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# Technical Expert Panel Summary Report: Development of Functional Outcome Quality Measures for Long-Term Care Hospitals (LTCHs)

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TECHNICAL EXPERT PANEL SUMMARY REPORT:  
DEVELOPMENT OF FUNCTIONAL OUTCOME QUALITY MEASURES FOR  
LONG-TERM CARE HOSPITALS (LTCHs)

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## **SECTION 1. INTRODUCTION AND OVERVIEW**

### **1.1 Introduction**

RTI International, on behalf of the Centers for Medicare & Medicaid Services (CMS), convened a Technical Expert Panel (TEP) to seek expert input on the development of Functional Outcome Measures for Long-Term Care Hospitals (LTCHs). This all-day, in-person TEP meeting was held on August 19, 2019, in Baltimore, MD.

This report provides a summary of the TEP proceedings, detailing key issues related to measure development and TEP discussion around those issues. In this section of the report, we provide a summary of the background, the process for the TEP meetings, and the organization of the TEP report.

### **1.2 Background**

CMS has contracted with RTI to develop Functional Outcome Measures for LTCHs. The contract name is Development and Maintenance of Symptom Management Measures (contract number HHSM-500-2013-13015I). As part of its measure development process, CMS asks measure developers to convene groups of stakeholders and experts who contribute direction and thoughtful input to the measure contractor during quality measure development and maintenance.

The purpose of the contract, Development and Maintenance of Symptom Management Measures, is to develop quality measures reflective of quality of care for post-acute care (PAC) settings, which could be used to support CMS quality missions. Care settings included in this measure development project are LTCHs, skilled nursing facilities (SNFs), and inpatient rehabilitation facilities (IRFs). Quality measures will be developed consistent with the Meaningful Measures initiative.

The objectives of the TEP meeting were:

- To obtain input on functional outcome quality measures that may be used in Long-Term Care Hospitals (LTCHs).
- To examine the following potential measures:
  - Functional Outcome Measure: Change in Mobility Score
  - Functional Outcome Measure: Discharge Mobility Score
- To specify the target population(s), including the inclusion and exclusion criteria
- To identify the risk adjustment variables and the approach for risk adjustment

### 1.3 Process of TEP Meeting

#### 1.3.1 TEP Nomination Process

On May 10, 2019, a “Call for TEP Members” and a “TEP Nomination Form” were posted on the CMS Measures Management System website (<https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/MMS/Technical-Expert-Panels.html>) to recruit TEP members. The TEP nomination opportunity period was 20 days (May 10, 2019 to June 4, 2019). Information about the opportunity to participate as a TEP member was also disseminated to national provider and professional associations, measure development experts, patient advocacy groups, potential consumer/patient representatives, and other stakeholder organizations.

After the nomination period, RTI finalized the TEP composition by selecting 11 nominees who offered a variety of clinical, research, and policy expertise in LTCH settings, and knowledge of functional outcomes. The selected TEP members offered a variety of perspectives related to quality improvement, patient outcomes, research methodology, data collection and implementation. One TEP member was chosen to provide consumer perspective. Another TEP member represented the health information technology perspective. *Table 1* lists the TEP members.

**Table 1**  
**Members of the TEP on the development of functional outcome quality measures for LTCHs**

Name	Professional role	Location
Heather Asthagiri, MD	Director of PM&R Consults Service, University of Virginia	Charlottesville, VA
Amanda Dawson, MA, PhD	VP Research, Select Medical	Mechanicsburg, PA
Jean DeLeon, MD	Professor in Physical Medicine and Rehabilitation and Medical Director of Wound Care, University of Texas Southwestern Medical Center	Dallas, TX
Dawn DeVries, DHA, MPA, CTRS	Consumer perspective  Associate Professor and Program Chair, Grand Valley State University  American Therapeutic Recreation Association (ATRA)	Grand Rapids, MI

(continued)

**Table 1 (continued)**  
**Members of the TEP on the development of functional outcome quality measures for LTCHs**

Name	Professional role	Location
Caitlin Gillooley, MS	Senior Associate Director, Policy, American Hospital Association	Washington, DC
Ronald “Bud” Langham, PT, MBA	Chief Clinical Officer, Encompass Health	Dallas, TX
Cres Morta, PT	Manager, Rehabilitation Services RML Specialty Hospital	Chicago, IL
Carrie O'Connell, RN, BSN	Health information technology perspective EVP of Clinical Informatics, Wellsky Healthcare Software	Harrington Park, NJ
William Reilly, MS, OTR/L	Director of Inpatient Rehabilitation, Spaulding Hospital for Continuing Medical Care and Spaulding Nursing and Therapy Center	Cambridge, MA
	American Occupational Therapy Association (AOTA)	
Jim Smith, PT, Professor of Physical Therapy	Utica College, Utica, NY	Utica, NY
Margaret Stuart, PT, DPT, NCS	Director of Clinical Services Texas NeuroRehab Center	Austin, TX
	National Association of Long-Term Hospitals (NALTH)	

### 1.3.2 TEP Meeting

The all-day, in-person TEP meeting took place in Baltimore, Maryland, on August 19, 2019 (see *Appendix A* for meeting agenda). The 11 selected TEP members attended the meeting, in addition to CMS staff, and RTI staff. Discussions were facilitated by the RTI staff, including Anne Deutsch, Terry Eng, Lauren Palmer, Tri Le and Amol Karmarkar. The following key topics were covered: (1) the LTCH Quality Reporting Program (QRP) and the IMPACT Act (2) the existing post-acute care functional outcome measures, (3) an environmental scan, (4) reliability and validity results of the existing mobility data elements, scales and quality measures, (5) exclusion criteria, and (6) risk adjustors including primary diagnosis, admission assessment data, and frailty. During the meeting, there were active discussions related to the specifications

of the quality measures. The meeting was audio recorded for the purpose of summarizing TEP proceedings in this report.

#### **1.4 Organization of the Report**

The following sections of the report discuss the conceptualization of measures and specifications proposed to the TEP and summarize the feedback obtained from TEP members during the meeting. *Section 2* summarizes CMS's existing functional outcome quality measures, *Section 3* reports the reliability and validity results of the existing scales and quality measures, *Section 4* summarizes the environmental scan findings, *Section 5* focuses on the exclusion criteria, and *Section 6* focuses on candidate risk adjustors and the risk adjustment methodology.

## **SECTION 2. BACKGROUND**

### **2.1 Long-Term Care Hospitals**

LTCHs provide health services to patients who are chronically critically ill, including those who develop persistent respiratory failure requiring prolonged mechanical ventilation. Utilization of LTCHs has increased in the last 20 years owing to the increased survival of patients following a critical illness or injury, the aging population, and acute care reimbursement models that incentivize shorter acute care stays. In calendar year 2017, there were 414 LTCHs providing care for 161,886 patient stays. The average length of stay in an LTCH is 27.0 days and the average Medicare cost per case in 2017 was \$38,253.

Many LTCH patients have functional limitations and are at high risk for functional decline during the LTCH stay. In addition to having complex medical care needs for an extended period, LTCH patients often have limitations in functioning because of the nature of their conditions, as well as deconditioning due to prolonged bed rest and treatment requirements (e.g., ventilator use). These patients are therefore at high risk for functional deterioration that is both condition-related and iatrogenic (i.e., related to medical treatment).

### **2.2 The LTCH Quality Reporting Program**

Section 3004(a) of the *Affordable Care Act of 2010* amended section 1886(m)(5) of the Social Security Act requiring the Secretary to establish quality reporting requirements for LTCHs. Under the LTCH QRP, CMS requires Medicare-certified LTCHs to submit quality data. This requirement applies to all patients receiving inpatient services in a facility certified as a hospital and designated as an LTCH under Medicare.

For fiscal year (FY) 2014, and each year after, if an LTCH does not submit the required quality data, the LTCH will be subject to a 2-percentage-point reduction in the applicable fiscal year (FY) annual payment update.

The LTCH QRP includes 15 quality measures, including 8 assessment-based measures with data collected using the LTCH Continuity Assessment Record and Evaluation (CARE) Data Set (LCDS), 4 Centers for Disease Control and Prevention (CDC) measures with data collected through the CDC's National Healthcare Safety Network (NHSN), and 3 Medicare Fee-For-Service claims-based measures.

