperly, could do more harm than good. The use of slings, especially during ambulation training to protect the shoulder from traction injury, may be considered, and the use of overhead pulley exercises should be avoided.^{70,120} Research has focused on several adjuvant treatments, including strapping, acupuncture, and neuromuscular electrical stimulation (NMES). There are a few RCTs with mixed results on shoulder strapping for the prevention of shoulder pain after acute stroke.^{121–123} Each study used different strapping (or taping) techniques and measured different pain outcomes. In the largest of these, Pandian and others¹²³ randomized 162 patients with acute stroke to either shoulder taping or sham taping. There was a trend toward a difference in visual analog pain scale and pain-related disability scores over 30 days, but these differences were not statistically or clinically significant. Currently, there is insufficient evidence to support or refute the efficacy of shoulder strapping (taping) for the prevention of hemiplegic shoulder pain.

Acupuncture in combination with standard therapeutic exercise may be a safe and effective adjuvant for the treatment of hemiplegic shoulder pain. This was suggested by Lee and colleagues¹²⁴ in a recent systematic review of this topic. They found 7 RCTs, all showing positive effects. However, they could not recommend concrete conclusions because of the limited number of available trials.

Various types of skin surface electrical stimulation have been evaluated for the treatment of hemiplegic shoulder pain, including transcutaneous electrical nerve stimulation (TENS) and NMES. These modalities have not been evaluated sufficiently, and their efficacy for pain prevention and treatment

remains inconclusive.¹²⁵ The largest RCT to date testing surface NMES to a hemiplegic shoulder showed no effect on pain prevention in patients with acute stroke; however, pain was not a primary outcome measure in this study.¹²⁶ Compliance with the use of surface NMES has been variable in these studies, and surface NMES has been shown to be less well tolerated than intramuscular NMES.^{126–128} Intramuscular NMES for 6 h/d over 6 weeks with 4 implanted electrodes showed efficacy in 2 open-label trials.^{129,130} Pain differences between treatment and control groups remained significant 12 months after treatment, and NMES was more effective in patients with less chronic stroke (defined as <77 months after stroke in this study).^{131,132} Although fully implanted intramuscular stimulators for hemiplegic shoulder have been developed, there are insufficient data to support efficacy to date.¹³³

Corticosteroid injection into glenohumeral joint or subacromial space is commonly used to treat shoulder pain. There are limited studies on the use of steroid injection in the painful hemiplegic shoulder. Observational studies have shown a significant reduction in hemiplegic shoulder pain after either glenohumeral or subacromial injection, but the long-term pain reduction has not been verified.^{134,135} These injections result in superior short-term pain reduction compared with standard care.¹³⁶ There are only 2 randomized trials of shoulder joint injections for pain. Snels and colleagues¹³⁷ showed no significant effect on pain reduction after glenohumeral injection. In contrast, Rah and others¹³⁸ showed a significant reduction in pain after corticosteroid injection compared with placebo. In the latter study, Rah et al selected only patients with shoulder joint pathology that was verified by ultrasonography.

Botulinum toxin injections into the shoulder musculature have shown mixed results in the management of shoulder pain. de Boer and colleagues¹³⁹ showed no impact of botulinum toxin injection into the subscapularis of painful hemiplegic shoulders, whereas Yelnick and colleagues¹⁴⁰ showed significant reductions in pain scores in patients treated for shoulder spasticity. Some investigators have noted reduced pain with shoulder movement after botulinum toxin injections to the pectoralis major and biceps brachii, but others found no change in reported pain scores after pectoralis major injection.^{141–143} Lim et al¹⁴⁴ found botulinum toxin injections to the pectoralis major, infraspinatus, and subscapularis muscles superior to glenohumeral steroid injection. Botulinum toxin injections may decrease shoulder spasticity and pain associated with spasticity-related joint mobility restrictions but are not sufficient to reduce shoulder pain in general.

Suprascapular nerve blocks may be effective in reducing shoulder pain through a reduction of both nociceptive and neuropathic pain mechanisms. A recent randomized, clinical trial showed that suprascapular nerve blocks were superior to placebo injections in reducing hemiplegic shoulder pain for up to 12 weeks after treatment.^{145,146} In another small, comparison study of patients with nonneuropathic hemiplegic shoulder pain, suprascapular nerve blocks were as effective as glenohumeral triamcinolone injections.¹⁴⁷

Surgical tenotomy of the pectoralis major, latissimus dorsi, teres major, and subscapularis muscles may reduce pain in patients with severe hemiplegia and restrictions in shoulder range of motion.¹⁴⁸ In patients with clinical evidence of a central pain component associated with sensory changes,

allodynia, and hyperpathia, medication management with neuromodulating medications may be considered.^{70,120,149}

Recommendations: Assessment, Prevention, and Treatment of Hemiplegic Shoulder Pain	Class	Level of Evidence
Patient and family education (ie, range of motion, positioning) is recommended for shoulder pain and shoulder care after stroke, particularly before discharge or transitions in care.	I	C
Botulinum toxin injection can be useful to reduce severe hypertonicity in hemiplegic shoulder muscles.	IIa	A
A trial of neuromodulating pain medications is reasonable for patients with hemiplegic shoulder pain who have clinical signs and symptoms of neuropathic pain manifested as sensory change in the shoulder region, allodynia, or hyperpathia.	IIa	A
It is reasonable to consider positioning and use of supportive devices and slings for shoulder subluxation.	IIa	C
A clinical assessment can be useful, including:		
Musculoskeletal evaluation	IIa	C
Evaluation of spasticity	IIa	C
Identification of any subluxation	IIa	C
Testing for regional sensory changes	IIa	C
NMES may be considered (surface or intramuscular) for shoulder pain.	IIb	A
Ultrasound may be considered as a diagnostic tool for shoulder soft tissue injury.	IIb	B
Usefulness of acupuncture as an adjuvant treatment for hemiplegic shoulder pain is of uncertain value.	IIb	B
Usefulness of subacromial or glenohumeral corticosteroid injection for patients with inflammation in these locations is not well established.	IIb	B
Suprascapular nerve block may be considered as an adjunctive treatment for hemiplegic shoulder pain.	IIb	B
Surgical tenotomy of pectoralis major, latissimus dorsi, teres major, or subscapularis may be considered for patients with severe hemiplegia and restrictions in shoulder range of motion.	IIb	C
The use of overhead pulley exercises is not recommended.	III	C

Central Pain After Stroke

Central poststroke pain is pain that results from a lesion in the somatosensory system rather than from a peripheral nociceptive or psychogenic cause.^{150,151} Diagnostic criteria include requirements that the pain occur after stroke, be located in an area of the body that corresponds to the lesion in the central nervous system, and not be accounted for by nociceptive or peripheral neuropathic pain.¹⁰⁰ Central pain is classically associated with thalamic stroke (Dejerine-Roussy syndrome) but can result from a lesion anywhere along the spinothalamic and thalamocortical tracts within the central nervous system.¹⁵⁰ Central pain symptoms are usually described as burning or aching and often include

allodynia associated with touch, cold, or movement.^{152–155} Use of diagnostic criteria for central poststroke pain such as those proposed by Klit et al¹⁵¹ can be helpful. The incidence of central poststroke pain is estimated at 7% to 8%, and it typically begins within a few days after stroke, with the majority of patients becoming symptomatic within the first month.^{152,154}

There is limited evidence on the efficacy of proposed treatments for central poststroke pain. Pharmacotherapy combined with therapeutic exercise and psychosocial support is a reasonable approach.¹⁵⁶ Response to treatment is best assessed with standardized serial measurements such as pain diaries, visual analog scales, or pain questionnaires.¹⁵⁷ Pharmacotherapy has relied primarily on antidepressant medications and anticonvulsants. Amitriptyline 75 mg at bedtime has been shown to lower daily pain ratings and to improve global functioning.¹⁵⁸ Lamotrigine can reduce daily pain ratings and cold-induced pain, but only 44% of patients given this medication have a good clinical response.¹⁵⁹ Results for pregabalin have been mixed, with 2 clinical trials finding that daily pain reporting with pregabalin was not significantly better than with placebo.^{160,161} Sleep and anxiety were improved with pregabalin, however. Gabapentin has not been well studied for poststroke central pain but has been effective in other forms of neuropathic pain.^{162,163} Other options for central pain management include carbamazepine and phenytoin, but their usefulness is not well established.^{158,164}

There are few nonpharmacological options for the management of central poststroke pain. TENS was shown to be ineffective in a small trial.¹⁶⁵ Motor cortex stimulation can be given with a surgically implanted dural electrode overlying the motor cortex that is connected to a subcutaneous pulse generator. In several case series, pain reductions of >50% on the visual analog scale were achieved in 50% to 83% of patients, with effectiveness for up to 2 years after implantation.^{166–169} However, cortical stimulator implantation is associated with several complications, including infection, hardware failure, postoperative seizures, and long-term epilepsy. Motor cortex stimulation may be an option for intractable central poststroke pain. Deep brain stimulation has conflicting evidence for the management of central pain and currently cannot be recommended.^{170,171}

Recommendations: Central Pain After Stroke (Continued)	Class	Level of Evidence
TENS has not been established as an effective treatment.	III	B
Motor cortex stimulation might be reasonable for the treatment of intractable central poststroke pain that is not responsive to other treatments in carefully selected patients.	IIb	B
Deep brain stimulation has not been established as an effective treatment.	III	B

Prevention of Falls

A great deal of research literature exists on the epidemiology, risk factors, and development of prevention programs for falls in the general population of older adults.¹⁷² Less information is available for individuals with stroke. Falls and their prevention in individuals with stroke require special considerations.¹⁷³ Risk factors, interventions, and prevention programs developed for the community-living older population will not necessarily translate to the population of individuals with stroke. The Balance and Ataxia section provides more discussion.

Up to 70% of individuals with a stroke fall during the first 6 months after discharge from the hospital or rehabilitation facility.¹⁷⁴ Individuals with stroke are also at risk to be repeat fallers and to experience an injury associated with a fall.¹⁷⁵ A larger portion of fractures occurring in individuals with stroke (27%) involve the hip or pelvis compared with <10% of the general population of older adults who fall.¹⁷⁶ The loss of bone mineral density (BMD) associated with stroke may contribute to the higher hip fracture rate for individuals with stroke.¹⁷⁷

In addition to the physical consequences associated with fractures and related injuries, falls have psychological and social consequences. The impairments in balance, gait, motor control, perception, and vision contribute to a heightened fear of falling in individuals with stroke. Studies indicate that 30% to 80% of individuals with stroke report various levels of fear associated with falling and mobility.¹⁷⁸ Fear of falling can lead to reduced levels of physical activity and deconditioning, creating a cascade that may result in greater declines in physical activity, a decrease in ADLs, a loss of independence, fewer community interactions, social isolation, and depression. Ironically, the reduction in physical activity resulting from fear of falling can itself contribute to an increased risk of falls.¹⁷⁹

Risk Factors and Assessment

Evaluation of risk factors is widely recognized as the first step in preventing falls. A systematic review¹⁸⁰ of factors contributing independently to falls in the general older population identified previous falls, low muscle strength, impaired gait, poor balance, and use of specific and multiple medications as the strongest risk factors for falls. Research suggests that risk factors in the stroke population are similar overall but with some differences.¹⁷³ For example, a history of falls before a stroke does not appear to be as strong a risk factor as it is in the general older population.¹⁷³

The probability of falling also increases with the number of risk factors. Tinetti and others¹⁸¹ reported that the 1-year risk of falling among the general elderly population increased from a range of 8% to 19% for individuals with no risk factors to >70% for individuals with ≥4 risk factors.

Recommendations: Central Pain After Stroke	Class	Level of Evidence
The diagnosis of central poststroke pain should be based on established diagnostic criteria after other causes of pain have been excluded.	I	C
The choice of pharmacological agent for the treatment of central poststroke pain should be individualized to the patient's needs and response to therapy and any side effects.	I	C
Amitriptyline and lamotrigine are reasonable first-line pharmacological treatments.	IIa	B
Interprofessional pain management is probably useful in conjunction with pharmacotherapy.	IIa	C
Standardized measures may be useful to monitor response to treatment.	IIb	C
Pregabalin, gabapentin, carbamazepine, or phenytoin may be considered as second-line treatments.	IIb	B

The assessment of risk factors varies across settings and circumstances. For example, a majority of falls for individuals with stroke that occur during hospitalization are associated with transfers and attempting activities without supervision, whereas the majority of falls for individuals with stroke living in the community are associated with walking.¹⁸²

Numerous fall risk assessment tools are available. A recent systematic review¹⁸³ identified 8 commonly used fall risk assessment tools with existing reliability and validity. The most commonly used assessment instrument in the 43 prevention studies reviewed was the Morse Fall Scale.¹⁸⁴ The Berg Balance Scale has demonstrated good sensitivity and specificity in predicting falls in individuals with stroke.¹⁸⁵ Several federal and professional associations have developed fall prevention toolkits that include risk assessment instruments and protocols (eg, the National Center of Patient Safety Falls Toolkit, the Centers for Disease Control and Prevention Stopping Elderly Accidents, Deaths and Injuries Toolkit, the AHRQ Preventing Falls in Hospitals—A Toolkit for Improving Quality Care, and the AHRQ Step-Up to Stop Falls Toolkit).

Prevention Programs

The most comprehensive assessment of preventing falls in the general population of older adults is the recent Cochrane database review.¹⁷² The evidence specific for fall prevention in individuals with stroke is limited. A recent randomized trial of a multifactorial falls prevention program for individuals with stroke¹⁸⁶ reported no benefit for this intervention compared with usual care among 156 participants. Tai Chi has been found to be more effective than strength and range-of-movement exercises in a clinical trial.¹⁸⁷ A nonrandomized, small-scale, controlled study found a community-based progressive group exercise program that included walking and strength and balance training for 1 hour 3 times a week for participants with mild to moderate hemiparesis to be safe, feasible, and efficacious in a community setting.¹⁸⁸

Recommendations: Prevention of Falls	Class	Level of Evidence
It is recommended that individuals with stroke discharged to the community participate in exercise programs with balance training to reduce falls.	I	B
It is recommended that individuals with stroke be provided a formal fall prevention program during hospitalization.	I	A
It is reasonable that individuals with stroke be evaluated for fall risk annually with an established instrument appropriate to the setting.	IIa	B
It is reasonable that individuals with stroke and their caregivers receive information targeted to home and environmental modifications designed to reduce falls.	IIa	B
Tai Chi training may be reasonable for fall prevention.	IIb	B

Seizure Prophylaxis

A new seizure diagnosis after stroke can be classified as early (beginning within the first few days of stroke) or late.

A seizure is most likely to arise during the first 24 hours after stroke onset, is usually partial at onset, and has a variable tendency to secondarily generalize. A poststroke seizure is more common with ICH¹⁸⁹ or when the stroke involves cerebral cortex¹⁹⁰; seizures in patients with lacunar stroke are rare.¹⁹¹ Estimates of the percentage of patients having a seizure during the first few days after a stroke range from 2% to 23% in various studies, with the true risk toward the lower end of this range.^{191,192} A minority of such patients will have a recurrent seizure, and status epilepticus is uncommon.¹⁹³

Estimates for the incidence of a seizure developing late after stroke are even more variable, ranging from 3% to 67%.¹⁹² One study found a 1.5% rate of seizures specifically during inpatient admission for stroke rehabilitation.¹⁹⁴ The probability of a late seizure is higher in patients with preexisting dementia.¹⁹⁵ Seizures with onset within 2 weeks of stroke are usually easy to control medically.¹⁹⁶

No data are available to guide the utility of prophylactic administration of antiepileptic drugs after stroke, and limited data are available on the efficacy of antiepileptic drugs in the treatment of stroke patients who have experienced a seizure. Any patient who develops a seizure should be treated with standard management approaches, including a search for reversible causes of seizure and any potential antiepileptic drugs. Subclinical seizures can be difficult to detect unless suspected, so the treating physician might consider pursuing this diagnosis in a patient with otherwise unexplained rapidly shifting sensorium or other deficits or transient fluctuations in vital signs.

Prophylactic administration of antiepileptic drugs to prevent a seizure is not recommended for patients with stroke,¹⁹² including patients with ICH.¹⁹⁷ RCTs are also lacking for the prevention or treatment of seizures in patients with subarachnoid hemorrhage.¹⁹⁸ However, prophylactic therapy with antiepileptic drugs is advocated by some on the basis of theoretical concerns such as an association of increased rate of seizures among subgroups of patients with subarachnoid hemorrhage with selected features such as thicker clot or rebleeding.¹⁹⁸

In all cases, it must be understood that prescribing a new antiepileptic drug carries a significant risk of side effects.^{199,200} Furthermore, some data suggest that prophylactic use of antiepileptic drug therapy may be associated with poorer outcome.^{199–202} The risk-benefit analysis of antiepileptic drug use after a recent stroke includes an important concern that does not pertain to many neurological settings. Evidence suggests that many of the medicines used to treat seizures, including phenytoin and benzodiazepines, dampen some mechanisms of neural plasticity that contribute to behavioral recovery after stroke.^{203–205}

Recommendations: Seizures	Class	Level of Evidence
Any patient who develops a seizure should be treated with standard management approaches, including a search for reversible causes of seizure in addition to potential use of antiepileptic drugs.	I	C
Routine seizure prophylaxis for patients with ischemic or hemorrhagic stroke is not recommended.	III	C

Secondary Stroke Prevention

Stroke shares many risk factors with other forms of cardiovascular disease such as hypertension, smoking, hyperlipidemia, and inactivity.²⁰⁶ With hospitalization for acute stroke brief, it is particularly important to address the secondary prevention of stroke and other cardiovascular diseases during the postacute rehabilitation phase of care. Readers are directed to the most recent AHA/American Stroke Association (ASA) secondary stroke prevention guideline for further information.²⁰⁶

Poststroke Depression, Including Emotional and Behavioral State

In the United States and globally, depression and anxiety are common after stroke and are associated with increased mortality and poor functional outcomes.^{207–214} There is evidence that the likelihood of depression increases with stroke severity,²¹⁵ but the mechanisms of poststroke depression are incompletely understood. Depression has been reported in up to 33% of stroke survivors compared with 13% of age- and sex-matched control subjects,²¹⁶ but reliable estimates of the incidence and prevalence of depression in a stroke cohort are limited.²¹⁷ Predictors of poststroke depression include a history of depression, severe disability, cognitive impairment, previous stroke, a positive family history of psychiatric disorder, and female sex.^{216–220} As poststroke psychosocial issues are studied, greater understanding of the complexity of the problem is obtained. For example, Vickery et al²¹⁴ analyzed how the stability of self-esteem plays a role in the rate of depressive symptoms. The depression and emotionalism section of the 2005 stroke rehabilitation clinical practice guidelines does an excellent job of describing the incidence of poststroke depression and pseudo-bulbar affect.¹⁴⁹ What is clear from the literature is that these issues are real and warrant assessment and treatment as early as possible and on an ongoing basis. The section on poststroke depression in the AHA/ASA “Palliative and End-of-Life Care in Stroke”²²¹ scientific statement gives highlights of prevention, assessment, and treatment. Here, we highlight how poststroke depression affects stroke rehabilitation and recovery and, vice versa, how rehabilitation and exercise affect depression.

Although data are inconclusive as to whether improvement of poststroke depression is independently associated with functional improvement,²²² depression can negatively affect a patient’s ability to actively participate in rehabilitation therapies.²²³ It is important to address symptoms early in the rehabilitation process, especially given the recent trend for less time in rehabilitation. Depression frequently coexists with other psychiatric symptoms. Anxiety in particular is found to coexist with depression in the poststroke patient population but frequently goes undiagnosed.²²⁴ Anxiety can create uncomfortable or disabling feelings of worry/fear accompanied by physical symptoms that make participation in therapy more difficult. Shimoda and Robinson²²⁵ reported that generalized anxiety disorder accompanied by poststroke depression delayed recovery from depression, delayed ADL recovery, and reduced

overall social functioning. Unfortunately, few studies have been conducted to address the treatment of and recovery from poststroke generalized anxiety disorder.²²⁶ Anxiety symptoms in poststroke patients should be assessed and treated, particularly in those patients with a diagnosed depressive disorder. Any patient diagnosed with 1 form of mood disorder should be assessed for others.

A review of intervention trials for treatment of poststroke depression yielded no evidence of benefits of psychotherapy in treating depression after stroke.²²⁷ de Man-van Ginkel et al²²⁸ identified additional nursing practices that had a positive impact on reducing depression symptoms, including life review therapy, motivational interviewing, nursing support programs, and physical exercise.

Rehabilitation, Exercise, and Recovery

A study with 49 depressed patients (24 treated for depression and 25 not treated as determined by physician preference) was conducted to evaluate the effects of poststroke depression and antidepressant therapy on the improvement of motor scores and disability.²²⁹ Poststroke depression was found to have negative effects on functional recovery, and the pharmacological treatment of depression was found to counterbalance this effect. Similarly, a study with 55 patients with poststroke major or minor depression found that remission of poststroke depression over the first few months after stroke is associated with greater recovery of ADL function than continued depression.²³⁰ Early effective treatment of depression may have a positive effect on the rehabilitation outcome. No larger-scale studies following up on this line of research were found.

Physical exercise may provide a complementary treatment for depression. Exercise may affect depressive symptoms through a number of mechanisms. For example, the hypothalamic-pituitary-adrenal axis may be dysregulated in depression, resulting in elevated cortisol levels. Exercise can improve regulation of hypothalamic-pituitary-adrenal responses.²³¹ Depression also has direct and indirect consequences on immune function,²³² and regular exercise may serve as a nonpharmacological stimulus for enhancing immune function.²³³ Furthermore, social contact through group exercise may be beneficial for individuals with depression.

Meta-analyses in adults with depression (but without stroke) have shown positive effects of exercise on depressive symptoms. A Cochrane review reported a large clinical effect with a standardized mean difference of -0.82 of physical exercise on depressive symptoms.²³⁴ A systematic review suggested that physical exercise was effective in treating depression, especially in individuals with high baseline levels of depression.²³⁵

In a meta-analysis of 13 studies ($n=1022$ patients), Eng and Reime²³⁶ found that depressive symptoms after stroke were lower immediately after ≥ 4 weeks of exercise (standardized mean difference= -0.13 [95% CI, -0.26 to -0.01]). Exercise appeared to have a small beneficial effect on depressive symptoms across both the subacute and chronic stages of stroke recovery, but these effects were not retained after the exercise was terminated. Saunders et al²³⁷ reviewed

8 exercise studies that included a depression outcome in a stroke population and meta-analyzed 3 of these studies. They concluded that the results were inconsistent among the trials. A major criticism is that the majority of the stroke studies used depressive symptoms as a secondary outcome, and as a result, the levels of depressive symptoms varied widely in these studies. Given the strong evidence in nonstroke populations with depression, coupled with the preliminary evidence in stroke populations, exercise may be useful as a potential treatment to reduce depressive symptoms in individuals with stroke.

Depression and other psychological disorders, specifically anxiety, can occur at any time after stroke. Healthcare providers should evaluate these issues during poststroke follow-up visits. One study compared different diagnostic tools to determine whether one was superior over another. Bergersen et al²³⁸ reported that patients and their caregivers fail to discuss psychosocial issues or symptomology with their providers. There are cultural differences in reporting psychosocial issues, resulting in part from perceived cultural morays discouraging personal feelings.²⁰⁹ Varying poststroke assessments on the basis of cultural background is an important consideration specifically in poststroke depression. Nonpharmacological treatment options can provide some successful outcomes. Unfortunately, there are no well-designed RCTs in which various treatment interventions are compared to determine superiority. Because of the complexity of the psychosocial diseases and limited understanding, a number of treatment options should be tried to determine patient-specific effectiveness. This supports the need for ongoing monitoring after treatment.

Medication

Poststroke depression is treatable with a variety of antidepressant medications, with selective serotonin reuptake inhibitors (SSRIs) and tricyclic antidepressants being the most widely studied.^{223,239} Treatment with heterocyclic antidepressant medications and SSRIs appears to be a viable option for poststroke depression, but their absolute or relative efficacy has yet to be fully established.²⁴⁰ In 1 study of 870 veterans with poststroke depression, poststroke SSRI treatment was associated with longer survival. The authors concluded that after a stroke, SSRI initiation or resumption of treatment should be considered as part of a medication therapy management service, especially if the patient has a history of depression or was taking an SSRI before the stroke.²⁴¹ A 2008 Cochrane review analyzing data for 13 pharmaceutical agents, including tricyclic antidepressants, SSRIs, and monoamine oxidase inhibitors, found some benefit of pharmacotherapy in terms of a complete remission of depression and improvement in scores on depression rating scales, but there was also an associated increase in adverse events.²²⁷ The analyses were complicated by a lack of standardized diagnostic and outcome criteria and differing analytic methods. To the best of our knowledge, there have been no studies on the effectiveness of a combined drug intervention (eg, SSRIs) and rehabilitation intervention on recovery outcomes after stroke.

Recommendations: Poststroke Depression, Including Emotional and Behavioral State	Class	Level of Evidence
Administration of a structured depression inventory such as the Patient Health Questionnaire-2 is recommended to routinely screen for poststroke depression.	I	B
Patient education about stroke is recommended. Patients should be provided with information, advice, and the opportunity to talk about the impact of the illness on their lives.	I	B
Patients diagnosed with poststroke depression should be treated with antidepressants in the absence of contraindications and closely monitored to verify effectiveness.	I	B
A therapeutic trial of an SSRI or dextromethorphan/quinidine is reasonable for patients with emotional lability or pseudobulbar affect causing emotional distress.	Ila	A
Periodic reassessment of depression, anxiety, and other psychiatric symptoms may be useful in the care of stroke survivors.	Ila	B
Consultation by a qualified psychiatrist or psychologist for stroke survivors with mood disorders causing persistent distress or worsening disability can be useful.	Ila	C
The usefulness of routine use of prophylactic antidepressant medications is unclear.	Ilb	A
Combining pharmacological and nonpharmacological treatments of poststroke depression may be considered.	Ilb	A
The efficacy of individual psychotherapy alone in the treatment of poststroke depression is unclear.	Ilb	B
Patient education, counseling, and social support may be considered as components of treatment for poststroke depression.	Ilb	B
An exercise program of at least 4 weeks duration may be considered as a complementary treatment for poststroke depression.	Ilb	B
Early effective treatment of depression may have a positive effect on the rehabilitation outcome.	Ilb	B
No recommendation for the use of any particular class of antidepressants is made. SSRIs are commonly used and generally well tolerated in this patient population.	III	A

Poststroke Osteoporosis

BMD and lean tissue mass commonly decline after stroke.^{242–244} Although declines in BMD and lean tissue mass can occur in both limbs, changes on the paretic side are more profound. BMD can decrease by >10% in <1 year in the paretic lower limb.²⁴² Moreover, the decline in BMD, coupled with balance deficits resulting from stroke, increases fracture risk.²⁴⁵ Changes in BMD after stroke are correlated with functional deficits in the paretic limb(s). Jørgensen et al²⁴⁶ assessed 40 patients at 6 days, 7 months, and 1 year after stroke. Seventeen patients were

initially nonambulatory, and 23 were ambulatory. Ambulatory status was predictive of changes in BMD 1 year after stroke. The nonambulatory patients had a 10% reduction in BMD in the paretic lower limb compared with a 3% reduction in BMD in ambulatory patients. Moreover, among the 17 patients who were initially nonambulatory, 12 regained walking ability with assistance 2 months after stroke. Those patients who regained ambulation ability had an 8% reduction in BMD in the paretic lower limb compared with a 13% reduction in those who remained nonambulatory. Pang et al²⁴⁷ found that femur BMD and lean mass were significantly lower and fat mass was significantly higher on the paretic side compared with the nonparetic side in ambulatory men and women who suffered a stroke >1 year earlier. However, the degree to which BMD was preserved in the paretic lower extremity was significantly correlated with 6-minute walk test distance, peak oxygen consumption ($\dot{V}O_2$), and handheld dynamometry. Multiple regression analysis revealed that peak $\dot{V}O_2$ was a significant predictor of paretic limb BMD and lean tissue mass. Paretic upper limbs also demonstrate significant declines in BMD and lean mass after stroke. The decline in BMD and lean mass is associated with paretic upper limb strength assessed by handheld dynamometry.²⁴⁸

The US Preventive Services Task Force²⁴⁹ recommends osteoporosis screening in all women ≥ 65 years of age; women <65 years of age whose fracture risk is greater than or equal to that of older white women with no additional risk factors should also undergo osteoporosis screening. The US Preventive Services Task Force concludes that there is inconclusive evidence to make any osteoporosis screening recommendations for men. Individuals with stroke have an increased risk for osteoporosis, particularly on the paretic side.²⁵⁰ The risk of fracture is also increased in patients with stroke.²⁵¹ In men with stroke, although osteoporosis and fracture risks are higher, no clear guidance on screening can be provided at this time.²⁵² The current US Preventive Services Task Force recommendations are appropriate in the stroke population.

Limited research indicates that increased levels of physical activity such as ambulation and resistance training attenuate the decline in, maintain, or increase BMD and lean tissue mass after stroke.^{245,246,253–257}

Recommendations: Poststroke Osteoporosis	Class	Level of Evidence
It is recommended that individuals with stroke residing in long-term care facilities be evaluated for calcium and vitamin D supplementation.	I	A
It is recommended that US Preventive Services Task Force osteoporosis screening recommendations be followed in women with stroke.	I	B
Increased levels of physical activity are probably indicated to reduce the risk and severity of poststroke osteoporosis.	Ila	B

Assessment

Level of Disability

Stroke can affect numerous aspects of neural function and structure. Clinically, this most often manifests as weakness, with other common impairments being aphasia, neglect, visual

field deficit, cognitive changes such as executive dysfunction or memory loss, major depression, sensory deficits, dysarthria, and problems with coordination.^{11,258,259}

Measures of body function tend to be more objective, easier to define, and easier to measure compared with other levels of the World Health Organization’s *ICF* but may have less relevance to a patient’s function and independence. Limited correlation exists across *ICF* dimensions.^{11,260} The reason is that numerous factors have a greater influence on outcome as one moves from body function/structure to activity limitations, participation restrictions, and quality of life.²⁶¹ During acute stroke management, the focus tends to be more on measures of body function, whereas toward the more chronic phases, the emphasis shifts to activities and participation.¹¹ Regardless of *ICF* dimension, formal standardized and validated measures should be used to the extent possible.

Many methods are available to measure loss of body function/structure. Chief among these is the physical examination. Many scales have been devised.²⁶² Some are global scales that aim to capture all major deficits and to combine the assessment into a single score, whereas others are modality specific. In the United States, the most widely used global assessment of impairment is the National Institutes of Health Stroke Scale, which ranges from 0 to 42, with higher scores indicating more severe loss of body function/structure. Training and formal certification on National Institutes of Health Stroke Scale scoring are widely available, increasing the precision of this measure and permitting the use of this tool by a variety of disciplines. The National Institutes of Health Stroke Scale is a good predictor of short-term and long-term morbidity and mortality²⁶³ and has been found to be sensitive to change in numerous studies. Limitations of the National Institutes of Health Stroke Scale include low granularity for defining differences in level of impairment and insensitivity to many common poststroke deficits such as depression, hand-motor deficits, swallowing, or memory loss.

Many modality-specific measures have been constructed for measuring loss of body function/structure across the many brain neural systems. Common examples include the upper limb motor section of the Fugl-Meyer scale or the Box and Block Test for measuring arm motor deficits; the leg motor section of the Fugl-Meyer scale or gait velocity for measuring leg motor deficits; the Western Aphasia Battery or the Boston Naming Test for language deficits; the Behavioral Inattention Test or The Line Cancellation test for measuring neglect; the Nottingham Sensory Assessment or the sensory section of the Fugl-Meyer scale for measuring somatosensory deficits; the Hamilton Depression Scale or the Beck Depression Inventory II for measuring severity of depression symptoms; and the Mini-Mental Status Exam or Trail Making Tests (A and B) for cognitive deficits. More complete lists of such tests have been compiled.^{11,258} In addition, the National Institute of Neurological Disorders and Stroke has compiled a set of common data elements for each dimension of the *ICF*,³ including the 3 major dimensions of body structures/body functions (impairments), activities (activity limitations), and participation (participation restrictions).

Some scales focus on measures that require specific equipment such as a dynamometer for measuring hand grip strength, various perimetry devices (eg, Humphrey or octopus) for measuring visual field loss, an electric goniometer for measuring

range of motion, or von Frey filaments for measuring tactile sensory deficits. Robotic devices are receiving increasing attention for their ability to quantify loss of body function/structure,²⁶⁴ in some cases generating data that cannot be obtained by a human examiner.²⁶⁵ Telemedicine may be used by examiners in remote locations to measure level of disability.²⁶⁶

The assessment of body function/structure in a patient recovering from stroke may be performed to predict outcome, to monitor recovery, to monitor response to a new therapy, to guide new treatment decisions, to document clinical status as part of reimbursement, to inform patient stratification such as in selecting postdischarge setting, in the context of a clinical trial, as part of stroke center or rehabilitation ward certification requirements, or in compliance with a stroke care plan protocol. Valid reliable measures have been defined for each of these purposes. Similar considerations apply to choosing the frequency with which impairments are measured.

Assessing Overall Rehabilitation Needs

After acute hospital admission for stroke, patients should have comprehensive assessments of body structures and function, activity limitations, and participation restrictions according to the *ICF*.^{11,267,268} These assessments can be performed concurrently with diagnostic testing as soon as 24 hours after admission, as the patient's medical stability allows. Evaluation of a stroke survivor's rehabilitation needs is best performed by an interprofessional team that can include a physician with expertise in rehabilitation, nurses, physical therapists, occupational therapists, speech/language therapists, psychologists, and orthotists.^{4,149,258} Prvu Bettger and colleagues¹² noted that among acute hospitals participating in the AHA's Get With The Guidelines program, 90% of patients have an assessment for postacute rehabilitation services documented, but little information is available about the nature or reliability of these assessments. If clinically indicated, appropriate postacute rehabilitation settings include outpatient rehabilitation or day rehabilitation programs, skilled nursing-level rehabilitation, long-term acute care hospitals, and acute rehabilitation hospitals.

Selection of the most appropriate level of care requires consideration of many factors, including the severity of residual neurological deficits, resulting activity limitations, cognitive and communicative ability, psychological status, swallowing ability, premorbid functional ability, medical comorbidities, level of family/caregiver support, likelihood of returning to community living, and ability to participate in a rehabilitation program.^{70,269,270} Certain factors such as older age, impaired cognition, lower functional level after stroke, and urinary incontinence are predictors of the need for inpatient rehabilitation care.^{54,271} The presence of neglect syndrome can predict a longer rehabilitation stay and lower functional status at discharge.²⁷² Among patients with less neurological impairment, assessment of balance ability with standardized measures such as the Berg Balance Scale or the Postural Assessment Scale for Stroke can help determine the risk of fall and need for inpatient rehabilitation rather than discharge home with outpatient services.²⁷³⁻²⁷⁵ (The Prevention of Falls section provides more information). For patients who can walk, assessment of gait speed with the 10-m walk test can help determine functional ambulatory ability.^{276,277} Risk of fall with ambulation is important for counseling patient and family on safety.

A comprehensive determination of functional abilities appears to be useful before acute hospital discharge with standardized assessments such as the Barthel Index or the Functional Independence Measure (FIM). Both the Barthel Index and the FIM are strong predictors of discharge functional status, discharge destination after inpatient rehabilitation, and length of rehabilitation stay.²⁷⁸⁻²⁸¹ The FIM is the most commonly used functional measure in the United States because it is tied to the prospective payment system of the Centers for Medicare & Medicaid Services.

There currently is no single functional assessment with measurement properties that is used throughout the entire clinical course of stroke care (acute hospital, inpatient rehabilitation, and outpatient care) for tracking stroke rehabilitation outcome. A computerized questionnaire called the Activity Measure for Post-Acute Care is not specific to stroke but has demonstrated feasibility as such a tool in stroke populations.²⁸² Although it requires cognitive and language ability to complete, proxy responses to the Activity Measure for Post-Acute Care are well correlated with patient responses.²⁸³ Thus, the Activity Measure for Post-Acute Care may prove to be a suitable longitudinal outcome measure for stroke patients, including those with cognitive deficits and aphasia.

ADLs, IADLs, and Disability Measurement

The term ADLs typically refers to routine self-care tasks that people perform as part of their everyday life.²⁸⁴ ADLs are generally subdivided into those associated with personal self-care and fundamental mobility, often referred to as basic ADLs, and tasks involving more complex domestic, community, and leisure activities, referred to as IADLs.²⁸⁵

An evidence-based consensus conference on improving measurement of disability sponsored by the AHRQ concluded that a single consensus definition of disability is not feasible or desirable.²⁸⁶ The AHRQ report contends that the meaning of disability is dependent on context and the purpose for which the definition will be used. The *ICF* uses disability as a generic term that includes aspects of body functions and structure, activity, and participation within the context of the environment and personal/social factors.^{3,287} The recommendations below for ADLs, IADLs, and disability are based on the conceptual approach to disability endorsed by the World Health Organization.³

In the 2005 stroke rehabilitation clinical practice guidelines, there were 2 recommendations on the assessment of function. The first was that a standardized assessment tool be used to evaluate functional status in individuals with stroke. The second recommendation was to consider using the FIM as the standardized assessment for function in individuals with stroke.¹⁴⁹

Over the past decade, there has been substantial progress in 2 general areas pertaining to measurement of function and disability, including ADLs and IADLs. The first is more sophisticated methodological approaches to assessment, specifically the development of methods based on item response theory and computer-adapted testing.²⁸⁸ The second is the recent attention to patient-centered and patient-reported outcome measures. The emphasis on patient-centered and patient-reported measures is related to healthcare reform and the implementation of the Patient Protection and Affordable Care Act.²⁸⁹

New tools for assessment include the Patient-Reported Outcomes Measurement Information System²⁹⁰ and the NIH Toolbox.²⁹¹ Both the Patient-Reported Outcomes Measurement Information System and the NIH Toolbox are designed to help clinicians and healthcare consumers by providing a common platform based on procedures and metrics that will generate outcomes comparable across large populations, including individuals with stroke.