One of the LTCH QRP assessment-based quality measures is the "Change in Mobility for Patients Requiring Ventilator Support." This measure was adopted in the LTCH QRP pursuant to Section 1206(c) of Division B of Public Law 113-67, the *Pathway to SGR Reform Act of 2013*, which amended section 1886(m)(5)(D) of the *Social Security Act* to add a new clause (iv) requiring the Secretary to establish by no later than October 1, 2015, "a functional status quality measure for change in mobility among inpatients requiring ventilator support."

## **2.3 Meaningful Measures**

The CMS Meaningful Measures framework identifies the highest priorities for quality measurement and improvement, and involves only assessing those core issues that are the most critical to providing high-quality care and improving individual outcomes. The Meaningful Measure Areas serve as the connectors between CMS strategic goals and individual measures/initiatives that demonstrate how high-quality outcomes for beneficiaries are being achieved. They are concrete quality topics, which reflect core issues that are most vital to high quality care and better patient outcomes. Each of these Meaningful Measure Areas helps to make the connection to specific CMS strategic goals such as “Empower patients and doctors to make decisions about their health care” and “Support innovative approaches to improve quality, safety, accessibility, and affordability” through depicting core issues that are broader than a given individual measure.

## **2.4 Improving Medicare Post-Acute Care Transformation (IMPACT) Act of 2014**

The *Improving Medicare Post-Acute Care Transformation Act of 2014* requires post-acute care providers, including LTCHs, IRFs, SNFs, and HHAs, to submit standardized patient assessment data and quality measure data to CMS. Providers must submit the standardized assessment data through PAC assessment instruments under applicable reporting provisions. The data categories are Functional status, Cognitive function and mental status, Special services, treatments, and interventions, Medical conditions and co-morbidities, Impairments, Other categories required by the Secretary. Quality measures data, and data on resource use are analyzed and there is public reporting of provider performance (quality of care) data.

The standardized patient assessment data submitted by post-acute care providers will enable monitoring of quality care that can improve patient outcomes; comparison of quality and data across post-acute care settings; person-centered and goals-driven discharge planning; exchangeability of data; and coordinated care.

## SECTION 3. EXISTING POST-ACUTE CARE FUNCTIONAL OUTCOME MEASURES

### 3.1 Existing CMS Functional Outcome Measures

Because the LTCH functional outcome measures are to be aligned with the existing IRF functional outcome measures, the measure developer reviewed the following CMS quality measures that are currently adopted in the LTCH and IRF QRPs:

- Long-Term Care Hospital (LTCH) Functional Outcome Measure: Change in Mobility Among Patients Requiring Ventilator Support (NQF #2632)
- Inpatient Rehabilitation Facility (IRF) Functional Outcome Measure: Change in Self-Care Score for Medical Rehabilitation Patients (NQF #2633)
- Inpatient Rehabilitation Facility (IRF) Functional Outcome Measure: Change in Mobility Score for Medical Rehabilitation Patients (NQF #2634)
- Inpatient Rehabilitation Facility (IRF) Functional Outcome Measure: Discharge Self-Care Score for Medical Rehabilitation Patients (NQF #2635)
- Inpatient Rehabilitation Facility (IRF) Functional Outcome Measure: Discharge Mobility Score for Medical Rehabilitation Patients (NQF #2636)

The functional assessment data elements (i.e., items) used to calculate the one LTCH and four IRF function quality measures are originally from the CARE Item Set. The CARE Item Set was developed and tested as part of the Post-Acute Care Payment Reform Demonstration. The CARE Item Set was designed to standardize assessment of patients and residents' status across acute and post-acute settings, including IRFs, LTCHs, SNFs, and HHAs.

The self-care and mobility data elements on the CARE Item Set include daily activities that clinicians typically assess at the time of admission and/or at discharge to determine patient and resident needs, evaluate patient progress, and prepare patients, residents, and their families for a transition to home or another setting.

The measure developer noted that the World Health Organization's (WHO) International Classification of Functioning, Disability, and Health (ICF) provides a standard language and framework for describing health and health-related states to describe changes in body function and structure (<https://www.who.int/classifications/icf/en/>). Within the ICF, *functioning* is an umbrella term that refers to all body functions and structure, activities and participation, and *disability* is a global term that refers to impairments, activity limitations and participation restrictions. The data elements used to calculate the function quality measures focus on activity limitations, which may occur as a consequence of an impairment and can be described in terms of a person's functional abilities or the nature and extent of function at the individual level. For example, activity limitations at the level of the person could include bathing, dressing, communicating, walking, or grooming.

The development of the CARE Item Set and a description and rationale for each data element is described in a report titled *The Development and Testing of the Continuity Assessment Record and Evaluation (CARE) Item Set: Final Report on the Development of the CARE Item Set: Volume 1 of 3*. Reliability and validity testing conducted as part of the Post-Acute Care Payment Reform Demonstration found the functional status data elements to have acceptable reliability and validity in the acute and post-acute patient populations. A description of the testing methodology and results are available in several reports, available at <http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Post-Acute-Care-Quality-Initiatives/CARE-Item-Set-and-B-CARE.html>.

The measure development contractor noted that CMS has adopted these self-care and mobility data elements and function quality measures in the IRF, LTCH, SNF, and HHA QRPs. For example, currently the LTCH Quality Reporting Program has adopted one cross-setting process quality measure, one LTCH-specific process quality measure, and one outcome quality measure. The IRF Quality Reporting Program has adopted one cross-setting process quality measure and four outcome quality measures. The specific quality measures adopted in each of the post-acute care QRPs are as follows:

#### LTCH Quality Reporting Program:

- An Application of Percent of Long-Term Care Hospital Patients with an Admission and Discharge Functional Assessment and a Care Plan That Addresses Function (NQF #2631)
- Percent of Long-Term Care Hospital Patients with an Admission and Discharge Functional Assessment and a Care Plan That Addresses Function (NQF #2631)
- Long-Term Care Hospital Functional Outcome Measure: Change in Mobility Among Patients Requiring Ventilator Support (NQF #2632)

#### IRF Quality Reporting Program:

- An Application of Percent of Long-Term Care Hospital Patients with an Admission and Discharge Functional Assessment and a Care Plan That Addresses Function (NQF #2631)
- Inpatient Rehabilitation Facility (IRF) Functional Outcome Measure: Change in Self-Care Score for Medical Rehabilitation Patients (NQF #2633)
- Inpatient Rehabilitation Facility (IRF) Functional Outcome Measure: Change in Mobility Score for Medical Rehabilitation Patients (NQF #2634)
- Inpatient Rehabilitation Facility (IRF) Functional Outcome Measure: Discharge Self-Care Score for Medical Rehabilitation Patients (NQF #2635)
- Inpatient Rehabilitation Facility (IRF) Functional Outcome Measure: Discharge Mobility Score for Medical Rehabilitation Patients (NQF #2636)

#### SNF Quality Reporting Program:

- An Application of Percent of Long-Term Care Hospital Patients with an Admission and Discharge Functional Assessment and a Care Plan That Addresses Function (NQF #2631)
- An Application of IRF Functional Outcome Measure: Change in Self-Care Score for Medical Rehabilitation Patients (NQF #2633)
- An Application of IRF Functional Outcome Measure: Change in Mobility Score for Medical Rehabilitation Patients (NQF #2634)
- An Application of IRF Functional Outcome Measure: Discharge Self-Care Score for Medical Rehabilitation Patients (NQF #2635)
- An Application of IRF Functional Outcome Measure: Discharge Mobility Score for Medical Rehabilitation Patients (NQF #2636)

#### HH Quality Reporting Program:

- An Application of Percent of Long-Term Care Hospital Patients with an Admission and Discharge Functional Assessment and a Care Plan That Addresses Function (NQF #2631)

#### **3.1.1 Self-Care and Mobility Data Elements**

The measure developer reviewed *Table 2*, which lists the self-care and mobility data elements included in Section GG of the LTCH CARE Data Set version 4.00 (effective July 1, 2018), IRF Patient Assessment Instrument (IRF-PAI) version 2.0 (effective October 1, 2018), Minimum Data Set (MDS) 3.0 version 1.16.0 (effective October 1, 2018), and Outcome and Assessment Information Set (OASIS-D) (effective January 1, 2019).