The largest and most comprehensive source of evidence-based reviews and reports focused on stroke rehabilitation is available from the Evidence-Based Review of Stroke Rehabilitation (EBRSR) program supported by the Canadian Stroke Network.^{270,292} Information and the evidence-based reports from EBRSR are available online.^{292a}

Specific to the assessment of ADLs and IADLs (disability), the EBRSR has produced an evidence-based report titled "Outcome Measures in Stroke Rehabilitation."^{292b} All reviewed assessments are classified according to the World Health Organization's *ICF* conceptual framework. The frequently used modified Rankin Scale is included within the Activity/Disability Outcome Measures section. With the use of the *ICF*, each assessment is categorized as providing information at the level of body functions and structure, activities, or participation. All assessment instruments in the EBRSR report are evaluated with 8 criteria. The criteria were derived from a comprehensive review of 413 articles on measurement methodology by the Health Technology Assessment Program.²⁹³ The criteria include operationally defined ratings for appropriateness, reliability, validity, responsiveness, precision, interpretability, acceptability, and feasibility. Appendix 2 includes measures reviewed in the EBRSR report as of November 2012.

Assessment Challenges

The instruments included in Appendix 2 and the evidence-based reviews in the EBRSR are based on traditional measurement models. As noted above, new assessments are being developed with the use of item response theory and computer-adapted testing. These assessments are difficult to evaluate with the traditional criteria such as validity and reliability normally used in evidence-based reviews. For example, Hsueh and colleagues³²⁹ reported the development of a computer-adapted test for evaluating ADLs in individuals with stroke referred to as the ADL-CAT (computer-adapted test). The authors report the ADL-CAT produced scores that were highly correlated with traditional ADL measures such as the Barthel Index but could be completed in one-fifth the time required to administer the Barthel Index.³²⁹ New or refined criteria consistent with advances in measurement approaches need to be developed and incorporated into existing levels of evidence hierarchies to accommodate the evaluation and evidence-based reviews of assessments.

Another challenge in establishing functional assessment guidelines is how to incorporate the growing emphasis on patient reported and patient-centered measures within the assessment of ADLs, IADLs, and other disability measures. The solution to this challenge extends beyond simply asking patients or consumers to respond to traditional ADL questions such as "Can you put on an article of clothing?" Rather, it requires patients and other stakeholders to be active partners in the assessment process and to help identify the items and outcomes that should be measured. Until computer-adapted tests (eg, ADL-CAT) for ADLs and

IADLs become routine in practice, a combination of assessments such as a basic ADL measure (eg, the 10-item Barthel Index)³³⁰ or the FIM and an IADL measure (eg, the 15-item Frenchay Activity Index)³³¹ is recommended to capture the broad spectrum of ADL function. Recently, a Rasch analysis was used to validate a combined measure of basic and extended daily life functioning after stroke.³³² Even those recovering from mild stroke or transient ischemic attack (eg, those scoring 100 on the Barthel Index) continue to demonstrate deficits in health status. Although basic ADL measures may not be sufficiently sensitive to change among the least impaired stroke survivors, the IADL assessment tool will likely be more sensitive to these more subtle deficits at discharge and provide useful information for discharge planning.

Recommendations: Assessment of Disability and Rehabilitation Needs	Class	Level of Evidence
It is recommended that all individuals with stroke be provided a formal assessment of their ADLs and IADLs, communication abilities, and functional mobility before discharge from acute care hospitalization and the findings be incorporated into the care transition and the discharge planning process.	I	B
It is recommended that all individuals with stroke discharged to independent community living from postacute rehabilitation or SNFs receive ADL and IADL assessment directly related to their discharge living setting.	I	B
A functional assessment by a clinician with expertise in rehabilitation is recommended for patients with an acute stroke with residual functional deficits.	I	C
Determination of postacute rehabilitation needs should be based on assessments of residual neurological deficits; activity limitations; cognitive, communicative, and psychological status; swallowing ability; determination of previous functional ability and medical comorbidities; level of family/caregiver support; capacity of family/caregiver to meet the care needs of the stroke survivor; likelihood of returning to community living; and ability to participate in rehabilitation.	I	C
It is reasonable that individuals with stroke discharged from acute and postacute hospitals/centers receive formal follow-up on their ADL and IADL status, communication abilities, and functional mobility within 30 days of discharge.	IIa	B
The routine administration of standardized measures can be useful to document the severity of stroke and resulting disability, starting in the acute phase and progressing over the course of recovery and rehabilitation.	IIa	C
A standardized measure of balance and gait speed (for those who can walk) may be considered for planning postacute rehabilitation care and for safety counseling with the patient and family.	IIb	B

Assessment of Motor Impairment, Activity, and Mobility

Motor impairments are common after stroke and occur when the stroke lesion includes the corticospinal system, that is, the motor cortical areas and the corticospinal tract.³³³ Indeed, the

extent of damage to the corticospinal system is predictive of motor outcomes and response to treatment.^{334–336} Assessment of motor impairments enables the clinician to understand which aspects of movement and motor control are disrupted after stroke. Assessment of activity such as upper extremity function, balance, and mobility is used to quantify the functional consequences of the motor impairments. Accurate assessment provides prognostic information^{337–341} and guides the selection of motor interventions and the tailoring of these interventions to each individual.²⁹⁴

Assessment of motor impairments and activity is critical for delivering efficient, high-quality rehabilitation services to individuals with stroke. Assessment results are used to determine who needs further services, what types of services are required, what is the most appropriate setting for those services, which interventions to select, how to tailor the interventions to individual patients, and whether the rehabilitation services are achieving the desired outcomes.^{342–344} When standardized assessments are implemented within and across facilities, measures that are familiar and clinician friendly and meet the clinical needs of the service are generally implemented most easily.^{345–347}

Technology to objectively measure real-world activity has been emerging over the past decades. Alternatively, clinicians have relied on self-report measures to gain insight into what a person is doing in daily life. The assumption that clinic performance is equivalent to outside-of-clinic performance may not be true.³²¹ Whereas patient-reported outcomes allow a more patient-centered approach, some self-report measures are prone to reporting biases.^{348,349} Commercially available devices to measure movement when people are outside the rehabilitation clinic are now readily available and becoming more user friendly. These devices include wrist-worn accelerometers,^{294,326} ankle-worn accelerometers,³²⁵ step-activity monitors,^{328,350} and the more economical alternative, pedometers.³²⁷ Recording movements allow the clinician to measure the quantity and sometimes the types of movements occurring in everyday life.

Recommendations: Assessment of Motor Impairment, Activity, and Mobility	Class	Level of Evidence
Motor impairment assessments (paresis/muscle strength, tone, individuated finger movements, coordination) with standardized tools may be useful.	IIb	C
Upper extremity activity/function assessment with a standardized tool may be useful.	IIb	C
Balance assessment with a standardized tool may be useful.	IIb	C
Mobility assessment with a standardized tool may be useful.	IIb	C
The use of standardized questionnaires to assess stroke survivor perception of motor impairments, activity limitations, and participation may be considered.	IIb	C
The use of technology (accelerometers, step-activity monitors, pedometers) as an objective means of assessing real-world activity and participation may be considered.	IIb	C
Periodic assessments with the same standardized tools to document progress in rehabilitation may be useful.	IIb	C

Assessment of Communication Impairment

Communication is a vital aspect of daily functioning, and stroke frequently results in communication impairment. One million people in the United States are estimated to have aphasia, commonly as a result of stroke.³⁵¹ Communication impairment can negatively affect participation in life activities immediately after the stroke and can result in long-term deficits. It is important to identify problems early with a thorough and holistic assessment. It is equally important to identify strengths and compensatory strategies that can enable the patient to maximize independence and to reenter life activities with as much competency and confidence as possible.

In recent years, more attention has been given to incorporating the *ICF* framework and principles into the assessment of communication. Communication is required for most daily activities, so everyday life can be significantly affected by impairment. In previous years, assessment focused on disability; now attention is focused on maximizing quality of life and participating in daily activities. Additionally, caregivers are increasingly included in the evaluation process because their skill and attitude have a significant impact on creating successful communication exchanges.

Telerehabilitation is becoming an accepted alternative to face-to-face communication assessment for people with communication impairment; however, telerehabilitation requires adequate technology. Multiple studies have demonstrated that telepractice for communication assessment is feasible and effective.^{352–354}

Recommendations: Assessment of Communication Impairment	Class	Level of Evidence
Communication assessment should consist of interview, conversation, observation, standardized tests, or nonstandardized items; assess speech, language, cognitive-communication, pragmatics, reading, and writing; identify communicative strengths and weaknesses; and identify helpful compensatory strategies.	I	B
Telerehabilitation is reasonable when face-to-face assessment is impossible or impractical.	IIa	A
Communication assessment may consider the individual's unique priorities using the <i>ICF</i> framework, including quality of life.	IIb	C

Assessment of Cognition and Memory

Cognitive impairment is found in a substantial portion of stroke survivors, affecting more than one third of stroke survivors at 3 and 12 months after stroke.³⁵⁵ These impairments persist in many individuals for years^{356,357} and are associated with poor long-term survival, higher disability, and greater institutionalization rates. Tatemichi et al³⁵⁸ found that the RR for dependent living associated with cognitive impairment was 2.4 at 3 months after stroke after adjustment for age and physical impairment. Another study found the RR of death associated with dementia 5 years after stroke was 3.11 (95% CI, 1.79–5.41) after adjustment for the effects of demographic factors, cardiac disease, severity of stroke, stroke type, and recurrent stroke.³⁵⁹ The cognitive domains most likely to be defective in patients with stroke compared with

control subjects were memory, orientation, language, and attention. Because physical and cognitive impairments after stroke have independent prognostic implications, evaluation of both domains should be routine in the clinical care of stroke patients. Prospective studies have shown that cognitive status is an important determinant of poststroke success. The Neurobehavioral Cognitive Status Examination is a brief screening tool that assesses cognition in the ability areas of language, constructions, memory, calculation, and reasoning. A small prospective study found that the Neurobehavioral Cognitive Status Examination both provides a rapid and sensitive measure of cognitive function and appears to predict functional status change as a result of inpatient stroke rehabilitation.³⁶⁰ A formal neuropsychological examination (including assessment of language, neglect, praxis, memory, emotional responses, and specific cognitive syndromes) may be helpful after the detection of cognitive impairment with a screening instrument. Neuropsychological protocols must be sensitive to a wide range of abilities, especially the assessment of executive and attentional functions. Brief mental status scales inadequately assess executive skills and other higher-level cognitive functions. Specific areas that should be included in this type of assessment include the following:

- Processing speed
- Simple attention and complex attention (“working memory”)
- Receptive, expressive, and repetition language abilities
- Praxis (performing skilled actions such as using a tool)
- Perceptual and constructional visual-spatial abilities, including issues related to visual fields and neglect
- Memory, including language-based memory and visual-spatial memory, and differentiating learning, recall, recognition, and forced-choice memory
- Executive functioning, including awareness of strengths and weaknesses, organization and prioritization of tasks, task maintenance and switching, reasoning and problem solving, error awareness and safety judgment, and emotional regulation

Recommendations: Assessment of Cognition and Memory	Class	Level of Evidence
Screening for cognitive deficits is recommended for all stroke patients before discharge home.	I	B
When screening reveals cognitive deficits, a more detailed neuropsychological evaluation to identify areas of cognitive strength and weakness may be beneficial.	Ila	C

Sensory Impairments, Including Touch, Vision and Hearing

Stroke may result in a variety of different types of sensory impairment such as loss of vision, touch, proprioception, hearing, and others. Sensory impairments are often assessed through physical examination, although methods exist for more precise measurement of certain sensory deficits such as automated perimetry for visual field loss or audiometry for hearing loss. Although these are not routinely used, such testing may be useful when a detailed understanding of sensory impairment is needed.

Various forms of sensory deficit are commonly seen after stroke. For example, somatosensory deficits are present

in 45%²⁵⁹ to 80%³⁶² of patients, and visual field loss occurs in roughly 30%³⁶³ (estimates range from 15%²⁵⁹–52%³⁶⁴) of patients. The high degree of connectivity³⁶⁵ in the human brain not only results in loss of function directly in the affected sensory modality but also affects complex behaviors that require distributed multimodal processing such as fine motor control.^{362,366} As a result, sensory impairments are directly linked to activity limitations and participation restrictions after stroke³⁶⁷ and can improve with therapeutic intervention,³⁶⁸ particularly those based on multimodal interventions such as virtual reality³⁶⁹ and augmented reality.³⁷⁰

Somatosensory Impairments

Somatosensory impairments include tactile, pain, temperature, pressure, vibration, proprioception, stereognosis, and graphesthesia. Tactile deficits may be the most common form of sensory deficit after stroke.³⁶⁷ In the months after a stroke, patients show substantial but variable somatosensory recovery, especially for proprioception.³⁷¹ Studies of experimental stroke in primates^{372,373} and rats³⁷⁴ describe the neurobiological basis of sensory recovery after stroke, with overall similar findings in human subjects scanned with functional magnetic resonance imaging.^{375,376} Assessment of sensory deficits remains largely a matter of bedside examination³⁷⁷; however, sensory scales are under study,^{378,379} and new devices can quantify deficits.^{380,381}

Visual Impairments

The most common visual impairment after stroke is visual field loss, affecting ≈30% of stroke survivors.³⁶³ Vision plays a central role in many human functions, so a reduction in vision can affect many roles, quality of life, motivation, and social behaviors.³⁸² Although assessment of visual field loss is most often obtained with confrontation methods at the bedside, automated perimetry methods are more sensitive and precise and thus may be preferred in settings where such clarity is deemed important such as evaluation for driving.³⁶⁴ Some degree of spontaneous restoration of visual fields generally occurs after stroke. However, the percentage of patients who achieve significant recovery is uncertain, with estimates ranging from 7% to 85%,³⁸³ and the degree of recovery is variable.³⁶⁴ As with many features of spontaneous behavioral recovery after stroke, gains are highest early after the injury, with the maximum period of spontaneous recovery of visual fields being reported to be in the first 2 to 10 days,³⁸⁴ the first month,³⁸⁵ or the first 3 months.³⁶³ Numerous other forms of visual impairment may be seen after stroke such as abnormal eye movements, reduced visual acuity, diplopia, impaired color vision, difficulty with reading, and deficits in higher-order visual processing.

Hearing Impairments

Stroke can also result in acute hearing loss. This may be present in as many as 21% of patients with posterior circulation ischemia,³⁸⁶ often resulting from ischemia in the distribution of the anterior inferior cerebellar artery, and in most cases is attributable to infarction in the inner ear. As a result, stroke-related hearing loss is usually accompanied by vertigo and often with additional deficits related to brainstem/cerebellar infarction.³⁸⁷ Audiometry

is more sensitive than bedside assessment of hearing loss. Neurotologic testing may provide insights by characterizing and measuring associated forms of vestibular dysfunction. Most patients show partial or complete recovery by 1 year after stroke.³⁸⁸

Recommendation: Sensory Impairments, Including Touch, Vision, and Hearing	Class	Level of Evidence
Evaluation of stroke patients for sensory impairments, including touch, vision, and hearing, is probably indicated.	Ila	B

Sensorimotor Impairments and Activities

Dysphagia Screening, Management, and Nutritional Support

Dysphagia is common after stroke, affecting 42% to 67% of patients within 3 days after stroke. Of these patients, about half aspirate, and one third of those patients develop pneumonia.³⁸⁹ Dysphagia or aspiration can lead to pneumonia, malnutrition, dehydration, weight loss, and overall decreased quality of life. Aspiration may be “silent” or “occult” and not clinically obvious. Early identification through screening can reduce the risk of developing these adverse health consequences.³⁸⁹ Additionally, observational studies suggest that dysphagia screening reduces the risk of pneumonia.³⁹⁰

A systematic review of 8 studies demonstrated that the odds of being malnourished were increased if dysphagia was present after stroke.³⁹¹ Despite the potential consequences of dysphagia, a review of nursing nutritional care concluded that a functional, supportive, and educational nursing nutritional role was essential, but little evidence was of sufficient quality to support policy and practice development or to inform education.³⁹²

In 2012, a group of dysphagia experts came to the consensus that early dysphagia screening should be conducted and that although no one screening tool can be recommended, a valid tool should be used.³⁹³ Additional systematic reviews and studies also support early screening for dysphagia. However, because dysphagia screening has not been well standardized and its utility has not been established rigorously in RCTs, it has been removed from The Joint Commission performance standards and from Get With The Guidelines–Stroke performance measures. Nonetheless, it remains an important component of clinical care. Therefore, we include the same recommendation that appears in the most recent “Guidelines for the Early Management of Patients With Acute Ischemic Stroke.”³⁹⁴

Once dysphagia or aspiration risk has been identified, a clinical bedside evaluation can provide valuable diagnostic information about the swallow mechanism and how to proceed with managing the patient. However, a bedside evaluation alone cannot predict the presence or absence of aspiration because patients can aspirate without overt clinical signs or symptoms.³⁹⁵

Instrumental evaluation (videofluoroscopy, fiberoptic endoscopic evaluation of swallowing, or fiberoptic endoscopic evaluation of swallowing with sensory testing)

allows the clinician to visualize swallow physiology, thus determining the presence or absence of aspiration, the quantity of aspiration, and the physiological or structural causes for dysphagia. This information is necessary for forming an appropriate and effective treatment plan, which can include swallow therapy and diet recommendations.^{396–398} There is no consensus in the literature on a preferred instrumental study. Both videofluoroscopy and fiberoptic endoscopic evaluation of swallowing can be used to evaluate the swallow mechanism.

Additionally, a large cohort study was completed, showing that fiberoptic endoscopic evaluation of swallowing with sensory testing is a relatively safe procedure for evaluating the sensory and motor aspects of dysphagia. Clinical judgment should be used to weigh the advantages and disadvantages of each study for each individual patient.³⁹⁹

Multiple systematic reviews showed that behavioral interventions, including “swallowing exercises, environmental modifications such as upright positioning for feeding, safe swallowing advice, and appropriate dietary modifications,”⁴⁰⁰ should be considered for the management and treatment of dysphagia.^{400,401} A group of dysphagia and swallow rehabilitation experts reviewed 10 principles of neural plasticity and discussed how they should be incorporated into dysphagia rehabilitation strategies and interventions to promote evidence-based practice.⁴⁰² Other therapies considered in systematic reviews, including drug therapy, NMES, pharyngeal electric stimulation, physical stimulation, transcranial direct current stimulation (tDCS), and transcranial magnetic stimulation, have no conclusive evidence supporting their use in dysphagia treatment.⁴⁰⁰ Additionally, acupuncture may be a beneficial alternative treatment of dysphagia.⁴⁰³ Cohort studies have shown that oral hygiene protocols may help reduce aspiration pneumonia after stroke.^{404,405}

Recently, there have been a series of clinical trials called the Feed or Ordinary Diet (FOOD) trials, which are large, well-designed RCTs that address when and how to feed patients after stroke.^{406–408} As a result of underrecruitment, definitive conclusions cannot be made; however, these studies and a Cochrane review⁴⁰⁰ offer much information.

Nutritional supplements are recommended only for patients with malnutrition or those at risk of malnutrition. Routine oral nutritional supplements are not associated with improved functional outcome at 6 months after stroke. This clinical trial has found that few participants (8%) were malnourished at baseline and that supplements may contribute to hyperglycemia if the patient is not malnourished.⁴⁰⁸

Early tube feeding (started within 7 days) may increase the survival of dysphagic patients who cannot safely eat by mouth; however, this may keep patients alive “in a severely disabled state when they otherwise would have died.”⁴⁰⁷ Therefore, to reduce case fatality, providers should initiate early tube feeds; however, they can wait up to 7 days after a stroke to initiate tube feeds, especially when conversations about the goals of care are needed. Tube feeds via nasogastric route are reasonable for the first 2 to 3 weeks after stroke unless there is a strong reason to opt for percutaneous endoscopic gastrostomy placement (eg, cannot pass a nasogastric tube).⁴⁰⁷

Early percutaneous endoscopic gastrostomy placement is not supported for stroke patients.⁴⁰⁶ After this time period, percutaneous endoscopic gastrostomy placement is recommended because it is associated with fewer treatment failures, higher feed delivery, and improved albumin concentration.⁴⁰⁰

Recommendations: Dysphagia Screening, Management, and Nutritional Support	Class	Level of Evidence
Early dysphagia screening is recommended for acute stroke patients to identify dysphagia or aspiration, which can lead to pneumonia, malnutrition, dehydration, and other complications.	I	B
Dysphagia screening is reasonable by a speech-language pathologist or other trained healthcare provider.	Ila	C
Assessment of swallowing before the patient begins eating, drinking, or receiving oral medications is recommended.	I	B
An instrumental evaluation is probably indicated for those patients suspected of aspiration to verify the presence/absence of aspiration and to determine the physiological reasons for the dysphagia to guide the treatment plan.	Ila	B
Selection of instrumental study (fiberoptic endoscopic evaluation of swallowing, videofluoroscopy, fiberoptic endoscopic evaluation of swallowing with sensory testing) may be based on availability or other considerations.	Ilb	C
Oral hygiene protocols should be implemented to reduce the risk of aspiration pneumonia after stroke.	I	B
Enteral feedings (tube feedings) should be initiated within 7 days after stroke for patients who cannot safely swallow.	I	A
Nasogastric tube feeding should be used for short term (2–3 weeks) nutritional support for patients who cannot swallow safely.	I	B
Percutaneous gastrostomy tubes should be placed in patients with chronic inability to swallow safely.	I	B
Nutritional supplements are reasonable to consider for patients who are malnourished or at risk of malnourishment.	Ila	B
Incorporating principles of neuroplasticity into dysphagia rehabilitation strategies/interventions is reasonable.	Ila	C
Behavioral interventions may be considered as a component of dysphagia treatment.	Ilb	A
Acupuncture may be considered as an adjunctive treatment for dysphagia.	Ilb	B
Drug therapy, NMES, pharyngeal electrical stimulation, physical stimulation, tDCS, and transcranial magnetic stimulation are of uncertain benefit and not currently recommended.	III	A

Nondrug Therapies for Cognitive Impairment, Including Memory

Impairments in multiple domains of cognition, including attention, processing speed, executive function, verbal and visual memory, language, and perception, occur frequently after stroke. Stroke doubles an individual’s risk for dementia (including Alzheimer disease).⁴⁰⁹

Cognitive rehabilitation has been the traditional nonpharmacological method to treat cognitive impairment and has been defined as a “systematic, functionally-oriented service of therapeutic cognitive activities, based on an assessment and understanding of the person’s brain-behavior deficits.”⁴¹⁰ These treatments are directed at the restoration or reestablishment of cognitive activity, the acquisition of strategies to compensate for impaired cognitive function, and the use of adaptive technique or equipment for increasing independence. Few studies have assessed interventions for cognitive deficits in the IRF environment. An RCT (n=83 at >4 months after stroke) compared a multicomponent cognitive therapy and graded activity training with cognitive therapy alone over 12 weeks and demonstrated that the multicomponent therapy exceeded the cognitive therapy in fatigue reduction and improved physical endurance.⁴¹¹ A systematic review⁴¹² published in 2011 of cognitive rehabilitation in stroke that searched guidelines in stroke management, other systematic reviews, and clinical RCTs concluded that compensatory strategies can be used to improve memory outcomes. However, use of an external memory aid is in itself a memory task, so those with the greatest need also have the greatest problems using them. One solution to this problem has been the development of a paging system whereby a paging service with a customized set of reminders and appropriate date and time sends out reminders to the individual pager that is carried by the person who needs to be reminded. Recently, this idea has been modernized by the use of text message reminders to one’s mobile device. The use of a paging system can significantly reduce everyday failures of memory and planning in stroke survivors. However, there was not enough evidence from RCTs to determine whether cognitive rehabilitation for memory problems after stroke is helpful.

Recently, attention has focused on the application of physical activity and exercise to improve cognitive function after stroke. Meta-analysis suggests that physical activity has a protective effect against cognitive decline⁴¹³ and may improve cognitive function in older adults without cognitive impairment.⁴¹⁴ A number of mechanisms have been suggested to explain the effects of exercise on cognition after stroke, including the increase in cerebral blood volume, increased expression of growth factors such as brain-derived neurotrophic factor, and a positive effect on depressive symptoms, which may mediate an improvement in cognitive performance.⁴¹⁵

In animal models, a stimulating and enriched environment has been shown to improve neurobehavioral function and learning after stroke.⁴¹⁶ Although it is not yet known exactly what type of environment might provide optimal stimulation for a person who has had a stroke, it has been suggested that the setting should be conducive to participating in physical activity and cognitive and social activities.⁴¹⁷

Cognitive Rehabilitation

Systematic reviews that include people with both traumatic brain injury and stroke are generally more positive on the benefits of cognitive rehabilitation⁴¹⁸ than those involving people with stroke alone.^{419–421} This may be due in part to the smaller number of stroke-only studies and the confounding factors of age and vascular involvement with stroke. A Cochrane review of 6 RCTs found a benefit of cognitive rehabilitation after stroke on some aspects of attention deficits at the end of the treatment period.⁴²⁰ Not all aspects of attention are similarly affected; attention training had a positive effect on divided attention immediately after the intervention (4 studies) but no effect on selective attention (6 studies), alertness (4 studies), or sustained attention (4 studies).⁴²⁰ Two cognitive rehabilitation RCTs found improvements in subjective measures of attention⁴²² and mental slowness⁴²³ after stroke immediately after treatment and at follow-up.

The European Federation of Neurological Societies guidelines on cognitive rehabilitation⁴²⁴ summarized a number of publications related to memory rehabilitation interventions without external memory aids, rehabilitation interventions with nonelectronic external memory aids, and rehabilitation interventions with assistive electronic technologies (the specific number of studies identified and reviewed was not given).

They concluded the following:

- That memory strategies without electronic aids are possibly effective (Level C recommendation)
- That specific learning strategies such as errorless learning are probably effective (Level B recommendation)
- That nonelectronic external memory aids such as diary or notebook keeping are possibly effective (Level C recommendation)
- That electronic external memory devices such as computers, paging systems, and portable voice organizers are probably effective (Level B recommendation)
- That the use of virtual environments has shown positive effects on verbal, visual, and spatial learning and that memory training in virtual environments is rated as possibly effective (Level C recommendation)
- That a direct comparison of memory training in virtual environments versus nonvirtual environments is still lacking and no recommendation can be made as to the specificity of the technique

An updated review of the literature (2003–2008)⁴¹⁸ concluded that (1) for individuals with mild memory impairments, memory strategy training, including the use of internalized strategies (eg, visual imagery) and external memory compensations (eg, notebooks), is recommended as a practice standard; (2) for individuals with severe memory deficits, the use of external compensations, including assistive technology, with direct application to functional activities is recommended as a practice guideline; and (3) for individuals with severe memory impairments, errorless learning techniques may be effective for learning specific skills or knowledge, although with limited transfer to novel tasks or reduction in overall functional memory problems

However, a recent Cochrane meta-analysis⁴²⁵ with 13 cognitive rehabilitation RCTs reported no benefit to executive

functioning after stroke, whereas other systematic reviews using a broader range of evidence have suggested some limited evidence.^{426,427} Current studies are small and have highly varied content, making comparisons difficult. Notably, an RCT delivered strategies focused on problem solving by 3 methods (face to face, online, and computer training) and found that although all improved problem-solving and IADL abilities, the face-to-face training group resulted in the most improvement in problem-solving self-efficacy.⁴²⁸ Another RCT⁴²⁹ found that using a pager was effective in increasing goal attainment (ie, medication and appointments) but that stroke participants' performance returned to baseline levels when the pager was discontinued. In contrast, specific aspects of memory (eg, visual-spatial recall, subjective memory experience, verbal and prospective memory, working memory, and attention) have been shown to improve after stroke in 6 different controlled trials that used very diverse cognitive training strategies.^{430–435}

A systematic review of the literature (1995–2011) focused specifically on information and communication technology tools for individuals with acquired brain injury, including stroke,⁴³⁶ reviewed 5 studies that addressed memory problems. The quality of the studies was so low that it was not possible to determine whether the tools were beneficial.

Only 2 studies have examined the effects of tDCS on attention in stroke patients.^{437,438} The first study⁴³⁸ found that anodal tDCS over the left dorsolateral prefrontal cortex was associated with enhanced complex attention (working memory) performance. The second study⁴³⁷ found that noninvasive anodal tDCS applied to the left dorsolateral prefrontal cortex improved attention compared with sham stimulation. Although improved attention may result in improved memory because people are better able to initially register information, neither addressed whether the performance benefits resulted in improved memory learning and retention.

In summary, most cognitive rehabilitation programs use a variety of activities, including practice requiring attention, planning or working memory with pencil and paper or computerized activities, and teaching of compensatory strategies. Although a growing number of RCTs have addressed immediate effects on standardized psychobehavioral tests, few studies have assessed the durability of treatment effects or relevance to everyday functioning.

Exercise

Cumming et al⁴¹⁵ performed a systematic review through 2011 and found 12 RCTs and controlled, clinical trials that studied the effects of a physical activity or exercise-based intervention on cognitive function in stroke. They concluded that there are reasonably consistent and relatively small positive effects of exercise on cognition, with some studies finding specific positive effects on memory. However, the pool of studies identified was small, and methodological shortcomings were widespread.

Because most studies measured cognition or memory as a secondary outcome, there was a wide range of baseline cognitive abilities, including those without cognitive impairment. The dose and content of the exercise protocols have

been highly diverse,^{415,440,441} preventing recommendations on the optimal intensity or timing. Although no longitudinal exercise or physical activity studies have been undertaken to prevent cognitive impairment or dementia after stroke, it would seem reasonable to extend the results of studies in older adults that suggest a protective effect of exercise on cognitive decline.⁴¹³

Enriched Environment

An RCT that modified the stroke rehabilitation environment with the provision of a computer with Internet, books, games, virtual reality gaming technology, and encouragement from staff to use the activities increased the engagement of patients with cognitive activities and reduced time spent inactive and alone.⁴¹⁷ Särkämö et al⁴⁴² performed a single-blind RCT to determine whether listening to music everyday can facilitate the recovery of cognitive functions after stroke. Two months of daily listening (95 minutes daily) to self-selected music after acute stroke improved verbal memory, focused attention, and depressive symptoms compared with listening to an audio book or not listening to music.⁴⁴²

Four weeks of playing virtual reality games for 30-minute sessions 3 times weekly improved visual attention and short-term visuospatial memory in a very small RCT of patients early after stroke.⁴⁴³ These games required primarily paretic arm movements (eg, raise a hand to stop soccer balls from entering the goal).

Recommendations: Nondrug Therapies for Cognitive Impairment, Including Memory (Continued)	Class	Level of Evidence
Exercise may be considered as adjunctive therapy to improve cognition and memory after stroke.	IIb	C
Virtual reality training may be considered for verbal, visual, and spatial learning, but its efficacy is not well established.	IIb	C
Anodal tDCS over the left dorsolateral prefrontal cortex to improve language-based complex attention (working memory) remains experimental.	III	B

Use of Drugs to Improve Cognitive Impairments, Including Attention

Several medications are used to treat general cognitive disorders, but little literature addresses their use for poststroke cognitive deficits. Dextroamphetamine has been studied for poststroke motor recovery,⁴⁴⁴ but no studies have substantiated its use for cognitive disorders. Although the effect of methylphenidate in 1 small trial might rely partly on an improvement in attention and effort through cingulum modulation,⁴⁴⁵ no studies have assessed its use in cognitive rehabilitation after stroke. Modafinil has been studied for the treatment of post-stroke depression⁴⁴⁶ and fatigue⁴⁴⁷ but not cognitive recovery. Atomoxetine also has been studied for the treatment of post-stroke depression but not cognitive deficits.

Donepezil has been studied in a small, randomized, clinical trial.⁴⁴⁸ Ten right-hemispheric stroke survivors were randomized to receive either 5 mg donepezil or placebo. The donepezil group demonstrated significant improvements on the Mini-Mental Status Examination 1 month after completion of treatment, and functional magnetic resonance imaging showed increased activation in both prefrontal areas, both inferior frontal lobes, and the left inferior parietal lobe.

A pilot study randomized 50 subjects to receive either rivastigmine or placebo.⁴⁴⁹ Subjects receiving rivastigmine demonstrated statistically significant improvement (1.70 versus 0.13; $P=0.02$) on the animal subtask of the verbal fluency measure compared with those on placebo, but a non-significant trend toward improvement was observed in the Color Trails II test, described as a culture-fair test of visual attention, graphomotor sequencing, and effortful executive processing abilities.

A study of 47 subjects at least 6 months after stroke were randomized to receive fluoxetine, nortriptyline, or placebo.⁴⁵⁰ Although no significant group effect was found at the end of treatment, the placebo group exhibited deterioration in executive functioning 21 months after treatment, whereas the groups who received fluoxetine or nortriptyline significantly improved, independently of depressive symptoms ($F=12.1$ $df=1, 45$; $P=0.001$). The improvement was attributed to possible reorganization of neuronal networks associated with prefrontal functions based on modulation of monoaminergic neurotransmission and the activity of neurotrophins.

Recommendations: Nondrug Therapies for Cognitive Impairment, Including Memory	Class	Level of Evidence
Enriched environments to increase engagement with cognitive activities are recommended.	I	A
Use of cognitive rehabilitation to improve attention, memory, visual neglect, and executive functioning is reasonable.	IIa	B
Use of cognitive training strategies that consider practice, compensation, and adaptive techniques for increasing independence is reasonable.	IIa	B
Compensatory strategies may be considered to improve memory functions, including the use of internalized strategies (eg, visual imagery, semantic organization, spaced practice) and external memory assistive technology (eg, notebooks, paging systems, computers, other prompting devices).	IIb	A
Some type of specific memory training is reasonable such as promoting global processing in visual-spatial memory and constructing a semantic framework for language-based memory.	IIb	B
Errorless learning techniques may be effective for individuals with severe memory impairments for learning specific skills or knowledge, although there is limited transfer to novel tasks or reduction in overall functional memory problems.	IIb	B
Music therapy may be reasonable for improving verbal memory.	IIb	B

Recommendations: Use of Drugs to Improve Cognitive Impairments, Including Attention	Class	Level of Evidence
The usefulness of donepezil in the treatment of poststroke cognitive deficits is not well established.	IIb	B
The usefulness of rivastigmine in the treatment of poststroke cognitive deficits is not well established.	IIb	B
The usefulness of antidepressants in the treatment of poststroke cognitive deficits is not well established.	IIb	B
The usefulness of dextroamphetamine, methylphenidate, modafinil, and atomoxetine in the treatment of poststroke cognitive deficits is unclear.	IIb	C

Limb Apraxia

Limb apraxia is “a decrease or difficulty in performing purposeful, skilled movements” that cannot be attributed to hemiplegia or lack of effort.⁴⁵¹ It is more common after left hemispheric than right hemispheric stroke.⁴⁵² Although not traditionally believed to affect daily life function,^{453,454} there is now evidence that apraxia is associated with reduced independence in daily life activities.^{455–457} Despite its incidence and its impact on independent functioning, there is a paucity of research on therapeutic interventions for limb apraxia. Several systematic reviews have been conducted since 2005,^{458–461} reviewing 5 small RCTs across the 4 reviews. Since these reviews, no additional RCTs and only 1 case study have been published.⁴⁶² Two reviews concluded that there was not enough information to determine whether interventions for apraxia were efficacious.^{458,459} Some studies have found immediate postintervention improvements on apraxia tests or in daily life activities, but few have found lasting advantages for the trained groups.⁴⁵⁹

Recommendations: Limb Apraxia	Class	Level of Evidence
Strategy training or gesture training for apraxia may be considered.	IIb	B
Task practice for apraxia with and without mental rehearsal may be considered.	IIb	C

Hemispatial Neglect or Hemi-Inattention

Hemispatial neglect, also called hemianagnosia, hemineglect, unilateral neglect, spatial neglect, contralateral neglect, unilateral visual inattention, hemi-inattention, neglect syndrome, or contralateral hemispatialagnosia, is a neuropsychological condition in which, after damage to a part of 1 hemisphere of the brain is sustained, a deficit in attention to and awareness of 1 side of space is observed. These symptoms are not attributable to a primary sensory (eg, visual) or motor deficit; they are typically contralateral to the lesion. Hemispatial neglect is common after stroke⁴⁶³ and significantly impairs the ability to participate effectively in rehabilitation.⁴⁶⁴ Although neglect improves over time, neglect symptoms continue to interfere with daily functioning long after stroke.^{465–467} The interventions developed for neglect fall into 2 general categories: bottom-up approaches, designed

to remediate attention processes for the left hemisphere and internal representations of space, and top-down approaches, aimed at teaching the person strategies for compensating for neglect.⁴⁶⁸ Most studies of neglect have been plagued by low-quality methods and small sample sizes.