The data elements included in the cross-setting function quality measure, an Application of Percent of Long-Term Care Hospital Patients with an Admission and Discharge Functional Assessment and a Care Plan that Addresses Function (NQF #2631), are marked with an asterisk. This cross-setting function quality measure, adopted into all four post-acute care QRPs, was adopted in the QRPs to meet the requirements of the *Improving Medicare Post-Acute Care Transformation (IMPACT) Act of 2014*. The additional self-care and mobility data elements are required to calculate other function quality measures and/or were adopted as Standardized Patient Assessment Data Elements in the quality reporting programs. For example, the additional items “Shower/bathe self,” “Upper body dressing,” “Lower body dressing,” and “Putting on/taking off footwear,” are included on the IRF-PAI and MDS 3.0, and are required to calculate the quality measures Change in Self-Care Score (NQF #2633) and Discharge Self-Care Score (NQF #2635).

The measure developer noted that in the FY 2020 IPPS/LTCH PPS final rule (84 FR 42524 through 42590), available at <https://www.govinfo.gov/content/pkg/FR-2019-08-16/pdf/2019->

[16762.pdf](#), CMS finalized the adoption of the 6 remaining mobility data elements in the LTCH QRP as Standardized Patient Assessment Data Elements with data collection starting in 2020.

**Table 2**  
**Self-care and mobility items included in Section GG of the IRF-PAI, MDS 3.0, LTCH CARE data set**

Data element identifier	Data element label	Long-Term Care Hospital CARE Data Set Version 4.00 July 2018	Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI) Version 2.0 Oct 2018	Minimum Data Set (MDS) 3.0 Version 1.16.0 Oct 2018	Outcome and Assessment Information Set (OASIS-D) Jan 2019
<b>SELF-CARE GG0130</b>					
GG0130A	Eating*	✓	✓	✓	✓
GG0130B	Oral hygiene*	✓	✓	✓	✓
GG0130C	Toileting hygiene*	✓	✓	✓	✓
GG0130D	Wash upper body	✓	—	—	—
GG0130E	Shower/bathe self	—	✓	✓	✓
GG0130F	Upper body dressing	—	✓	✓	✓
GG0130G	Lower body dressing	—	✓	✓	✓
GG0130H	Putting on/taking off footwear	—	✓	✓	✓
<b>MOBILITY GG0170</b>					
GG0170A	Roll left and right	✓	✓	✓	✓
GG0170B	Sit to lying*	✓	✓	✓	✓
GG0170C	Lying to sitting on side of bed*	✓	✓	✓	✓
GG0170D	Sit to stand*	✓	✓	✓	✓
GG0170E	Chair/bed-to-chair transfer*	✓	✓	✓	✓
GG0170F	Toilet transfer*	✓	✓	✓	✓
GG0170G	Car transfer	—	✓	✓	✓
GG0170I	Walk 10 feet	✓	✓	✓	✓
GG0170J	Walk 50 feet with two turns*	✓	✓	✓	✓
GG0170K	Walk 150 feet*	✓	✓	✓	✓

(continued)

**Table 2 (continued)**  
**Self-care and mobility items included in Section GG of the IRF-PAI, MDS 3.0, LTCH CARE data set**

Data element identifier	Data element label	Long-Term Care Hospital CARE Data Set Version 4.00 July 2018	Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI) Version 2.0 Oct 2018	Minimum Data Set (MDS) 3.0 Version 1.16.0 Oct 2018	Outcome and Assessment Information Set (OASIS-D) Jan 2019
GG0170L	Walking 10 feet on uneven surface	—	✓	✓	✓
GG0170M	1 step (curb)	—	✓	✓	✓
GG0170N	4 steps	—	✓	✓	✓
GG0170O	12 steps	—	✓	✓	✓
GG0170P	Picking up object	—	✓	✓	✓
GG0170Q	Does the patient/resident use a wheelchair and/or scooter?*	✓	✓	✓	✓
GG0170R	Wheel 50 feet with two turns*	✓	✓	✓	✓
GG0170RR	Indicate the type of wheelchair or scooter used.*	✓	✓	✓	✓
GG0170S	Wheel 150 feet*	✓	✓	✓	✓
GG0170SS	Indicate the type of wheelchair or scooter used.*	✓	✓	✓	✓

NOTES:

✓ Item is included in the assessment instrument.

— Item is not included in the assessment instrument

\* Data elements included in the quality measure Application of Percent of Long-Term Care Hospital Patients with an Admission and Discharge Functional Assessment and a Care Plan that Addresses Function (NQF #2631).

**3.1.2 Risk Adjustors for the Existing LTCH and IRF Change in Mobility Measures**

Prior to reviewing the risk adjustors for the functional outcome measures, the measure developer noted that patients treated in LTCHs and those treated in IRFs vary in terms of primary diagnosis, demographic characteristics, and coexisting conditions, and patients may have different expected improvement in function on the basis of these factors. Therefore, the functional outcome measures are risk-adjusted. Risk adjustment controls for specific patient

characteristics (e.g., age or diagnosis) that may affect patients' outcomes so that facility data may be compared.

The risk adjustors for the LTCH and IRF change in mobility measures were reviewed with TEP members and are shown in *Table 3* and *Table 4*.

**Table 3**  
**Intercept and risk-adjustor definitions and covariate values for the change in mobility among patients requiring ventilator support measure (NQF #2632)**

Risk adjustor	Category	LTCH CARE data set coding and recoding	Intercept and coefficients for NQF #2632 All values have 4 decimal places
Model Intercept	—	—	12.6294
Age Group	<55 years	Truncate (A0220 – A0900) = age; If age < 55 years = 1; else = 0	2.9821
Age Group	55–64 years	Truncate (A0220 – A0900) = age; If age 55-64 years = 1; else = 0	2.1077
Age Group	65–74 years (reference category)	Truncate (A0220 – A0900) = age; If age 65-74 years = 1; else = 0	—
Age Group	75–84 years	Truncate (A0220 – A0900) = age; If age 75-84 years = 1; else = 0	-1.6863
Age Group	85+ years	Truncate (A0220 – A0900) = age; If age >= 85 years = 1; else = 0	-3.3091
Communication Impairment	Moderate to Severe	= [1] (Yes) if BB0700 (Expression of ideas and wants) = [1, 2] or [1] (Yes) if BB0800 (Understanding verbal content) = [1, 2] Else = [0] (No)	-1.9412
Prior functioning: indoor ambulation	Dependent	= [1] (Yes) if GG0100B = [1] (Dependent) Else = [0] (No)	-4.2700
Prior functioning: indoor ambulation	Some help	= [1] (Yes) if GG0100B = [2] (Needed some help) Else = [0] (No)	-1.9684
Prior Device Use	Manual Wheelchair or Motorized and/or Scooter	= [1] (Yes) if GG0110A (Manual wheelchair) = [1] or GG0110B (Motorized wheelchair or scooter) = [1] Else = [0] (No)	-2.0660
Prior Device Use	Mechanical Lift	= [1] (Yes) if GG0110C (Mechanical lift) = [1] Else = [0] (No)	-2.4056

(continued)

**Table 3 (continued)**  
**Intercept and risk-adjustor definitions and covariate values for the change in mobility**  
**among patients requiring ventilator support measure (NQF #2632)**

Risk adjustor	Category	LTCH CARE data set coding and recoding	Intercept and coefficients for NQF #2632 All values have 4 decimal places
Primary Medical Condition Category	Chronic respiratory condition	= [1] (Yes) if I0050 = [2] Else = [0] (No)	-2.2277
Primary Medical Condition Category	Acute onset and chronic respiratory conditions	= [1] (Yes) if I0050 = [3] Else = [0] (No)	-0.5331
Primary Medical Condition Category	Chronic cardiac condition	= [1] (Yes) if I0050 = [4] Else = [0] (No)	-1.2701
Primary Medical Condition Category	Other medical condition	= [1] (Yes) if I0050 = [5] Else = [0] (No)	-0.8384
Stage 3, 4, or unstageable pressure ulcer/injury	Presence	= [1] (Yes) if ([M0300C1 (Number of stage 3 pressure ulcers) > 0] or [M0300D1 (Number of stage 4 pressure ulcers) > 0] or [M0300E1 (Number of unstageable pressure ulcers due to non-removable dressing/device) > 0] or [M0300F1 (Number of unstageable pressure ulcers due to coverage of wound bed by slough and/or eschar) > 0] or [M0300G1 ((Number of unstageable pressure ulcers with suspected deep tissue injury in evolution) > 0]) Else = [0] (No)	-1.7629
Comorbidities	Severe and Metastatic Cancers	= [1] (Yes) if I0103 = [1] or I0104 = [1] Else = [0] (No)	-0.1293
Comorbidities	Dialysis and Chronic Kidney Disease, Stage 5	= [1] (Yes) if O0100J = [1] or I1501 = [1] Else = [0] (No)	-0.6848
Comorbidities	Diabetes Mellitus (DM)	= [1] (Yes) if I2900 = [1] Else = [0] (No)	-0.5808
Comorbidities	Major Lower Limb Amputation	= [1] (Yes) if I4100 = [1] Else = [0] (No)	-1.7373
Comorbidities	Stroke, Hemiplegia or Hemiparesis	= [1] (Yes) if I4501 = [1] or I4900 = [1] Else = [0] (No)	-3.5778
Comorbidities	Dementia	= [1] (Yes) if I4801 = [1] Else = [0] (No)	-1.3576
Comorbidities	Paraplegia, Incomplete Tetraplegia, Other Spinal Cord Disorder/Injury	= [1] (Yes) if I5000 = [1] or I5102 = [1] or I5110 = [1] Else = [0] (No)	-5.3440

SOURCE: RTI analysis of LTCH CARE Data Set, July 2016 – March 2018. (Program reference: 2632\_03).

**Table 4**  
**Intercept and risk-adjustor definitions and covariate values for the change in mobility measure (NQF #2634)**

Risk adjustor	Risk adjustor category	IRF-PAI item(s) and recoding	Intercept and coefficients for change in mobility (NQF #2634) All values have 4 decimal places
Intercept	—	—	33.9674
Age Group	<35 years	Truncate (Item 12 – Item 6) = age; If age <35 years = 1; else = 0	-1.0232
Age Group	35–44 years	Truncate (Item 12 – Item 6) = age; If age 35–44 years = 1; else = 0	-0.6223
Age Group	45–54 years	Truncate (Item 12 – Item 6) = age; If age 45–54 years = 1; else = 0	0.3772
Age group	55–64 years	Truncate (Item 12 – Item 6) = age; If age 55–64 years = 1; else = 0	-0.0486
Age Group	75–84 years	Truncate (Item 12 – Item 6) = age; If age 75–84 years = 1; else = 0	-1.1907
Age Group	85–90 years	Truncate (Item 12 – Item 6) = age; If age 85–90 years = 1; else = 0	-2.7306
Age Group	>90 years	Truncate (Item 12 – Item 6) = age; If age >90 years = 1; else = 0	-4.5621
Admission Mobility - continuous form	Admission Mobility - continuous form	Admission Mobility Score = (GG0170A1 + GG0170B1 + GG0170C1 + GG0170D1 + GG0170E1 + GG0170F1 + GG0170G1 + GG0170I1 + GG0170J1 + GG0170K1 + GG0170L1 + GG0170M1 + GG0170N1 + GG0170O1 + GG0170P1)	0.8718
Admission Mobility - squared form	Admission Mobility - squared form	Admission Mobility Squared = (GG0170A1 + GG0170B1 + GG0170C1 + GG0170D1 + GG0170E1 + GG0170F1 + GG0170G1 + GG0170I1 + GG0170J1 + GG0170K1 + GG0170L1 + GG0170M1 + GG0170N1 + GG0170O1 + GG0170P1) * (GG0170A1 + GG0170B1 + GG0170C1 + GG0170D1 + GG0170E1 + GG0170F1 + GG0170G1 + GG0170I1 + GG0170J1 + GG0170K1 + GG0170L1 + GG0170M1 + GG0170N1 + GG0170O1 + GG0170P1)	-0.0169
Primary Diagnosis Group	Stroke	= 1 if Item 21A = 0001.1 or 0001.2 or 0001.3 or 0001.4 or 0001.9; else = 0	-21.2855
Primary Diagnosis Group	Non-Traumatic Brain Dysfunction	= 1 if Item 21A = 0002.1 or 0002.9; else = 0	-13.3061
Primary Diagnosis Group	Traumatic Brain Dysfunction	= 1 if Item 21A = 0002.21 or 0002.22 or 0014.1 or 0014.2; else = 0	-9.5438

(continued)

**Table 4 (continued)**  
**Intercept and risk-adjustor definitions and covariate values for the change in mobility measure (NQF #2634)**

Risk adjustor	Risk adjustor category	IRF-PAI item(s) and recoding	Intercept and coefficients for change in mobility (NQF #2634) All values have 4 decimal places
Primary Diagnosis Group	Non-Traumatic Spinal Cord Dysfunction	= 1 if Item 21A = 0004.110 or 0004.111 or 0004.112 or 0004.120 or 004.1211 or 0004.1212 or 0004.130; else = 0	-14.2253
Primary Diagnosis Group	Traumatic Spinal Cord Dysfunction	= 1 if Item 21A = 0004.210 or 0004.211 or 0004.212 or 0004.220 or 004.2211 or 0004.2212 or 0004.230 or 0014.3; else = 0	-19.1942
Primary Diagnosis Group	Progressive Neurological Conditions	= 1 if Item 21A = 0003.1 or 0003.2; else = 0	-13.9890
Primary Diagnosis Group	Other Neurological Conditions	= 1 if Item 21A = 0003.3 or 0003.4 or 0003.5 or 0003.8 or 0003.9; else = 0	-12.1751
Primary Diagnosis Group	Fractures and Other Multiple Trauma	= 1 if Item 21A = 0008.11 or 0008.12 or 0008.2 or 0008.3 or 0008.4 or 0014.9; else = 0	-10.9297
Primary Diagnosis Group	Amputation	= 1 if Item 21A = 0005.1 or 0005.2 or 0005.3 or 0005.4 or 0005.5 or 0005.6 or 0005.7 or 0005.9; else = 0	-18.0956
Primary Diagnosis Group	Other Orthopedic Conditions	= 1 if Item 21A = 0006.1 or 0006.2 or 0006.9 or 0007.1 or 0007.2 or 0007.3 or 0007.9 or 0008.9; else = 0	-12.7626
Primary Diagnosis Group	Debility, Cardiorespiratory Conditions	= 1 if Item 21A = 0009 or 0010.1 or 0010.9 or 0016 or 0017.4 or 0017.51 or 0017.52; else = 0	-12.0697
Primary Diagnosis Group	Medically Complex Conditions	= 1 if Item 21A = 0011 or 0012.1 or 0012.9 or 0013 or 0015 or 0017.1 or 0017.2 or 0017.31 or 0017.32 or 0017.6 or 0017.7 or 0017.8 or 0017.9; else = 0	-12.7777
Interaction of admission mobility score and primary diagnosis group	Stroke	Admission mobility: continuous form (see above) multiplied by Primary diagnosis: Stroke (see above)	0.3699
Interaction of admission mobility score and primary diagnosis group	Non-Traumatic Brain Dysfunction	Admission mobility: continuous form (see above) multiplied by Primary diagnosis: Non-Traumatic Brain Dysfunction (see above)	0.1953
Interaction of admission mobility score and primary diagnosis group	Traumatic Brain Dysfunction	Admission mobility: continuous form (see above) multiplied by Primary diagnosis: Traumatic Brain Dysfunction (see above)	0.1291
Interaction of admission mobility score and primary diagnosis group	Non-Traumatic Spinal Cord Dysfunction	Admission mobility: continuous form (see above) multiplied by Primary diagnosis: Non-Traumatic Spinal Cord Dysfunction (see above)	0.2475