Three systematic reviews have been completed since 2005,^{468–470} reviewing 24 unique randomized, clinical trials and 14 additional studies with weaker designs. The interventions studied and outcome measures varied widely in these reviews. Fifteen additional RCTs investigating neglect were found that were not included in those reviews (prism adaptation, 2; virtual reality, 2; limb activation, 2; neck vibration with prism adaptation, 1; visual scanning with limb activation, 1; mental practice, 1; repetitive transcranial magnetic stimulation, 4; and optokinetic stimulation, 2).^{471–483} There is evidence for the efficacy of several top-down and bottom-up approaches in improving both immediate performance and long-term performance on standard neglect tests such as cancellation tests and line bisection tests.* These include half-field eye patching, visual scanning training, prism adaptation, limb activation, optokinetic stimulation, mental imagery (but see the work by Welfringer and colleagues⁴⁸²), and brain stimulation with repetitive transcranial magnetic stimulation, theta burst transcranial magnetic stimulation, or tDCS. Two randomized, clinical trials of eye patching for unilateral neglect in 35 subjects⁴⁸⁷ and 60 subjects⁴⁸⁸ did not demonstrate any significant functional improvement. None of these treatments resulted in improvement on all neglect tests.

Few studies have examined the efficacy of these interventions on daily life functioning. Several have used the behavioral tests from the Behavioral Inattention Test⁴⁸⁹ or the Baking Tray Test,⁴⁹⁰ which are simulated real-life activities. Some studies have examined functional outcomes with the Catherine Bergego Scale,⁴⁹¹ which measures neglect symptoms during everyday activities or paragraph reading tasks. Others have used the less sensitive, general tests of functioning in ADLs such as the Barthel Index³³⁰ and the FIM.⁴⁹² There is limited evidence to date that these interventions increase daily life functioning, even when performance on neglect tests has improved,^{468,470} although some individual RCTs have found positive results on daily function.^{469,471,475,481,484}

Cognitive rehabilitation may have immediate benefits on tests of neglect, as supported by a meta-analysis of 23 RCTs, but it is uncertain whether disability associated with neglect was altered.⁴¹⁹ Finally, a meta-analysis⁴⁹³ found that compensatory scanning training improved reading and visual scanning in people with visual field defects (and possibly coexisting visual neglect).

It is important to note that in many of the studies, the target intervention was provided in addition to regular therapy or scanning training. Therefore, there is not sufficient evidence to ascertain whether neglect interventions are effective when provided in isolation. In addition, several issues in understanding how to treat neglect exist. These include understanding the heterogeneous response to treatment across clients, the heterogeneous response to treatment across measured tasks, the parameters of treatment (dosing, type of practice activity during or after treatment), and the relative efficacy of the various interventions, either alone or in combination.

*References 469–471, 473, 475, 476, 478, 480, 481, 484–486

Recommendations: Hemispatial Neglect or Hemi-Inattention	Class	Level of Evidence
It is reasonable to provide repeated top-down and bottom-up interventions such as prism adaptation, visual scanning training, optokinetic stimulation, virtual reality, limb activation, mental imagery, and neck vibration combined with prism adaptation to improve neglect symptoms.	Ila	A
Right visual field testing may be considered.	IIb	B
Repetitive transcranial magnetic stimulation of various forms may be considered to ameliorate neglect symptoms.	IIb	B

Communication Disorders

Disorders of communication and related cognitive impairments are common after stroke and include aphasia, cognitive-communication disorders, dysarthria, and apraxia of speech. Communication disorders may affect speaking, listening, reading, writing, gestures, and pragmatics. The presence of a communication disorder may negatively affect social participation, psychosocial well-being, and quality of life.

A certified speech and language pathologist normally performs the evaluation and treatment of communication disorders. The overall goals of speech and language treatment are to facilitate the recovery of communication, to assist patients in developing strategies to compensate for communication disorders, and to counsel and educate people in the patient's environment on assistive communication supports to facilitate communication, to decrease isolation, and to meet the patient's wants and needs. Compensatory and assistive communication supports may range from low-tech strategies such as paper/pencil and communication boards/books to high-tech devices that include smart phones and speech-generating devices.

Cognitive-Communication Disorders

There is great diversity in the presentation of cognitive-communication problems after stroke.⁴⁹⁴ A systematic review of cognitive-communication disorders after right hemispheric stroke suggested that many individuals at both the chronic and acute phases of recovery benefit from sentence- or discourse-level communication treatments.⁴⁹⁵

Several reviews summarize research evidence for treatments of attention, visual neglect, memory training, and other cognitive treatments for individuals with acquired brain injuries, including right hemispheric stroke. Although RCTs are lacking,^{419,420,425} a systematic review concludes that there is now sufficient information to support evidence-based protocols to implement empirically supported treatments for cognitive and communication disability after stroke.⁴¹⁸ The Nondrug Therapies for Cognitive Impairment, Including Memory section above provides more information on nonpharmacological treatments for cognitive disorders after stroke.

Aphasia

An RCT indicated that daily aphasia therapy in very early stroke recovery (starting at 3 days) improved communication

outcomes in people with moderate to severe aphasia.⁴⁹⁶ One systematic review of treatment in patients at >6 months after stroke concluded that aphasia therapy continued to be efficacious in the chronic stages,⁴⁹⁷ whereas another concluded that there was no significant relationship between time after onset and response to treatment.⁴⁹⁸ Insufficient evidence exists to know when treatment should start or how long it should continue.

Several systematic reviews have indicated that intensive treatment is favored,⁴⁹⁹⁻⁵⁰¹ but there is no consensus on the optimum amount, intensity, distribution, or duration of treatment.³⁵³ For subacute aphasia, 1 RCT has shown that a short duration (3 weeks) of intensive therapy is efficacious,⁵⁰² whereas another RCT indicated that intensive treatment over a longer duration (12 weeks) may not always be feasible.⁵⁰³ Therefore, intensive therapy should be provided as tolerated and feasible.

A variety of different treatment approaches for aphasia have been developed. Small-group and single-subject studies support their efficacy.⁴⁹⁷ A systematic review of RCTs of aphasia treatment stated that no conclusions can be made about the effectiveness of one treatment over another.⁴⁹⁹

Three RCTs evaluated computer-based therapy, with 1 RCT comparing it with no treatment, 1 comparing it with the same treatment provided by a speech and language therapist, and the third comparing it with the same amount of nonlinguistic computer training.⁵⁰⁴⁻⁵⁰⁶ These 3 trials concluded that computer-based therapy is feasible and efficacious. Therefore, computerized treatment is beneficial and can be used to supplement treatment provided by a speech-language pathologist.

A systematic review concluded that communication partner training is effective in improving communication activities or the participation of the communication partner. It is also probably effective in improving communication activities or the participation of individuals with chronic aphasia when they are interacting with trained communication partners.⁵⁰⁷ Communication partners may include family members and caregivers, healthcare professionals, and others in the community or organization. Further studies are needed to examine the impact of communication partner training with individuals with acute aphasia.⁵⁰⁷

Two systematic reviews have addressed group therapy.^{499,508} Group treatments for people with aphasia occur across the continuum of care.⁵⁰⁸ Overall, results indicate that group participation can improve specific linguistic processes with no significant difference in outcomes between individual one-on-one therapy and group therapy. There is also some evidence that outpatient and community-based group participation can benefit social networks and community access.⁵⁰⁸

Several small RCTs have shown that drug therapy appears to be beneficial in conjunction with SLT, whereas other studies have failed to show a benefit. Drugs showing promise include donepezil,⁵⁰⁹ memantine,⁵¹⁰ and galantamine.⁵¹¹ Bromocriptine⁵¹² and piracetam⁵¹³ do not appear beneficial. More extensive studies of pharmacotherapy for aphasia are needed before the routine use of any medication can be

recommended. Further research on the dose and timing of administration is needed.

Brain stimulation techniques, including epidural cortical stimulation, repetitive transcranial magnetic stimulation, and tDCS, have been used to modulate cortical excitability during poststroke language recovery. Small studies have shown therapeutic benefits when brain stimulation techniques are used, typically in combination with behavioral language therapy.^{504,514–516} Most studies are small-group or single-subject studies and have been conducted in patients with chronic aphasia. Two RCTs investigating repetitive transcranial magnetic stimulation in acute and subacute aphasia^{517,518} found mixed results. Brain stimulation combined with speech language therapy may benefit selected patients, but more information on the site of stimulation and stimulation parameters is needed before it can be used in routine clinical practice.^{437,438,516}

Recommendation: Cognitive Communication Disorders	Class	Level of Evidence
Interventions for cognitive-communication disorders are reasonable to consider if they are individually tailored and target:	Ila	B
The overt communication deficit affecting prosody, comprehension, expression of discourse, and pragmatics		
The cognitive deficits that accompany or underlie the communication deficit, including attention, memory, and executive functions		

Recommendations: Aphasia	Class	Level of Evidence
Speech and language therapy is recommended for individuals with aphasia.	I	A
Treatment for aphasia should include communication partner training.	I	B
Intensive treatment is probably indicated, but there is no definitive agreement on the optimum amount, timing, intensity, distribution, or duration of treatment.	Ila	A
Computerized treatment may be considered to supplement treatment provided by a speech-language pathologist.	Ilb	A
A variety of different treatment approaches for aphasia may be useful, but their relative effectiveness is not known.	Ilb	B
Group treatment may be useful across the continuum of care, including the use of community-based aphasia groups.	Ilb	B
Pharmacotherapy for aphasia may be considered on a case-by-case basis in conjunction with speech and language therapy, but no specific regimen is recommended for routine use at this time.	Ilb	B
Brain stimulation techniques as adjuncts to behavioral speech and language therapy are considered experimental and therefore are not currently recommended for routine use.	III	B

Motor Speech Disorders: Dysarthria and Apraxia of Speech

Dysarthria is a collective term for a group of speech disorders that result from paralysis, weakness, or incoordination of the speech musculature after neurological damage. Dysarthria can affect, singly or in combination, any of the subsystems underlying speech production: the respiratory, laryngeal, velopharyngeal, and oral-articulatory subsystems. It is estimated that 20% of stroke patients present with dysarthria,⁵¹⁹ although the type of dysarthria and its specific characteristics vary, depending on factors such as lesion site and severity.

Apraxia of speech is a disorder of motor planning or programming resulting in difficulty in volitionally producing the correct sounds of speech. In addition to articulatory disturbances, prosodic deficits such as slow rate of speech and restricted variations in pitch and loudness may be present. Apraxia of speech typically co-occurs with nonfluent aphasia, and the existence of a pure apraxia of speech without aphasia is debatable.

Motor speech disorders affect the intelligibility, naturalness, and efficiency of communication. The presence of a motor speech disorder may negatively affect social participation, psychosocial well-being, and quality of life.

Speech and language therapists use a range of behavioral treatments to address motor speech disorders in individuals after stroke.^{520–523} Behavioral treatments for motor speech disorders are diverse in their focus and theoretical underpinnings and should be tailored to the individual’s unique strengths, deficits, goals, priorities, and circumstances. Behavioral treatments may focus on improving the physiological support for speech and target impairments in respiration, phonation, articulation, and resonance. Behavioral treatments may also include strategies to increase the precision of articulation, to modify the rate and loudness of speech, and to improve prosody. To date, no randomized, clinical trials have addressed the efficacy of these approaches,^{524,525} but small, nonrandomized group studies and carefully designed, single-subject, experimental studies have demonstrated positive results.^{521,526–528} Individuals with motor speech disorders may improve as a result of treatment, even when the condition is chronic.^{521,522,528,529} There is no consensus on the optimum amount, distribution, or variability of practice or the best type, frequency, and timing of treatment.

Patients with motor speech disorders may benefit from using augmentative and alternative communication devices to supplement their communication. Augmentative and alternative communication devices range from simple picture boards or spelling boards to portable amplification systems and high-tech electronic devices with eye-tracking capability.^{522,530} Supplemental strategies such as gesture or writing can be used to enhance communication attempts. Two systematic reviews have concluded that augmentative and alternative communication and speech supplementation techniques may be useful for individuals with motor speech disorders, when speech is insufficient to meet the individual’s communication needs.^{527,531}

The effects of motor speech disorders after stroke extend beyond the physiological characteristics of the impairment. Studies have shown that the resulting communication difficulties affect social participation and quality of life^{532,533} and that the psychosocial impact of a motor speech disorder is disproportionate to the severity of the physiological impairment.^{532,533}

Behavioral management of motor speech disorders includes support and counseling. Interventions addressing the broad life implications of motor speech disorders are being developed, and pilot studies are underway.⁵³⁴

Addressing environmental factors during rehabilitation is consistent with the *ICF* and warrants consideration.⁵³⁵⁻⁵³⁷ For individuals with motor speech disorders, this may include providing education that addresses the knowledge and attitudes of communication partners or modifying the characteristics of the physical environment such as reducing noise levels.⁵³⁵⁻⁵³⁷

Telerehabilitation may be used to overcome barriers of access to services.⁵³⁸ The quality of telerehabilitation services must be consistent with the quality of services delivered face to face.⁵³⁸ Studies demonstrating the feasibility of telerehabilitation in the management of dysarthria are emerging.³⁵³

Recommendations: Motor Speech Disorders: Dysarthria and Apraxia of Speech	Class	Level of Evidence
Interventions for motor speech disorders should be individually tailored and can include behavioral techniques and strategies that target:	I	B
Physiological support for speech, including respiration, phonation, articulation, and resonance		
Global aspects of speech production such as loudness, rate, and prosody		
Augmentative and alternative communication devices and modalities should be used to supplement speech.	I	C
Telerehabilitation may be useful when face-to-face treatment is impossible or impractical.	Ila	C
Environmental modifications, including listener education, may be considered to improve communication effectiveness.	Ilb	C
Activities to facilitate social participation and promote psychosocial well-being may be considered.	Ilb	C

Spasticity

Spasticity, classically defined as a velocity-dependent resistance to stretch of a muscle, is a component of the upper motor neuron syndrome. Poststroke spasticity may have dystonic features, including involuntary muscle activity and limb positioning. Spasticity is correlated with activity limitations associated with hygiene, dressing, and pain. These activity limitations increase caregiver burden and reduce quality of life as measured by the EuroQol-5.⁵³⁹

When spasticity is present, the cost of care is 4 times higher than when spasticity is absent; however, because spasticity is strongly associated with stroke severity, the independent impact of spasticity on costs is not known.⁵⁴⁰ Thus, the cost of treating spasticity may not reduce the overall cost of stroke-related care. For example, in 1 study, the use of botulinum toxin injections for upper limb spasticity combined with therapy was not found to be cost-effective compared with therapy alone.⁵⁴¹

The prevalence of poststroke spasticity in any limb is in the range of 25% to 43% over the first year after stroke.⁵⁴²⁻⁵⁴⁵

For patients who require acute rehabilitation after stroke, the prevalence of spasticity in any limb is 42%.⁵⁴⁶ The incidence of upper limb spasticity over the first 3 months in patients admitted to rehabilitation is 33%.⁹ The strongest predictor of moderate to severe spasticity (Ashworth scale score ≥ 2) is severe proximal and distal limb weakness on acute hospital or rehabilitation admission.^{543,547}

The use of resting hand splints is not effective for reducing wrist and finger spasticity, and the use of such splints is controversial for the prevention of contracture in the setting of spasticity.⁷⁵ For ankle plantarflexor spasticity, a short course of ankle casting may facilitate spasticity reduction after injection of botulinum toxin. Taping, however, has no effect on spasticity after lower limb botulinum toxin injection and is not recommended.^{548,549}

NMES combined with therapy may improve spasticity, but there is insufficient evidence that the addition of NMES improves functional gait or hand use.⁵⁵⁰ Vibration applied to spastic muscle groups might be considered to reduce spasticity transiently, but it is not effective for long-term reduction of spastic hypertonia.⁵⁵¹⁻⁵⁵³

Injection of botulinum toxin is used commonly to treat upper limb spasticity in patients with stroke and is recommended in several recent review articles and previously published guidelines as an important tool in the comprehensive management of poststroke spastic hypertonia.^{149,554-557} Injections of botulinum toxin A can reduce spasticity significantly as measured by the Ashworth scale. In a meta-analysis, botulinum toxin was shown to have a small but statistically significant effect on activity as measured by the Disability Assessment Scale after injection into the upper limb.⁵⁵⁸ However, improvements were attributable to the lowered resistance to muscle stretch during passive repositioning of the upper limb rather than to the actual skilled functional use of the arm and hand. Thus, there is no evidence to suggest that botulinum toxin injections will improve functional upper limb use, but it may improve limb active or passive positioning for activities such as dressing and hygiene.^{559,560} Although botulinum toxins are clinically recommended for spasticity reduction, it is not clear that they are a cost-effective means to manage spastic hypertonia compared with physical or occupational therapies alone.⁵⁴¹ However, if a reduction in caregiver burden is taken into account, the use of botulinum toxins with therapy may be cost-effective.⁵⁶¹ The early injection of botulinum toxins as soon as hypertonia appears may be effective in preventing later spasticity, but this needs further study.^{562,563}

Botulinum toxins injected into the ankle plantarflexor and inverter muscles significantly reduce lower limb spasticity as measured by the Ashworth scale.⁵⁶⁴⁻⁵⁶⁶ Injections may also improve gait speed, although only slightly.⁵⁶⁷ Botulinum toxin injections into the rectus femoris muscle may improve tonic knee extension during the swing phase of gait in stroke, but further study is needed.⁵⁶⁸ Although botulinum toxins have been used to improve orthotic fit, no studies of this application have been reported.

Oral antispasticity agents, including baclofen, dantrolene sodium, and tizanidine, have a marginal effect on reducing generalized spasticity, but dose-limiting side effects such as tiredness and lethargy are common.⁵⁶⁹⁻⁵⁷⁷ Intrathecal baclofen therapy is effective in reducing generalized spastic

hypertonia in patients with stroke.^{570,578–582} A consensus panel in 2006 recommended that intrathecal baclofen therapy is appropriate in those patients with spasticity who do not respond well to other interventions or in patients who experience adverse effects from other treatments. They also concluded that intrathecal baclofen therapy can be considered as early as 3 to 6 months after stroke for patients refractory to other treatments.⁵⁸³

Recommendations: Spasticity	Class	Level of Evidence
Targeted injection of botulinum toxin into localized upper limb muscles is recommended to reduce spasticity, to improve passive or active range of motion, and to improve dressing, hygiene, and limb positioning.	I	A
Targeted injection of botulinum toxin into lower limb muscles is recommended to reduce spasticity that interferes with gait function.	I	A
Oral antispasticity agents can be useful for generalized spastic dystonia but may result in dose-limiting sedation or other side effects.	Ila	A
Physical modalities such as NMES or vibration applied to spastic muscles may be reasonable to improve spasticity temporarily as an adjunct to rehabilitation therapy.	Ilb	A
Intrathecal baclofen therapy may be useful for severe spastic hypertonia that does not respond to other interventions.	Ilb	A
Postural training and task-oriented therapy may be considered for rehabilitation of ataxia.	Ilb	C
The use of splints and taping are not recommended for prevention of wrist and finger spasticity after stroke.	III	B

Balance and Ataxia

Balance depends on sensory inputs from the visual, vestibular, and somatosensory systems. These sensory inputs are integrated and used to control anticipatory and reactive motor output to postural disturbances. Balance impairment (inclusive of postural control impairment) is common after stroke^{182,584,585} because stroke can affect 1 or more of the sensory and motor networks. Impaired balance makes it difficult to safely complete ADLs, to move about the home and community, and to live independently. A large percentage of people report falling at least once in the first 6 months after stroke.^{182,585} People with stroke who fall are twice as likely to sustain a hip fracture compared with those who fall but do not have a stroke.⁵⁸⁶ Balance impairments can result in low balance confidence, which in turn may further reduce activity.⁵⁸⁷ If left undetected or untreated, balance impairments can result in a cascade of serious, undesirable, and expensive events.^{175,245}

Evaluation of balance abilities is considered part of routine clinical practice in individuals with stroke.^{308,588,589} Standardized tests of balance challenge different aspects of postural control such as anticipatory postural reactions during a variety of functional behaviors. Specific balance limitations

identified during the evaluation will help determine the risk of falling and guide the selection and tailoring of balance-specific interventions.^{308,591}

Although balance training programs have been shown to be beneficial after stroke, no specific approach or program has been demonstrated to be superior, nor is the optimal timing clear. Balance training has been successfully implemented as group and one-on-one sessions, circuit training, and hospital-versus home- versus community-based programs. Content of the training typically includes balance-specific activities, (eg, practice responding to challenges in standing) and more general activities (eg, strengthening exercises, gait activities).⁵⁹² Shorter, more time-intensive programs appear comparable to longer, less time-intensive programs.⁵⁹² Progression to more challenging training activities over the course of training is important. The one type of training that has not been shown to be beneficial for balance is water-based programs.⁵⁹³

Studies of balance training have generally been small, typically 10 to 60 subjects. Subjects typically have been able to ambulate independently (with or without an assistive device) and be relatively cognitively intact. Four systematic reviews and meta-analyses have reviewed the effects of various interventions on balance after stroke, with the latest one published in 2013. Findings across these reviews show inconsistent effects on balance outcomes. Subsequent published RCTs have tested a variety of types of balance training devices (sliding board, trunk exercises on a physioball, shoe wedge) or programs (yoga, Tai Chi,¹⁸⁷ gait training, motor imagery). The later studies have similar methodological challenges (8–40 subjects per group) and lead to similar, inconsistent conclusions about the superiority of any 1 specific treatment.^{594–604} Likewise, a systematic review of fall prevention after stroke has shown that inconsistencies in outcome measures, intervention type, and implementation in previous research make it difficult to determine the effectiveness of fall prevention programs after stroke.¹⁷⁴ The Prevention of Falls section provides more discussion.

Use of devices and orthotics (eg, cane, AFO) also improves balance.⁶⁰⁵ Finally, it should be noted that improving balance alone may not be sufficient for preventing falls because falls may have multiple contributing causes.

Ataxia is a disorder of coordinated muscle activity during voluntary movement associated with injury to the cerebellum, cerebellar peduncles, and brainstem cerebellar tracts. Patients with ataxia have delayed movement initiation, timing errors, abnormal limb trajectories, and dysmetria.^{606,607} Ataxia is present in 68% to 86% of patients with brainstem stroke. Ataxia typically improves during acute rehabilitation.^{608,609} Ataxia without concurrent hemiparesis has a better prognosis for functional recovery in acute rehabilitation.⁶¹⁰ However, the presence of ataxia with or without weakness does not affect general functional recovery negatively.^{608,609} Ataxia can affect the quality of use of the functional hand negatively because patients with cerebellar lesions can have impaired motor learning (eg, reduced skill improvement on a pursuit rotor task or ability to learn a finger sequence).^{611,612} Despite this, case studies indicate that intensive task-oriented therapy may improve motor performance and actual use of ataxic limbs in patients with stroke-related ataxia.

After participating in a task-oriented training program, patients improved reaching speed and had reduced trunk motion during reaching.⁶¹³ Stoykov and others⁶⁰⁶ noted that postural training and provision of trunk support could have a positive impact on upper limb motor control and dexterity in a patient with upper limb ataxia. There is a paucity of research on rehabilitation approaches to limb ataxia, but at present, postural training and task-oriented upper limb training are recommended.

Recommendations: Balance and Ataxia	Class	Level of Evidence
Individuals with stroke who have poor balance, low balance confidence, and fear of falls or are at risk for falls should be provided with a balance training program.	I	A
Individuals with stroke should be prescribed and fit with an assistive device or orthosis if appropriate to improve balance.	I	A
Individuals with stroke should be evaluated for balance, balance confidence, and fall risk.	I	C
Postural training and task-oriented therapy may be considered for rehabilitation of ataxia.	IIb	C

Mobility

The loss or difficulty with ambulation is one of the most devastating sequelae of stroke, and restoration of gait is often one of the primary goals of rehabilitation. Gait-related activities include such tasks as mobility during rising to stand, sitting down, stair climbing, turning, transferring (eg, wheelchair to bed or bed to chair), using a wheelchair after stroke, walking quickly, and walking for specified distances.⁶¹⁴ Limitations in gait and gait-related activities are associated with an increase in fall risk. A number of systematic reviews have demonstrated enhanced outcomes of gait, gait-related activities, and ADLs⁶¹⁵ after intensive, repetitive task training.⁶¹⁶⁻⁶¹⁸ The role of treadmill training and electromechanics-assisted gait training remains under study.⁶¹⁹

Key training parameters for improving mobility after stroke are activity-specific and functional task practice; practice that is progressively more difficult and challenging; practice that is of sufficient intensity, frequency, and duration; and practice that is at an appropriate time relative to stroke onset.^{616,620} These parameters pertain to treadmill training with or without body weight support, circuit training, mobility training, and electromechanics-assisted training.⁶¹⁶

Dickstein⁶²¹ reviewed a variety of mobility training techniques and found that gains were comparable across treatments but generally insufficient for patients to advance to a higher functional walking category on the basis of the categories defined by Perry et al.²⁷⁷ No benefit was seen for more complex methods such as treadmill and robotic-based interventions compared with more traditional approaches.

Circuit class therapy is a form of group treatment with exercises focused on repetitive practice of functional tasks.⁶²²⁻⁶²⁴ A 2009 meta-analysis and recent systematic review concluded that circuit class therapy was a safe and effective method for improving mobility after stroke.^{623,625}

Treadmill training in the context of task-specific training may be used with or without body weight support or therapists to assist the paretic lower extremity in stepping. A recent systematic review concluded that compared with no intervention or with an intervention with no walking component, treadmill training without body weight support improved walking speed and distance among ambulatory people after stroke. Although these benefits were maintained beyond the intervention period, it is not yet known whether treadmill training is superior to overground walking training.^{621,626} Recently, it was demonstrated that treadmill training with body weight support and traditional gait training were equally effective in improving walking and transfers in patients dependent on walking assistance after stroke.^{51,627} A recent systematic review, including those <3 months after stroke and unable to walk, reported that those individuals who are earlier after stroke and more severe are more likely to have a better gait recovery outcome with mechanically assisted training compared with overground training and by using a harness in conjunction with the mechanical device. Mechanically assisted walking (eg, treadmill, electromechanical gait trainer, robotic device, servo-motor) with body weight support was found to be more effective than overground walking at increasing independent walking in nonambulatory patients early after stroke.⁶²⁸

Lower Extremity Strengthening

A 2007 review concluded that graded strength training improves the ability to generate force but does not transfer to improvements in walking.⁶¹⁸ However, a more recent meta-analysis demonstrated that providing lower limb resistance training to community-dwelling individuals who are 6 months after stroke has the capacity to improve comfortable gait speed and total distance walked.⁶²⁹ Similarly, a 2008 review concluded that despite limited long-term follow-up data, there is evidence that resistance training produces increased strength, gait speed, and functional outcomes, as well as improved quality of life.⁶³⁰

NMES has been used to stimulate the ankle dorsiflexors during the swing phase of the gait cycle. A recent systematic review revealed a small but significant treatment effect of NMES on gait capacity in individuals in the chronic phase after stroke.⁶³¹ Similarly, a meta-analysis revealed the effectiveness of NMES at improving gait speed in subjects after stroke.⁶³² Several RCTs have observed improved recovery of gait function after stroke in the chronic^{550,633-635} and acute phases^{636,637} when NMES was applied in conjunction with a conventional rehabilitation program. Studies comparing the use of an AFO to NMES in controlling foot drop during walking have found similar results.^{638,639} Although subjects preferred the foot drop stimulator used in 2 multisite RCTs, both the stimulator and a conventional AFO produced equivalent functional gains.^{638,640,641} Similar results were obtained in a comparison of surface peroneal nerve stimulation and use of an AFO.^{642,643} Significant improvements in functional mobility were found with both peroneal nerve stimulation and AFO during the treatment period and were maintained at the 6-month follow-up.

Medications for Motor Recovery

Several medications have been studied as potential contributors to stroke recovery in general and to motor recovery in

particular, including dextroamphetamine, methylphenidate, levodopa, and SSRIs. Fluoxetine was found to be helpful for motor recovery in a double-blind, placebo-controlled trial,⁶⁴⁴ and several smaller studies of SSRIs were also suggestive of benefit.^{645–648} A systematic review and meta-analysis found evidence of benefit for SSRIs in overall disability after stroke.⁶⁴⁹ The overall quality of these studies was not sufficient, however, to make a definitive recommendation, and larger, well-controlled trials are in progress. A randomized, double-blind, placebo-controlled trial of dextroamphetamine in 71 subjects was negative,⁴⁴⁴ and a subsequent systematic review of the use of amphetamines for improving motor recovery after stroke found inconsistent findings,⁶⁵⁰ and these carry a risk of adverse cardiovascular effects. A randomized, double-blind, placebo-controlled trial of levodopa found short-term benefit of this therapy compared with placebo for motor function but was limited by relatively small size (47 subjects analyzed), baseline differences in stroke severity and patient age between the 2 treatment groups, and the short-term follow-up of only 3 weeks after the completion of therapy.⁶⁵¹

Acupuncture

The Ottawa Panel recommends that there is good scientific evidence to consider including acupuncture as an adjunct to standard stroke rehabilitation to improve walking mobility.⁶³⁹ Shifflett⁶⁵² reviewed a number of RCTs of acupuncture for stroke recovery and performed a reanalysis suggesting that acupuncture may be effective as an adjunctive treatment for improving walking speed.

Transcutaneous Electrical Nerve Stimulation

TENS provides electrically induced sensory input to the lower limb. A meta-analysis revealed that there was insufficient research to make conclusions about the effectiveness of TENS in improving gait and gait-related activities.⁶³² Three subsequent RCTs provided evidence of a potential benefit of TENS on physical function after stroke, particularly when combined with task-related activity.^{653–655}

Rhythmic Auditory Cueing

Rhythmic auditory cueing is a therapy approach in which overground walking is synchronized to a rhythmic auditory cue to improve temporal and spatial gait measures. An evidence synthesis found moderate evidence of improved velocity and stride length in people with stroke after gait training with rhythmic music. Synchronizing walking to rhythmic auditory cues can result in short-term improvement in gait measures of people with stroke. Further high-quality studies are needed before recommendations for clinical practice can be made.⁶⁵⁶

Use of AFOs

Use of AFOs is an effective method of compensating for motor impairments in the lower limb after stroke.^{657–660} The reader is referred to the section below on adaptive equipment for details.

Robotic and Electromechanics-Assisted Training Devices

Robots and electromechanics-assisted training devices have been used in an effort to promote gait recovery after stroke.

Most of these devices incorporate body weight support along with treadmills or foot platform pedals analogous to an elliptical trainer. Their main advantage over conventional gait training is that they reduce the need for intensive therapist support. These devices include the Lokomat, the Gait Trainer GT 1, and the AutoAmbulator. A Cochrane systematic review updated in 2013 concluded that patients with stroke who received electromechanics-assisted gait training in combination with PT were more likely to achieve independent walking than patients receiving gait training without these devices, but it did not find an increase in gait velocity.⁶⁶¹ The review concluded that the individuals most likely to benefit from this therapy appear to be those who are within the first 3 months after stroke and those who are unable to walk. In contrast, a study by Hornby et al⁶⁶² demonstrated greater improvement in gait velocity and single limb support time on the paretic limb after therapist-assisted locomotor training compared with robotic-assisted locomotor training.⁶⁶² A systematic review found improved balance for stroke survivors receiving robotic gait training, but there was insufficient evidence comparing robotic gait training with conventional gait training to determine whether these therapies are similar in this regard.⁶⁶³

Exoskeletal wearable lower limb robotic devices are also available for gait training after stroke and allow overground walking with the device. Most of these devices (eg, Ekso, Ekso Bionics, Richmond, CA; Indego, Parker-Hannifin; and ReWalk, Marlborough, MA) are bilateral in design, although unilateral exoskeletal wearable devices have also been developed (eg, Bionic Leg, AlterG, Fremont, CA). Although a pilot study of a unilateral device did not demonstrate benefit compared with conventional exercise therapy,⁶⁶⁴ most of the devices in this class have not yet been examined in controlled trials for stroke survivors. Overall, although robotic therapy remains a promising therapy as an adjunct to conventional gait training, further studies are needed to clarify the optimal device type, training protocols, and patient selection to maximize benefits.

Electromyographic Biofeedback

Electromyographic biofeedback is a technique that uses visual or audio signals to provide the patient with feedback on his/her muscle activity. The literature on the use of electromyographic biofeedback plus conventional rehabilitation includes some studies suggesting improved motor power, functional recovery, and gait quality compared with conventional rehabilitation alone. However, a 2007 Cochrane database systematic review did not find a treatment benefit. The results of the systematic review are limited because the trials were small, were generally poorly designed, and used varying outcome measures, making it difficult to compare across studies.⁶⁶⁵

Virtual Reality

Virtual reality is the use of computerized technology to allow patients to engage in specific task practice within a computer-generated visual environment in a naturalistic fashion. An environment that may be more interesting to a subject may enhance motivation to practice. In 2011, the Cochrane Stroke Group concluded that there was insufficient evidence to reach conclusions about the effect of virtual reality and interactive video gaming on gait speed.⁶⁶⁶ However, a recent systematic

review⁶⁶⁷ suggests that virtual reality promotes changes in gait parameters despite diversity of protocols, participant characteristics, and number of subjects included.

Traditional Physiotherapeutic Approaches (Neurodevelopmental Therapy/Bobath, Brunnstrum, Proprioceptive Neuromuscular Facilitation)

A recent systematic review conducted by Langhammer and Stanghelle⁶⁶⁸ assessed the efficacy of the traditional physiotherapeutic approaches. Although improvements in motor function were demonstrated, no trial showed that these approaches were superior to the respective comparison therapies.⁶⁶⁸ Similarly, it was concluded that neurodevelopmental approaches were equivalent or inferior to other approaches in improving walking ability in a 2007 systematic review.⁶¹⁸

Water-Based Exercises

The conclusions drawn in a 2012 Cochrane systematic review revealed that the evidence from RCTs to date does not confirm or refute that water-based exercises after stroke might help to improve gait and gait-related activities.⁵⁹³

Recommendations: Mobility	Class	Level of Evidence
Intensive, repetitive, mobility- task training is recommended for all individuals with gait limitations after stroke.	I	A
An AFO after stroke is recommended in individuals with remediable gait impairments (eg, foot drop) to compensate for foot drop and to improve mobility and paretic ankle and knee kinematics, kinetics, and energy cost of walking.	I	A
Group therapy with circuit training is a reasonable approach to improve walking.	Ila	A
Incorporating cardiovascular exercise and strengthening interventions is reasonable to consider for recovery of gait capacity and gait-related mobility tasks.	Ila	A
NMES is reasonable to consider as an alternative to an AFO for foot drop.	Ila	A
Practice walking with either a treadmill (with or without body-weight support) or overground walking exercise training combined with conventional rehabilitation may be reasonable for recovery of walking function.	Ilb	A
Robot-assisted movement training to improve motor function and mobility after stroke in combination with conventional therapy may be considered.	Ilb	A
Mechanically assisted walking (treadmill, electromechanical gait trainer, robotic device, servo-motor) with body weight support may be considered for patients who are nonambulatory or have low ambulatory ability early after stroke.	Ilb	A
There is insufficient evidence to recommend acupuncture for facilitating motor recovery and walking mobility.	Ilb	B

Recommendations: Mobility (Continued)	Class	Level of Evidence
The effectiveness of TENS in conjunction with everyday activities for improving mobility, lower extremity strength, and gait speed is uncertain.	Ilb	B
The effectiveness of rhythmic auditory cueing to improve walking speed and coordination is uncertain.	Ilb	B
The usefulness of electromyography biofeedback during gait training in patients after stroke is uncertain.	Ilb	B
Virtual reality may be beneficial for the improvement of gait.	Ilb	B
The effectiveness of neurophysiological approaches (ie, neurodevelopmental therapy, proprioceptive neuromuscular facilitation) compared with other treatment approaches for motor retraining after an acute stroke has not been established.	Ilb	B
The effectiveness of water-based exercise for motor recovery after an acute stroke is unclear.	Ilb	B
The effectiveness of fluoxetine or other SSRIs to enhance motor recovery is not well established.	Ilb	B
The effectiveness of levodopa to enhance motor recovery is not well established.	Ilb	B
The use of dextroamphetamine or methylphenidate to facilitate motor recovery is not recommended.	III	B

Upper Extremity Activity (Includes ADLs, IADLs, Touch, Proprioception)

The majority of individuals with stroke experience problems with the upper extremity, most commonly paresis,^{670,671} which is the key impairment in most cases.^{333,337,341,672,673} Only a small portion of people fully recover from upper limb paresis after a stroke, with the remainder left with lingering upper extremity impairments, activity limitations, and participation restrictions.^{338,674} An inability to use the upper extremity in daily life can lead to loss of independence with ADLs and of important occupations (eg, work, driving) and can even contribute to institutionalization.

Task-specific training, or functional task practice, is based on the premise that practice of an action results in improved performance of that action and is focused on learning or relearning a motor skill.^{675,676} Task-specific practice is an element of or used in combination with many upper extremity interventions such as constraint-induced movement therapy (CIMT) and NMES. Across a large number of studies, the key elements of task-specific training are repeated, challenging practice of functional, goal-oriented activities. Trunk restraint during task-specific training is beneficial in reducing compensatory trunk movements and promoting proximal movement control.^{677,678} Strengthening upper extremity muscles may be beneficial as an adjunct to task-specific training,^{679,680} when therapy time permits, or when the strengthening activities can be performed outside formal therapy sessions.