(continued)

**Table 4 (continued)**  
**Intercept and risk-adjustor definitions and covariate values for the change in mobility measure (NQF #2634)**

Risk adjustor	Risk adjustor category	IRF-PAI item(s) and recoding	Intercept and coefficients for change in mobility (NQF #2634) All values have 4 decimal places
Interaction of admission mobility score and primary diagnosis group	Traumatic Spinal Cord Dysfunction	Admission mobility: continuous form (see above) multiplied by Primary diagnosis: Traumatic Spinal Cord Dysfunction (see above)	0.3625
Interaction of admission mobility score and primary diagnosis group	Progressive Neurological Conditions	Admission mobility: continuous form (see above) multiplied by Primary diagnosis: Progressive Neurological Conditions (see above)	0.2007
Interaction of admission mobility score and primary diagnosis group	Other Neurological Conditions	Admission mobility: continuous form (see above) multiplied by Primary diagnosis: Other Neurological Conditions (see above)	0.2438
Interaction of admission mobility score and primary diagnosis group	Fractures and Other Multiple Trauma	Admission mobility: continuous form (see above) multiplied by Primary diagnosis: Fractures and Other Multiple Trauma (see above)	0.1736
Interaction of admission mobility score and primary diagnosis group	Amputation	Admission mobility: continuous form (see above) multiplied by Primary diagnosis: Amputation (see above)	0.1188
Interaction of admission mobility score and primary diagnosis group	Other Orthopedic Conditions	Admission mobility: continuous form (see above) multiplied by Primary diagnosis: Other Orthopedic Conditions (see above)	0.2086
Interaction of admission mobility score and primary diagnosis group	Debility, Cardiorespiratory Conditions	Admission mobility: continuous form (see above) multiplied by Primary diagnosis: Debility, Cardiorespiratory Conditions (see above)	0.2188
Interaction of admission mobility score and primary diagnosis group	Medically Complex Conditions	Admission mobility: continuous form (see above) multiplied by Primary diagnosis: Medically Complex Conditions (see above)	0.2214
Prior surgery	Surgical	=1 if J2000 = 1; else = 0	0.4752
Prior functioning: indoor ambulation (dependent only)	Dependent	=1 if GG0100B = 1; else = 0	-4.4336
Prior functioning: indoor ambulation (some help only)	Some help	=1 if GG0100B = 2; else = 0	-3.1450
Prior functioning: stair negotiation	Dependent	=1 if GG0100C = 1; else = 0	-3.0295
Prior functioning: stair negotiation	Some help	=1 if GG0100C = 2; else = 0	-1.2775

(continued)

**Table 4 (continued)**  
**Intercept and risk-adjustor definitions and covariate values for the change in mobility measure (NQF #2634)**

Risk adjustor	Risk adjustor category	IRF-PAI item(s) and recoding	Intercept and coefficients for change in mobility (NQF #2634) All values have 4 decimal places
Prior functioning: cognition	Dependent	=1 if GG0100D = 1; else = 0	-2.4905
Prior Mobility Device/Aid	Walker	=1 if GG0110D = 1; else = 0	-0.8478
Prior Mobility Device/Aid	Wheelchair/Scooter Full Time/Part Time	=1 if GG0110A = 1 or GG0110B = 1; else = 0	-3.3862
Prior Mobility Device/Aid	Mechanical Lift	=1 if GG0110C = 1; else = 0	-3.6862
Prior Mobility Device/Aid	Orthotics/Prosthetics	=1 if GG0110E = 1; else = 0	-0.6771
Stage 2 Pressure Ulcer	Present	=1 if M0300B1 ≥ 1; else = 0	-1.8035
Stage 3, 4 or Unstageable Pressure Ulcer	Present	=1 if M0300C1 ≥ 1 or M0300D1 ≥ 1 or M0300E1 ≥ 1 or M0300F1 ≥ 1 or M0300G1 ≥ 1; else = 0	-2.8531
Cognitive Function: Brief Interview for Mental Status score	Moderately Impaired	=1 if C0500 = 8, 9, 10, 11, or 12 or ([C0900A = 1 and C0900B = 1] or [C0900B = 1 and C0900C = 1] or [C0900A = 1 and C0900C = 1]) or [C0900A = 1 and C0900E = 1] or [C0900B = 1 and C0900E = 1] or [C0900C = 1 and C0900E = 1]); else = 0	-1.6275
Cognitive Function: Brief Interview for Mental Status score	Severely Impaired	=1 if C0500 = ≤ 7 or (C0900Z = 1 or ([C0900A=1 and C0900B = 0, and C0900C = 0, and C0900E = 0] or [C0900B=1 and C0900A = 0, and C0900C = 0, and C0900E = 0] or [C0900C=1 and C0900A = 0, and C0900B = 0, and C0900E = 0] or [C0900E=1 and C0900A = 0, and C0900B = 0, and C0900C = 0]); else = 0	-3.6158
Communication Impairment	Moderate to Severe	=1 if BB0800 = 1 or BB0800 = 2 or BB0700 = 1 or BB0700 = 2; else = 0	-1.8199
Communication Impairment	Mild	=1 if BB0800 = 3 or BB0700 = 3; else = 0	-0.2523
Bladder Incontinence	Less than daily, Daily, Always incontinent	=1 if H0350 = 2 or H0350 = 3 or H0350 = 4; else = 0	-2.1385
Bowel Incontinence	Always incontinent	=1 if H0400 = 3; else = 0	-4.4006
Bowel Incontinence	Less than daily, Daily	=1 if H0400 = 1 or H0400 = 2; else = 0	-1.7334
Health Conditions	History of Falls	= 1 if J1750 = 1; else = 0	-0.9022
Swallowing Ability	Tube/Parenteral Feeding	=1 if K0110C = 1; else = 0	-1.2839

(continued)

**Table 4 (continued)**  
**Intercept and risk-adjustor definitions and covariate values for the change in mobility measure (NQF #2634)**

Risk adjustor	Risk adjustor category	IRF-PAI item(s) and recoding	Intercept and coefficients for change in mobility (NQF #2634) All values have 4 decimal places
Body Mass Index (BMI)	Low BMI	= 1 if BMI ≥ [12.0] AND ≤ [19.0]; = 0 if BMI < [12.0] OR BMI > [19.0]; = 0 if Item 25A = [0, 00, -] OR Item 26A = [-]; else = 0. Where: BMI = (([Item 26A] * 703) / Item 25A2) and the resulting value is rounded to one decimal place.	-1.0548
Comorbidity Condition Group 1	Viral and Late Effects Central Nervous System Infections (HCC4)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #4; =0 if Item 21A = 0017.1 or 0002.1 or 0002.9 or 0004.11 thru 0004.13; else = 0	-1.2959
Comorbidity Condition Group 2	Tuberculosis (HCC5)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #5; =0 if Item 21A = 0017.1; else = 0	-1.0397
Comorbidity Condition Group 3	Opportunistic Infections (HCC6)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #6; =0 if Item 21A = 0017.1; else = 0	-1.4703
Comorbidity Condition Group 4	Other Infectious Diseases (HCC7) Only	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #7; =0 if Item 21A = 0017.1; else = 0	-1.1173
Comorbidity Condition Group 5	Metastatic Cancer and Acute Leukemia (HCC8)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #8; =0 if Item 21A = 0017.2; else = 0	-3.4864
Comorbidity Condition Group 6	Lung and Other Severe Cancers (HCC9)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #9; =0 if Item 21A = 0017.2; else = 0	-1.7947
Comorbidity Condition Group 7	Lymphoma and Other Cancers (HCC10)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #10; =0 if Item 21A = 0017.2; else = 0	-1.2882
Comorbidity Condition Group 8	Other Digestive and Urinary Neoplasms (HCC14)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #14; =0 if Item 21A = 0017.2; else = 0	-0.4166
Comorbidity Condition Group 9	Other Neoplasms (HCC15)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #15; =0 if Item 21A = 0017.2; else = 0	-0.3027
Comorbidity Condition Group 10	Diabetes: Diabetes with Chronic Complications (HCC18)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #18; =0 if Item 21A = 0017.31, 0017.32; else = 0	-0.4738
Comorbidity Condition Group 11	Diabetes without Complication (HCC19)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #19; =0 if Item 21A = 0017.31, 0017.32; else = 0	-0.2139
Comorbidity Condition Group 12	Bone/Joint/Muscle Infections/Necrosis (HCC39)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #39; =0 if Item 21A = 0017.1, 0017.7; else = 0	-1.9662

(continued)

**Table 4 (continued)**  
**Intercept and risk-adjustor definitions and covariate values for the change in mobility measure (NQF #2634)**

Risk adjustor	Risk adjustor category	IRF-PAI item(s) and recoding	Intercept and coefficients for change in mobility (NQF #2634) All values have 4 decimal places
Comorbidity Condition Group 13	Severe Hematological Disorders (HCC46)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #46; else = 0	-0.7094
Comorbidity Condition Group 14	Delirium and Encephalopathy (HCC50)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #50; else = 0	-0.8601
Comorbidity Condition Group 15	Dementia: Dementia with Complications (HCC51)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #51; =0 if Item 21A = 0002.1, 0002.9; else = 0	-2.2539
Comorbidity Condition Group 16	Dementia Without Complications (HCC52)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #52; =0 if Item 21A = 0002.1, 0002.9; else = 0	-2.3939
Comorbidity Condition Group 17	Nonpsychotic Organic Brain Syndromes/ Conditions (HCC53)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #53; else = 0	-0.6172
Comorbidity Condition Group 18	Mental Health Disorders: Schizophrenia (HCC57)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #57; else = 0	-0.8184
Comorbidity Condition Group 19	Major Depressive, Bipolar, and Paranoid Disorders (HCC58)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #58; else = 0	-0.2632
Comorbidity Condition Group 20	Reactive and Unspecified Psychosis (HCC59)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #59; else = 0	-0.8747
Comorbidity Condition Group 21	Personality Disorders (HCC60 )	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #60; else = 0	-0.7401
Comorbidity Condition Group 22	Tetraplegia (HCC70)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #70; =0 if Primary Diagnosis Group = Non-traumatic spinal cord dysfunction or Traumatic spinal cord dysfunction; else = 0	-4.2895
Comorbidity Condition Group 23	Paraplegia (HCC71)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #71; =0 if Primary Diagnosis Group = Non-traumatic spinal cord dysfunction or Traumatic spinal cord dysfunction; else = 0	-4.0884
Comorbidity Condition Group 24	Spinal Cord Disorders/Injuries (HCC72)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #72; =0 if Primary Diagnosis Group = Non-traumatic spinal cord dysfunction or Traumatic spinal cord dysfunction; else = 0	-1.3005
Comorbidity Condition Group 25	Amyotrophic Lateral Sclerosis and Other Motor Neuron Disease (HCC73)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #73; =0 if Item 21A = 0003.8, 0003.9; else = 0	-2.7526

(continued)

**Table 4 (continued)**  
**Intercept and risk-adjustor definitions and covariate values for the change in mobility measure (NQF #2634)**

Risk adjustor	Risk adjustor category	IRF-PAI item(s) and recoding	Intercept and coefficients for change in mobility (NQF #2634) All values have 4 decimal places
Comorbidity Condition Group 26	Cerebral Palsy (HCC74)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #74; =0 if Item 21A = 0003.5; else = 0	-4.5800
Comorbidity Condition Group 27	Muscular Dystrophy (HCC76)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #76; =0 if Item 21A = 0003.8; else = 0	-4.2318
Comorbidity Condition Group 28	Multiple Sclerosis (HCC77)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #77; =0 if Item 21A = 0003.1; else = 0	-2.2982
Comorbidity Condition Group 29	Parkinson's and Huntington's Diseases (HCC78)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #78; =0 if Item 21A = 0003.2 or 22A, 22B or 22C = G10; else = 0	-1.8034
Comorbidity Condition Group 30	Seizure Disorders and Convulsions (HCC79)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #79; else = 0	-0.7711
Comorbidity Condition Group 31	Angina Pectoris (HCC88)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #88; =0 if Item 21A = 0009; else = 0	-0.3272
Comorbidity Condition Group 32	Cerebral Hemorrhage (HCC99); Ischemic or Unspecified Stroke (HCC100); Cerebrovascular Atherosclerosis, Aneurysm, and Other Disease (HCC102); Hemiplegia/Other Late Effects of CVA: Hemiplegia/Hemiparesis (HCC103); Late Effects of Cerebrovascular Disease Except Paralysis (HCC105)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #99; HCC #100; HCC #102; HCC #103; HCC #105; =0 if Primary Diagnosis Group = Stroke; else = 0	-2.2688
Comorbidity Condition Group 33	Atherosclerosis of the Extremities with Ulceration or Gangrene (HCC106)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #106; =0 if Item 21A = 0017.4; else = 0	-1.3037
Comorbidity Condition Group 34	Aspiration, Bacterial, and Other Pneumonias: Aspiration and Specified Bacterial Pneumonias (HCC114)	=1 in Item 24 = see Crosswalk ICD-10 codes to HCC #114; =0 if Item 21A = 17.51 or 17.52; else = 0	-0.2599

(continued)

**Table 4 (continued)**  
**Intercept and risk-adjustor definitions and covariate values for the change in mobility measure (NQF #2634)**

Risk adjustor	Risk adjustor category	IRF-PAI item(s) and recoding	Intercept and coefficients for change in mobility (NQF #2634) All values have 4 decimal places
Comorbidity Condition Group 35	Pneumococcal Pneumonia, Empyema, Lung Abscess (HCC115)	=1 in Item 24 = see Crosswalk ICD-10 codes to HCC #115; =0 if Item 21A = 17.51 or 17.52; else = 0	-0.2686
Comorbidity Condition Group 36	Legally Blind (HCC119)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #119; else = 0	-3.6968
Comorbidity Condition Group 37	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage (HCC122); Diabetic and Other Vascular Retinopathies (HCC123)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #122; HCC #123; else = 0	-1.7997
Comorbidity Condition Group 38	Dialysis and Chronic Kidney Disease - Stage 5: Dialysis Status (HCC134); Chronic Kidney Disease, Stage 5 (HCC136)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #134; HCC #136; =0 if Item 21A = 0017.9 or 22A, 22B or 22C = N18.5; else = 0	-2.8110
Comorbidity Condition Group 39	Acute Renal Failure (HCC135)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #135; =0 if Item 21A = 0017.9; else = 0	-0.5551
Comorbidity Condition Group 40	Chronic Kidney Disease, Severe (Stage 4) (HCC137)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #137; =0 if 22A, 22B or 22C = N18.1 or N18.2 or N18.3 or N18.4 or N18.9; else = 0	-1.0977
Comorbidity Condition Group 41	Chronic Kidney Disease, Moderate (Stage 3) (HCC138)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #138; =0 if 22A, 22B or 22C = N18.1 or N18.2 or N18.3 or N18.4 or N18.9; else = 0	-0.3368
Comorbidity Condition Group 42	Urinary Obstruction and Retention (HCC142)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #142; else = 0	-1.4022
Comorbidity Condition Group 43	Chronic Ulcer of Skin, Excluding Pressure Ulcer (HCC161)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #161; =0 if Item 21A = 0017.7; else = 0	-1.3206
Comorbidity Condition Group 44	Severe Skin Burn or Condition (HCC162)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #162; =0 if Item 21A = 0011; else = 0	-1.0960
Comorbidity Condition Group 45	Hip Fracture/Dislocation (HCC170)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #170; =0 if Item 21A = 0008.51 or 0008.52 or 0008.11 or 0008.12 or 0008.3; else = 0	-2.1596

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**Table 4 (continued)**  
**Intercept and risk-adjustor definitions and covariate values for the change in mobility measure (NQF #2634)**