CIMT has been demonstrated to improve upper extremity activity, participation, and quality of life in individuals with baseline ability to control wrist and finger extension compared with usual care.^{52,678,681-685} It is less clear whether CIMT has

any advantage over dose-matched conventional upper limb therapy.^{686,687} CIMT can be delivered in its original form 3 to 6 h/d for 5 d/wk for 2 weeks or in a modified version 1 h/d for 3 d/wk for 10 weeks. The modified CIMT intervention appears to result in improvements that are comparable to the original version, although it has not been as extensively tested.⁶⁸⁸⁻⁶⁹⁴

Bilateral upper limb training has not been as well studied as CIMT. Two meta-analyses and more recent trials suggest that there is a small but measurable benefit compared with no intervention, but no consistent evidence of superiority over other task-specific training interventions has been shown.⁶⁹⁵⁻⁶⁹⁹ Recent trials comparing bilateral training with CIMT or modified CIMT indicate that they may have similar efficacy for individuals with preserved isolated wrist and finger movement.⁷⁰⁰⁻⁷⁰²

For individuals with more severe paresis, the potential for recovery of upper extremity function is greatly reduced, particularly later after stroke.⁶⁷⁴ Robotic therapy can deliver larger amounts of upper extremity movement practice for these individuals. There are a variety of types of upper extremity robots, consisting primarily of workstation devices used in a rehabilitation facility but also including some wearable exoskeletal devices that can be used in a home environment. A Cochrane review updated in 2012 found that upper limb robotic therapy provided benefit with regard to ADLs and arm function but not arm muscle strength.⁷⁰³ The variation within the trials with regard to duration and amount of training, the specific devices used, and patient populations studied limits the interpretation of these results. Moreover, many of the studies performed with robot-aided therapy have compared it with usual care rather than dose-matched conventional upper limb exercise therapy. Those studies incorporating dose-matched exercise as a comparison treatment show minimal or no differences in the efficacy between these 2 treatments.^{704,705} Overall, robotic therapy appears to provide some benefit for upper extremity motor abilities and participation but is of uncertain utility compared with dose-matched conventional upper limb exercise therapies.⁷⁰⁶⁻⁷¹³

NMES can be used for those with minimal ability for volitional muscle activation. It may be beneficial for improving upper extremity activity if used in combination with task-specific training, particularly when applied to the wrist and hand muscles.⁷¹⁴⁻⁷¹⁶ Alternatively, it is beneficial in preventing or correcting shoulder subluxation.^{125,132,717}

Mental practice, or mental imagery, may be useful as an adjunct to upper extremity exercise therapies.⁷¹⁸⁻⁷²² Initial training in mental practice occurs within a therapy session, but additional practice can happen outside formal therapy time. It is feasible to integrate mental practice with physical practice.⁷²³ Longer durations of mental practice appear to produce more benefit.⁷²⁴

Virtual reality and video gaming have the potential to increase participant engagement and the amount of upper extremity movement practice. Computer-based video games are widely available for recreational purposes for the general public, including those with handheld controllers (eg, Wii) and motion capture systems (Xbox Kinect, Microsoft, Inc). In addition, these systems can be used as remotely monitored telerehabilitation systems.⁷²⁵ To date, most studies of efficacy have been small and have used a variety of technologies and training programs, making generalization difficult. A Cochrane review⁶⁶⁶ found benefit in terms of upper limb function and

ADLs but no improvements in upper limb strength. The studies were of low quality in many cases, reducing confidence in this finding. Efficacy of Virtual Reality Exercises in Stroke rehabilitation (EVREST),⁷²⁷ a multicenter, randomized, clinical trial, is under way that may provide more definitive evidence. At present, virtual reality and video gaming are reasonable alternative methods to engage individuals with stroke in the rehabilitation process and to increase the amount of movement practice.^{666,728,729,731-733}

A variety of interventions have been the focus of ≥1 studies but have not yet been shown to be consistently beneficial for upper limb motor rehabilitation. These include somatosensory stimulation⁷³⁴⁻⁷³⁸ and noninvasive brain stimulation (transcranial magnetic stimulation or tDCS) in combination with upper extremity exercise therapy,⁷³⁹⁻⁷⁴⁶ interventions targeting motor apraxia,⁴⁵⁸ and manual therapy approaches such as stretching, passive exercise, and mobilization,⁷⁴⁸ although these approaches are a routine part of practice for individuals with more severely affected upper extremities to prevent contractures and to manage spasticity.

Finally, upper extremity rehabilitation programs can be delivered in a variety of settings such as inpatient hospitals and outpatient clinics and within the home. A recent systematic review and subsequent RCT indicate that both outpatient and home service delivery models produce similar results on upper extremity activity, including the ability to perform ADLs.^{749,750}

Recommendations: Upper Extremity Activity, Including ADLs, IADLs, Touch, and Proprioception	Class	Level of Evidence
Functional tasks should be practiced; that is, task-specific training, in which the tasks are graded to challenge individual capabilities, practiced repeatedly, and progressed in difficulty on a frequent basis.	I	A
All individuals with stroke should receive ADL training tailored to individual needs and eventual discharge setting.	I	A
All individuals with stroke should receive IADL training tailored to individual needs and eventual discharge setting.	I	B
CIMT or its modified version is reasonable to consider for eligible stroke survivors.	Ila	A
Robotic therapy is reasonable to consider to deliver more intensive practice for individuals with moderate to severe upper limb paresis.	Ila	A
NMES is reasonable to consider for individuals with minimal volitional movement within the first few months after stroke or for individuals with shoulder subluxation.	Ila	A
Mental practice is reasonable to consider as an adjunct to upper extremity rehabilitation services.	Ila	A
Strengthening exercises are reasonable to consider as an adjunct to functional task practice.	Ila	B
Virtual reality is reasonable to consider as a method for delivering upper extremity movement practice.	Ila	B

Recommendations: Upper Extremity Activity, Including ADLs, IADLs, Touch, and Proprioception (Continued)	Class	Level of Evidence
Somatosensory retraining to improve sensory discrimination may be considered for stroke survivors with somatosensory loss.	IIb	B
Bilateral training paradigms may be useful for upper limb therapy.	IIb	A
Acupuncture is not recommended for the improvement of ADLs and upper extremity activity.	III	A

Adaptive Equipment, Durable Medical Devices, Orthotics, and Wheelchairs

Many patients require assistive devices, adaptive equipment, mobility aids, wheelchairs, and orthoses to maximize independent functioning after stroke. Many types of adaptive devices and equipment are available. Type and level of functional deficit, degree of achieved adaptation, and the structural characteristics of the living environment determine the need for a particular item.

A vast array of adaptive devices are available, including devices to make eating, bathing, grooming, and dressing easier for patients with functional limitations. The Convention on the Rights of Persons With Disabilities supports facilitating access by individuals with disabilities to quality mobility aids, devices, and assistive technologies by making them available at affordable cost.⁷⁵¹ Many patients may need to use adaptive devices early during rehabilitation but will not require long-term use. This should be taken into account when the provision of a device is considered. Examples of adaptive devices include (but are not limited to) eating utensils with built-up handles, rocker knives, plate guards, nonskid placemats, long-handled sponges for bathing, handheld showers, tub and shower chairs, grab bars for bathrooms, and elevated toilet seats. A meta-analysis found that OT increased independence in ADLs.⁷⁵² The protocols in these studies focused on improving personal ADLs, including the provision and training in the use of adaptive equipment.

Stroke can cause a number of gait impairments; consequently, stroke patients often have an unstable, inefficient walking pattern and a high risk for falls (see the sections Prevention of Falls and Mobility). More than half of stroke patients require an assistive device (cane, walker, wheelchair) to assist mobility, most frequently a cane.⁷⁵³ Studies that have assessed the immediate effects of different assistive devices provided in random order have shown that ambulatory function (speed, step length, functional ambulation category) was improved with a cane after stroke.^{754,755} Patients felt that their walking, walking confidence, and walking safety improved and said they would rather walk with an assistive device than delay walking to achieve a normal gait pattern.⁷⁵⁵ Walking devices increase the base of support around a patient's center of gravity and reduce the balance and effort needed to walk. Walking aids include (but are not limited to) the following:

- Single-point cane: a conventional cane that provides 1 point of contact and limited improvement in balance and stability.

- Tripod and quad cane: canes that have 3 or 4 points of contact and offer more stability than a single-point cane but are heavier, bulkier, and more awkward to use. A quad cane has been shown to reduce postural sway more than a single-point cane in patients with stroke.⁷⁵⁶
- Two-wheeled walkers, 4-wheeled walkers, or rollators (ie, 4-wheeled walker with a seat): devices that require the use of both arms and legs. They support more body weight than a cane and are more energy efficient but cannot be used on stairs. They should be lightweight and foldable for use outside the home. Four-wheeled walkers may require hand-motor coordination to manage hand-brakes on a downhill slope.

For individuals with stroke who cannot ambulate safely, a wheelchair can enhance mobility. Up to 40% of stroke patients have been reported to use a manual wheelchair at rehabilitation discharge.⁷⁵⁷ A wheelchair may be required when a patient is unable to ambulate or when there is concern about his/her ability to ambulate safely or functionally.⁷⁵⁸ The patient often propels the chair by using the less affected hand on 1 wheel and foot on the floor. Self-propulsion in a wheelchair early after a stroke has not been shown to be detrimental to muscle tone or functional outcomes.⁷⁵⁹ Many stroke survivors also use manual wheelchairs for longer-distance travel such as shopping or physician appointments although they are capable of short-distance ambulation within the home. In these situations, the wheelchair is typically propelled by a caregiver.

Although powered wheelchairs are less commonly used after stroke, many stroke patients can learn to use powered wheelchairs safely with appropriate training.⁷⁶⁰ Wheelchair designs vary greatly, and a wheelchair prescription should be specific to the patient's needs and environment and patient and family/caregiver preferences. The prescription of a wheelchair (manual or powered) in the community can increase participation and improve quality of life.^{761,762}

A common approach to managing the lower limb motor impairments resulting from a stroke is to use an orthotic device (an orthosis), most commonly an AFO. Meta-analyses have shown a favorable impact of lower limb orthoses on walking disability (speed), walking impairment (step/stride length), and balance (weight distribution in standing).^{659,605} However, the included studies examined only the immediate effects while the orthosis was worn.⁶⁵⁹ A recent meta-analysis and systematic review suggested the potential mechanism(s) associated with the above effects by demonstrating a positive effect of an AFO on ankle kinematics, knee kinematics in stance phase, kinetics, and energy cost.⁶⁵⁸ Two RCTs^{763,764} showed that after 3 months of AFO use, AFO users had better mobility while wearing the AFO. One small RCT⁷⁶⁴ found that although a dynamic hinged AFO improved ambulatory function over a standard AFO, it induced some dependence; the standard AFO group performed better after 3 months of use when walking without any orthosis. With respect to the patient's perspective, it is important to determine whether an individual is willing to wear an AFO regularly. Considerations to improve compliance with using an AFO

include verification that it fits correctly and comfortably and is acceptable in appearance.

Recommendations: Adaptive Equipment, Durable Medical Devices, Orthotics, and Wheelchairs	Class	Level of Evidence
Ambulatory assistive devices (eg, cane, walker) should be used to help with gait and balance impairments, as well as mobility efficiency and safety, when needed.	I	B
AFOs should be used for ankle instability or dorsiflexor weakness.	I	B
Wheelchairs should be used for nonambulatory individuals or those with limited walking ability.	I	C
Adaptive and assistive devices should be used for safety and function if other methods of performing the task/activity are not available or cannot be learned or if the patient's safety is a concern.	I	C

Motor Impairment and Recovery: Deconditioning and Fitness After Stroke

People having sustained a stroke present with varying degrees of compromised cardiorespiratory fitness, as reflected in peak $\dot{V}O_2$ levels of 8 to 22 mL $O_2 \cdot kg^{-1} \cdot min^{-1}$ (an average of $\approx 53\%$ of age- and sex-matched normative values).⁷⁶⁵ Given that 15 to 18 mL $O_2 \cdot kg^{-1} \cdot min^{-1}$ is deemed necessary for independent living, the state of fitness after stroke is a significant health, functional, and quality-of-life issue.⁷⁶⁶ Multiple factors before stroke, at the time of stroke, and after stroke help explain this state. The result is often a profound and persistent deconditioned state that leads to further physical inactivity, reduced socialization, and heightened risk of further vascular events, including a second stroke.

The lifetime risk of stroke recurrence among people with stroke is $\approx 30\%$, and the risk of either nonstroke vascular death or myocardial infarction is $\approx 2\%/y$.⁷⁶⁷ Recurrence of stroke has been found to vary by sex: 24% of women and 42% of men experience a recurrence within 5 years of onset.^{768,769} The reported rates of vascular risks are high among people who have a recurrence: The prevalence of hypertension (75%), ischemic heart disease (37%), hyperlipidemia (56%), atrial fibrillation (29%), and diabetes mellitus (24%) is significant in individuals who sustain a second stroke.⁷⁷⁰ For a comprehensive and timely set of evidence-based recommendations for all clinicians who manage secondary prevention, the reader is directed to the AHA/ASA guidelines for the prevention of stroke in patients with stroke and transient ischemic attack.²⁰⁶

Activity level after stroke is an independent predictor of life satisfaction, after controlling for demographic variables and depression.⁷⁷¹ Low levels of physical activity have been documented across the continuum of stroke severity and care, even among people who have had what is considered a mild stroke.⁷⁷² A behavioral mapping study revealed that activity out of bed during acute stroke care (ie, <14 days after the onset of stroke) varied widely among the European countries studied, ranging between 2% and 56% of the total time of the observation periods.⁷⁷³ Stroke rehabilitation sessions have

been reported to be of inadequate intensity to induce a cardiovascular training effect,^{774,775} with an average of 17 minutes spent in standing and walking per session.⁷⁷⁶ Daily ambulatory activity of community-dwelling stroke survivors has been reported to be 50%⁷⁷⁷ to 61%⁷⁷⁸ of that of nondisabled control subjects, less than that of older adults with other chronic health conditions of the musculoskeletal or cardiovascular system.⁷⁷⁹ At the same time, self-reports of physical activity among people with chronic stroke tend to be highly inflated.⁷⁸⁰

Sedentary behavior is defined as a waking behavior such as sitting or lying that involves an energy expenditure of <1.5 metabolic equivalents (METs; 1 MET is the amount of oxygen consumed while sitting at rest and is ≈ 3.5 mL $O_2 \cdot kg^{-1} \cdot min^{-1}$). Less sedentary behavior has been found to be an independent predictor of successful aging among individuals ≥ 45 years of age.⁷⁸¹ Moreover, prolonged bouts of sedentary behavior and total amount of physical inactivity appear to be independently related to risk factors associated with metabolic syndrome (eg, increased waist circumference, body mass index, triglycerides, and plasma glucose).⁷⁸² To date, little research has been conducted on patterns of sedentary behavior after stroke. A cohort study reported that people after stroke ($n=25$) spent less time being physically active and had fewer breaks in sedentary behavior at 1 week, 3 months, and 6 months after stroke compared with nondisabled control subjects matched by age, sex, and body mass index.⁷⁸¹

Intervention strategies are needed to break the relentless poststroke cycle of reduced physical activity leading to further reductions in functional capacity and heightened risk of secondary complications. The central role that aerobic exercise plays in improving cardiorespiratory fitness is well known and strongly supported by evidence.⁷⁸³ It is now clear that people with mild or moderate stroke are capable of improving their exercise capacity through exercise or structured physical activity.^{784–786} Enhanced fitness enables individuals to engage in daily physical activities at a lower percentage of their maximal capacity and hence with a lower physiological burden.⁷⁸⁷ Exercise-induced gains in peak $\dot{V}O_2$ have been relatively modest, with the magnitude of improvement ranging from 0.3 METs⁷⁸⁸ to 1.2 METs⁷⁸⁹ in trials of individuals in the subacute poststroke period and averaging ≈ 0.5 METs in trials of individuals with chronic stroke. However, even modest improvements in exercise capacity are associated with reduced cardiac complications in people with coronary artery disease⁷⁹⁰ and increased survival (10%–25% reduction in mortality for every 1-MET increase in exercise capacity).⁷⁹¹

Emerging research suggests that aerobic exercise after stroke confers clinically meaningful health benefits in numerous physical and psychosocial domains that extend well beyond the cardiorespiratory system. At the impairment level, some evidence exists that exercise positively affect bone health⁷⁹² (but not risk of fracture²⁵³), fatigue,⁴¹¹ executive functioning and memory, depressive symptoms,^{794,795} and emotional well-being¹⁸⁸ (see the earlier section on the benefits of exercise for poststroke depression). At the activity level, improvements have been noted in walking ability⁷⁹⁶ (endurance more than speed⁷⁹⁷) and upper extremity muscle strength.⁶⁸⁰ At the participation level, preliminary evidence has reported an association between exercise training after

stroke and social participation,¹⁸⁸ as well as return to work.⁷⁹⁹ Finally, a meta-analysis reported that exercise interventions for community-based stroke survivors have significant effects on health-related quality of life, which is arguably the ultimate goal of stroke rehabilitation.⁸⁰⁰

The role of exercise in preventing further vascular events after stroke, including a second stroke, myocardial infarction, and vascular death, has not been firmly established.⁷⁸⁶ There is evidence that aerobic exercise as a stand-alone intervention after stroke improves certain vascular risk factors, including glucose intolerance,⁸⁰¹ vascular stiffness,⁸⁰² high resting blood pressure,^{803,804} and elevated total cholesterol.⁸⁰³ A multifaceted approach that combines nonpharmacological interventions (ie, exercise, dietary advice, lifestyle counseling, and patient education) and appropriate pharmacological therapy has been encouraged,⁸⁰⁵ but the effectiveness of specific nonpharmacological components remains to be investigated.⁸⁰⁶ Pilot studies of second stroke prevention using a cardiac rehabilitation approach have demonstrated a reduction in cardiac risk scores⁸⁰⁷ and improvements in total cholesterol, body composition, and resting blood pressure,⁸⁰⁸ but these results must be confirmed in larger, controlled trials. Despite a lack of robust evidence, exercise and physical activity are regarded as key components of comprehensive stroke risk-reduction efforts.²⁰⁶

Individually Tailored Exercise Program Prescription

Active participation in exercise should be initiated early after stroke for several reasons: to minimize the detrimental effects of bedrest and inactivity, to capitalize on heightened neuroplasticity present in the early poststroke period, and to begin the important process of fostering exercise self-efficacy and self-monitoring. Mobilization within 24 hours after stroke has been shown in a phase II trial to accelerate recovery of walking and functional ability⁸⁰⁹; however, a recent study reported possible detrimental effects with such early activity.⁸¹⁰ In the recently completed AVERT RCT, the high-dose, very early mobilization protocol was associated with a reduction in the odds of a favorable outcome at 3 months.⁵⁸ In contrast to very early mobilization, there is growing evidence that the initiation of aerobic exercise in the subacute period (ie, a mean of 11–78 days after stroke) is safe and effective in improving exercise capacity and walking endurance.^{784,789} Specific recommendations for graded exercise testing can be found in the AHA guideline on stable ischemic heart disease.^{811,812} The ASH/ASA scientific statement “Physical Activity and Exercise Recommendations for Stroke Survivors”^{781,3} provides more details on the pre-exercise evaluation.

As with all aspects of stroke rehabilitation, the training regimen should emphasize repetition, gradually progressive task difficulty, and functional practice.⁸¹⁴ The standard parameters of exercise prescription, that is, mode, frequency, duration, and intensity, require careful consideration to ensure a safe intervention that accommodates the individual’s functional limitations, comorbidities, motivation, and goals. Because the optimal training parameters have not been determined specifically for the stroke population,⁸¹⁵ current recommendations are based on general exercise guidelines⁸¹⁶ and on protocols shown to be effective in training studies involving people after stroke.⁷⁹⁶ A wide range of exercise modes (eg,

treadmill, body weight–supported treadmill, recumbent bicycle, cycle ergometer, stepper, aqua aerobics) have been used effectively in training studies.⁷⁹⁶ Because overground walking at self-selected speeds after stroke elicits oxidative stress in the range of 2.6 METs⁸¹⁸ to 3.4 METs,⁸¹⁹ it may be an appropriate aerobic modality for people who are moderately unfit. Preliminary evidence also suggests that participants in the chronic poststroke period can achieve low to moderate exercise intensities when playing an active video game (Nintendo Wii Sports).⁸²⁰ Furthermore, a recent trial involving people with subacute stroke demonstrated greater gains in peak $\dot{V}O_2$ with a combination of robot-assisted gait training and conventional PT than conventional therapy alone.⁸²¹

There is some evidence that the combination of aerobic and strengthening exercises in nonstroke populations enhances health outcomes (eg, reducing resting blood pressure⁸²² and metabolic syndrome risk factors⁸²³). However, conclusions from a meta-analysis indicated the need for further investigation to determine whether combining aerobic and strengthening exercises bestows similar advantages in the stroke population.⁷⁸⁵ Since then, a small, single-cohort study involving individuals with chronic stroke reported improved muscle strength and walking endurance but no change in peak $\dot{V}O_2$ after an 8-week program of lower extremity strength training at 85% to 95% of 1-repetition maximum.⁸²⁵

Benefits derived from aerobic training are dose dependent. The appropriate total volume of exercise, achieved through various combinations of frequency, duration, and intensity, is key to attaining and maintaining cardiorespiratory fitness. Nevertheless, there appears to be a minimal threshold for each parameter to achieve the most favorable outcomes. The frequency of structured aerobic exercise should be at least 3 d/wk for a minimum of 8 weeks, with lighter forms of physical activity (eg, brisk walking, stair climbing) promoted on the other days of the week. The duration of each session should be a minimum of 20 minutes in the training zone in addition to 3- to 5-minute periods of low-intensity warm-up and cool-down. For very deconditioned individuals, including many people after stroke, exercise may be delivered in multiple bouts of ≤ 5 minutes in a single session or throughout the day.⁷⁸³

Exercise intensity is the most challenging parameter to determine but also the most critical to ensure that a dose that is safe, attainable, and adequate to elicit a training effect. Factors that affect intensity are baseline fitness level, neurological and cardiac status, comorbidities, motivation, and goals of the program. Heart rate is typically used to establish and monitor training intensity, with resting rate measured after a minimum of 5 minutes of quiet sitting and exercise heart rate measured with an electronic device. It is important to note that β -blocker medication depresses the heart rate response to exercise and that atrial fibrillation (common after stroke) yields a chronically irregular ventricular rate, thus posing challenges in the prescription of exercise intensity.⁸²⁶ Various recommendations have been made on the appropriate exercise intensity for patients after stroke, including “moderate training intensities,”²⁰⁶ 40% to 70% of heart rate reserve (maximal heart rate minus resting heart rate),⁸²⁷ and 50% to 80% of maximal heart rate.⁷⁸⁵ A meta-analysis concluded that for extremely unfit individuals, intensities as low as 30% of heart rate reserve can induce a cardiovascular training

effect.⁸²⁸ At the other end of the spectrum, 2 pilot exercise studies provided early evidence supporting the safe and effective use, at least in the chronic stroke population, of high-intensity exercise (ie, 60%–80% of heart rate reserve,⁸²⁹ 85%–95% of peak heart rate⁸³⁰). The recent AHA/ASA scientific statement “Physical Activity and Exercise Recommendations for Stroke Survivors”⁸¹⁵ gives more details on exercise/physical activity recommendations for stroke survivors.

Chronic Care Management: Home- and Community-Based Participation

Because exercise confers health benefits even years after stroke, participation in physical activity should be encouraged regardless of how much time has elapsed since stroke onset. The effectiveness of exercise training in the chronic stages of stroke is no longer in question; in fact, the vast majority of fitness trials have involved people at this stage of stroke chronicity.⁷⁹⁶ Moreover, it has long been recognized that benefits of training decline significantly without ongoing participation in physical activity.⁸³¹ Thus, physical activity designed to promote cardiovascular fitness should be an important aspect of community reintegration after stroke. However, adherence to regular physical activity is influenced by a host of individual factors (eg, stroke severity, preexisting/comorbid conditions, motivation, health beliefs, exercise history, fatigue, depression, adaptability, coping skills, cognition), social/cultural factors (eg, family support, social policies, professionals’ attitudes about exercise, social norms and stigmas), and environmental factors (eg, program costs, access to transportation, fitness facilities and equipment).^{832,833} These factors must be systematically addressed to achieve the goal of long-term commitment to healthy, active living behaviors among stroke survivors.

Strategies to instill long-term commitment to a physically active lifestyle should be initiated during formal stroke rehabilitation, but evidence to guide intervention is lacking.⁸³⁴ Considering the high likelihood of a prestroke history of sedentary behavior, fostering exercise self-efficacy is particularly important to ease the transition from structured, institution-based aerobic training to home- and community-based physical activity.⁸³⁴ Incorporating principles of adult learning (eg, observation, practice, repetition, relevance) and self-management (eg, problem solving, goal setting, making choices, taking action, using available resources) is essential.^{835,836} Early participation in fitness training and education on lifestyle choices, risk factor reduction, and secondary prevention may facilitate uptake of healthy behaviors. Myths about exercise (exercise is unsafe, causes second stroke, increases fatigability)^{833,837,838} need to be dispelled in the process of rehabilitation. Most important, patients’ preferences concerning exercise must be sought out and respected.⁸³⁹ Finally, stroke survivors who are unable to exercise will need alternative solutions to maintain an active and engaged lifestyle.

The fitness program should be customized on the basis of the participant’s functional limitations, long-term health-related goals, and social and environmental factors. Periodic monitoring of the intensity of the program and the participant’s fitness level and adherence may be reasonable. Investigations of the effectiveness of pre-discharge counseling

in increasing long-term adherence to activity after stroke have yielded mixed results.^{840,841} In addition, a self-guided stroke workbook did not elicit demonstrable changes in physical activity.⁸⁴² It appears that passive approaches (professional advice, written material) alone are not adequate to increase physical activity after stroke.⁸⁴¹ Given that the most common motivator to physical activity after stroke is the opportunity to meet other stroke survivors,⁸³³ together with the findings that stroke survivors report greater preferences for exercising in groups and at fitness centers,⁸³⁹ it is prudent to direct resources to facilitating participation in physical activity in community settings. Developing partnerships between healthcare professionals and fitness centers or community exercise programs could help to address a concern expressed by patients after stroke that exercise instructors must be suitably trained and knowledgeable about stroke.⁸³⁷ Integrated care models that include periodic liaison between care providers and patients after stroke via telephone or electronic follow-up may be the solution to providing ongoing support for physical activity.⁸⁴³

Recommendations: Chronic Care Management: Home- and Community-Based Participation	Class	Level of Evidence
After successful screening, an individually tailored exercise program is indicated to enhance cardiorespiratory fitness and to reduce the risk of stroke recurrence.	I	A (for improved fitness); B (for reduction of stroke risk)
After completion of formal stroke rehabilitation, participation in a program of exercise or physical activity at home or in the community is recommended.	I	A

Treatments/Interventions for Visual Impairments

Treatments and interventions for visual impairments after stroke focus on 3 areas: deficits in eye movements, deficits in visual fields, and deficits in visual-spatial or perceptual deficits. There have been 7 systematic reviews of treatments for visual impairments after stroke.^{382,418,493,737,844,846,847} These systematic reviews covered reports up to 2011. The literature is generally limited in this area, and the methodological quality was poor in general or poorly reported, providing insufficient high-quality evidence on which to reach generalizable conclusions. However, limited evidence suggested that compensatory scanning training is effective at improving scanning and reading outcomes but not improving visual field deficits. There was insufficient evidence of the impact of compensatory scanning training on ADLs. There was also insufficient evidence about the benefits of vision restoration therapy (restitutive intervention) after stroke. Across these systematic reviews, 2 studies targeted eye movement deficits, 2 case studies and 1 nonrandomized prospective study assessed interventions for visual field cuts, and 3 studies dealt with perceptual deficits. In general, there was insufficient evidence to reach conclusions about the effectiveness of interventions for patients with any of these visual deficits after stroke. Barrett⁸⁴⁴ reviewed the behavioral optometry literature. Behavioral optometry proposes that eye and visual function can be improved through various vision therapy methods, including

eye exercises and the use of lenses, prisms, filters, occluders, specialized instruments, and computer programs to improve vision skills such as eye movement control, eye focusing, and coordination. Barrett concluded that there is a paucity of controlled trials in the literature to support behavioral optometry approaches and that a large majority of behavioral management approaches are not evidence based. However, there was evidence supporting the use of eye exercises for treatment of convergence insufficiency, the use of yoked prisms in stroke patients with visual field cuts, and the use of vision rehabilitation of visual field defects (selecting areas of residual vision that are then stimulated during computer-assisted training to achieve visual field enlargement).

A number of studies included as part of a broader review dealing with rehabilitation of cognitive deficits⁴¹⁸ focused on visual neglect, which is addressed elsewhere in this guideline. However, with regard to other forms of visual deficits, those studies concluded that systematic training of visual organization skills may be considered for individuals with visual perceptual deficits, without visual neglect, and after right hemispheric stroke as part of acute rehabilitation and that computer-based interventions intended to produce extension of damaged visual fields may be considered for people with traumatic brain injury or stroke.

In addition to those covered by the 7 systematic reviews, 3 studies dealt with treatments for visual impairments after stroke.^{848–850} Mödden et al⁸⁵⁰ concluded that computer-based compensatory therapy improved functional deficits after visual field loss compared with compensation strategies training (ie, standard OT). A 2010 study⁸⁴⁸ concluded that multimodal audiovisual exploration training is more effective than exploration training alone. Finally, a 2012 study⁸⁴⁹ reported that a virtual reality training group showed a significant difference in all Motor-Free Visual Perception Test raw scores and response times, with improvements in recognizing shapes, solving pictorial puzzles, and object perception.

Recommendations: Treatments/Interventions for Visual Impairments	Class	Level of Evidence
For deficits in eye movements:		
Eye exercises for treatment of convergence insufficiency are recommended.	I	A
Compensatory scanning training may be considered for improving functional ADLs.	IIb	B
Compensatory scanning training may be considered for improving scanning and reading outcomes.	IIb	C
For deficits in visual fields:		
Yoked prisms may be useful to help patients compensate for visual field cuts.	IIb	B
Compensatory scanning training may be considered for improving functional deficits after visual field loss but is not effective at reducing visual field deficits.	IIb	B
Computerized vision restoration training may be considered to expand visual fields, but evidence of its usefulness is lacking.	IIb	C

Recommendations: Treatments/Interventions for Visual Impairments (Continued)	Class	Level of Evidence
For visual-spatial/perceptual deficits:		
Multimodal audiovisual spatial exploration training appears to be more effective than visual spatial exploration training alone and is recommended to improve visual scanning	I	B
There is insufficient evidence to support or refute any specific intervention as effective at reducing the impact of impaired perceptual functioning.	IIb	B
The use of virtual reality environments to improve visual-spatial/perceptual functioning may be considered.	IIb	B
The use of behavioral optometry approaches involving eye exercises and the use of lenses and colored filters to improve eye movement control, eye focusing, and eye coordination is not recommended.	III	B

Hearing Loss

The healthcare provider’s ability to effectively communicate with a patient who has had a stroke is essential to provide adequate patient care. Unfortunately, hearing impairment is common among stroke patients, and this may significantly affect communication. This impairment must be considered when communicating with patients to provide effective patient-centered care.

Hearing impairment is commonly associated with aging, and the associated communication difficulties are only further exacerbated after stroke. It has been reported that the most common type of communication impairment within an acute hospital stroke unit is a hearing impairment, with estimates that 67% to 90% of these patients have a mild or greater hearing impairment.⁸⁵¹ Although a sudden onset of hearing loss resulting from a stroke is uncommon, stroke patients often have a preexisting or an undiagnosed hearing loss. In some instances, difficulty hearing may simply be caused by cerumen impaction or may be attributable to age-related hearing loss.⁸⁵¹ Stroke patients with communication or cognitive impairments may be unable to relay information about their hearing history. Reports from family or significant others often give healthcare providers some indication of the patient’s hearing abilities before the stroke. It is recommended that any noticeable hearing impairment be assessed and documented to improve patient care. Edwards et al⁸⁵² reported that 86% of stroke patients in acute care facilities had a hearing impairment that was not documented in their chart.

Amplification can often help patients who have had a stroke to overcome the barrier of a hearing impairment. One study reported that of 52 patients who had suffered a stroke and had a hearing impairment, 11 (21%) owned hearing aids.⁸⁵¹ By verifying that the hearing aids or amplification devices are working and reminding the patients to wear them, healthcare providers will be able to better communicate with these patients. Unfortunately, not all patients with a hearing impairment have hearing aids. In this case, it is important to incorporate communication strategies such as looking at the

patient when talking to him/her and minimizing the level of background noise.

Recommendations: Hearing Loss	Class	Level of Evidence
If a patient is suspected of a hearing impairment, it is reasonable to refer to an audiologist for audiometric testing.	IIa	C
It is reasonable to use some form of amplification (eg, hearing aids).	IIa	C
It is reasonable to use communication strategies such as looking at the patient when speaking.	IIa	C
It is reasonable to minimize the level of background noise in the patient's environment.	IIa	C

Transitions in Care and Community Rehabilitation

Ensuring Medical and Rehabilitation Continuity Through the Rehabilitation Process and Into the Community

The transition from inpatient care to home after a stroke can be difficult for patients and caregivers. Those patients who require ongoing rehabilitation after discharge should continue to be followed up by a care team with expertise in stroke rehabilitation whenever possible. Patients who do not require additional rehabilitation services and are discharged to home or who are profoundly and permanently disabled and discharged to a long-term care setting can be managed by a primary care provider.

One recent systematic review of 9 RCTs looked at the effectiveness of various models of primary care-based follow-up after stroke. The studies included interventions using stroke support workers, care coordinators, or case managers. As a result of the wide variability of the methodological quality of the studies, interpretation was limited. The authors noted that although patients and caregivers receiving follow-up were generally more satisfied with some aspects of communication and had a greater knowledge of stroke, there did not appear to be any gains in physical function, mood, or quality of life compared with those who did not.⁸⁵³ Another systematic review examining transitional care models after stroke or myocardial infarction showed that hospital-initiated transitional care could improve some outcomes in adults hospitalized for stroke or myocardial infarction.⁸⁵⁴

Although not specific to stroke, a 2012 Cochrane study to determine the effectiveness of discharge planning for patients moving from an acute hospital stay to a home setting evaluated the results of 24 RCTs comparing individualized discharge plans with routine discharge care that was not tailored to the individual patient. Using data from 8098 patients, the investigators found that hospital length of stay and hospital readmissions were “statistically significantly reduced for patients admitted to hospital with a medical diagnosis and who were allocated to discharge planning (mean difference length of stay -0.91, 95% CI -1.55 to -0.27, 10 trials; readmission rates RR 0.82, 95% CI 0.73 to 0.92, 12 trials).” For elderly patients with a medical condition, they found no significant difference between groups with

respect to mortality (RR, 0.99; 95% CI, 0.78–1.25, 5 trials) or being discharged from hospital to home (RR, 1.03; 95% CI, 0.93–1.14, 2 trials). The authors concluded that a “discharge plan tailored to the individual patient probably brings about reductions in hospital length of stay and readmission rates for older people admitted to hospital with a medical condition” but that the impact of discharge planning on mortality, health outcomes, and cost remained unclear.⁸⁵⁵ For patients who have suffered a stroke and are being discharged from acute care, the discharge planning should include rehabilitation professionals who can identify long-term needs and help organize provision of those services.

Alternative methods of communication and support such as telephone visits, telehealth, or Web-based support are newer options that should be considered, particularly for patients in rural settings who may have difficulty traveling for medical care once they are discharged from formal rehabilitation services.⁸⁵⁶ These technologies can be used for long-distance counseling, problem solving, and educational sessions, as well as for transmitting critical data such as blood pressure readings, weight, or laboratory results.

Recommendation: Ensuring Medical and Rehabilitation Continuity Through the Rehabilitation Process and Into the Community	Class	Level of Evidence
It is reasonable to consider individualized discharge planning in the transition from hospital to home.	IIa	B
It is reasonable to consider alternative methods of communication and support (eg, telephone visits, telehealth, or Web-based support), particularly for patients in rural settings.	IIa	B

Social and Family Caregiver Support

As a result of the complexity of the disease, the deficits and disability, and the change in family and significant other dynamics, the caregiver and family are integral to the post-stroke treatment plan. A major challenge is that 12% to 55% of caregivers suffer from some emotional distress,²⁰⁹ most commonly depression.²³⁸ A growing body of research is focused on the caregiver’s quality of life and on treatment strategies to benefit both the caregiver and the stroke survivor.

Families and caregivers of stroke survivors sustain a significant impact on their psychosocial health. Worldwide, depression is observed not only in the patient but also in the caregiver. Untreated depression is associated with a lower quality of life and increased burden for the caregiver and survivor.⁸⁵⁷ In Korea, increased burden was related to increased patient depression and insufficient support. In contrast, an American study found that increased caregiver burden is more closely correlated with lack of time for self.⁸⁵⁸ Smith and colleagues⁸⁵⁹ found that the caregiver needs varied as a function of age. Younger caregivers want information and training and are more inclined to criticize the healthcare system, whereas older caregivers need support to maintain a positive outlook and are less inclined to criticize the healthcare system.

Since the previous guidelines published in 2005, many researchers have investigated the caregiver perspective and better understand the interventions most likely to improve quality of life and to decrease burden. The Cochrane Collaboration

found that information improved the patient’s and caregiver’s knowledge while also slightly decreasing patient depression. The most effective educational programs included active involvement and follow-up by the educator. Education programs for caregiver and stroke participant should include supportive problem solving and skill development,⁸⁶⁰ “how to’s” of physical care needs and financial assistance,⁸⁶¹ medications,⁸⁶² respite, domestic assistance, and reassurance.⁸⁶³ Ongoing support for the caregiver favorably affects the stroke survivor and caregiver. This support comes in many different actions. Steiner et al⁸⁶⁴ studied physical and emotional support, whereas Campos de Oliveira⁸⁶⁵ more clearly defined the support as a needed support structure. The caregivers need either family or friends to provide emotional and physical assistance, and the caregivers need the healthcare providers to help them establish and maintain this over time.⁸⁶⁶ Counseling can also be a helpful intervention.⁸⁶⁷ In summary, healthcare professionals need to consider the patient, along with a diverse set of support options and treatments for the family and primary caregiver.