Risk adjustor	Risk adjustor category	IRF-PAI item(s) and recoding	Intercept and coefficients for change in mobility (NQF #2634) All values have 4 decimal places
Comorbidity Condition Group 46	Major Fracture, Except of Skull, Vertebrae, or Hip (HCC171)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #171; =0 if Item 21A = 0008.2 or 0008.4 or 0008.9 or 0014.9; else = 0	-3.5896
Comorbidity Condition Group 47	Complication of Specified Implanted Device or Graft (HCC176)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #176; =0 if Primary Diagnosis Code = Hip and Knee Replacements; =0 if Item 21A = 0017.8; else = 0	-2.1571
Comorbidity Condition Group 48	Amputation Status, Lower Limb/Amputation Complications (HCC189)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #189; =0 if Primary Diagnosis Group (calculated above) = Amputation; else = 0	-2.8671
Comorbidity Condition Group 49	Major Organ Transplant or Replacement Status (HCC186)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #186; =0 if Item 21A = 0017.8 or 0017.9; else = 0	-1.7947
Comorbidity Condition Group 50	Other Organ Transplant Status/Replacement (HCC187)	=1 if Item 24 = see Crosswalk ICD-10 codes to HCC #187; =0 if Item 21A = 0017.8; else = 0	-0.7205

### 3.2 TEP Discussion

TEP members asked questions about the existing IRF and LTCH quality measures to better understand the quality measure calculations. TEP members noted that the diverse population of patients treated in the LTCH setting creates a challenge to developing functional outcome quality measures for the LTCH population compared with IRF and SNF populations.

## SECTION 4. ENVIRONMENTAL SCAN

### 4.1 Introduction

The measure developer conducted an environmental scan based on a review of scientific medical literature, gray literature, and current assessment practices, as well as a review of existing quality measures related to functional status.

### 4.2 Literature Review: LTCHs and Patient Functioning

The measure developer reviewed the scientific literature focused on functional outcomes of patients treated in LTCHs. The literature review identified a limited number of LTCH-specific studies that examined patient functioning, functional improvement, or functional outcomes. In addition, studies addressing assessment of mobility, including early mobilization, rehabilitation therapy, including physical and occupational therapy, and rehabilitation outcomes were reviewed. LTCH studies on measuring respiratory and physiological outcomes were not included in this review.

LTCHs provide skilled nursing and respiratory services to liberate individuals from mechanical ventilators, heal wounds, monitor cardiac status, address unsolved complex medical conditions,<sup>1</sup> and provide rehabilitation services.<sup>2,3,4,5,6</sup> Physical, occupational, and speech language therapy during these hospital stays provide interventions with the goals of restoring patients' functional skills, including bed mobility, swallowing, self-feeding, and ambulation.

Specific functional assessment instruments used in the identified studies were:

The **Zubrod Functional Scale or Eastern Cooperative Oncology Group (ECOG)**, was developed for oncology patients. Introduced in the 1960s, this instrument uses a five-point scale that assesses a patient's ability to walk, care for self, and the need for dependence on others. The scale ranges from 0-4 with 0 being the most functional and 4 being bedridden. Scheinhorn et al.<sup>7</sup>

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<sup>1</sup> Himes D. Long-term acute care hospitals. *Critical Care Nurse Q* 2008; 3191:46-51.

<sup>2</sup> Frengley, Sansone, Shakya, Kaner. Prolonged Mechanical Ventilation in 540 Seriously Ill Older Adults: Effects of Increasing Age on Clinical Outcomes and Survival. *Journal of American Geriatrics Society*. 2014. doi: 10.1111/jgs.12597.

<sup>3</sup> Scheinhorn DJ, Hassenpflug MS, Votto JJ, Chao DC, Epstein SK, Doig GS, Knight EB, Petrak RA. Post-ICU mechanical ventilation at 23 long-term care hospitals: a multicenter outcomes study. *Chest*. 2007 Jan;131(1):85-93.

<sup>4</sup> Thrush A, Rozek M, Dekerlegand JL. The clinical utility of the functional status score for the intensive care unit (FSS-ICU) at a long-term acute care hospital: a prospective cohort study. *Physical Therapy*. 2012 Dec;92(12):1536-45.

<sup>5</sup> Sansone, G., Frengley, D., Vecchione, J., Manogaram, M., & Kaner, R. Relationship of the Duration of Ventilator Support to Successful Weaning and Other Clinical Outcomes in 437 Prolonged Mechanical Ventilation Patients. *Journal of Intensive Care Medicine* 2017 Volume 32(4) 283-291.

<sup>6</sup> Irons SL, Hoffman JE, Elliott S, Linnaus M. Functional outcomes of patients with sternectomy after cardiothoracic surgery: a case series. *Cardiopulmonary Physical Therapy Journal*. 2012 Dec;23(4):5-11.

<sup>7</sup> Scheinhorn DJ, Hassenpflug MS, Votto JJ, Chao DC, Epstein SK, Doig GS, Knight EB & Petrak RA (2007) Ventilator-dependent survivors of catastrophic illness transferred to 23 long-term care hospitals. *Chest* 2007; 131; 76-84

used Zubrod scores to measure changes in activities of daily living status pre and post discharge from an LTCH to examine the effect of age on function scores. The changes in the Zubrod scores from the initial assessment to the discharge assessment did not vary based on age. The authors noted that although the Zubrod/ECOG is a popular scale in pulmonary care, scores were too broad to measure minute differences of physical function.

Several researchers used FIM data in the LTCH setting to examine functional outcomes. Frengley et al.<sup>8</sup> used the FIM instrument to examine differences in functional skills between cohorts of age groups. The FIM scores were gathered on admission and discharge. They noted significant differences in FIM scores at discharge among the cohort age groups. Montagnani et al.<sup>9</sup> studied 56 LTCH patients who had difficulty being liberated from a mechanical ventilator and reported that patients who were admitted to an LTCH had significant increases in FIM scores. Irons<sup>10</sup> also used the FIM to demonstrate outcomes of six patients with a sternectomy after cardiothoracic surgery who were admitted to a LTCH and received physical therapy. The authors of this study also reported that the LTCH stay resulted in all six patients returning home following a course of multi-disciplinary inpatient rehabilitation on the LTCH unit.

Jubran et al.<sup>11</sup> examined changes in functional status during LTCH stays using the **Katz Activities of Daily Living** summary score and **hand grip scales**. The Katz Activities of Daily Living instrument was developed for chronically ill individuals, and includes six activities: bathing, dressing, toileting transferring, continence, and feeding. Each domain is rated 0 for dependent or 1 for independent. Jubran<sup>12</sup> found that distal strength measured by hand grip was indicative of increases in activities of daily living status. Peripheral strength and decreased activities of daily living function was severely impaired upon admission. The Katz score and functional status measured 6 months after discharge demonstrated that individuals who showed improvement in hand strength also showed significant improvement in the Katz summary score. Katz activity of daily living scores improved by 64%.

Thrush, et al.<sup>13</sup> measured the clinical feasibility of the **FSS-ICU scale** that was used in ICU units for 101 LTCH patients. Using a five-category scale, it assesses rolling, supine to sit transfers, unsupported sitting, sit-to-stand transfers, and ambulation. Functional categories are rated on a scale of 0–7 with a maximum cumulative FSS-ICU score of 35. Higher scores indicate higher function. The FSS-ICU scale was found to demonstrate significant functional

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<sup>8</sup> Frengley, Sansone, Alba, Uppa, Kleinfeld. Influence of Age on Rehabilitation Outcomes and Survival in Post-acute inpatient cardiac rehabilitation. *Journal of Cardiopulmonary Rehabilitation and Prevention* 2011; 31:230-238.

<sup>9</sup> Montagnani G, Vaghegini G, Panait V, Berrighi D, Pantani L, Nicolino A. Use of the Functional Independence Measure in People for whom weaning from mechanical ventilation is difficult. *Physical Therapy*. 2011;91:1109-1115.

<sup>10</sup> Irons SL, Hoffman JE, Elliott S, Linnaus M. Functional outcomes of patients with sternectomy after cardiothoracic surgery: a case series. *Cardiopulmonary Physical Therapy Journal*. 2012 Dec;23(4):5-11.