Recommendations: Social and Family Caregiver Support	Class	Level of Evidence
It may be useful for the family/caregiver to be an integral component of stroke rehabilitation.	IIb	A
It may be reasonable that family/caregiver support include some or all of the following on a regular basis:	IIb	A
Education		
Training		
Counseling		
Development of a support structure		
Financial assistance		
It may be useful to have the family/caregiver involved in decision making and treatment planning as early as possible and throughout the duration of the rehabilitation process.	IIb	B

Referral to Community Resources

Successful transition to the community requires careful assessment of the match between patient needs and the availability of formal and informal resources. Referral to appropriate local community resources can help to support the needs and priorities of the patient and the family or caregiver. Some services can be organized and in place before hospital discharge, whereas referral to some community resources may be provided on transition to the community. A range of community resources are available that patients and their families/caregivers may desire to access immediately or in the future as their needs change.

Formal referral may be required for services such as vocational counseling, psychological services, social services, sexual health counseling, driver evaluation, or home environment assessment. Referral to a day service program may be appropriate for a patient who may benefit from a structured program and for caregivers who need respite time.

Multiple potential resources may assist stroke patients and their families/caregivers in the management of the long-term effects of stroke such as local stroke survivor and caregiver

support groups, leisure and exercise programs, respite care, self-management programs, and home support (eg, Meals on Wheels).

More than 50% of stroke survivors require support with IADLs.⁸⁶⁸ A high proportion of stroke survivors 1 to 5 years after injury use community services, with the most frequently accessed being household services (housework, lawn/garden care, and Meals on Wheels) and then therapy services (eg, PT).⁸⁶⁸

Caregivers have identified that it is important to know what resources are available and to be able to access them.⁸⁶⁹ Stroke patients and their caregivers can be active in managing their chronic condition if they have appropriate information and resources. If stroke survivors and caregivers are to be active in their decision making and the management of the long-term effects of stroke, appropriate information delivered in a timely and effective format is necessary. It is critical that the process involve assessment of an individual’s needs, education about available resources, linking of patient and resources, referrals, and follow-up to ensure the individual receives the necessary services. Health providers may wish to use a checklist to identify whether referral to other services is warranted.⁸⁷⁰ A meta-analysis of 21 trials showed that the provision of information (including local resources) to patients and their caregivers may improve aspects of patient satisfaction, improve knowledge of stroke, and reduce patient depression scores.⁸⁷¹

A systematic review⁸⁷² and meta-analysis⁸⁷³ demonstrated the growing recognition that functional outcomes (including motor, cognitive, and psychosocial function) can be improved or at least maintained in chronic stroke with community interventions. In addition, a meta-analysis of 17 RCTs showed that lifestyle interventions (eg, health promotion or education, lifestyle counseling) may reduce the risks leading to another stroke or cardiovascular event.⁸⁷⁴ A meta-analysis of 8 RCTs showed that exercise referral schemes that provide a clear referral by primary care professionals to third-party professionals to increase exercise or physical activity can increase the number of participants who achieve 90 to 150 min/wk of moderate physical activity and reduce depressive symptoms in sedentary individuals with or without a medical diagnosis (obesity, hypertension, depression, diabetes mellitus).⁸⁷⁵ In a qualitative study, stroke survivors described great physical and psychological well-being after participation in an exercise referral scheme.⁸⁷⁶

Recommendations: Referral to Community Resources	Class	Level of Evidence
It is recommended that acute care hospitals and rehabilitation facilities maintain up-to-date inventories of community resources.	I	C
Patient and family/caregiver preferences for resources should be considered.	I	C
It is recommended that information about local resources be provided to the patient and family.	I	C
It is recommended that contact with community resources be offered through formal or informal referral.	I	C
Follow-up is recommended to ensure that the patient and family receive the necessary services.	I	C

Rehabilitation in the Community

The Centers for Medicare & Medicaid Services define community as one of the following settings: home, board and care, transitional living, intermediate care, or assisted living residence. More than 80% of the >6 million survivors of stroke in the United States live in the community, most of them at home, and the majority with some residual functional limitations. Studies have documented that 35% to 40% of individuals have limitations in basic ADLs 6 months after a stroke. More than 50% have limitations in ≥ 1 IADLs.^{794,877}

There is substantial evidence that rehabilitation services, particularly exercise-based programs, provided in the community after discharge from acute or institutional care can improve cardiovascular health and decrease the risk of cardiovascular events, leading to increased short-term survival rates for individuals who have experienced a stroke.^{878,879} Other community-based intervention trials have demonstrated enhanced ambulation and mobility, better self-care, and greater functional independence.⁸⁸⁰

Benefits associated with community- and home-based rehabilitation programs have been reported for a variety of outcomes, including reduced costs, decreased length of stay in hospitals or institutional settings, more opportunity for patient and family involvement in the treatment process, and less stress on caregivers and family members.^{881,882}

It has also been consistently reported that individuals recovering from a stroke and their family members or caregivers prefer home- or community-based rehabilitation programs over center- or institutionally located rehabilitation services for a variety of practical and personal reasons.⁸⁸¹ Patient satisfaction with home-based rehabilitation programs is generally higher than for institutionally based alternatives.⁸⁸² Because the potential for recovery exists regardless of age and time after stroke and because fewer financial resources appear to be dedicated to providing optimal care during the later phases of stroke recovery, family caregiver education and support are recommended. Intervention, referrals, and follow-up care based on detailed caregiver assessments conducted during the survivor's inpatient stay are likely to smooth the transition of care to the home setting.¹¹ There is growing evidence for the effectiveness of stroke family caregiver and dyad (caregiver and patient) interventions.⁸⁸³ Among the Class I, Level of Evidence A recommendations about caregiver and dyad interventions were the following: (1) Interventions that combine skill building with psycho-educational strategies should be chosen over interventions that only use psycho-educational strategies; (2) interventions that are tailored or individualized on the basis of the needs of stroke caregivers should be chosen over nontailored, one-size-fits-all interventions; (3) postdischarge assessments with tailored interventions based on changing needs should be performed to improve caregiver outcomes; (4) interventions that are delivered face to face or by telephone are recommended; and (5) interventions consisting of 5 to 9 sessions are recommended.

The ability to translate these findings into targeted intervention programs and guidelines for the care of individuals with stroke is complicated by several factors.^{884,885} There is substantial variability in the timing of the initiation of home-based treatment programs. Home-based rehabilitation may

not be appropriate for all individuals with stroke, depending on level of severity, comorbidities, or the need for specialized treatment or equipment. Existing studies comparing community- and home-based rehabilitation vary substantially in the duration and intensity of the intervention and in the nature and complexity of the treatment programs provided.⁸⁸¹ For example, some treatment programs are single interventions such as exercise; other programs involve multiple components requiring levels of specialized expertise.

Issues related to the fidelity and integrity of the treatment, patient safety, and the lack of equipment and capacity to provide selected interventions in a home or community setting have been identified as concerns associated with home-based rehabilitation.⁸⁸⁶ Research-based evidence on potential adverse effects associated with rehabilitation programs conducted in the home and community is limited.

The majority of trials and reviews of community-based rehabilitation programs have compared home-based intervention programs with programs provided in centers or hospital/clinic-based outpatient programs.⁸⁸¹ Several studies published since the 2005 stroke rehabilitation clinical practice guidelines have examined a combination of ESD programs and community rehabilitation and compared these programs with standard inpatient and outpatient rehabilitation services. Langhorne and colleagues^{17,18} found that the combination of ESD and community rehabilitation reduced inpatient length of stay and hospital readmission rates and increased functional independence and the ability of patients to live at home and participate in the community.

A systematic review by Hillier and Inglis-Jassiem⁸⁸¹ examined data comparing the benefits of home-based programs and programs in rehabilitation centers for individuals with stroke living in the community. Eleven trials met the inclusion criteria. Functional outcome data were pooled for the Barthel Index across the majority of the trials. Functional status was significantly improved for the home-based cohort at 6 weeks and 3 to 6 months. The difference between home-based and rehabilitation center groups was less clear after 6 months. Cost benefits and caregiver satisfaction were secondary measures and favored the home-based intervention trials.

A widely cited Cochrane Collaboration review^{887,888} examined therapy-based rehabilitation services for stroke patients at home (Outpatient Service Trialists). The review examined trials meeting the Cochrane Collaboration criteria and compared home-based therapy with conventional care or no care within 1 year of hospital discharge for individuals with stroke. The primary outcomes were adverse events, deterioration in ability to perform ADLs, and level of improvement in ADL outcomes. The authors concluded that home-based therapy reduced the odds of a poor outcome, that is, death or deterioration in the ability to perform ADLs. Patients in the home-based therapy program also demonstrated improved ADL abilities compared with individuals in the usual or no treatment groups.^{887,888}

The majority of trials and reviews examining community- and home-based rehabilitation programs in individuals with stroke have focused on functional, mobility, or motor outcomes. A recent meta-analysis by Graven and others⁷⁹⁴ examined the impact of community-based rehabilitation on reducing

depression and increasing participation and health-related quality of life in individuals with stroke. The 54 studies included in the review were divided into 9 intervention categories. Analyses revealed significant reductions in depressive symptoms. The reduction in depressive symptoms was associated with exercise interventions. Treatments involving leisure and recreational activities showed moderate effects for the outcomes of participation and health-related quality of life. Comprehensive, multifactorial rehabilitation interventions demonstrated limited evidence for depression and participation but showed strong evidence for health-related quality-of-life outcomes.⁷⁹⁴

Recommendations: Rehabilitation in the Community	Class	Level of Evidence
Patients with stroke receiving comprehensive ADL, IADL, and mobility assessments, including evaluation of the discharge living setting, should be considered candidates for community- or home-based rehabilitation when feasible. Exclusions include individuals with stroke who require daily nursing services, regular medical interventions, specialized equipment, or interprofessional expertise.	I	A
It is reasonable that caregivers, including family members, be involved in training and education related directly to home-based rehabilitation programs and be included as active partners in the planning and implementation or treatment activities under the supervision of professionals.	Ila	B
A formal plan for monitoring compliance and participation in treatment activities may be useful for individuals with stroke referred for home- or community-based rehabilitation services. A case manager or professional staff person should be assigned to oversee implementation of the plan.	IIb	B

Sexual Function

Sexuality is an important aspect of poststroke quality of life for both patients and their significant others. Although there is substantial individual variation, overall stroke survivors tend to experience a high prevalence of sexual dysfunction. Comorbid medical conditions (eg, diabetes mellitus, hypertension, depression), medication side effects, stroke-related physical and functional deficits, lack of knowledge, and concerns about safety, role changes, and change in libido can affect the patient’s sexual function. Healthcare workers need to help the patient and significant other navigate through the issues surrounding sexual function.

Multiple studies indicate that stroke survivors and their significant others have concerns about sexuality but are frequently reluctant to ask their healthcare providers about these concerns.⁸⁸⁹ This reluctance may stem from the patient’s embarrassment or other cultural barriers, as well as a lack of knowledge on the part of the healthcare provider. The greater the patient’s disability is, the greater is the likelihood of sexual dysfunction and decreased sexual life satisfaction.⁸⁹⁰ Stroke survivors report a desire for more information about sexuality from healthcare providers, physicians in particular.⁸⁹¹ It is important for the patient and significant other to know

that sex is not contraindicated after stroke. The most common sexual dysfunctions after stroke are decreased libido, erection and ejaculation disorders in men, lubrication and orgasm in women, and self-image and role changes for both men and women. Interventions and education about sexuality that address these concerns such as positioning, timing, open communication, and functional treatments can be helpful. Additional training for healthcare providers on this topic, including methods of appropriately approaching patients and their partners to discuss sexuality, may be needed.⁸⁹²

Recommendation: Sexual Function	Class	Level of Evidence
An offer to patients and their partners to discuss sexual issues may be useful before discharge home and again after transition to the community. Discussion topics may include safety concerns, changes in libido, physical limitations resulting from stroke, and emotional consequences of stroke.	IIb	B

Recreational and Leisure Activity

Engagement in leisure and recreational pursuits is important to health.^{893–896} Active leisure and recreational activities have been targeted as particularly important.^{894,895,897} However, individuals with stroke are limited in their ability to engage in leisure and recreational activities, particularly active ones.^{779,898–900}

In general, poststroke rehabilitation in the United States provides little attention to leisure and recreation.⁹⁰² Individuals with stroke report that they engage in significantly fewer leisure and recreation activities than they did before the stroke.^{898,899} In addition, the leisure activities in which they do engage have shifted from active to sedentary activities such as television watching and reading.⁸⁹⁸ Limited research examines the efficacy of rehabilitation for increasing participation in leisure and recreation activities. However, several studies (1 qualitative study, 2 RCTs, and 2 systematic reviews) suggest that therapy targeted at leisure/recreation and the provision of some adaptive equipment may facilitate increased engagement in leisure or recreation activities.^{794,903,904,906} Although therapy was variable across the studies, in several, the therapy consisted of education about the importance of being physically active, education on community resources, and training in problem solving around barriers to being physically active.^{794,903} One study that showed that such programming facilitated long-term increased physical activity engagement offered this kind of programming during rehabilitation, suggesting that such programming could begin early during rehabilitation.^{908,909} It must be noted, however, that this study took place in Europe, involved much longer durations of rehabilitation than individuals experience in the United States, and involved individuals with a variety of disabling conditions (only 26% were individuals with stroke); in addition, results were not broken down by disability condition. The provision of a wheelchair may be critical because many individuals with stroke who are able to ambulate do not have the endurance to ambulate for long periods in the community.⁹⁰⁶

Recommendations: Recreational and Leisure Activity	Class	Level of Evidence
It is reasonable to promote engagement in leisure and recreational pursuits, particularly through the provision of information on the importance of maintaining an active and healthy lifestyle.	IIa	B
It is reasonable to foster the development of self-management skills for problem solving for overcoming barriers to engagement in active activities.	IIa	B
It is reasonable to start education and self-management skill development about leisure/recreation activities during and in conjunction with in-patient rehabilitation.	IIa	B

Return to Work

In the United States, ≈20% of strokes occur in individuals who are of vocational age.⁹¹⁰ Vocational roles provide a social identity and contribute to increased self-esteem and life satisfaction.⁹¹¹ It is estimated that about one third of the economic burden of stroke through the year 2050 will be attributable to lost earnings after stroke.⁹¹²

The percentage of individuals who were working before their stroke who return to work after stroke varies widely across studies, from 20%⁹¹³ to 66%.⁹¹⁴ This stems from large differences in sample characteristics, healthcare and social system differences in different countries, various definitions of work, and variable follow-up periods. It is clear, however, that a large percentage of individuals with stroke who are of vocational age do not return to work. It is estimated that one third of the \$1.75 trillion in annual costs¹ associated with stroke are attributable to lost earnings in the United States alone.⁹¹² The factors associated with return to work have also varied across different studies. Factors most frequently found to be associated with return to work are younger age, less severe impairments, independence in ADLs, good communication skills, good higher-level cognitive skills and processing speed, and a white collar profession.⁹¹⁵⁻⁹²¹ Some of those who do return to work have been able to return full-time to their previous jobs; some have required job modifications or alternative jobs; and others were able to return only part-time.^{890,917,919} The ability to resume driving may also be an important factor in being able to return to employment.⁹¹⁵

Because several of the variables presenting barriers to return to work are modifiable, therapy targeted at vocational goals has the potential to increase return-to-work rates for individuals with stroke. However, no controlled trials have examined the efficacy or effectiveness of therapy targeted at vocational goals or vocational rehabilitation programs, and a structured review found insufficient evidence to support or refute the efficacy of any specific vocational rehabilitation program.⁹²² Several case studies suggest that for some individuals, therapy targeted at vocational goals can result in successful return to work.^{923,924} Chan and colleagues⁹²⁵ reported that their vocational rehabilitation program facilitates 55% of their enrollees to return to work. However, the lack of enrollee description makes it unclear how to interpret their success rate because several studies have found similar return-to-work rates without formal vocational rehabilitation. Although evidence is limited, many clinicians advise that for individuals

considering return to work, an assessment of cognitive, perception, physical, and motor abilities be performed to determine readiness and the needed accommodations to return to work. This assessment should be tailored to the individual's needs and capabilities for the specified job situation and may include executive functions, high-level oral and written communication, and fatigue. Once performance under the best conditions has been assessed, further assessment under conditions of fatigue and stress may be useful to mimic potential job situations.

Discrimination against individuals with disabilities remains common in the workplace and may not be identified by the prospective employer as a reason for denying a disabled candidate employment. Familiarity with the provisions of the Americans With Disabilities Act and its requirements for "reasonable accommodation" is important for individuals seeking to return to a job after stroke or seeking a new position. Rehabilitation professionals can serve as a resource for motivated employers to help overcome workplace barriers for employees with disabilities.

Recommendations: Return to Work	Class	Level of Evidence
Vocationally targeted therapy or vocational rehabilitation is reasonable for individuals with stroke considering a return to work.	IIa	C
An assessment of cognitive, perception, physical, and motor abilities may be considered for stroke survivors considering a return to work.	IIb	C

Return to Driving

Driving is an essential IADL for many individuals in that it has a major impact on participation in activities outside the home.⁹²⁶ Between one third and two thirds of individuals after stroke resume driving after 1 year.^{927,928} However, because driving is a highly complex activity that requires skills in cognition, perception, emotional control, and motor control,⁹²⁹ the ability to drive is often affected by stroke.⁹²⁸ State law determines whether someone with a stroke is eligible to drive. The law concerning this topic varies by state. For example, in some states, individuals who have a neurological condition (stroke, traumatic brain injury, Parkinson disease, multiple sclerosis), among other non-neurological health conditions, are required to report their health condition to the appropriate state agency (eg, Department of Transportation or Department of Public Safety). After this reporting, the physician should assess patients' physical or mental impairments that might adversely affect driving abilities. Each case must be evaluated individually because not all impairments may give rise to an obligation on the part of the physician. In other states without self-reporting, physicians must take several initial steps before reporting: have a tactful but candid discussion with the patient and family about the risks of driving, suggest to the patient that he or she seek further treatment such as substance abuse treatment or OT, and encourage the patient and the family to decide on a restricted driving schedule. Efforts made by physicians to inform patients and families, to advise them of their options, and to negotiate a workable plan may render reporting unnecessary. Physicians should use their best judgment

when determining when to report impairments that could limit a patient’s ability to drive safely. The physician’s role is to report medical conditions that would impair safe driving as dictated by his or her state’s mandatory reporting laws and standards of medical practice. Physicians should disclose and explain to their patients this responsibility to report. Physicians should protect patient confidentiality by ensuring that only the minimal amount of information is reported and that reasonable security measures are used in handling that information. Physicians should work with their state medical societies to create statutes that uphold the best interests of patients and community and that safeguard physicians from liability when reporting in good faith.⁹³⁰ The appropriate state agency determines whether the individual is allowed to keep his/her license or obtain a restricted license or whether another option is necessary. However, the decision about return to driving should happen with the physiatrist or primary care provider, patient with stroke, and family. If necessary, a driving rehabilitation specialist can perform a formal driving evaluation. The ASA Driving after Stroke Web site provides information on life after stroke.^{930a}

The majority of individuals who sustain a stroke want to and do return to driving within a year after stroke.^{927,928,931} Despite a significant number of individuals in whom driving ability is reduced^{928,932} and the incidence of reduced self-awareness of driving difficulties after stroke,⁹³³ very few individuals are ever formally assessed for driving, nor is return to driving discussed with them.^{72,928,934} This is clearly a neglected area in the current healthcare system surrounding rehabilitation services after stroke.

There are no standardized driving assessment batteries. Many assessments contain both neuropsychological tests and on-the-road testing. There is no clear consensus on whether neuropsychological tests adequately predict the ability to drive. Two recent reviews (1 systematic review,⁹³⁶ 1 meta-analysis⁹³⁷) examined the ability of neuropsychological tests to predict on-the-road driving test performance or voluntary cessation of driving across 37 studies (8 overlapping studies). The only neuropsychological test that was a significant predictor of fitness to drive in both reviews was the Trail Making Test B. There is great variation across studies in sample selection and in which neuropsychological tests were used to predict fitness to drive. For example, finding no effect for vision is likely the result of a biased sample excluding subjects with visual impairments consistent with state laws restricting such individuals from driving.⁹³⁷ Driving simulators offer the ability to test an individual for fitness to drive in dynamic environments that are safer than on-the-road tests.⁹³⁸ One cautionary note is that currently few studies have tested to what degree (if any) driving simulator performance is a sufficient predictor of on-the-road driving to determine the safety of return to driving. One study of 23 participants⁹³⁹ showed that the simulator performance variables of complex reaction time and distance to collision were able to correctly classify 85% of the participants as fit to drive or not. Because there is no single set of neuropsychological tests that can accurately predict fitness to drive, an on-the-road driving test should also be strongly considered, especially for individuals who possess the cognitive ability and are eligible on the basis of local laws.

Several studies have shown that some individuals with stroke who are unable to pass fitness-to-drive tests can do so after intervention.^{938,940–942} Intervention programs may involve adaptive equipment and training for the specific impairments interfering with driving (eg, infrared controls for 1-handed driving, cognitive training, vision training) or simulator training, on-road training, or their combination. Although few studies have tested the efficacy of driving training on driving ability, 2 studies have found simulator training to be superior to traditional cognitive training.^{938,941} One study showed that visual training with the Dynavision system (Dynavision LLC, West Chester, OH) did not result in increased driving ability.⁹⁴³ Unfortunately, other studies that investigated vision training and showed improved driving-related visual skills did not include measures of actual driving ability.⁹⁴⁴ Thus, the evidence is insufficient to determine whether visual training improves driving performance in those individuals with insufficient visual skills. In general, studies examining the efficacy of driver training suffer from small, heterogeneous samples. In addition, intervention programs in these studies do not appear to be specific to the impairments of the participants.

Recommendations: Return to Driving	Class	Level of Evidence
Individuals who appear to be ready to return to driving, as demonstrated by successful performance on fitness-to-drive tests, should have an on-the-road test administered by an authorized person.	I	C
It is reasonable that individuals be assessed for cognitive, perception, physical, and motor abilities to ascertain readiness to return to driving according to safety and local laws.	IIa	B
It is reasonable that individuals who do not pass an on-the-road driving test be referred to a driver rehabilitation program for training.	IIa	B
A driving simulation assessment may be considered for predicting fitness to drive.	IIb	C

Conclusions

Stroke rehabilitation requires a sustained and coordinated effort from a large team, including the patient and his or her goals, family and friends, other caregivers (eg, personal care attendants), physicians, nurses, physical and occupational therapists, speech-language pathologists, recreation therapists, psychologists, nutritionists, social workers, and others. Communication and coordination among these team members are paramount in maximizing the effectiveness and efficiency of rehabilitation and underlie this entire guideline. Without communication and coordination, isolated efforts to rehabilitate the stroke survivor are unlikely to achieve their full potential.

The evidence base on specific stroke rehabilitation interventions has expanded considerably in recent years, although many gaps remain. In addition to summarizing the current evidence base, this document serves to highlight areas where additional research is needed to clarify the most effective treatment strategies.

Treatment gaps and future research directions identified include the following:

- Investigate multimodal interventions (eg, drug and therapy, brain stimulation, and therapy)
- Consider including multiple outcomes such as patient-centered, self-report outcomes in future intervention effectiveness trials (Patient Reported Outcomes Measurement Information System [PROMIS²⁹⁰])
- Consider computer-adapted assessments for personalized and tailored interventions
- Explore effective models of care that consider stroke as a chronic condition rather than simply a single acute event
- Capitalize on newer technologies such as virtual reality, body-worn sensors, and communication resources, including social media

- Develop interventions for individuals with severe stroke
- Develop better predictor models to identify responders and nonresponders to different therapies

As systems of care evolve in response to healthcare reform efforts, postacute care and rehabilitation are often considered a costly area of care to be trimmed, but without recognition of their clinical impact and their ability to reduce the risk of downstream medical morbidity caused by immobility, depression, loss of autonomy, and reduced functional independence. The provision of comprehensive rehabilitation programs with adequate resources, dose, and duration is an essential aspect of stroke care and should be a priority in these redesign efforts. We hope that these guidelines help inform these efforts.

Appendix 1. Structure and Organization of Stroke Rehabilitation Care in the United States

Setting	Admission	Median Length of Stay	Specialist Involvement
Acute inpatient facility (hospital)	Near onset	4 d for ischemic stroke 7 d for hemorrhagic stroke	Major: MD, RN More limited: OT, PT, SLT, SW
IRF	5–7 d	15 d (range, 8–30 d)	Major: MD, RN, OT, PT, SLT More limited: SW
SNF	5–7 d	Highly variable (maximum, 100 d)	Major: LPN/LVN, NA, OT, PT, SLT More limited: MD, RN
Long-term care (nursing home)	Highly variable	Prolonged and highly variable	Major: LPN/LVN, NA More limited: RN, OT, PT, SLT, MD
Long-term care hospital	Variable	25-d average (required)	Major: RN, MD More limited: OT, PT, SLT
HHCA	Variable (typically 5–30 d)	Maximum 60-d episode	Major: NA, RN More limited: OT, PT, SLT, MD
Outpatient office	Variable (typically 5–30 d)	Variable	Major: OT, PT, SLT, MD

HHCA indicates home healthcare agency; IRF, inpatient rehabilitation facility; LPN/LVN, licensed practical or vocational nurse; MD, medical doctor; NA, nurse assistant; OT, occupational therapist; PT, physical therapist; RN, registered nurse (preferably with training in rehabilitation); SLT, speech-language therapist; SNF, skilled nursing facility; and SW, social worker. Modified from Miller et al.¹¹ Copyright © 2010, American Heart Association, Inc.

Appendix 2. Recommended* Measures Table

Construct/Measure	Comments	Approximate Time to Administer, min	References for Further Information
Impairment			
Paresis/strength			
Motricity Index	Consists of strength testing via manual muscle testing at 3 key UE segments and 3 key LE segments; yields a score from 0–100 indicating strength of each limb	<5 for UEs; <5 for LEs	294–299
Muscle strength	Via manual muscle testing, graded on a 0–5 scale or handheld dynamometry	<5	
Grip, pinch dynamometry	Grip and pinch dynamometers are available in most rehabilitation clinics and hospitals; normative data are available for comparison	<5	
Tone			
Modified Ashworth scale	Quantifies spasticity on a scale measuring resistance to passive movement from 0–4, with higher numbers indicating greater severity; can assess at all joints or only a few	10	294, 298, 299

(Continued)

Appendix 2. Continued

Construct/Measure	Comments	Approximate Time to Administer, min	References for Further Information
Sensorimotor impairment measures			
Fugl-Meyer	Quantifies sensorimotor impairment of the UE (0–66 points) and LE (0–34 points) on separate subscales; items are rated on ability to move out of abnormal synergies	25	298–302
Chedoke McMaster Stroke Assessment, impairment inventory	Quantifies impairments in 6 dimensions of shoulder pain, postural control, arm, hand, leg, and foot, each on a 7-point scale, with higher scores equalling less impairment	45	
Activity			
UE function			
Action Research Arm Test	Criteria based with 19 items; scores are from 0–57, with normal=57; allows observation of multiple grasps, grips, and pinches	10	294, 298–300, 302–306
Box and Block Test	Score is the number of blocks moved in 1 min; higher scores equal better performance; normative data are available for comparison	<5	
Chedoke Arm and Hand Activity Index	Criterion based with functional items requiring bilateral UE movement; available in 7-, 8-, 9-, and 13-item versions	25	
Wolf Motor Function Test	Time- and criterion-based scores on 15 items; contains some isolated joint movements and some functional tasks	15	
Balance			
Berg Balance Scale	Criterion-based assessment of static and dynamic balance; widely used in multiple settings	15	307–311
Functional Reach Test	A single-item test that measures how far one can reach in standing; normative data are available for comparison	<5	
Mobility			
Walking speed†	Brief and widely used; categories based on speed are: <0.4 m/s=household ambulation 0.4–0.8 m/s=limited community ambulation >0.8 m/s=community ambulation; normative data available for comparison	<5	307, 308, 312–314
Timed Up and Go	Quantifies more than straight walking, including sit/stand and a turn; scored by time to complete; criterion values available for comparison	<5	
6-Min walk test	Quantifies walking endurance; normative and criterion values for community ambulation distances available	<10	
Functional ambulation category	Classification made after observation or self-report of walking ability; 6-point scale with higher equals better walking ability; this tool allows assessment of walking ability in people who are not independent ambulators	<5	
Observational gait analysis	Commonly used in many clinics to plan treatment programs; several standardized formats are available; appropriate to use in conjunction with one of the above more quantifiable measures	5	
Participation			
Self-reported impairments, limitations, and restrictions			
Stroke Impact Scale: Strength, Mobility, ADL, and Hand Function subscales	These 4 subscales measure different aspects of physical performance; people rate their perceived ability to do different items; each subscale ranges from 0–100, with higher scores indicating better abilities	5 per subscale	294, 304, 307, 315
Motor Activity Log	14 or 28 questions about how the affected UE is used in daily life; scores range from 0–5, with 5 equal to similar to before the stroke	20	
Activities-specific Balance Confidence Scale	16 questions in which people with stroke rate their balance confidence during routine activities; scores range from 0–100, with higher scores indicating more confidence	20	316–319

(Continued)

Appendix 2. Continued

Construct/Measure	Comments	Approximate Time to Administer, min	References for Further Information
Technology for monitoring activity and participation			
Accelerometers, step activity monitors, pedometers	Numerous commercially available options; issues to consider when purchasing: cost, expected wear and tear, accompanying software, ease of use, wearing comfort; pedometers are the most economic option but need to be checked for ability to register steps of individuals with slow walking speeds	<5 to don/doff; additional processing time	7, 294, 321–328, 350

ADL indicates activity of daily living; LE, lower extremity; and UE, upper extremity.

*Note that it is recommended that clinicians select a single measure for each construct; it is often unnecessary to use >1 measure.

†Generally tested on 5- or 10-m walkways.

Disclosures

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Writing Group Member	Employment	Research Grant	Other Research Support	Speakers' Bureau/Honoraria	Expert Witness	Ownership Interest	Consultant/Advisory Board	Other
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Beth Fisher	University of Southern California	None	None	None	None	None	None	None
Richard L. Harvey	Rehabilitation Institute of Chicago	Nexstim Corporation*	None	None	None	None	St. Jude Medical*; Nexstim Corporation†	None
Catherine E. Lang	Washington University School of Medicine (St. Louis)	NIH (grant to test interventions for individuals with stroke)†; NIH (coinvestigator on grant investigating brain connectivity after stroke)*; Barnes Jewish Hospital Foundation*; NIH (coinvestigator on grant to investigate postacute rehabilitation for general medical population)*	None	None	None	None	Neuroolutions, Inc*; Rehabilitation Institute of Chicago's NIDRR National Center for Rehabilitation Robotics*; Centers of Excellence in Stroke Collaborative Research for Regeneration, Resilience, and Secondary Prevention*; American Heart/American Stroke Association*; Bugher Foundation*	Royalties for book, AOTA Press Inc*

(Continued)

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This table represents the relationships of writing group members that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all members of the writing group are required to complete and submit. A relationship is considered to be "significant" if (a) the person receives \$10 000 or more during any 12-month period, or 5% or more of the person's gross income; or (b) the person owns 5% or more of the voting stock or share of the entity, or owns \$10 000 or more of the fair market value of the entity. A relationship is considered to be "modest" if it is less than "significant" under the preceding definition.

*Modest.
†Significant.

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*Modest.

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Acute Rehabilitation after Trauma: Does it Really Matter?



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- BACKGROUND:** The impact of post-discharge rehabilitation care for the trauma patient remains poorly investigated. Here we describe the functional outcomes of trauma patients discharged to an inpatient rehabilitation facility (IRF), and compare the likelihood of discharge home, 1-year rehospitalization, and 1-year mortality between patients discharged to an IRF and a propensity score-matched cohort of patients not discharged to an IRF.
- STUDY DESIGN:** The Washington State Rehabilitation Registry was used to collect data for all trauma patients discharged to an IRF between 2011 and 2012. These charts were linked to the Washington State Trauma Registry and the Comprehensive Hospital Abstract Reporting System database to obtain detailed patient, injury, and mortality data. Propensity score matching was used to identify a control group of patients who were not discharged to an IRF. Primary outcomes measures were improvement in Functional Independence Measure score with inpatient rehabilitation and the likelihood of discharge home, 1-year rehospitalization, and 1-year mortality.
- RESULTS:** Nine hundred and thirty-three trauma patients were discharged to an IRF between 2011 and 2012. Total functional independence measure scores improved from 63.7 (SD 20.3) to 92.2 (SD 20.9) ($p < 0.001$) with care at an IRF. When patients discharged to an IRF were compared with the propensity score-matched control patients, rehabilitation was found to significantly increase the likelihood of discharge to home (odds ratio = 9.41; 95% CI, 6.80–13.01) and to decrease 1-year mortality (odds ratio = 0.60; 95% CI, 0.39–0.92).
- CONCLUSIONS:** Acute trauma patients should be recognized as an underserved population that would benefit considerably from inpatient rehabilitation services after discharge from the hospital. (J Am Coll Surg 2016;223:755–763. © 2016 by the American College of Surgeons. Published by Elsevier Inc. All rights reserved.)
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Trauma is the most common cause of significant functional impairment, disability, and mortality worldwide. According to the CDC, the annual work-lost cost in the

United States for injured patients who survive to hospital discharge is an astonishing \$150 billion.¹ These injured patients are typically motivated and productive members of society who almost universally desire recovery of functional independence and return to community living and work. Helping them regain their functional independence has the potential to improve their quality of life considerably, and also decrease the socioeconomic impact of their injuries. The care of these injured patients does not end on discharge from the acute care hospital, and many of these patients require ongoing rehabilitation after discharge. This rehabilitation can occur in one of several settings, including an inpatient rehabilitation facility (IRF), skilled nursing facility (SNF), or in the outpatient setting. The impact of rehabilitation care for the trauma patient in these varied settings is not completely understood.

CME questions for this article available at
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Abbreviations and Acronyms

AIS	=	Abbreviated Injury Score
CMS	=	Centers for Medicare and Medicaid Services
FIM	=	Functional Independence Measure
IRF	=	inpatient rehabilitation facility
ISS	=	Injury Severity Score
LOS	=	length of stay
RR	=	rehabilitation registry
SNF	=	skilled nursing facility
TBI	=	traumatic brain injury
TR	=	trauma registry

Over the past 20 years, there has been a nearly 50% decrease in the number of trauma patients discharged to rehabilitation centers in the state of Washington, with a similar trend on the national level. Today, only approximately 6% of all hospitalized trauma patients in Washington State are discharged to an IRF.² No studies to date have evaluated the effect of inpatient rehabilitation after traumatic injury on functional outcomes and the likelihood of subsequent discharge home. Recent evidence does, however, demonstrate that the post-acute care setting can be predictive of long-term outcomes for trauma patients. Specifically, Davidson and colleagues,² demonstrate that trauma patients discharged to a SNF are more likely to die after discharge compared with patients discharged home. In contrast, patients discharged to an IRF do not have an increased risk of post-discharge mortality. Despite this, we know from Ayoung-Chee and colleagues,³ that in the recent past there has been a considerable increase in the number of trauma patients discharged to SNFs compared with IRFs.

In the state of Washington, we now have in place a unique rehabilitation registry that contains demographic and functional outcomes data for all trauma patients discharged to any one of the state's 14 IRFs. Empowered with the ability to track the progress of trauma patients through their rehabilitation course, we sought to describe the characteristics and immediate outcomes of a cohort of trauma patients who received care at an IRF, and to determine the likelihood of eventual discharge home and the likelihood of rehospitalization and death within 1 year for trauma patients who received post-discharge care at an IRF compared with a cohort of propensity score-matched patients who did not receive post-discharge care at an IRF.

METHODS

We performed a retrospective cohort study of injured patients of any age who were treated inclusively at any of the 14 IRFs within the state of Washington during

the 2-year period between 2011 and 2012. These data were recorded in a unique Washington State trauma rehabilitation registry (RR) that includes basic demographic data and functional outcomes as measured by the Functional Independence Measure (FIM) score. Patient records from the RR were linked to the Washington State trauma registry (TR), which contains more detailed data for all injured patients admitted to a state-designated trauma hospital (Levels I to V). Washington State does not require that isolated hip fractures in patients older than age 65 years be reported, and primary burn patients were excluded.

The FIM score is a widely used functional assessment scale and has been well validated in the trauma population.^{4,5} It consists of 13 motor (eating, grooming, bathing, upper body dressing, lower body dressing, toileting, bladder management, bowel management, bed to chair transfer, toilet transfer, shower transfer, locomotion, stairs) and 5 cognitive (cognitive comprehension, expression, social interaction, problem solving, memory) items designed to assess the amount of functional assistance required for a person to perform basic life activities. Each activity is scored on a scale of 1 to 7, resulting in a total FIM score from 18 to 126, a motor FIM score from 13 to 91, and a cognitive FIM score from 5 to 35. Admission and discharge FIM scores were available for patients in the RR. The modified FIM score is a simplified version of this functional assessment that consists of a 4-point scoring scale assessing locomotion, feeding, and expression, resulting in a total modified FIM score of 3 to 12.⁶ The modified FIM score is a variable encoded in the TR and was available for all patients at the time of hospital discharge.

Patient demographics, injury-specific data, and details about the initial inpatient hospitalization were recorded for all injured patients discharged to an IRF in Washington State between 2011 and 2012. This was compared with all trauma patients in the TR during the same period. For patients treated at an IRF after discharge from the hospital, ICD-9 codes from the TR were manually translated into one of several injury categories: traumatic brain injury (TBI), orthopaedic injury (vertebral fracture and/or extremity injury), thoracic injury, abdominal injury, and spinal cord injury. For patients treated at an IRF after discharge from the hospital, FIM scores at the time of admission to, and discharge from, rehabilitation were recorded.

Propensity score matching was used to identify a comparison cohort of patients within the TR who did not receive care at an IRF, despite the same propensity to receive care at an IRF as those who did. Factors used for the propensity score matching included age, insurance

status, mechanism, Injury Severity Score (ISS), Abbreviated Injury Score (AIS), emergency department Glasgow Coma Scale, Charlson Comorbidity Index, number of operative procedures, mechanical ventilation, ICU admission, hospital length of stay (LOS), and modified FIM at discharge from the hospital.

The RR and TR were linked to the Comprehensive Hospital Abstract Reporting System database and to the Washington state death registry using Link Plus, a probabilistic record linkage software program developed at the CDC. Multiple imputation was used to account for any variable that was missing with a frequency of >5%. Multivariable regression analyses were used to determine the effect of several factors (ie age, mechanism, ISS, AIS, emergency department Glasgow Coma Scale, Charlson Comorbidity Index, number of operative procedures, mechanical ventilation, blood product transfusion, ICU admission, hospital LOS, modified FIM at discharge, and discharge to an IRF) on the likelihood of discharge home and the incidence of 1-year unplanned rehospitalization and mortality. Logistic regression with odds ratio was used to predict the discharge outcomes. To account for deaths in the rehospitalization analysis, a competing risk regression analysis was performed using post-discharge deaths as the competing risk factor, and adjusted sub-hazard ratios were calculated. Post-discharge mortality was assessed using a Cox proportional hazard model to provide an adjusted hazard ratio.

All statistical analyses were performed using STATA software, version 13.0 (Stata Corp). Two-sided tests of significance (*Z*-test and Student's *t*-test) were used when appropriate, and results were considered significant with a *p* value <0.05.

RESULTS

In the 2-year period from 2011 to 2012, there were 1,283 patients recorded in the TR as being discharged to an inpatient rehabilitation center after hospitalization for injury. During the same time period, the RR had records of 2,646 patients categorized as being cared for at a rehabilitation facility after an acute injury. The discrepancy was largely due to some erroneous reporting of noninjured patients to the RR by a few rehabilitation centers. These records were screened and truly injured patients reported in the RR were linked to specific patients within the TR. With this, a total of 1,011 injured patients from the RR were successfully linked to the TR. After excluding 18 patients with isolated burns, there were 993 trauma patients that could be reliably tracked from their initial injury through their inpatient rehabilitation. During the same time period, there were 51,464 total patients

hospitalized for treatment of a traumatic injury in the state of Washington.

Descriptive characteristics of patients discharged to an inpatient rehabilitation facility compared with the general Washington State trauma population between 2011 and 2012

Table 1 compares basic patient characteristics for all trauma patients and those who received care at an IRF in Washington State between 2011 and 2012. The mean (SD) age of patients discharged to an IRF was 50.5 (23.5) years. The vast majority of patients had suffered a blunt injury (94.9%). The most common injury was TBI, with 595 (34.2%) patients sustaining an isolated TBI and another 240 (25.7%) suffering a TBI in conjunction with another major injury. Mean (SD) ISS for patients discharged to a rehabilitation facility was 19.8 (11.8) with 53.9% having an ISS between 9 and 24 and 36.0% having an ISS of >25. Head AIS was >3 for 46.9% of patients discharged to an IRF; and AIS for the thorax, abdomen, and extremity was ≤3 for the vast majority of patients. Basic demographic characteristics were similar between those patients discharged to an IRF and the general population during the same time period. However, those discharged to an IRF were more severely injured with higher ISS, body region AIS, and a higher likelihood of being intubated and admitted to the ICU. Additionally, patients admitted to an IRF had lower modified FIM scores at the time of hospital discharge compared with the general trauma population.

Mean (SD) length of inpatient rehabilitation stay was 19 (36) days. Patients having sustained a combined TBI and spinal cord injury had the longest inpatient rehabilitation stay at 54 (97) days (Fig. 1).

Outcomes for trauma patients discharged to an inpatient rehabilitation facility

The FIM scores at admission to and discharge from an IRF were used to determine improvement in functional status with rehabilitation. Total FIM scores (SD) improved by 29 (17.0) points (45%), from 63.7 (20.3) to 92.2 (20.9) (*p* < 0.001) with the majority of this improvement occurring in the motor category (mean [SD] Δ motor FIM 24.6 [14.6], 60% increase; *p* < 0.001) compared with the cognitive category (mean [SD] Δ cognitive FIM 4.6 (5.7), 20% increase; *p* < 0.001) (Fig. 2). Improvements in FIM scores with rehabilitation were notable across injury types (Fig. 3). The vast majority of patients (78.2%) admitted to an acute rehabilitation center after trauma were successfully discharged to home.

Table 1. Characteristics of All Trauma Patients, Those Discharged to an Inpatient Rehabilitation Facility and a Propensity Score-Matched Cohort of Patients Not Discharged to an Inpatient Rehabilitation Facility in Washington State Between 2011 and 2012

Characteristic	All trauma (n = 51,464)		IRF* (n = 993)		IRF propensity score-matched cohort† (n = 731)		No IRF propensity score-matched cohort‡ (n = 631)	
	n	%	n	%	n	%	n	%
Sex, male	30,644	59.5	678	68.3	494	69.3	390	61.8
Age								
0 to 14 y	6,978	13.6	36	3.6	28	3.9	53	8.4
15 to 34 y	12,421	24.1	272	27.4	189	26.5	136	21.6
35 to 54 y	10,371	20.2	221	22.3	155	21.7	134	21.2
55 to 74 y	10,636	20.7	261	26.3	191	26.8	165	26.2
75 to 84 y	5,274	10.3	138	14.0	101	14.2	66	10.5
>85 y	5,779	11.2	65	6.6	49	6.9	77	12.2
Unknown	5	0.01	0	0	0	0	0	0
Insurance								
Commercial	19,699	38.3	379	38.2	284	39.8	259	41.1
Medicare	13,511	26.3	290	29.2	216	30.3	187	29.6
Medicaid	9,998	19.4	247	24.9	166	23.3	144	22.8
None	6,428	12.5	61	6.1	47	6.6	41	6.5
Unknown	1,828	3.6	16	1.6	0	0	0	0
Mechanism								
Blunt	45,638	88.9	942	94.9	676	94.8	598	94.8
Penetrating	3,384	6.5	41	4.1	31	4.4	26	4.1
Other	2,309	4.4	9	0.9	6	0.8	7	1.1
Unknown	75	0.1	1	0.1	0	0	0	0
Injury Severity Score								
0 to 8	29,614	57.5	100	10.1	61	8.6	80	12.7
9 to 15	14,599	28.4	262	26.4	164	23.0	143	22.7
16 to 24	4,182	8.1	273	27.5	181	25.4	152	24.2
25 to 75	2,702	5.3	357	36.0	307	43.1	254	40.4
Unknown	367	0.7	1	0.1	0	0	2	0.3
AIS score								
Head AIS >3	3,869	7.4	466	46.9	335	47.0	265	42
Thorax AIS >3	1,098	2.1	85	8.6	60	8.4	48	7.6
Abdominal AIS >3	608	1.2	43	4.3	24	3.4	22	3.5
Extremity AIS >3	519	1.0	24	2.4	12	1.7	6	1.0
ICU admission, yes	9,613	18.3	713	71.8	530	74.3	453	71.8
Mechanical ventilation, yes	3,267	6.2	250	25.2	169	23.7	129	20.4
Modified FIM at hospital discharge								
Mild dependence (FIM 11 to 12)	20,271	39.4	286	28.8	271	38.0	317	50.4
Moderate dependence (FIM 8 to 10)	7,437	14.5	350	35.3	327	45.9	198	31.4
Severe dependence (FIM 3 to 7)	1,338	2.6	121	12.2	114	16.0	102	16.2
Unknown	22,418	43.6	236	23.8	1	0.1	14	2.2

*Entire cohort of injured patients discharged to an inpatient rehabilitation facility.

†Injured patients discharged to an inpatient rehabilitation facility who were included in propensity score matching.

‡Injured patients not discharged to an inpatient rehabilitation facility identified as propensity score-matched cohort.

AIS, Abbreviated Injury Scale; FIM, Functional Independence Measure; IRF, inpatient rehabilitation facility.

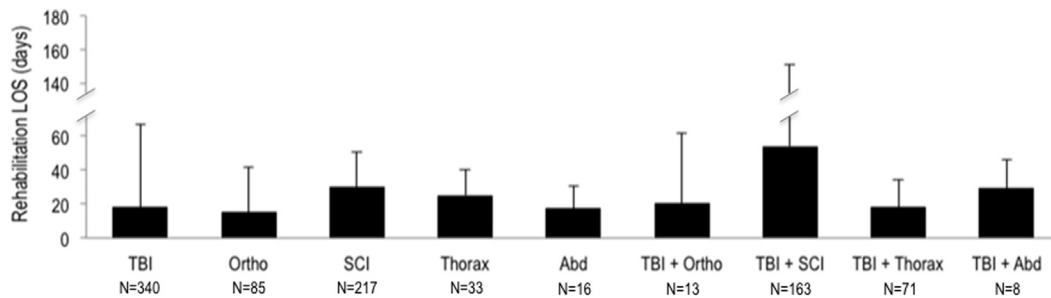


Figure 1. Rehabilitation length of stay (LOS) for trauma patients discharged to inpatient rehabilitation by injury type. All data presented as mean \pm SD. Abd, abdominal injury; Ortho, orthopaedic injury (vertebral fracture and/or extremity injury); SCI, spinal cord injury; TBI, traumatic brain injury; Thorax, thoracic injury.

Comparing patients discharged to an inpatient rehabilitation facility with a propensity score-matched cohort of patients who did not receive care at an inpatient rehabilitation facility

With the propensity score matching, 631 patients who did not receive care at an IRF were identified as a propensity score-matched cohort of control patients for comparison with 731 patients who did receive care at an IRF. Characteristics of both groups are shown in [Table 1](#).

Likelihood of discharge home

Multivariable logistic regression analyses were conducted on the combined cohort of patients who received care at an IRF and the propensity score-matched cohort to identify predictors of eventual discharge home. Older age, penetrating trauma, hospital LOS, and moderate or severe dependence on the modified FIM score at hospital discharge were all associated with a lower likelihood of discharge home. The only factor associated with a higher

likelihood of discharge home was post-hospital discharge treatment at an IRF, with an OR of 9.41 (95% CI, 6.80–13.01; $p < 0.001$) ([Table 2](#)). Additionally, post-hospital discharge care at an IRF significantly increased the likelihood of eventual discharge home for trauma patients of all age groups (15 to 34 years old: OR = 41.46; 95% CI, 14.85–115.77; 35 to 54 years old: OR = 8.50; 95% CI, 3.18–22.73; 55 to 74 years old: OR = 12.70; 95% CI, 6.75–23.90; and 75 years and older: OR = 13.55; 95% CI, 6.88–26.67).

Unplanned rehospitalization within 1 year

Looking at the cohort of patients who received inpatient rehabilitation and the comparison propensity score-matched cohort, multivariable competing risk regression analysis with death as the competing risk showed that older age and having sustained a ground-level fall or penetrating trauma compared with a non-ground-level fall blunt trauma were associated with a higher likelihood of rehospitalization within 1 year. Care at an IRF did not affect the likelihood of rehospitalization within 1 year ([Table 2](#)).

1-Year mortality

Looking at the cohort of patients who received inpatient rehabilitation and the comparison cohort of propensity score-matched patients, multivariable Cox regression analysis was used to identify factors predictive of mortality at 1 year. Older age, penetrating trauma, longer hospital LOS, and severe dependence on the modified FIM at hospital discharge were associated with a higher 1-year mortality. Care at an IRF was the only factor associated with lower 1-year mortality ([Table 2](#)).

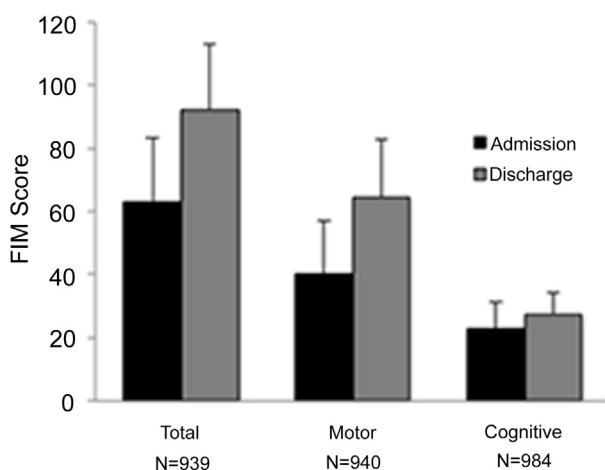


Figure 2. Total, motor, and cognitive Functional Independence Measure (FIM) scores at the time of admission to and discharge from rehabilitation for trauma patients discharged to inpatient rehabilitation. All data presented as mean \pm SD.

DISCUSSION

The inpatient mortality for trauma patients has decreased, but post-discharge mortality has actually increased over time,⁷⁻⁹ which highlights the fact that short-term outcomes measures achieved during the inpatient

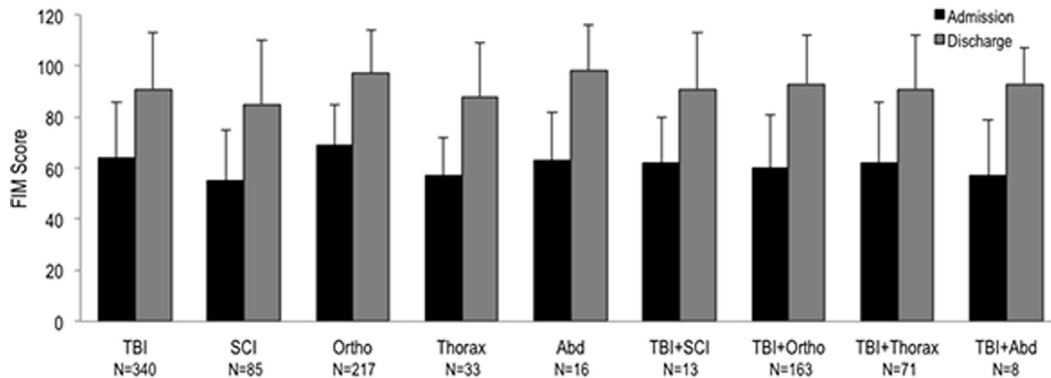


Figure 3. Total Functional Independence Measure (FIM) scores at the time of admission to and discharge from rehabilitation by injury type for trauma patients discharged to inpatient rehabilitation. All data presented as mean \pm SD. Abd, abdominal injury; Ortho, orthopaedic injury (vertebral fracture and/or extremity injury); SCI, spinal cord injury; TBI, traumatic brain injury; Thorax, thoracic injury.

hospitalization of the trauma patient are simply not an adequate method for measuring trauma care success. Functional outcomes and quality of life measures are equally important, if not more important, than mortality, but have rarely been evaluated. Traumatic injury has a profound prolonged impact on quality of life and the magnitude and duration of this effect is often severely underestimated.¹⁰ This quality of life is intimately linked with the attainment of functional independence, and discharge to an IRF has the potential to increase the likelihood of functional independence and improve quality of life substantially.

Definitive studies about the optimal post-discharge rehabilitation setting for trauma patients are lacking. In this retrospective database study of adult trauma patients, we sought to gain a better appreciation of the benefits of post-discharge care of the trauma patient at an IRF. We found that injured patients who received post-discharge rehabilitation care at IRFs in Washington State experienced a considerable improvement in functional outcomes during the course of their rehabilitation, and that 78% of these patients were successfully discharged home from the IRF. This is particularly striking when one considers the fact that these are generally older and severely injured patients. We also demonstrate that, compared with a propensity score-matched cohort that did not receive post-discharge care at an IRF, those treated at an IRF had a higher likelihood of eventually being discharged home, with an associated reduction in 1-year mortality.

Previous studies demonstrate that discharge of a trauma patient to a location other than home and specifically to a SNF is an independent predictor of mortality, although patients discharged to an IRF do not have the same increased risk of post-discharge mortality.^{2,7,8} Despite this, during the last several years, there has been an

increase in the number of trauma patients being discharged to SNFs and a decrease in the number being discharged to IRFs.³ The data from the current study make this trend particularly concerning. Conversely, patients who suffer strokes are more likely to be discharged to an IRF in comparison with patients suffering a traumatic injury. According to the Centers for Medicare and Medicaid Services (CMS), approximately 20% of all patients who suffer a stroke are discharged to an IRF, and stroke has been the leading diagnosis among Medicare beneficiaries admitted to an IRF. The reasons for this are complex. Earlier studies have demonstrated that stroke patients discharged to an IRF have improved functional outcomes compared with patients discharged to a SNF.¹¹⁻¹⁵ This evidence has since been translated into clinical practice, and the Joint Commission has required primary stroke centers to evaluate the post-discharge rehabilitation needs for all stroke survivors.

From 2005 to 2011, the number of IRFs has generally been decreasing, with stabilization in the number of facilities between 2011 and 2012.¹⁶ A compliance threshold was created for all IRFs mandating that a certain proportion of all patients in each IRF have diagnoses specified by CMS as requiring intensive inpatient rehabilitation. The enforcement of this rule and additional restrictions has resulted in a substantial decline in the volume of Medicare patients treated in IRFs. Occupancy rates have been steady since 2002, at only approximately 62% to 63%.¹⁶ This has led CMS to declare that the number of IRF facilities and beds is adequate to meet current demand. But, are we getting the most out of this resource, and is it possible that we are depriving certain patient populations the post-discharge care that might allow them to regain enough functional independence to return to their lives? It has been established that stroke patients

Table 2. Predictors of Discharge Home, 1-Year Rehospitalization, and 1-Year Mortality on Multivariable Logistic Regression Analysis

Predictor	Discharge home			1-year rehospitalization			1-year mortality		
	Odds ratio*	95% CI	p Value	Sub-hazard ratio*	95% CI	p Value	Hazard ratio*	95% CI	p Value
Age	0.96	0.95–0.97	<0.001	1.02	1.01–1.03	<0.001	1.05	1.04–1.07	<0.001
Mechanism									
Blunt	1.00	Reference	NA	1.00	Reference	NA	1.00	Reference	NA
Ground-level fall	0.80	0.51–1.25	0.319	1.55	1.05–2.30	0.029	1.41	0.90–2.21	0.138
Penetrating	0.40	0.20–0.78	0.007	2.03	0.94–4.38	0.070	3.97	1.33–11.86	0.013
Emergency department Glasgow Coma Scale score									
14 to 15	1.00	Reference	NA	1.00	Reference	NA	1.00	Reference	NA
9 to 13	1.32	0.61–2.87	0.482	1.07	0.45–2.56	0.871	0.59	0.19–1.78	0.349
3 to 8	1.14	0.60–2.18	0.685	1.44	0.70–2.95	0.320	0.71	0.27–1.90	0.500
Injury Severity Score									
0 to 8	1.00	Reference	NA	1.00	Reference	NA	1.00	Reference	NA
9 to 15	1.30	0.73–2.31	0.370	0.55	0.31–0.98	0.044	1.53	0.66–3.53	0.317
16 to 24	0.84	0.44–1.60	0.594	0.67	0.36–1.26	0.218	1.04	0.39–2.76	0.932
25 to 75	0.68	0.34–1.36	0.279	0.81	0.43–1.52	0.510	1.05	0.37–2.99	0.929
Head Abbreviated Injury Scale score									
≤3	1.00	Reference	NA	1.00	Reference	NA	1.00	Reference	NA
>3	1.27	0.84–1.92	0.260	NA	NA	NA	1.47	0.74–2.90	0.269
Hospital length of stay	0.98	0.97–1.00	0.014	1.00	0.99–1.01	0.684	1.03	1.02–1.03	<0.001
ICU admission									
No	1.00	Reference	NA	1.00	Reference	NA	1.00	Reference	NA
Yes	0.84	0.55–1.31	0.462	1.21	0.74–1.97	0.456	0.86	0.46–1.60	0.885
Mechanical ventilation									
No	1.00	Reference	NA	1.00	Reference	NA	1.00	Reference	NA
Yes	1.10	0.68–1.79	0.689	0.78	0.43–1.43	0.420	1.04	0.48–2.27	0.631
Modified FIM at discharge									
Mild dependence (FIM 11 to 12)	1.00	Reference	NA	1.00	Reference	NA	1.00	Reference	NA
Moderate dependence (FIM 8 to 10)	0.22	0.15–0.31	<0.001	1.01	0.69–1.48	0.950	0.99	0.60–1.62	0.958
Severe dependence (FIM 3 to 7)	0.07	0.04–0.12	<0.001	0.98	0.59–1.62	0.940	2.84	1.63–4.95	<0.001
Rehabilitation									
No	1.00	Reference	NA	1.00	Reference	NA	1.00	Reference	NA
Yes	9.41	6.80–13.01	<0.001	1.25	0.90–1.72	0.182	0.60	0.39–0.92	0.018

For total cohort, n = 1,624, which includes patients discharged to acute inpatient rehabilitation (n = 993) and propensity score-matched control (n = 631).

*Adjusted odds ratio, hazard ratio, and sub-hazard ratio with propensity score matching.

FIM, Functional Independence Measure; NA, not applicable.

and those with neurologic disorders are a cohort of patient that derive substantial functional benefit from inpatient rehabilitation care and this has likely contributed to the high percentage of these patients discharged to rehabilitation centers.¹¹⁻¹⁵ Until now, the functional benefit that acutely injured patients gain from inpatient rehabilitation after hospital discharge has not been understood. Our

data would suggest that post-discharge care at an IRF rather than a SNF has the potential to profoundly improve functional outcomes for acutely injured patients.

One of the limitations of the current study is the fact that our propensity score-matched cohort of patients who did not receive care at an IRF might not be a perfect control group. This method of statistical analysis allows us

to generate a comparison cohort of patients based on factors that we deem to be important and that we are able to measure and quantify. The appropriateness of the comparison cohort depends on our ability to include all of the correct variables in the propensity score analysis. It must be recognized that we were unable to account for whether patients met CMS criteria for discharge to an IRF, which includes 3 basic components: patient must require and be reasonably expected to benefit from intensive rehabilitation therapy that consists of at least 3 hours/day at least 5 days/week; patient must require therapy in at least 2 modalities; and patient must require supervision by a rehabilitation physician. A randomized clinical trial would be the most definitive way of determining whether post-hospital discharge care at an IRF really matters; however, randomizing patients that qualify for rehabilitation to a non-treatment arm (no IRF) is neither ethical nor practical. With the caveat that a randomized controlled trial might not be possible, we believe that this propensity score analysis represents the most rigorous statistical method available to look at the question at hand.

The other potential limitation of this study is the fact that it is a retrospective cohort study and carries with it the same limitations as all other retrospective database studies. The databases used for this study, specifically the RR, TR, and Comprehensive Hospital Abstract Reporting System, are rigorously maintained registries that are continuously monitored to ensure complete and quality data. Despite this, not all data within the registries are complete, which we addressed by using the method of multiple imputations for variables that were missing in >5% of cases. This is a well-validated method of accounting for missing variables and likely results in less bias than excluding missing variables entirely from the analysis.^{17,18}

CONCLUSIONS

Inpatient rehabilitation is a scarce resource and every effort should be made to use this relatively scarce resource on patients most likely to benefit from these services. Our data suggest that acute trauma patients should be recognized as a relatively underserved population that would benefit considerably from inpatient rehabilitation services after discharge from the hospital. Given the profound functional benefit that appropriate trauma patients derive from inpatient rehabilitation, it is imperative that we more clearly define the specific cohort of trauma patients that benefits most from this service. This will allow for the development of protocols for trauma centers to consistently identify patients most suitable for rehabilitation services and to maximize the benefit of this service for injured patients.

Author Contributions

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Analysis and interpretation of data: Nehra, Nixon, Bulger, Cuschieri, Maier, Arbabi

Drafting of manuscript: Nehra, Nixon, Arbabi

Critical revision: Nehra, Nixon, Lengenfelder, Bulger, Cuschieri, Maier, Arbabi

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Comparison of Functional Status Improvements Among Patients With Stroke Receiving Postacute Care in Inpatient Rehabilitation vs Skilled Nursing Facilities

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Abstract

IMPORTANCE Health care reform legislation and Medicare plans for unified payment for postacute care highlight the need for research examining service delivery and outcomes.

OBJECTIVE To compare functional outcomes in patients with stroke after postacute care in inpatient rehabilitation facilities (IRF) vs skilled nursing facilities (SNF).

DESIGN, SETTING, AND PARTICIPANTS This cohort study included patients with stroke who were discharged from acute care hospitals to IRF or SNF from January 1, 2013, to November 30, 2014. Medicare claims were used to link to IRF and SNF assessments. Data analyses were conducted from January 17, 2017, through April 25, 2019.

EXPOSURES Inpatient rehabilitation received in IRFs vs SNFs.

MAIN OUTCOMES AND MEASURES Changes in mobility and self-care measures during an IRF or SNF stay were compared using multivariate analyses, inverse probability weighting with propensity score, and instrumental variable analyses. Mortality between 30 and 365 days after discharge was included as a control outcome as an indicator for unmeasured confounders.

RESULTS Among 99 185 patients who experienced a stroke between January 1, 2013, and November 30, 2014, 66 082 patients (66.6%) were admitted to IRFs and 33 103 patients (33.4%) were admitted to SNFs. A higher proportion of women were admitted to SNFs (21 466 [64.8%] women) than IRFs (36 462 [55.2%] women) ($P < .001$). Compared with patients admitted to IRFs, patients admitted to SNFs were older (mean [SD] age, 79.4 [7.6] years vs 83.3 [7.8] years; $P < .001$) and had longer hospital length of stay (mean [SD], 4.6 [3.0] days vs 5.9 [4.2] days; $P < .001$) than those admitted to IRFs. In unadjusted analyses, patients with stroke admitted to IRF compared with those admitted to SNF had higher mean scores for mobility on admission (44.2 [95% CI, 44.1-44.3] points vs 40.8 [95% CI, 40.7-40.9] points) and at discharge (55.8 [95% CI, 55.7-55.9] points vs 44.4 [95% CI, 44.3-44.5] points), and for self-care on admission (45.0 [95% CI, 44.9-45.1] points vs 41.8 [95% CI, 41.7-41.9] points) and at discharge (58.6 [95% CI, 58.5-58.7] points vs 45.1 [95% CI, 45.0-45.2] points). Additionally, patients in IRF compared with those in SNF had larger improvements for mobility score (11.6 [95% CI, 11.5-11.7] points vs 3.5 [95% CI, 3.4-3.6] points) and for self-care score (13.6 [95% CI, 13.5-13.7] points vs 3.2 [95% CI, 3.1-3.3] points). Multivariable, propensity score, and instrumental variable analyses showed a similar magnitude of better improvements in patients admitted to IRF vs those admitted to SNF. The differences between SNF and IRF in odds of 30- to 365-day mortality (unadjusted odds ratio, 0.48 [95% CI, 0.46-0.49]) were reduced but not eliminated in multivariable analysis (adjusted odds ratio, 0.72 [95% CI, 0.69-0.74]) and propensity score analysis (adjusted odds ratio, 0.75 [95% CI, 0.72-0.77]). These differences were no longer statistically significant in the instrumental variable analyses.

(continued)

Key Points

Question Is change in physical function associated with receiving postacute care after a stroke in inpatient rehabilitation vs skilled nursing facilities?

Findings This cohort study included 99 185 patients who received postacute care in inpatient rehabilitation or skilled nursing facilities after a stroke. Care in an inpatient rehabilitation facility was associated with greater improvement in mobility and self-care compared with care in a skilled nursing facility, and a significant difference in functional improvement remained after accounting for patient, clinical, and facility characteristics at admission.

Meaning These findings suggest that there is room for payment reform in postacute care and highlight the need to target decision-making regarding discharge to postacute facilities based on patient needs and potential for recovery.

+ Supplemental content

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Abstract (continued)

CONCLUSIONS AND RELEVANCE In this cohort study of a large national sample, inpatient rehabilitation in IRFs for patients with stroke was associated with substantially improved physical mobility and self-care function compared with rehabilitation in SNFs. This finding raises questions about the value of any policy that would reimburse IRFs or SNFs at the same standard rate for stroke.

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Introduction

More than 40% of Medicare beneficiaries are discharged from acute care hospitals to postacute care each year. Reports by the National Academy of Sciences¹ and the Institute of Medicine² have found that postacute care was the largest contributor to geographic variation in Medicare costs. The 2014 Improving Medicare Post-Acute Care Transformation (IMPACT) Act³ requires the Secretary of the Department of Health and Human Services to establish a unified payment system for postacute care. As a step in this process, the Medicare Payment Advisory Commission recommended that inpatient rehabilitation facilities (IRFs) and skilled nursing facilities (SNFs) explore similar episode-based reimbursement for a given condition. The proposal is based, in part, on the substantial overlap in patient populations served by IRFs and SNFs.^{4,5}

The purpose of our study was to examine changes in functional status in a national sample of Medicare beneficiaries with stroke who received inpatient rehabilitation at an IRF or SNF following acute hospital discharge. We selected stroke because it is a major cause of disability in the United States and an important public health issue, patients with stroke have complex neurological disorders that require a range of treatments and expertise, and stroke represents the largest impairment group treated in IRFs.⁶

In this study, we compared functional outcomes of patients with stroke who were discharged from a hospital to an IRF or SNF. There are challenges in comparing outcomes in observational studies, the most important of which is bias by indication, or selection bias. Inpatient rehabilitation facilities have more stringent criteria for admission than do SNFs, including the requirement that patients be able to complete 3 hours of rehabilitation therapy daily. Several studies⁷⁻⁹ have shown that traditional methods of controlling for patient characteristics, such as logistic regression and propensity analyses, tend not to be effective in the face of strong selection biases. There are several approaches to mitigating this problem. One approach is to assess how large a bias would have to be to eliminate the association observed, which allows the reader to judge whether the existence of such a bias is plausible, such as by use of the E-value.¹⁰ Another approach is to indirectly assess the strength of the bias and whether it is eliminated by a specific analytic approach, such as by using a control outcome, a measure that should not be affected by differences between the 2 treatments but would be affected by selection biases. In this study, we used all-cause mortality between 30 and 365 days after hospital discharge as a control outcome. The control outcome should be strongly related to the underlying health of the patients but only minimally influenced by residence in an IRF vs SNF. If the statistical analyses show significant IRF vs SNF differences in 30- to 365-day mortality, that result would suggest that underlying selection biases remain. A third approach is to use analytic approaches shown to minimize selection biases, such as instrumental variable analysis.⁷⁻⁹ We used these 3 approaches to compare outcomes of patients with stroke who were discharged from acute care to IRFs vs SNFs.

We hypothesized that patients discharged to IRFs would have larger improvements in mobility and self-care function than those discharged to SNFs.

Methods

This study was approved by the institutional review board of the University of Texas Medical Branch and complies with the Centers for Medicare & Medicaid Services (CMS) Data Use Agreement requirements, which waived the need for informed consent for use of the study data because data were deidentified. We reported the study findings according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

Study Data

Our data included Medicare files from 2012 to 2014. These files included Master Beneficiary Summary for patient demographics, Medicare Provider Analysis and Review for claims from hospital and postacute care stays with clinical variables, Inpatient Rehabilitation Facility-Patient Assessment Instrument from IRF,^{4,11} Minimum Data Set 3.0 from SNF,¹² and the Provider of Services Current Files for hospital characteristics.

Sample Selection

The study sample included Medicare beneficiaries 66 years or older discharged from January 1, 2013, to November 30, 2014, to an IRF or SNF after an index acute stay for stroke denoted by Medicare Severity Diagnosis Related Group codes O61 to O66 (eFigure in the Supplement).¹³ Additional inclusion criteria included Medicare Part A coverage without enrollment in a health maintenance organization in the year before and 1 month after the index stroke discharge, residing in the community prior to the index stroke hospitalization, and full mobility and self-care functional measures at the IRF admission and discharge or SNF admission and last follow-up (eTable 1 and eTable 2 in the Supplement).

Functional Measures: Mobility and Self-Care

Our methods are described in more detail in the eAppendix in the Supplement. We used mobility and self-care items from the Inpatient Rehabilitation Facility-Patient Assessment Instrument and the Minimum Data Set 3.0 (eTable 3 in the Supplement). The Inpatient Rehabilitation Facility-Patient Assessment Instrument includes 5 mobility items and 6 self-care items, with a 7-point rating scale. The Minimum Data Set 3.0 consists of 6 mobility items with a 4-point rating scale and 5 self-care items with a 5-point rating scale.

We used the crosswalk developed by Mallinson et al¹⁴ to construct comparable admission and discharge functional scores for the postacute care settings.¹⁵ The scores at admission and discharge for mobility and self-care are reported on a scale of 0 to 100 points, with higher scores indicating greater functional status. This method has demonstrated efficacy in several settings.^{16,17}

Covariates

Patient characteristics included age at admission to IRF or SNF (ie, 66-69, 70-74, 75-79, 80-84, or ≥ 85 years), sex, race/ethnicity (ie, non-Hispanic white, non-Hispanic black, Hispanic, or other), length of stay (LOS) in acute care (ie, 1-3, 4-7, 8-11, 12-25, or ≥ 26 days), Medicaid eligibility, type of stroke (ischemic or hemorrhagic) and any stay in intensive care. The race/ethnicity variable was defined by the CMS and was included because some outcomes differ among racial/ethnic groups.¹⁸ The 30 most frequent CMS Hierarchical Condition Categories for comorbidities were identified through diagnoses on the inpatient claims from the previous year and the secondary diagnoses during the index stroke hospitalization (eTable 4 and eTable 5 in the Supplement).¹⁹ In addition, we added 6 diagnoses related to cognitive function (eTable 6 in the Supplement). Hospital characteristics included location (urban or rural), hospital type (ie, for-profit, nonprofit, or other), presence of swing beds (yes or no), rehabilitation unit within hospital (yes or no), teaching hospital (yes or no), number of stroke discharges from the index hospital in the same year of the index stroke discharge, and number of beds in index stroke hospital.

Outcomes

The outcomes were changes in mobility and self-care scores during the IRF or SNF stay. As a control outcome, we assessed mortality between 30 and 365 days after hospital discharge. We selected this outcome to assess how well the analytic techniques controlled for any differences in underlying health status between patients admitted to IRF or SNF. The assumption was that mortality in this time frame would be closely linked to health status and minimally associated with the type of facility.

Statistical Analysis

Data were analyzed from January 17, 2017, through April 25, 2019. We began with unadjusted bivariate analyses of all variables compared across IRF and SNF settings. We used several analytic approaches to control for potential confounders across IRF and SNF settings, including multivariable analysis, inverse probability weighting with propensity scores and instrumental variable analyses. The multivariable approach used ordinary least squares, adjusting for covariates. Next, we used inverse probability treatment weighting with propensity scores with and without multilevel adjustment.

The propensity score was generated with a logistic regression model using an average treatment effect estimation²⁰ that incorporated all covariates listed in eTable 4 and eTable 5 in the [Supplement](#). If any covariates in the propensity score model were not balanced, we additionally controlled for those covariates in the outcome models. Next, we used hierarchical general linear mixed-effects models to account for patients nested within hospitals. Additionally, we used ordinary least squares models with inverse probability treatment weighting, with propensity scores also adjusted for unbalanced covariates, to compare functional status outcome (ie, mobility and self-care) at discharge from IRF or SNF.

We used instrumental variable analysis to adjust for unmeasured confounders across patients and facilities.²¹ The instrumental variables included difference in the distance from the acute care hospital to the nearest IRF vs the nearest SNF, difference in the distance from the beneficiary's residence to the nearest IRF vs nearest SNF, number of stroke patients discharged to an IRF in the hospital referral region (HRR) in 2013 through 2014, and the previous discharge location assignment (IRF or SNF) for patients with the same type of stroke from the same acute care hospital (eTable 7 and eTable 8 in the [Supplement](#)). We estimated the parameters using 2-stage least square regression.²²⁻²⁴ For the control outcome of 30- to 365-day mortality, the parameters were estimated from 2-stage residual inclusion models because the outcome was dichotomous. Lastly, we calculated E-values for mobility scores, self-care scores, and mortality between patients admitted to IRF or SNF, to assess the potential magnitude of unmeasured confounding that might have produced the results.¹⁰ Data were analyzed using SAS statistical software version 9.4 (SAS Institute). *P* values were 2-tailed, and statistical significance was set at less than .05.

Results

A total of 99 185 patients with stroke from 3405 hospitals were included in the study, including 66 082 patients (66.6%) who received stroke rehabilitation in an IRF and 33 103 patients (33.4%) who received stroke rehabilitation in an SNF. **Table 1** presents the baseline differences in the patient characteristics between those admitted to IRFs or SNFs. A higher proportion of women were admitted to SNFs (21 466 [64.8%] women) than IRFs (36 462 [55.2%] women) ($P < .001$). Compared with patients admitted to IRFs, patients admitted to SNFs were older (mean [SD] age, 79.4 [7.6] years vs 83.3 [7.8] years; $P < .001$), had longer hospital LOS (mean [SD], 4.6 [3.0] days vs 5.9 [4.2] days; $P < .001$), and had more comorbidities (mean [SD], 2.8 [2.0] comorbidities vs 3.3 [2.1] comorbidities; $P < .001$) (Table 1; eTable 4 in the [Supplement](#)). The LOS in SNFs was more than 2-fold that in IRFs (mean [SD], 38.1 [24.1] days vs 15.2 [7.3] days).

Table 2 presents the unadjusted mobility and self-care scores at admission and discharge for patients in IRFs and SNFs, along with the change in scores between admission and discharge.

Table 1. Characteristics of Patients Admission to IRF and SNF

Variable	Patients, No. (%)		P Value ^a
	IRF (n = 66 082)	SNF (n = 33 103)	
Age, mean (SD), y ^b	79.4 (7.6)	83.3 (7.8)	<.001
66-69	7959 (12.0)	1869 (5.6)	
70-74	11 994 (18.2)	3244 (9.8)	
75-79	13 421 (20.3)	4931 (14.9)	
80-84	13 931 (21.1)	6978 (21.1)	
≥85	18 777 (28.4)	16 081 (48.6)	
Sex			
Men	29 620 (44.8)	11 637 (35.2)	<.001
Women	36 462 (55.2)	21 466 (64.8)	
Race/ethnicity			
Non-Hispanic white	52 826 (79.9)	26 775 (80.9)	<.001
Non-Hispanic black	7753 (11.7)	3915 (11.9)	
Hispanic	3202 (4.9)	1371 (4.1)	
Other	2301 (3.5)	1042 (3.1)	
Stroke type			
Ischemic	58 872 (89.1)	29 272 (88.4)	.002
Hemorrhagic	7210 (10.9)	3831 (11.6)	
Length of stay in acute care, mean (SD), d ^b	4.6 (3.0)	5.9 (4.2)	<.001
1-3	28 099 (42.5)	9723 (29.4)	
4-7	29 996 (45.4)	16 403 (49.6)	
8-11	5839 (8.8)	4390 (13.3)	
12-25	2066 (3.1)	2403 (7.3)	
≥26	82 (0.1)	184 (0.6)	
Admission function score, mean (SD) ^c			
Mobility ^d	44.2 (7.4)	40.8 (9.4)	<.001
Self-care ^e	45.0 (11.1)	41.9 (11.7)	<.001
No. of comorbidities, mean (SD) ^b	2.8 (2.0)	3.3 (2.1)	<.001
Medicaid eligible	10 454 (15.8)	7222 (21.8)	<.001
Stayed in ICU or CCU	39 195 (59.3)	17 178 (51.9)	<.001
Urban hospital	60 114 (91.0)	28 207 (85.2)	<.001
Hospital type			
For-profit	9480 (14.3)	4074 (12.3)	<.001
Nonprofit	48815 (73.9)	24 848 (75.1)	
Other	7787 (11.8)	4181 (12.6)	
Swing bed	1710 (2.6)	2023 (6.1)	<.001
Rehabilitation unit in IRF ^f	40 742 (61.7)	14 657 (44.3)	<.001
Teaching hospital	34 919 (52.8)	15 858 (47.9)	<.001
Stroke discharges, No., mean (SD) ^b	248.0 (175.9)	218.7 (174.8)	<.001
Hospital beds, No., mean (SD) ^b	463.0 (329.2)	414.2 (332.0)	<.001

Abbreviations: CCU, cardiac care unit; ICU, intensive care unit; IRF, inpatient rehabilitation facilities; SNF, skilled nursing facilities.

^a Based on χ^2 test.

^b Based on Wilcoxon rank sum test.

^c Scores were scaled on 0- to 100-point scales, with higher scores indicating greater functional status.

^d Mobility score for IRF measured the level of help needed for transfer to bed, chair, or wheelchair, transfer to toilet, transfer tub or shower, locomotion via walking or a wheelchair, and locomotion on stairs. Mobility score for SNF measured the level of help needed for bed mobility, transfer, walking in a room, walking in a corridor, locomotion on the unit, and locomotion off the unit.

^e Self-care scores in IRF measured the level of help needed for eating, grooming, bathing, dressing upper body, dressing lower body, and toileting. For SNF, self-care score measured the level of help needed for dressing, eating, toilet use, personal hygiene, and bathing.

^f Indicates a rehabilitation unit that is part of an acute care hospital rather than a free-standing rehabilitation facility.

Table 2. Unadjusted Admission and Discharge Results

Score	Mean (95% CI)			
	IRF		SNF	
	Mobility	Self-care	Mobility	Self-care
At admission	44.2 (44.1-44.3)	45.0 (44.9-45.1)	40.8 (40.7-40.9)	41.8 (41.7-41.9)
At discharge	55.8 (55.7-55.9)	58.6 (58.5-58.7)	44.4 (44.3-44.5)	45.1 (45.0-45.2)
Change	11.6 (11.5-11.7)	13.6 (13.5-13.7)	3.5 (3.4-3.6)	3.2 (3.1-3.3)

Abbreviations: IRF, inpatient rehabilitation facilities; SNF, skilled nursing facilities.

Compared with patients in IRFs, patients in SNFs had lower mean scores for mobility (44.2 [95% CI, 44.1-44.3] points vs 40.8 [95% CI, 40.7-40.9] points) and self-care (45.0 [95% CI, 44.9-45.1] points vs 41.8 [95% CI, 41.7-41.9] points) at admission and for mobility (55.8 [95% CI, 55.7-55.9] points vs 44.4 [95% CI, 44.3-44.5] points) and self-care (58.6 [95% CI, 58.5-58.7] points vs 45.1 [95% CI, 45.0-45.2] points) at discharge. The changes in mobility and self-care scores were substantially greater among IRF patients. For mobility, the change was 11.6 (95% CI, 11.5-11.7) points for patients in IRFs vs 3.5 (95% CI, 3.4-3.6) points for those in SNFs. For self-care, the change was 13.6 (95% CI, 13.5-13.7) points vs 3.2 (95% CI, 3.1-3.3) points.

After applying propensity score weights, most demographics and comorbidities were balanced between IRF and SNF (49 of 52 variables [94.2%]) (eTable 4 and eTable 5 in the Supplement). **Table 3** presents stroke outcomes by mobility and self-care discharge scores for patients in IRF or SNF. Regardless of covariate adjustment method, the patients with stroke who were discharged from IRF had higher mobility and self-care scores than those discharged from SNF. In multivariate adjustment analysis, the mean (SE) difference in scores between patients from IRF vs SNF was 7.8 (0.05) points for mobility and 9.7 (0.06) points for self-care. In the multilevel multivariate propensity score inverse probability of treatment weighting model, the mean (SE) difference in scores between patients from IRF vs SNF was 8.0 (0.04) points for mobility and 9.9 (0.05) points for self-care. Results of instrumental variable analyses are summarized in Table 3 and show similar results, including by differential distance from acute care hospital to nearest IRF or SNF (mean [SE] difference: mobility score, 8.2 [0.34] points; self-care score, 9.8 [0.39] points), by differential distance from patient's residence to nearest IRF or SNF (mean [SE] difference: mobility score, 5.6 [0.63] points; self-care score, 8.7 [0.72] points), by percentage of IRFs within the acute hospital HRR (mean [SE] difference: mobility score, 10.4 [0.21] points; self-care score, 11.9 [0.25] points), and by previous IRF or SNF assignment by stroke type within each hospital (mean [SE] difference: mobility score, 9.2 [0.30] points; self-care score, 10.7 [0.34] points). In all models, the changes in mobility and self-care scores for those discharged from IRFs were at least 2-fold those for patients discharged from SNFs.

In order to assess the ability of the various analytic techniques to adjust for unmeasured confounders, we assessed mortality between 30 and 365 days as a control outcome (**Table 4**). In unadjusted analyses, patients with stroke who were discharged from IRF had lower mortality than those discharged from SNF (17.5% vs 30.5%, OR, 0.48 [95% CI, 0.46-0.49]). Adjustment for patient and hospital characteristics in a multivariate adjustment model increased the OR to 0.72 (95% CI, 0.69-0.74), which was similar to results of the inverse probability weighted propensity models

Table 3. Change in Score From Admission to Discharge in IRF and SNF

Analysis	Score, Mean (SE)					
	IRF		SNF		Difference	
	Mobility	Self-care	Mobility	Self-care	Mobility	Self-care
Estimation method						
Unadjusted	11.6 (0.03)	13.6 (0.04)	3.5 (0.03)	3.2 (0.04)	8.0 (0.05)	10.4 (0.06)
Multivariate adjustment	11.5 (0.03)	13.4 (0.03)	3.7 (0.04)	3.7 (0.05)	7.8 (0.05)	9.7 (0.06)
Propensity score models						
Multivariate IPTW adjustment ^a	11.5 (0.03)	13.4 (0.03)	3.5 (0.03)	3.4 (0.03)	8.0 (0.04)	9.9 (0.05)
Multilevel multivariate IPTW adjustment	11.4 (0.03)	13.2 (0.04)	3.4 (0.03)	3.4 (0.04)	8.0 (0.04)	9.9 (0.05)
Instrumental variable analysis						
Differential distance from acute to nearest IRF or SNF	11.7 (0.12)	13.4 (0.13)	3.4 (0.23)	3.6 (0.26)	8.2 (0.34)	9.8 (0.39)
Differential distance from beneficiary to nearest IRF or SNF	10.8 (0.21)	13.1 (0.24)	5.2 (0.42)	4.4 (0.48)	5.6 (0.63)	8.7 (0.72)
Percentage of IRFs within acute hospital referral region	12.4 (0.07)	14.2 (0.09)	2.0 (0.14)	2.2 (0.16)	10.4 (0.21)	11.9 (0.25)
Previous IRF or SNF assignment by stroke type within each hospital	12.0 (0.10)	13.7 (0.12)	2.8 (0.20)	3.0 (0.23)	9.2 (0.30)	10.7 (0.34)

Abbreviations: IPTW, inverse probability of treatment weighting; IRF, inpatient rehabilitation facility; SNF, skilled nursing facility.

mobility score (IRF mean [SD], 43.3 [6.6]; SNF, 43.7 [12.0]; $P < .001$), admission self-care score (IRF, 44.0 [9.8]; SNF, 44.3 [14.3]; $P = .001$), and hemiplegia or hemiparesis (IRF, 43.7%; SNF, 42.7%; $P = .02$).

^a After applying propensity score weights, most demographics and stroke comorbidities were balanced between IRF and SNF (49 out of 52 variables), except for admission

(adjusted odds ratio, 0.75 [95% CI, 0.72-0.77]). In contrast, the 4 instrumental variable models resulted in odds of mortality closer to 1.0, with ORs ranging from 0.92 (95% CI, 0.76-1.11) when adjusted for previous IRF or SNF assignment by stroke type within each hospital to 1.25 (95% CI, 0.88-1.76) when adjusted by differential distance from patient's residence to the nearest IRF or SNF (Table 4).

Lastly, for each outcome, we calculated the E-value to assess the minimum strength of association that an unmeasured confounder would need to have with the outcome and postacute care setting to eliminate the association between postacute care setting and each outcome (eTable 9 in the Supplement). The lower confidence limit of the E-value was 4.0 for the change in mobility and 4.2 for self-care scores. E-values this large indicate that the association between function score change and postacute care setting we observed was strong.¹⁰

Discussion

Currently, the decision-making process in selecting postacute care services is heavily influenced by nonclinical factors.²⁵⁻³⁰ This is shown by the substantial geographic variation in the proportions of patients with stroke discharged to IRFs or SNFs.²⁸ The choice is associated with measures of availability, such as distance to the nearest facility.²⁹ The association of IRF vs SNF use with these nonclinical factors allows investigators to use them as instruments in an instrumental variable analysis, which should better control for unmeasured confounders that might be influencing the choice of IRF vs SNF.

Comparative research related to functional outcomes for persons with stroke receiving rehabilitation in IRFs vs SNFs is limited, to our knowledge. A recent systematic review reported better functional outcomes and higher costs for patients in IRFs compared with those in SNFs and emphasized the need for additional research.⁴ Limited research has reported generally better functional outcomes associated with patients in IRFs vs SNFs after a stroke.^{4,29,31,32} The findings of our study support this trend. In the 4 instrumental variable models, the differences in improvement in mobility scores between IRF and SNF patients between 5 and 10 points and for self-care scores, the difference was between 8 and 12 points. A 10-point difference in self-care in an IRF is the difference between a patient rating of needing maximal assistance vs needing supervision. Maximal assistance requires another person to physically assist the patient. Needing supervision simply involves another person being present to monitor the activity but not provide physical assistance unless required. Patients at the level of needing supervision are usually ready for discharge to home, while patients needing maximal assistance will require continued institutional care or in-home nursing support after discharge from postacute care.^{32,33}

We also found differences in functional outcomes between IRF and SNF using logistic regression and propensity scores. However, the inability of more analytical techniques to eliminate the

Table 4. 30- to 365-d Mortality From Hospital Discharge Between IRFs and SNFs

Analysis	Odds Ratio (95% CI)
Estimation method	
Unadjusted	0.48 (0.46-0.49)
Multivariate adjustment	0.72 (0.69-0.74)
Propensity score model	
Multivariate IPTW adjustment	0.75 (0.72-0.77)
Multilevel multivariate IPTW adjustment	0.72 (0.69-0.74)
Instrumental variable	
Differential distance from acute to nearest IRF or SNF	1.01 (0.82-1.23)
Differential distance from beneficiary to nearest IRF or SNF	1.25 (0.88-1.76)
Percentage of IRFs with the acute hospital referral region	1.02 (0.89-1.17)
Previous IRF or SNF assignment by stroke type within each hospital	0.92 (0.76-1.11)

Abbreviations: IPTW, inverse probability of treatment weighting; IRF, inpatient rehabilitation facilities; SNF, skilled nursing facilities.

differences in the control outcome of all-cause mortality between 30 and 365 days suggests that those approaches did not eliminate selection biases. This pattern is consistent with prior comparative effectiveness studies using observational data⁷⁻⁹ and reinforces the view that such techniques should be avoided in the face of strong selection bias.

Our study adds to the accumulating scientific literature that better functional outcomes, such as mobility and self-care, are associated with discharge from IRFs vs SNFs among stroke survivors.^{4,29,31,32} This has not been true for other conditions, such as hip fracture or joint replacement.³⁴ A study by Mallinson et al³⁴ comparing mobility and self-care outcomes, which were measured in the same way as in our study, among patients with hip fracture receiving rehabilitation from IRFs, SNFs, or home health agencies found no statistically significant differences in fully adjusted models. The difference in findings between the Mallinson et al study³⁴ and our study could be related to many factors. We believe the difference in conditions (ie, hip fracture and joint replacement vs stroke) is the most plausible explanation.

Stroke is a complex neurological condition affecting multiple body systems and requiring intensive rehabilitation from several disciplines with different areas of expertise. An IRF is designed to provide intensive rehabilitation to complex patients who need specialized care. To effectively and safely implement unified payment in postacute care,³ it will be necessary to recognize differences in the rehabilitation needs of patients with stroke and other complex conditions. The CMS 60% rule identifies 13 diagnostic conditions that classify a facility as an IRF for Medicare reimbursement.³⁵ Stroke is the largest category of these conditions, with 20.5% of all patients in IRFs in 2017.⁶

The instrumental variable analyses in this study describe the outcomes of the marginal patient, that is, those patients who reasonably could have been discharged either to an IRF or SNF. The assumption is that there are patients at the ends of the spectrum who are highly likely to be discharged to an IRF or SNF, but that there are also patients in the middle who could go to either one and for whom the choice is influenced by nonclinical factors. It is not possible to directly measure the size of the population of marginal patients. In a study of Medicare spending and outcomes after postacute care for stroke and hip fracture, Buntin et al³⁶ estimated the percentage of marginal patients as between 20% to 30% of patients with hip fracture or stroke. One way to estimate the size of the marginal patient population is to examine the distribution in variation in percentage of patients with stroke discharged to an IRF or SNF among HRRs. The assumption is that the underlying health of patients with stroke would vary somewhat among HRRs, but not markedly, and that the variation reflects local availability of the 2 types of facilities along with other medical cultural issues. Our findings are similar to what Buntin et al³⁶ estimated as the percentage of patients with marginal stroke and hip fracture. Our findings and the research of Buntin et al³⁶ indicate that it may be possible to improve our ability to identify appropriate candidates for the high-intensity, specialized services provided in IRFs.

Additional research is necessary to confirm our findings and to identify whether any of the other 13 conditions identified by CMS as priority diagnoses for receiving services in IRFs (the 60% rule) may also show differences in functional outcomes based on treatment in IRFs vs SNFs. Our findings also have implications regarding the IMPACT Act.³ Studies that compare functional outcomes for all patients discharged to postacute care may be missing treatment effects that appear only in some impairment groups requiring the intense or specialized rehabilitation available in IRFs.³⁰ For many hospital discharges, the postacute care setting may not matter, but our results suggest that, for at least one-third of patients with a stroke, discharge to an IRF vs SNF was associated with a significant difference in self-care and mobility at discharge.

As the IMPACT Act³ and unified payment are implemented, it will be important to accurately identify subgroups and target patients who would do better in one setting vs another. The current CMS rules for identifying priority patients for IRFs are a good start, but challenges remain, such as the large disparity in the availability of IRFs vs SNFs. Another concern is the current cost differential between postacute care settings. The Medicare Payment Advisory Commission reports^{6,37} consistently demonstrate that IRF costs are higher than those of SNF and home health. In a unified

payment system, there would be financial incentives to shift high-cost patients, such as patients with stroke and other complex medical conditions, to lower-cost postacute care options. Effective administrative oversight will be required to ensure patients receive the appropriate care in the right setting.

Limitations

This study has limitations. Our findings are based on Medicare files for IRF and SNF settings only and are not applicable to stroke rehabilitation in other postacute venues (eg, home health care, long-term care hospitals, or outpatient care). We were not able to examine cognitive function before and after the stroke, stroke severity, or location of the stroke. The number of items to measure cognitive function in the IRF and SNF assessment protocols are small, and our preliminary analyses to develop a cocalibrated crosswalk revealed low precision.^{16,38} Instead, we included diagnoses associated with cognitive dysfunction in the comorbidities that were controlled for (eTable 6 in the Supplement). The development of a standardized measure of cognitive function is an important area for future research and is included as part of the IMPACT Act.³ Previous investigations have consistently reported that the costs for rehabilitation services provided in SNFs are significantly lower than in IRFs, even when the longer LOSs associated with SNFs are considered.^{4,36} We did not conduct cost comparisons or cost benefit analyses associated with outcomes across the 2 postacute settings. This is an important topic for future research.

Conclusions

This cohort study found that Medicare beneficiaries who received services at an IRF after a stroke demonstrated greater improvement in mobility and self-care compared with patients who received inpatient rehabilitation at a SNF. A significant difference in functional improvement remained after accounting for patient, clinical, and facility characteristics at admission. Our findings indicate the need to carefully manage discharge to postacute care based on the patient's needs and potential for recovery. Postacute care reform based on the IMPACT Act³ must avoid a payment system that shifts patients with stroke who could benefit from intensive inpatient rehabilitation to lower cost settings.

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Author Contributions: Dr Ottenbacher had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Concept and design: Goodwin, Reistetter, Kuo, Karmarkar, Ottenbacher.

Acquisition, analysis, or interpretation of data: All authors.

Drafting of the manuscript: Hong, Goodwin, Ottenbacher.

Critical revision of the manuscript for important intellectual content: All authors.

Statistical analysis: Hong, Kuo, Karmarkar, Lin.

Obtained funding: Reistetter, Ottenbacher.

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SUPPLEMENT.

eFigure. Study Flow Diagram for the Sample

eTable 1. Patient Characteristics Between Skilled Nursing Facility (SNF) Stays Included in the Cohort and Those Excluded Owing to Incomplete Data for Function Scores

eTable 2. Patient Comorbidities Between Skilled Nursing Facility (SNF) Stays Included in the Cohort and Those Excluded Due to Incomplete Data for Function Scores

eAppendix. eMethods

eTable 3. Comparison of Inpatient Rehabilitation Facility-Patient Assessment Instrument (IRF-PAI) With Minimum Data Set 3.0 (MDS) Items in the Mobility and Self-care Construct

eTable 4. Demographics Across Inpatient Rehabilitation Facilities (IRFs) and Skilled Nursing Facilities (SNFs) Before and After Inverse Probability of Treatment Weighting

eTable 5. Stroke Comorbidities Across Inpatient Rehabilitation Facilities (IRFs) and Skilled Nursing Facilities (SNFs) Before and After Inverse Probability of Treatment Weighting

eTable 6. Additional Diagnoses Related to Cognitive Function

eTable 7. Instrumental Variables Across Inpatient Rehabilitation Facilities (IRFs) and Skilled Nursing Facilities (SNFs)

eTable 8. Standardized Difference for Instrumental Variables

eTable 9. E-values for Mobility and Self-care Scores and 30- to 365-Day Mortality From Hospital Discharge

eReferences

Attachment H

Admission Policy

Nondiscrimination in the Delivery of Healthcare Policy

Financial Assistance Policy



Policy#: 121 Title: Admissions Category: Administration

Policy Status: Published Effective Date: 10/08/2018 Last Reviewed Date: 10/08/2018

PURPOSE

To establish a process to accurately and timely accept, receive and admit patients upon their arrival to the hospital and to ensure that all documentation is captured accurately and timely in PAS and on required paperwork.

Definitions

PAS: Patient Accounting System

IM: Important Message from Medicare – a required notification of hospital discharge appeal rights per 42 CFR 405, 412, 422 and 489; Claims Processing Manual Chapter 30, Medicare Managed Care Manual Chapter 13.

LOA: Leave of Absence

MSPQ: Medicare Secondary Payor Questionnaire

LRD: Lifetime Reserve Days

MPI: Master Patient Index within PAS

POC: Plan of Care

POLICY

Upon admission and prior to medical care being provided all required documentation will be reviewed with the patient or their guardian and signatures/dates/time obtained. The admission checklist will be used as a guide to ensure all documents are completed and retained in a timely manner. The checklist will be signed/dated/timed indicating all financial/billing information is accurately entered into PAS. Patients will not be activated in PAS until they have physically arrived at the hospital. All required information will be gathered, posted in PAS and scanned into the appropriate electronic document scanning and archiving system no later than the 3rd business day after date of admission.

1. Ensure all pertinent information required for a valid and complete admission and/or check in is received, scanned and posted into PAS.
2. Any missing or in error information must have appropriate action taken to obtain the correct information, documentation and either scanned and/or posted in PAS.
3. Work Queues will be reviewed and corrected on a daily business day basis to ensure accuracy and timeliness of patient account activity.
4. The admission checklists (In and Out) will be used to validate the required documentation needs for the patient. If a document is required for the patient and is not listed on the admission checklist, scan document in the appropriate folder within the appropriate electronic document scanning system.
5. Admission Notifications must be completed at time of admission for those payors requiring them. Refer to IPReports WQ6700.R01 and HE2016.cq.
6. Consent to Treat must be signed by the patient and/or their guardian. If the patient is unable to sign and the guardian is not present, every attempt should be made to obtain a verbal approval prior to administering clinical services. The verbal should be indicated in signature field with a signature of 2 hospital employee witnesses. Upon guardian arrival, a signature and date/time should be obtained.
7. For all Medicare and Medicare Advantage patients, the IM must be delivered and signed/dated at time of admission and no more than 2 calendar days following admission.
8. MSPQ must be completed in PAS on all patients that indicate Medicare is a payor regardless if it is primary, secondary, tertiary, etc. Medicare Advantage patients are not required to complete an MSPQ. MSPQ's must be updated every 90 days of the patient's stay. Refer to IPReports WQ6700.R01.
9. Election not to use LRDs can be made at time of admission or anytime during the stay. IP Medicare beneficiaries that have already used or will use 90 IP days must be notified by the hospital that they are approaching LRD days and can elect not to use LRDs. The hospital should give notice of the option to elect not to use LRDs when the beneficiary has five (5) regular coinsurance days left and the patient is expected to be hospitalized beyond that period. If notice was not provided at five (5) days, when discovered,

immediately notify patient. Document patient's LRDs election via the Lifetime Reserve Authorization Form. The form must be scanned in the Financial Folder of the Admission Packet.

10. Medicare beneficiaries transferred to Acute Care on the same date of admission and not returning before midnight must follow the LOA policy.

11. Patients admitted and discharged on the same day will not be billed to any payor. These types of admits cannot be cancelled and is applicable for all discharge destinations.

12. All patients whether inpatient or outpatient should be discharged with appropriate date/time in PAS on a timely basis according to their departure from their stay or episode of care.

13. Payor and financial class corrections may require changes to the patient type and/or accommodation code.

14. Corrections to a financial class can be found on IPReports HS8129 for potential revenue reclasses for the current month revenue.

15. For hospitals with outpatient therapy services Outpatients not seen in 35 days should be discharged back to their last posted day of activity or missed therapy. Refer to the Work Queue report WQ6700.R01 or the search by drop down menu under Pat Accts.

16. For hospitals with outpatient therapy services Medical Necessity software provides medical necessity checks and must be completed, if applicable, within 24 hours of the POC being developed and prior to the first scheduled visit after therapy. If at any time the therapist changes the POC, a new Medical Necessity check must be performed.



Encompass Health

Nondiscrimination In the Delivery of Healthcare

PURPOSE

Federal laws, including the Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act (ADA) of 1990, the Age Discrimination Act of 1975, and Section 1557 of the Affordable Care Act prohibit healthcare providers from discriminating against patients seeking access to medical care (collectively the “Civil Rights Laws”). The purpose of this policy is to implement the requirements of the Civil Rights Laws.

SCOPE

This policy applies to all Company hospitals.

DEFINITIONS

Auxiliary Aids and Services (“AAS”). AAS include, but are not limited to, the following: (1) Qualified interpreters on-site or through video remote interpreting (VRI) services; note takers; real-time computer-aided transcription services; written materials; exchange of written notes; telephone handset amplifiers; assistive listening devices; assistive listening systems; telephones compatible with hearing aids; closed caption decoders; open and closed captioning, including real-time captioning; voice, text, and video-based telecommunication products and systems, text telephones (TTYs), videophones, and captioned telephones, or equally effective telecommunications devices; videotext displays; accessible electronic and information technology; or other effective methods of making orally delivered information available to individuals who are deaf or hard of hearing; (2) Qualified readers; taped texts; audio recordings; Braille materials and displays; screen reader software; magnification software; optical readers; secondary auditory programs; large print materials;

Policy Details

Policy ID

CMP-500

Audience

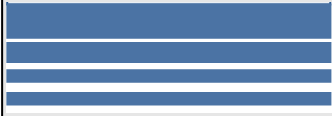
All

Effective Date

2/3/2009

Last Review Date

11/14/2018



accessible electronic and information technology; or other effective methods of making visually delivered materials available to individuals who are blind or have low vision; (3) Acquisition or modification of equipment and devices; and (4) Other similar services and actions.

[on the] Basis of Sex includes, but is not limited to, discrimination on the basis of pregnancy, false pregnancy, termination of pregnancy, or recovery therefrom, childbirth or related medical conditions, sex stereotyping, and gender identity.

Disability means, with respect to an individual, a physical or mental impairment that substantially limits one or more major life activities of such individual; a record of such an impairment; or being regarded as having such an impairment.

Gender Identity means an individual's internal sense of gender, which may be male, female, neither, or a combination of male and female, and which may be different from an individual's sex at birth. The way an individual expresses gender identity is frequently called "gender expression," and may or may not conform to social stereotypes associated with a particular gender. A transgender individual is an individual whose gender identity is different from the person's sex.

Limited English Proficiency ("LEP") Individual means an individual whose primary language for communication is not English and who has a limited ability to read, write, speak, or understand English.

Language Assistance Services ("LAS") may include, but are not limited to: (1) oral language assistance, including interpretation in non-English languages provided in-person or remotely by a qualified interpreter for an individual with limited English proficiency, and the use of qualified bilingual or multilingual staff to communicate directly with individuals with limited English proficiency; (2) Written translation, performed by a qualified translator, of written content in paper or electronic form into languages other than English; and (3) Taglines.

National Origin includes, but is not limited to, an individual's, or his or her ancestor's, place of origin (such as country or world region) or an individual's manifestation of the physical, cultural, or linguistic characteristics of a national origin group.

Qualified Bilingual/Multilingual Staff means an employee of the hospital who has been determined by the home office to meet the LSA Basic Healthcare Language Proficiency requirements. The employee will provide oral language assistance as part of the individual's current, assigned job responsibilities.

Qualified Interpreter for an Individual with a Disability means an interpreter, who via a remote interpreting service or an on-site appearance: (1) adheres to generally accepted interpreter ethics principles, including client confidentiality; and (2) is able to interpret effectively, accurately, and impartially, both receptively and expressively, using any necessary specialized vocabulary, terminology and phraseology. For an individual with a disability, qualified interpreters can include, for example, sign language interpreters, oral transliterators (individuals who represent or spell in the characters of another alphabet), and cued language transliterators (individuals who represent or spell by using a small number of handshapes).

Qualified interpreter for an Individual with Limited English Proficiency means an interpreter who via a remote interpreting service or an on-site appearance: (1) Adheres to generally accepted interpreter ethics principles, including client confidentiality; (2) has demonstrated proficiency in speaking and understanding both spoken English and at least one other spoken language; and (3) is able to interpret effectively, accurately, and impartially, both

receptively and expressly, to and from such language(s) and English, using any necessary specialized vocabulary, terminology and phraseology.

Qualified Translator means a translator who: (1) Adheres to generally accepted translator ethics principles, including client confidentiality; (2) has demonstrated proficiency in writing and understanding both written English and at least one other written non-English language; and (3) is able to translate effectively, accurately, and impartially to and from such language(s) and English, using any necessary specialized vocabulary, terminology and phraseology.

Taglines mean short statements written in non-English languages that indicate the availability of language assistance services free of charge.

ROLES & RESPONSIBILITIES

n/a

POLICY

The Company does not discriminate on the basis of Race, Color, National Origin, Sex, Age, or Disability in the delivery of healthcare to its patients. The Company also will provide appropriate Auxiliary Aids and Services, including Qualified Interpreters for Individuals with Disabilities and information in alternate formats, free of charge and in a timely manner, when such aids and services are necessary to ensure an equal opportunity of participation to individuals with disabilities. Finally, the Company will provide language assistance services, including translated documents and oral interpretation, free of charge and in a timely manner, when such services are necessary to LEP Individuals

PROCEDURES

A. General Procedures

1. Patient Civil Rights Coordinator. The Hospital will designate at least one employee to coordinate its efforts to comply with and carry out the Company's responsibilities under Section 1557 of the Affordable Care Act, including the investigation of any complaint alleging noncompliance with Section 1557 or alleging any action that would be prohibited by Section 1557.
2. Notices and Written Materials. The Hospital will post the notices required by Section 1557. The types of notices and the locations of these notices are set forth in Appendix A of this policy. The notices will be available through Print Solutions.

B. Procedures for Effective Communication with Individuals with Limited English Proficiency

1. Admission. Prior to, but not later than at the time of admission, Attachment 1 ("I Speak" Language Identification Flashcard) of this policy will be provided to

patients who reasonably appear to require Language Assistance services.

2. Free Language Assistance Services. LEP Individuals will not be charged for Language Assistance Services.
3. Oral Interpretation. The Hospital will offer a Qualified Interpreter to an LEP Individual when oral interpretation is a reasonable step to provide meaningful access for that LEP Individual.
4. Qualified Translators. The Hospital will use a Qualified Translator when translating written content in paper or electronic form.
5. Restrictions on Who Can Be Interpreters.
 - a. The Hospital will not: require an individual with limited English proficiency to provide his or her own interpreter;
 - b. rely on an adult accompanying an LEP Individual to interpret or facilitate communication, except (a) in an emergency involving an imminent threat to the safety or welfare of a patient or member of the public where there is no Qualified Interpreter immediately available for the LEP Individual; or (b) where the LEP patient specifically requests that the accompanying adult interpret or facilitate communication, the accompanying adult agrees to provide such assistance, and reliance on that adult for such assistance is appropriate under the circumstances. The patient's request will be documented in the patient's medical record;
 - c. rely on a minor child to interpret or facilitate communication, except in an emergency involving an imminent threat to the safety or welfare of a patient or member of the public where there is no Qualified Interpreter immediately available for the LEP Individual;
 - d. rely on staff other than Qualified Bilingual/Multilingual staff to communicate directly with LEP Individuals; or
 - e. rely on other patients to be interpreters.
6. Video Remote Interpreting Services. If the Hospital provides a Qualified Interpreter for an LEP Individual through video remote interpreting services, the Hospital ensure that the quality is sufficient (i.e., clear images and audio).
7. Qualified Bilingual/Multilingual Staff. Qualified Bilingual/Multilingual Staff. Only employees who have met the requirements of the LSA Basic Healthcare Language Proficiency will be used as Qualified Bilingual/Multilingual interpreter.

C. Procedures for Effective Communication with Individuals with Disabilities

1. General Requirements. Reasonable attempts will be made upon admission to determine if a patient has a Disability and what types of Auxiliary Aids or Services may be necessary to ensure effective communication, including the patient's preferred method of communication. The type of auxiliary aid or service necessary to ensure effective communication will vary in accordance with the method of communication used by the patient; the nature, length, and complexity of the communication involved; and the context in which the communication is taking place. In determining what types of auxiliary aids and services are necessary, the Hospital will give primary consideration to the requests of patients with Disabilities. In order to be effective, auxiliary aids and services must be provided in accessible formats, in a timely manner, and in such a way as to protect the privacy and independence of the patient with a Disability. The patient's communication needs and preferences will be documented in the patient's medical record, as well as conspicuously displayed in the patient's room (i.e., whiteboard). A patient will not be coerced to either use language services or decline the use of language services available.
2. Restrictions on Who Interprets or Facilitates Communication with a Patient with Disabilities. The Hospital will not:
 - a. require an individual with a disability to bring another individual to interpret for him or her.
 - b. rely on an adult accompanying a patient with a Disability to interpret or facilitate communication except (i) in an emergency involving an imminent threat to the safety or welfare of the patient or member of the public where there is no interpreter available; or (ii) Where the patient with a Disability specifically requests that the accompanying adult interpret or facilitate communication, the accompanying adult agrees to provide such assistance, and reliance on that adult for such assistance is appropriate under the circumstances.
 - c. rely on a minor child to interpret or facilitate communication, except in an emergency involving an imminent threat to the safety or welfare of a patient or member of the public where there is no interpreter available.
3. Interpretation Services. The Company will contract with one or more third-party vendors to provide real-time language translation services at a reduced cost to the Company's facilities. Information regarding the third-party vendor will be available from the Company's Quality and Clinical Excellence Department. Options for other services include:
 - a. American Sign Language interpreter services (available through the third-party vendor).
 - b. Telecommunications device for the deaf (TDD): Each hospital will produce written documentation indicating where the TDD is located, how to operate it, and the telephone number. If a hospital does not have a TDD device, the

hospital can contact the State in which it is located to determine how to utilize the State's Relay Services (see Attachment 2).

- c. Depending upon the hospital's technological equipment, the hospital may choose to offer voice-to-text or video relay/remote interpretation. This service is offered through the third-party vendor.
4. Visually Impaired Patients. For patients with visual impairments, the Hospital will provide a reader, who may be a member of the staff, who will read out loud to the patient the content of any written material concerning benefits, services, waivers of rights, and consent to treat forms. When a reader is provided, the Hospital should have a witness to the reading of the documents and make a notation in the patient medical record regarding the materials that were read and witnessed. In the alternative, the Hospital may also provide large print, audio-recording and Braille materials. The Hospital must also have written documentation as to what aids are available, where they are located, and how they are used.
5. Speech Impaired Patients. The Hospital may use a combination of the methods above depending on the level and type of impairment. In any case, the hospital should have written documentation indicating what written materials, TDD and computers are available to facilitate communication with speech impaired persons.
6. Cognitive Disorder Procedures. For persons with cognitive disorders, including learning disabilities, a hospital will need to utilize various means, which would depend on the type and severity of the patient's disorder, to address special communication needs. Examples of access features for individuals with cognitive disorders may include, but are not limited to the following:
 - Provision of reading services and/or verbal service descriptions, upon request.
 - Depending upon the hospital's technological equipment, the hospital may offer voice-to-text or video relay/remote interpretation.
 - The hospital contacting a disability service organization (e.g., The ARC of the US, United Cerebral Palsy, Easter Seals, etc.).

D. **Accessibility Rights and Procedures**

1. General Requirements. All Company facilities must ensure that all of its programs and activities are accessible to and usable by persons with disabilities, including persons with impaired hearing and vision. Accessibility encompasses both physical access to the building and examination rooms or equipment, as well as programmatic access to Company services. Examples of access features for physical or environmental considerations may include, but not limited to, the following:
 - Convenient off-street parking designated for individuals with disabilities.
 - Curb cuts and ramps between parking areas and buildings.
 - Level access into first floor level with elevator access to all other floors.

- Accessible offices, bathrooms, public waiting areas, cafeterias, patient treatment areas, including examining rooms and patient areas.
 - A full range of assistive and communication aids provided to persons with impaired hearing, vision, speech, or manual skills without additional charge for such aids.
2. Readily Accessible. Generally, barriers to physical access (in existing facilities) shall be removed from a facility when "readily achievable." Readily achievable barrier removal or modification is that which is easily accomplishable and able to be carried out without much difficulty or expense. Examples of readily achievable barrier removal or modification are: ramping of a few steps, installations of wall grab bars where only minor structural modification of the wall is required, and the lowering of public telephones to accommodate wheelchair users and others. The Hospital is not required to make every part of the facility physically accessible to and usable by persons with disabilities. However, reasonable efforts will be made to do so. If the Hospital is unable to accommodate an individual with a disability, the facility must find an alternate provider(s) and refer the person to services that are accessible, with follow-up to assure the individuals' needs were properly met by the referral provider.
 3. Service Animals. Service animals are defined as dogs that are individually trained to do work or perform tasks for people with Disabilities. Examples of such work or tasks include guiding people who are visually impaired, alerting people who are hearing impaired, pulling a wheelchair, alerting and protecting a person who is having a seizure, reminding a person with mental illness to take prescribed medications, calming a person with Post Traumatic Stress Disorder (PTSD) during an anxiety attack, or performing other duties. Service animals are working animals, not pets. The work or task a dog has been trained to provide must be directly related to the person's Disability. Dogs whose sole function is to provide comfort or emotional support do not qualify as service animals under the ADA. However, some state and local laws also define service animal more broadly than the ADA does. Information about such laws can be obtained from the various states attorney general offices. Contact the Compliance Department or Legal Services with any questions relating to service animals.
 - a. Hospitals may ask if an animal is a service animal and ask what tasks the animal has been trained to perform, but cannot require special ID cards for the animal or ask about the patient's Disability.
 - b. Patients with disabilities who use service animals cannot be charged extra fees, isolated from other patrons, or treated less favorably than other patrons. However, if a hospital normally charges guests for damage that they cause, a patient or guest with a disability may be charged for damage caused by his or her service animal.
 - c. A patient with a Disability cannot be asked to remove his/her service animal from the premises unless: (1) the animal is out of control and the animal's owner does not take effective action to control it (for example, a dog that barks repeatedly and disturbs other patients), (2) the animal is not

clean or well-groomed such that it poses a health or safety risk, or (2) the animal poses a direct threat to the health or safety of others. The patient is also required to have full control of the animal at all times and responsible for feeding, bathing and walking (bathroom) the animal.

d. For more information, please see Attachment 3.

E. Complaint Process:

1. Who May File; Timing. Any person alleging patient discrimination on the basis of race, color, national origin, sex, age or disability may file a grievance with the Patient Civil Rights Coordinator within thirty (30) of the date the person filing the grievance becomes aware of the alleged discriminatory action. (Grievances may be filed by the patient, the patient's family member, or Personal Representative.)
2. Complaint in Writing. A complaint must be in writing, containing the name and address of the person filing it. The complaint must state the problem or action alleged to be discriminatory and the remedy or relief sought.
3. Review by the Patient Civil Rights Coordinator. The Patient Civil Rights Coordinator (or her/his designee) shall conduct an investigation of the complaint. This investigation may be informal, but it will be thorough, affording all interested persons an opportunity to submit evidence relevant to the complaint. The hospital Civil Rights Coordinator will maintain the files and records at the Hospital relating to such complaints. To the extent possible, and in accordance with applicable law, the Patient Civil Rights Coordinator will take appropriate steps to preserve the confidentiality of files and records relating to grievances and will share them only with those who have a need to know.
4. Written Decision. The Patient Civil Rights Coordinator will prepare a draft written decision on the complaint, based on a preponderance of the evidence, no later than thirty (30) days after its filing, including a notice to the complainant of their right to pursue further administrative or legal remedies. The draft will be reviewed and finalized by the Compliance Department within fifteen (15) days.
5. Appeal of Decision. The person filing the grievance may appeal the decision of the Patient Civil Rights Coordinator by writing to the Company's Chief Compliance Officer within fifteen (15) days of receiving the Patient Civil Rights Coordinator's decision. The Chief Compliance Officer shall issue a written decision in response to the appeal no later than thirty (30) days after its filing

GUIDELINES

n/a

REFERENCES

n/a

NOTES

Contact Person: Christopher T. Terrell, Deputy Chief Compliance Officer & Privacy Officer—chris.terrell@encompasshealth.com

APPENDIX A
Section 1557 Notice and Documentation Requirements

Under Section 1557 of the Affordable Care Act (ACA), covered entities are required to post notices of nondiscrimination and taglines that alert individuals with Limited English Proficiency (LEP) to the availability of language assistance services. The following chart summarizes these requirements

DOCUMENT	LOCATIONS	TAGLINES
Notice of Nondiscrimination (“Notice”) (Attached as Exhibit A)	<p>1. In significant publications and significant communications targeted to beneficiaries, enrollees, applicants, and members of the public, except for significant publications and significant communications that are small-sized, such as postcards and tri-fold brochures;</p> <p>2. In conspicuous physical locations where the entity interacts with the public; and</p> <p>3. In a conspicuous location on the Hospital’s Web site accessible from the home page of the Hospital’s Web site.</p>	<p>Top 15 languages spoken by LEP Individuals in the relevant state(s) (Sample tagline attached as Exhibit C; the top fifteen languages in the states served by the Company can be found in Appendix B)</p> <p>Note: While the Notice itself need only be in English, it does need to contain taglines in the relevant state(s) top 15 non-English languages.</p>
Statement of Nondiscrimination (“Statement”) (Attached as Exhibit B)	Significant Publications in small-sized format (e.g., postcards and tri-fold brochures)	Top two languages spoken by LEP Individuals in the relevant state (s)

APPENDIX B

Top Fifteen Languages by State

Alabama	Spanish Chinese Korean Vietnamese Arabic German French Gujarati Tagalog Hindi Laotian Russian Portuguese Turkish Japanese
Arizona	Spanish Navajo Chinese Vietnamese Arabic Tagalog Korean French German Russian Japanese Persian (Farsi) Syriac Serbo-Croatian Thai
Arkansas	Spanish Vietnamese Marshallese Chinese Laotian Tagalog Arabic German French Hmong Korean Portuguese Japanese Hindi Gujarati

<p>California</p>	<p>Spanish Chinese Vietnamese Tagalog Korean Armenian Persian (Farsi) Russian Japanese Arabic Panjabi Mon-Khmer, Cambodian Hmong Hindi Thai</p>
<p>Colorado</p>	<p>Spanish Vietnamese Chinese Korean Russian Amharic Arabic German French Nepali Tagalog Japanese Cushite Persian (Farsi) Kru (Bassa), Ibo, and Yoruba (Tied for 15th)</p>
<p>Delaware</p>	<p>Spanish Chinese French Creole (Haitian Creole) Gujarati French Korean Italian Vietnamese German Tagalog Hindi Urdu Arabic Telugu Dutch</p>
<p>Florida</p>	<p>Spanish French Creole (Haitian Creole) Vietnamese</p>

	Portuguese Chinese French Tagalog Russian Arabic Italian German Korean Polish Gujarati Thai
Georgia	Spanish Vietnamese Korean Chinese Gujarati French Amharic Hindi French Creole (Haitian Creole) Russian Arabic Portuguese Persian (Farsi) German Japanese
Illinois	Spanish Polish Chinese Korean Tagalog Arabic Russian Gujarati Urdu Vietnamese Italian Hindi French Greek German
Indiana	Spanish Chinese German Pennsylvanian Dutch Burmese Arabic Korean

	<p>Vietnamese French Japanese Dutch Tagalog Russian Panjabi Hindi</p>
Kansas	<p>Spanish Vietnamese Chinese German Korean Laotian Arabic Tagalog Burmese French Japanese Russian Hmong Persian (Farsi) Swahili</p>
Kentucky	<p>Spanish Chinese German Vietnamese Arabic Serbo-Croatian Japanese French Korean Pennsylvanian Dutch Nepali Cushite Russian Tagalog Bantu</p>
Louisiana	<p>Spanish French Vietnamese Chinese Arabic Tagalog Korean Portuguese Laotian Japanese Urdu</p>

	<p>German Persian (Farsi) Russian Thai</p>
Maine	<p>French Spanish Chinese Cushite Vietnamese Arabic Mon-Khmer, Cambodian Russian Tagalog German Korean Polish Japanese</p>
Maryland	<p>Spanish Chinese Korean Vietnamese French Tagalog Russian Amharic Kru (Bassa), Ibo, and Yoruba (tied for 9th) Urdu Persian (Farsi) French Creole (Haitian Creole) Portuguese Arabic Gujarati</p>
Massachusetts	<p>Spanish Portuguese Chinese French Creole (Haitian Creole) Vietnamese Russian Arabic Mon-Khmer, Cambodian French Italian Korean Greek Polish Hindi Gujarati</p>
Missouri	

	<p>Spanish Chinese Vietnamese Serbo-Croatian German Arabic Korean Russian French Tagalog Pennsylvanian Dutch Persian (Farsi) Cushite Portuguese Amharic</p>
Nevada	<p>Spanish Tagalog Chinese Korean Vietnamese Amharic Thai Japanese Arabic Russian French Persian (Farsi) Samoan German Ilocano</p>
New Hampshire	<p>Spanish French Chinese Nepali Vietnamese Portuguese Greek Arabic Serbo-Croatian Indonesian Korean Russian French Creole (Haitian Creole) Bantu Polish</p>
New Jersey	<p>Spanish Chinese Korean Portuguese</p>

	<p>Gujarati Polish Italian Arabic Tagalog Russian French Creole (Haitian Creole) Hindi Vietnamese French Urdu</p>
New Mexico	<p>Spanish Navajo Vietnamese German Chinese Arabic Korean Tagalog Japanese French Italian Russian Hindi Persian (Farsi) Thai</p>
North Carolina	<p>Spanish Chinese Vietnamese Korean French Arabic Hmong Russian Tagalog Gujarati Mon-Khmer, Cambodian German Hindi Laotian Japanese</p>
Ohio	<p>Spanish Chinese German Arabic Pennsylvanian Dutch Russian French Vietnamese</p>

	<p>Cushite Korean Italian Japanese Dutch Ukrainian Romanian</p>
Oklahoma	<p>Spanish Vietnamese Chinese Korean German Arabic Burmese Hmong Tagalog French Laotian Thai Urdu Cherokee Persian (Farsi)</p>
Pennsylvania	<p>Spanish Chinese Vietnamese Russian Pennsylvanian Dutch Korean Italian Arabic French German Gujarati Polish French Creole (Haitian Creole) Mon-Khmer, Cambodian Portuguese</p>
South Carolina	<p>Spanish Chinese Vietnamese Korean French Tagalog Russian German Gujarati Arabic Portuguese Japanese</p>

	Ukrainian Hindi Mon-Khmer, Cambodian
Tennessee	Spanish Arabic Chinese Vietnamese Korean French Laotian Amharic Gujarati Japanese Tagalog Hindi Russian Persian (Farsi)
Texas	Spanish Vietnamese Chinese Korean Arabic Urdu Tagalog French Hindi Persian (Farsi) German Gujarati Russian Japanese Laotian
Utah	Spanish Chinese Vietnamese Korean Navajo Nepali Tongan Serbo-Croatian Tagalog German Russian Arabic Mon-Khmer, Cambodian French Japanese
Virginia	

	<p>Spanish Korean Vietnamese Chinese Arabic Tagalog Persian (Farsi) Amharic Urdu French Russian Hindi German Bengali Kru (Bassa), Ibo, and Yoruba (tied for 15th)</p>
<p>West Virginia</p>	<p>Spanish Chinese French German Arabic Vietnamese Korean Japanese Tagalog Italian Thai Nepali Persian (Farsi) Russian Urdu</p>
<p>Puerto Rico</p>	<p>Spanish Chinese French Arabic Portuguese Italian German Hindi Catalonian Japanese Ukrainian Vietnamese Polish French Creole (Haitian Creole) Korean</p>

EXHIBIT A
Notice of Nondiscrimination

The Company complies with applicable Federal civil rights laws and does not discriminate on the basis of race, color, national origin, age, disability, or sex. The Company does not exclude people or treat them differently because of race, color, national origin, age, disability, or sex.

The Company:

- Provides free aids and services to people with disabilities to communicate effectively with us, such as:
 - Qualified sign language interpreters
 - Written information in other formats (large print, audio, accessible electronic formats, other formats)
- Provides free language services to people whose primary language is not English, such as:
 - Qualified interpreters
 - Information written in other languages

If you need these services, contact the Patient Civil Rights Coordinator.

If you believe that the Hospital has failed to provide these services or discriminated in another way on the basis of race, color, national origin, age, disability, or sex, you can file a grievance with: Patient Civil Rights Coordinator, 9001 Liberty Parkway, Birmingham, AL 35242; Phone: 1-800-765-4772 Extension 8148; Fax: (205) 970-4854; Email: patientcivilrightscoordinator@encompasshealth.com. You can file a grievance in person or by mail, fax, or email. If you need help filing a grievance, Patient Civil Rights Coordinator is available to help you.

You can also file a civil rights complaint with the U.S. Department of Health and Human Services, Office for Civil Rights, electronically through the Office for Civil Rights Complaint Portal, available at <https://ocrportal.hhs.gov/ocr/portal/lobby.jsf> , or by mail or phone at:

U.S. Department of Health and Human Services
200 Independence Avenue, SW
Room 509F, HHH Building
Washington, D.C. 20201
1-800-368-1019, 800-537-7697 (TDD)
Complaint forms are available at <http://www.hhs.gov/ocr/office/file/index.html>

EXHIBIT B
Statement of Nondiscrimination

The Company complies with applicable Federal civil rights laws and does not discriminate on the basis of race, color, national origin, age, disability, or sex.

EXHIBIT C
Sample Tagline in English and Spanish

ATTENTION: If you speak [insert language], language assistance services, free of charge, are available to you.

ATENCIÓN: si habla español, tiene a su disposición servicios gratuitos de asistencia lingüística. Llame al

New England Rehabilitation Hospital of Portland, a Joint Venture of Maine Medical Center and Encompass Health

Policy#: 438	Title: Financial Assistance (ME)	Category: Administration
Policy Status: Published	Effective Date: 08/19/2020	Last Reviewed Date: 11/16/2022

PURPOSE

This policy outlines the circumstances under which the hospital will provide free medically necessary care to eligible patients who are unable to pay for their care, as determined by the hospital in accordance with the eligibility criteria and other terms specified in this policy. Patients are expected to cooperate with the hospital's procedures for obtaining Financial Assistance, securing insurance or other forms of payment, and contributing to the cost of their care based on their ability to pay.

This policy applies to emergency or medically necessary care provided by the hospital. This policy does not apply to care that is not emergency or medically necessary care, including elective services or items that are solely for the comfort or convenience of a patient. This policy does not apply to care delivered by physicians or other healthcare providers who bill "privately" (separate from the hospital). (See Attachment A for additional information about physicians and other healthcare providers providing care within the hospital.)

Financial Assistance does not apply to amounts that are covered by insurance, governmental programs or other funding sources (which may include, but are not limited to, workers' compensation, automobile or other liability insurance, crime victims' compensation funds, and litigation recoveries). To be eligible for Financial Assistance, a patient is expected to apply for and comply with all processes related to seeking assistance from other insurers and/or third-party sources of payment (including all applicable governmental programs) as requested by hospital staff. Patients who are noncompliant or uncooperative in attempting to obtain insurance coverage, qualification under governmental programs, or payment from third-party sources will not be eligible for Financial Assistance.

A patient will be ineligible for Financial Assistance if the patient, or his or her representative, provides false information or falsified documentation of household size, income or other pertinent information.

Definitions

Covered Services – emergency or medically necessary care provided by the hospital. Covered Services do not include services that are not emergency or medically necessary care, or care that is provided by physicians or other healthcare providers who bill "privately."

Emergency or medically necessary care – services that are necessary and appropriate to sustain life or to prevent serious deterioration in the health of the patient from injury or disease. Medically necessary, for purposes of an inpatient stay, is defined as a CMS-13 qualifying condition.

Family – A family is a group of two or more persons related by birth, marriage or adoption who reside together and among whom there are legal responsibilities for support: all such related persons are considered as one family. (If a household includes more than one family and/or more than one related individual, the income guidelines are applied separately to each family and/or unrelated individual, and not to the household as a whole.)

Financial Assistance – reduction of an eligible patient's account balance for Covered Services under the terms of this policy.

Patient – the individual receiving medical treatment and/or, in the case of an unemancipated minor or other dependent, the parent, legal guardian or other person (guarantor) who is financially responsible for the patient.

Maine resident - an individual who has established Maine as a permanent home or an individual living in the state voluntarily with the intention of making a home in Maine. An individual who is visiting or is in Maine temporarily is not a resident. Proof of residency will be requested as part of the application process.

Uninsured – a patient who does not have health insurance coverage, is unable to obtain affordable coverage, and is ineligible for government healthcare programs or other third-party payment sources.

Underinsured – a patient who is not uninsured, but whose out-of-pocket medical expenses exceed his or her financial ability to pay.

POLICY

Subject to the terms of this policy, Financial Assistance is provided to eligible Maine residents who are uninsured or underinsured.

Eligibility for Financial Assistance is based on an individualized assessment by the hospital of a patient's financial need, generally determined by measuring the patient's gross family income against the Federal Poverty Guidelines as specified in the Financial Assistance Discount Guidelines in Attachment B, provided that the patient does not have other funding sources that could be used to pay for his or her care. The Financial Assistance Discount Guidelines are adjusted annually to reflect changes in the Federal Poverty Guidelines. If annual income is equal to or less than 150% of the federal poverty level, the applicant will receive 100% free care. If the annual income exceeds 150% of the federal poverty level, the applicant is responsible for 100% of unpaid medical services.

A patient determined to be eligible for Financial Assistance will not be billed more than the amount generally billed for emergency or other medically necessary care by hospital to individuals who have insurance covering such care. (See Attachment B for additional information about the "amount generally billed" limitation.)

If a patient is underinsured and is determined to be eligible for Financial Assistance, discounts will only apply to the balance due from the patient after insurance payments and other third-party payment sources have been applied to the account.

For purposes of this policy, "income" includes, but is not limited to, revenue from the following sources (before taxes):

- money wages and salaries before any deductions,
- net receipts from non-farm or farm self-employment (receipts from a person's own business or from an owned or rented farm after deductions for business or farm expenses);
- regular payments from social security, railroad retirement, unemployment compensation, workers' compensation, strike benefits from union funds, veterans' benefits;
- public assistance including Temporary Assistance to Needy Families, Supplemental Security Income, and General Assistance money payments;
- training stipends;
- alimony, child support, and military family allotments or other regular support from an absent family member or someone not living in the household;
- private pensions, government employee pensions, and regular insurance or annuity payments;
- dividends, interest, rents, royalties, or periodic receipts from estates or trusts; and
- net gambling or lottery winnings.

Income does not include the following:

- capital gains;
- any liquid assets, including withdrawals from a bank or proceeds from the sale of property;
- tax refunds;
- gifts, loans, and lump-sum inheritances;

- one-time insurance payment or other one-time compensation for injury;
- non-cash benefits such as the employer-paid or union paid portion of health insurance or other employee fringe benefits;
- the value of food and fuel produced and consumed on farms and the imputed value of rent from owner occupied non-farm or farm housing; and
- Federal non-cash benefit programs, including Medicare, Medicaid, Food Stamps, school lunches, and housing assistance.

Note: Although one-time insurance payments are excluded from income, one-time insurance payments made for coverage of hospital services would limit the availability of Financial Assistance to bills not covered by such payments.

To apply for Financial Assistance, a complete Financial Assistance Application is required. A complete Financial Assistance Application is inclusive of, but not limited to, disclosure of household size, employment information, income and other financial resources and supporting documents (such as recent tax returns and pay stubs), as detailed in the Financial Assistance Application. If documentation proving household income is not available, patients may call the hospital finance department at the phone number listed above to discuss other evidence demonstrating eligibility. Failure to provide the required information and documentation in a timely manner may result in ineligibility for Financial Assistance.

Complete Financial Assistance Applications should be submitted to the hospital at the address listed above. A hospital finance representative will review the application for completeness. Financial Assistance determinations must be approved by the Facility Controller, and in certain circumstances, by the hospital CEO. The hospital will notify patients in writing of the decision on their eligibility under this policy. If a patient has been determined qualified for Financial Assistance under this policy, the patient shall not be billed.

Hospital will allow the determination of qualification for outpatient Financial Assistance to remain valid for up to six months. A determination of qualification for inpatient Financial Assistance shall be made with each admission.

All patients will be offered a plain language summary of the Financial Assistance Policy during discharge or intake.

Billing statements will contain a written conspicuous notice informing patients about the availability of financial assistance, a telephone number where they may receive more information, as well as website address where the Financial Assistance Policy, application and plain language summary may be found.

Once a patient has been discharged and the patient's balance due has been determined, the Billing Office will mail the patient monthly account statements and make phone calls in an attempt to collect the outstanding balance. If no payment has been received for 120 days, the account may be sent to a third-party collection agency.

The hospital, and any third parties acting on its behalf, do not engage in extraordinary collection actions such as lawsuits, liens, foreclosures, wage garnishment or reporting adverse information to credit agencies. For additional information, please see the Billing and Collections Policy, which may be downloaded from hospital website. Copies are also available upon request, free of charge, by mail and in admitting/registration areas of the Hospital.

Copies of this policy, a plain language summary of this policy and the Financial Assistance Application are available free of charge upon request by writing to the address above. These documents can be found in the admitting/registration areas of the hospital and may also be downloaded at hospital's website.

Further information about this Financial Assistance Policy and assistance with the application process are available by calling Hospital Phone Number, or in person during normal business hours or by appointment from a hospital finance representative.

Nondiscrimination & emergency medical care

Hospital does not have a dedicated emergency department. The hospital will appraise emergencies, provide initial treatment, and refer or transfer an individual to another hospital/facility, when appropriate, without discrimination and without regard to whether the individual is eligible for Financial Assistance.

Hospital will not engage in actions that discourage individuals from seeking emergency medical care, such as demanding that an individual pay before receiving initial treatment for emergency medical conditions or permitting debt collection activities that interfere with hospital's appraisal and provision, without discrimination, of such initial treatment.

Notice of opportunity for a fair hearing

In accordance with 22 M.R.S.A. §1716, DHHS must grant the opportunity for a fair hearing regarding eligibility for Financial Assistance to:

- Any applicant who requests it because his or her claim for Financial Assistance is denied or not acted upon with reasonable promptness, or
- Any recipient of care who requests it because he or she believes the hospital has taken an action erroneously.

Procedure to request an administrative hearing

An applicant for Financial Assistance may request an Administrative hearing if he or she is aggrieved by the action that denies the request for Financial Assistance. The Department may respond to a series of individual requests for a hearing by conducting a single group hearing. The applicant must follow the procedures described in this Section when requesting an administrative hearing from DHHS.

- An Administrative Hearing may be requested by an applicant or his/her representative
- Unless otherwise specified in these rules, administrative hearings must be requested within sixty (60) days of the date of written notification to the applicant of the action the applicant wishes to appeal.
- Request must be made by the applicant or his/her representative, in writing or verbally, for a Hearing to the Administrative Hearings Unit, Department of Health and Human Services, 11 State House Station, Augusta, Maine 04333-0011. For the purposes of determining when a hearing was requested, the date of the fair hearing request shall be the date on which the request for a hearing is made is considered the date of request for the hearing. The Administrative Hearings Unit may also request that a verbal request for an administrative hearing be followed up in writing, but may not delay or deny a request on the basis that a written follow-up has not been received.
- The Hearing will be held in conformity with the Maine Administrative Procedure Act, 5 M.R.S.A. §8001 et seq. and the Department's Administrative Hearing Manual.
- The Hearing will be conducted at a time, date and place convenient to hospital and the claimant, and at least twenty (20) days preliminary notice will be given. In scheduling a hearing, there may be instances where the hearing officer shall schedule the hearing location near the claimant or by telephone or Interactive Television System.
- The Department, the hospital and the applicant may be represented by legal counsel and may have witnesses appear.
- When a medical assessment by a medical authority other than the one involved in the decision under question is requested by the hearings officer, the hospital or the applicant and considered necessary by the hearings officer, it will be obtained at the Department's expense, and forwarded to the applicant or the applicant's representative, the hospital or its representative, and hearing officer allowing all parties to comment.
- When the applicant or the hospital or a Department staff person requests a delay, the hearing officer may reschedule the hearing, after notice to all parties.
- The decisions, rendered by the hearing authority, in the name of DHHS, will be binding upon the Department, unless the Commissioner directs the hearing officer to make a proposed decision reserving final decision making authorization to him or herself.
- Any person who is dissatisfied with the hearing authority's decision has a right to judicial review under Maine Rules of Civil Procedure, Rule 80C.

Dismissal of administrative hearing requests

If any of the following circumstances exist, the Office of Administrative Hearings may dismiss the request for an administrative hearing.

- The claimant withdraws the request for a hearing.
- The claimant, without good cause, abandons the hearing by failing to appear.
- The sole issue being appealed is one of federal or state law requiring an automatic change adversely affecting some or all applicants for Financial Assistance.
- Where an applicant's request for an administrative hearing is dismissed, the Office of Administrative Hearings shall notify the individual of his or her right to appeal that decision in Superior Court.

Corrective action

The hospital must promptly make corrective action when appropriate, retroactive to the date an incorrect action was taken by the hospital if:

- The hearing decision is favorable to the applicant; or
- DHHS decides in the applicant's favor before the hearing.

Attachments

[Attachment A-ProviderListings-NERHP.pdf](#)

[Attachment B-Discout_Guidelines-NERHP.pdf](#)

Close

Attachment B – 2023 Financial Assistance Discount Guidelines

New England Rehabilitation Hospital of Portland, a Joint Venture of
Maine Medical Center and Encompass Health
335 Brighton Ave. Unit 201
Portland, ME 04102-2374
207.775.4000
ehc.rehab/NERHP-FA

2023 Family Income as a Percent of Federal Poverty Guidelines

Discount provided		100% discount
Family size	Federal poverty guidelines*	Income less than or equal to 150% of FPG
1	\$14,580	\$0 - \$21,870
2	\$19,720	\$0 - \$29,580
3	\$24,860	\$0 - \$37,290
4	\$30,000	\$0 - \$45,000
5	\$35,140	\$0 - \$52,710
6	\$40,280	\$0 - \$60,420
7	\$45,420	\$0 - \$68,130
8	\$50,560	\$0 - \$75,840

* For family units with more than 8 persons, add \$5,140 for each additional person.

Amounts charged to a patient eligible for Financial Assistance under this policy will be based on the applicable discount stated in the table above multiplied by the gross charges otherwise billable to the patient, subject to the “AGB” limitation described below.

In accordance with Internal Revenue Code section 501(r), a patient eligible for Financial Assistance under this policy will not be charged more than the amount generally billed to individuals who have insurance covering such care (“AGB”).

Facility has initially elected to calculate AGB under the “prospective Medicare method” described in applicable Treasury Regulations, using the billing and coding process the Facility would use if the individual were a Medicare fee-for-service beneficiary and setting AGB for the care at the amount the Facility determines would be the total amount Medicare would allow for the care (including both the amounts that would be reimbursed by Medicare and the amount the beneficiary would be personally responsible for paying in the form of co-payments, co-insurance, and deductibles).

Attachment I

IRF-PAI Quality Indicator and Credentialing Policy

N/A		
Policy#: 2	Title: IRF-PAI Quality Indicator Training and Credentialing	Department: Administration
Policy Status: Published	Effective Date: 2020-04-01	

PURPOSE

The hospital will implement a training and credentialing process that ensures staff can accurately complete the Quality Indicators sections of the Patient Assessment Instrument (PAI). This process shall encompass the following steps:

1. Establishing the Patient Assessment Standards Coordinator (PASC) as the QI Credentialing Coordinator
2. Conducting Quality Indicator (QI) training and credentialing
3. Tracking methodology for staff QI credentialing
4. Establishing qualifications for Patient Assessment Standards (PAS) Coordinators.

POLICY

I. Quality Indicator (QI) Training and Credentialing

1. The CEO of the hospital shall delegate the responsibility for the QI training process to the PAS Coordinator. PAS Coordinators must have a clinical background, in compliance with the Encompass Health PASC job description.
2. The PAS Coordinator, in working with hospital clinical leadership and the HRD, is responsible for ensuring that the hospital is credentialed within the 6-month established cycle of April 1 through October 1. The hospital is credentialed through UDS_{MR}® every 24 months.
3. All licensed clinicians who, within the scope of their license, are participating in the completion of the Quality Indicators on the IRF-PAI are required to complete QI training and credentialing. Attendance in a training session is required prior to taking the credentialing exam.
4. The hospital shall have at least one instructor (PAS Coordinator) and one back-up instructor (another hospital clinician) who will be responsible for training hospital staff in the Quality Indicators sections of the IRF-PAI. It is highly preferable to have nursing and

therapy disciplines trained in separate instructional sessions.

5. The PAS coordinator and all other instructors must pass the licensed QI credentialing exam with a minimum score of 90%. The PAS coordinator must complete all sessions of the UDS QI Webinar Series within 1 year of hire and prior to training other clinicians. A newly hired PASC or a clinician who transfers into the PASC role or serves in the PASC role in any capacity must attend a QI Training class and achieve a score of 90% on the credentialing exam prior to performing PASC duties independently.

6. All QI Training instructors are required to attend all sessions of the UDS QI Webinar Series annually.

7. The PAS Coordinator is responsible for the implementation of an effective training/credentialing program. This program is described below:

A. Each staff member should receive an adequate amount of QI instruction time to ensure proper training. This training can include any of the Encompass Health approved materials and the designated CMS and UDS_{MR}® training materials.

B. 100% of inpatient/bedside RN, LPN, PT, OT, SLP, PTA, and COTAs, as well as clinical department leaders, must be QI credentialed.

C. All full and part time nursing and therapy staff have 30 days from hire to pass the exam at 80%, and PRN employees will have 90 days to pass the exam with a score of at least 80%. The exam may be taken up to a maximum of four (4) times. The credentialing exam should be taken immediately after attending the QI Training session to achieve the best results. After the first failed attempt to achieve 80% or greater on his/her exam, remediation/reeducation is conducted by the PASC or trainer. The exam should be taken within one week of the first attempt. After the second failed attempt, the clinician must attend the next scheduled QI training session. If the clinician fails the third attempt, remediation/reeducation is conducted. The exam should be taken immediately after training. These guidelines should not interfere with the accomplishment of hospital credentialing by the credentialing deadline. If after the fourth and final attempt to pass the QI exam, an employee is unable to achieve a passing score of 80% or greater, the employee does not meet the requirements for his/her position. The employee may apply for another available position within the hospital for which he/she qualifies that does not require QI credentialing. If there is not another position available or he/she is not selected, employment may be terminated, and he/she is not eligible to reapply for 12 months. For new hospitals, staff must receive training in a timely manner to facilitate testing within the first 30 days of opening a new hospital or hiring new staff for full and part time employees or 90 days for PRN staff.

D. The Human Resources Director (HRD), working with the PAS Coordinator, will oversee the tracking process for staff credentialing.

E. The PAS Coordinator will review the UDS_{MR}® online reports for any areas with high error rates. If a clinician(s) is missing questions in specific areas, individual peer review may be considered.

II. UDS Test Submission

1. Individuals taking the credentialing exam must do so online and without any assistance unless required under the Americans With Disabilities Act (ADA). 2. The person testing may use the IRF-PAI manual and any other Encompass Health approved tools to assist during the test in compliance with UDS_{MR}® instructions.
2. Results are immediately available and should be printed and given to the PAS Coordinator and/or department supervisor.

III. Annual Education

The hospital shall use only the Encompass Health approved resources from CMS and UDS_{MR}® to provide for an annual education review of IRF-PAI and Encompass Health documentation practices for all clinical staff. . Required annual documentation training and review will be provided through Encompass Health's learning management system.

IV. Formal Tracking System

The hospital HRD will track compliance through PeopleSoft HR System.

V. Unlicensed Assistive Personnel: QI Training and testing is optional and can be provided by the PASC or nursing trainers. Although these staff members are not licensed/certified clinicians and do not count toward the credentialing of the hospital, testing can be provided through the UDS system to assess competency using the UAP key codes. The decision to test unlicensed staff should be made by hospital or regional leadership.

IV. Qualifications and training path for Patient Assessment Standards (PAS) Coordinators:

1. **Licensed or certified clinician with at least 1 year healthcare experience, as per PASC job description**
2. **Attend UDS QI Webinar Series within the 1st year functioning as PASC and annually thereafter**
3. **Pass the QI Credentialing exam with a minimum score of 90%**
4. **Attend UDS Boot Camp after 1st year functioning in PASC role but prior to 2nd anniversary**
5. **Attend UDS PPS Certification course after 2 years functioning in the PASC role but prior to 3rd anniversary**
6. **Achieve a minimum score of 85% on the PPS Certification exam**

References

IRF-PAI Manual: <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/IRF-Quality-Reporting/IRF-PAI-and-IRF-PAI-Manual>

Attachment J

Project will Have a Positive Relationship to Existing Providers

Encompass' proven experience documents that there will be no adverse impact to existing providers.

Encompass' Active Education of Physicians, Case Managers, and Caregivers Benefits all Providers

Encompass Health's Entry in the Market will Not Adversely Impact Existing IRFs

CBSA	Average IRF Occupancy 3 Years <u>Prior</u> to EH Entry	Average IRF Occupancy 3 Years <u>Post</u> EH Entry	Notes
Atlanta-Sandy Springs-Roswell GA	54%	64%	Encompass Health Rehabilitation Hospital of Newnan opened in 2014
Philadelphia-Camden-Wilmington PA-NJ-DE-MD	61%	61%	Encompass Health Rehabilitation Hospital of Middletown opened in 2014
Nashville-Davidson-Murfreesboro-Franklin TN	57%	64%	Encompass Health Rehabilitation Hospital of Franklin opened in 2015
Savannah GA	63%	64%	Encompass Health Rehabilitation Hospital of Savannah opened in 2015

Source: Medicare Cost Reports.

Notes: CBSA = Core-Based Statistical Area. Metropolitan and Micropolitan Statistical Areas are collectively referred to as Core-Based Statistical Areas and include at least one urbanized area (or cluster) plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties.

**Encompass Health's Entry in the Market will NOT Adversely Impact Nursing Homes,
Particularly Considering that IRFs and SNFs Provide Distinct Levels of Care**

**Encompass Health's Entry in the Market will Not Adversely Impact Nursing Homes
(Encompass Middletown is a Delaware Hospital – in a CON state)**

Calendar Year	Encompass Middletown Rehab Hospital (37 Beds)	Skilled Nursing Facilities' Occupancy Post-EH Opening			
		Broadmeadow (120 Beds)	Pinnacle (151 Beds)	Silver Lake (120 Beds)	Westminster Village (61 Beds)
2015	82.8%	93.4%	92.9%	96.4%	91.7%
2016	93.3%	98.4%	92.9%	95.3%	93.6%
2017	96.6%	93.7%	94.1%	93.1%	97.3%
2018	95.5%	93.4%	94.3%	94.6%	90.2%

Source: Medicare Cost Reports.

Note: Encompass Middletown Rehabilitation Hospital opened in 2014.

**Encompass Health's Entry in the Market will NOT Adversely Impact Nursing Homes,
Particularly Considering that IRFs and SNFs Provide Distinct Levels of Care**

**Encompass Health's Entry in the Market will Not Adversely Impact Nursing Homes
(Encompass Newnan is a Georgia Hospital – in a CON state)**

Calendar Year	Encompass Newnan Rehab Hospital (50 Beds)	Skilled Nursing Facilities' Occupancy Post-EH Opening		
		Ansley Park (66 Beds)	Newnan Health (77 Beds)	Avalon (90 Beds)
2015	47.3%	88.5%	92.8%	67.9%
2016	60.0%	89.9%	113.2%	78.5%
2017	66.8%	84.7%	115.1%	62.8%
2018	82.8%	85.7%	111.6%	87.7%

Source: Medicare Cost Reports.
 Notes: Encompass Newnan Rehabilitation Hospital opened in 2014.
 Newnan Health added 27 beds in 2016 to serve its growing patient population. For comparison purposes, occupancy is based on 77 beds, which is the number of beds prior to EH's facility opening.

Encompass Health’s Entry in the Market will NOT Adversely Impact Nursing Homes, Particularly Considering that IRFs and SNFs Provide Distinct Levels of Care

**Encompass Health’s Entry in the Market will Not Adversely Impact Nursing Homes
(Encompass Cumming is a Georgia Hospital – in a CON state)**

Calendar Year	Encompass Rehab Hospital of Cumming (50 Beds)	Skilled Nursing Facilities’ Occupancy Post-EH Opening			
		Cumming Health & Rehab (87 Beds)	Pruitt Health - Lanier (117 Beds)	Salude - the Art of Recovery (124 Beds)	Willowwood Healthcare and Rehabilitation (100 Beds)
2021	57.6%	62.9%	50.7%	27.7%	78.3%
2022	76.1%	65.6%	51.6%	47.6%	88.3%
2023	86.4%	71.7%	55.7%	48.5%	94.3%

Sources: Georgia Department of Community Health (DCH) Annual Nursing Home Questionnaire (ANHQ) Database updated 10/24/23 and Annual Hospital Questionnaire (AHQ) Database updated 6/30/23; and Encompass Rehab Hospital of Cumming 2023 internal data.
 Notes: Encompass Health Rehabilitation Hospital of Cumming opened 6/8/21. The facility's CY21 occupancy rate is based on the availability of IRF beds 207 days in that calendar year. 2023 shown is for YTD23 (Jan. 1 – Nov. 31).
 DCH ANHQ data are reported on a state Fiscal Year (July-June) basis; the AHQ data are reported on a Calendar Year (Jan-Dec) basis.

Encompass Health’s Entry in the Market will NOT Adversely Impact Nursing Homes, Particularly Considering that IRFs and SNFs Provide Distinct Levels of Care

**Encompass Health’s Entry in the Market will Not Adversely Impact Nursing Homes
(Encompass Aldie is a Virginia Hospital – in a CON state)**

Calendar Year	Encompass Aldie Rehab Hospital (60 Beds)	Skilled Nursing Facilities’ Occupancy Post-EH Opening				
		Leesburg HC (164 Beds)	Ashby Ponds (44 Beds)	Falcons Landing (60 Beds)	Potomac Falls (150 Beds)	Gainesville Health (120 Beds)
2015	87.7%	89.8%	73.5%	90.2%	95.6%	94.6%
2016	89.8%	90.5%	90.5%	88.2%	94.8%	93.4%
2017	83.5%	87.7%	94.4%	89.2%	93.7%	91.9%
2018	87.0%	89.1%	96.4%	85.2%	95.3%	91.5%

Source: Medicare Cost Reports.
 Note: Encompass Aldie Rehabilitation Hospital opened in 2014.