<sup>11</sup> Jubran A, Grant BJ, Duffner LA, Collins EG, Lanuza DM, Hoffman LA, Tobin MJ. Long-term outcome after prolonged mechanical ventilation: A long-term acute care hospital study. *American Journal of Respiratory Critical Care Medicine*. 2019 N 9. DOI: 10.1164/RCCM.201806-1131OC.

<sup>12</sup> Ibid.

<sup>13</sup> Thrush A, Rozek M, Dekerlegand JL. The clinical utility of the functional status score for the intensive care unit (FSS-ICU) at a long-term acute care hospital: a prospective cohort study. *Physical therapy*. 2012 Dec;92(12):1536-45.

improvements of patients in an LTCH setting. The cumulative baseline median (IQR) change score of 9 (3-17) increased to 14 (5-24) at discharge ( $z = -6.11, p < .001$ ).

### **4.3 Literature Review: Items/Instruments Related to Function**

The measure developer noted that due to the limited amount of relevant literature focused on the LTCH patient population, the team expanded the literature search to include data elements and instruments used to measure functioning in the intensive care unit. The team identified three recent literature reviews focused on measuring patient functioning in intensive care units (ICUs).

The most recent review, a scoping review by Gonzalez Seguel et al.<sup>14</sup> analyzed 60 physical functioning measurement instruments used in the ICUs. Using the International Classification of Functioning as a framework, they found that mobility is the most frequently measured ICF domain and was included in 38 of the 60 reviewed instruments. No other domain is included in more than 11 of 60 instruments (*Table 5*). The authors also examined the frequency of mobility subdomains, which are reported in *Table 6*.

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<sup>14</sup> González-Seguel F, Corner EJ, Merino-Osorio C. International classification of functioning, disability and health domains of 60 physical functioning measurement instruments used during the adult intensive care unit stay: a scoping review. *Phys Ther.* 2019; 99:627–640.

**Table 5**  
**ICF domains of the 42 physical functioning scales, scores and questionnaires (Gonzalez-Seguel, 2019)<sup>15</sup>**

ICF component	ICF domain	N of scales/scores that included measure, of 33 examined	N of questionnaires that included measure, of 9 examined
Body Functions	Functions of joints and bones [b710-b729]	0	0
	Muscle functions [b730-b749]	11	0
	Movement functions [b750-b789]	9	1
	Respiratory muscle functions [b445]	2	0
	Exercise tolerance functions [b455]	8	0
	Respiration functions [b440]	3	1
	Other body function	6	5
Body Structures	Structures related to movement [s710-s799]	0	0
	Muscles of respiration [s4303]	0	0
Activities and Participation	General tasks and demands [d2]	1	7
	Mobility [d4]	27	8
	Self-care [d5]	2	8
	Domestic life [d6]	1	6
	Community, social and civic life	2	5
	Other activities and participation	2	5
Environmental Factors	Products and technology for personal use in daily living [e115]	2	2

<sup>15</sup> González-Seguel F, Corner EJ, Merino-Osorio C. International classification of functioning, disability and health domains of 60 physical functioning measurement instruments used during the adult intensive care unit stay: a scoping review. *Phys Ther.* 2019; 99:627–640.

**Table 6**  
**ICF mobility subdomains (Gonzalez-Seguel, 2019)<sup>16</sup>**

<b>Mobility Subdomains</b>	<b>Number of instruments that included measure, of the 38 instruments that measured mobility</b>
Lying Down (d4100)	16
Sitting (d4103)	12
Standing (d4104)	18
Bending (d4105)	2
Shifting the Body's CoG (d4106)	2
Rolling Over (d4107) <sup>b</sup>	8
Maintaining a Lying Position (d4150)	6
Maintaining a Sitting Position (d4153)	15
Maintaining a Standing Position (d4154)	10
Transferring Oneself While Sitting (d4200)	16
Transferring Oneself While Lying (d4201)	2
Fine Hand Use - Picking Up (d4400)	2
Reaching (d4452)	1
Walking Short Distances (d4500)	24
Walking on Different Surfaces (d4502)	1
Walking, Other Specified (d4508) <sup>c</sup>	11
Climbing (d4551)	2
Jumping (d4553)	1
Moving Around Using Equipment: Wheelchair	8

Parry et al.'s<sup>17</sup> article entitled *Evaluating physical functioning in critical care: considerations for clinical practice and research* also examined items and instruments used to evaluate physical functioning in the ICUs. In this review, the authors analyzed 11 instruments that measured physical functioning and examined factors that influence measurement. They noted the importance of establishing the purpose of assessment, such as intervention efficacy, as well as changes in the relevance and feasibility of instruments across the recovery trajectory. The authors offered a stage-based recommendation for selecting an instrument for 3 stages: prior to

<sup>16</sup> González-Seguel F, Corner EJ, Merino-Osorio C. International classification of functioning, disability and health domains of 60 physical functioning measurement instruments used during the adult intensive care unit stay: a scoping review. *Phys Ther.* 2019;99:627–640.

<sup>17</sup> Parry, Selina M., Minxuan Huang, and Dale M. Needham. "Evaluating physical functioning in critical care: considerations for clinical practice and research." *Critical Care* 21, no. 1 (2017): 249.

ICU admission, at ICU admission, and during the ICU stay. They also mapped mobility data elements to the ICF framework (*Table 7*).

**Table 7**  
**Mapping mobility data elements to ICF framework (Parry, 2017)<sup>18</sup>**

Mobility subdomains	Number of instruments that included activity, of 11 instruments examined
Lying down [d4100]	9
Sitting [d4103]	10
Standing [d4104]	3
Maintaining a lying position [d4150]	2
Maintaining a sitting position [d4153]	8
Maintaining a standing position [d4154]	8
Transferring one-self while sitting [d4200]	6
Fine hand use (picking up) [d4400]	1
Jumping [d4553]	1
Walking short distances [d4500]	9
Walking, other specified [d4508]	3
Climbing [d4551]	1
Moving around using equipment [d465]	1

The third review article was published in 2015 and is entitled *Assessment of impairment and activity limitations in the critically ill: a systematic review of measurement instruments and their clinimetric properties*. In this article, Parry et al.<sup>19</sup> reviewed 33 instruments used to evaluate patient functioning in the critically ill population. Of 26 functional assessment instruments examined, 12 were evaluated for their clinimetric properties. They found that excellent reliability had been established for five instruments specifically developed for use in the ICU setting: Chelsea Critical Care Physical Assessment Tool (CPAx), Physical Function in Intensive Care Test (PFIT-s), Perme mobility scale, ICU mobility scale, and Surgical intensive care unit optimal mobility scale (SOMS).

#### **4.4 Literature Review: Primary Diagnosis Groups and Comorbidities**

The environmental scan also examined LTCH studies to better understand how researchers reported primary diagnosis and comorbidity/co-existing condition information for LTCH patients.

<sup>18</sup> Parry, Selina M., Minxuan Huang, and Dale M. Needham. "Evaluating physical functioning in critical care: considerations for clinical practice and research." *Critical Care* 21, no. 1 (2017): 249.

<sup>19</sup> Parry, Selina M., Catherine L. Granger, Sue Berney, Jennifer Jones, Lisa Beach, Doa El-Ansary, Rene Koopman, and Linda Denehy. "Assessment of impairment and activity limitations in the critically ill: a systematic review of measurement instruments and their clinimetric properties." *Intensive Care Medicine* 41, no. 5 (2015): 744-762.

Among the studies that did not focus exclusively on patients requiring mechanical ventilation, reporting on diagnosis information tended to be broad. For example, Thrush<sup>20</sup> reported that his sample included patients with 3 types of medical conditions: ventilator-dependent respiratory failure, complex wounds/infections, and cardiovascular conditions. Kahn<sup>21</sup> relied on the Major Diagnostic Category groupings, and reported frequencies for 5 groups: respiratory conditions, neurological conditions, cardiac surgery, non-surgical cardiac conditions and other conditions. Koenig<sup>22</sup> also reported by Major Diagnostic Category groupings, reporting on the following medical conditions: respiratory, circulatory, digestive, parasitic diagnoses/disorders, and musculoskeletal and connective tissue and infections. Makam et al.<sup>23</sup> examined LTCH utilization among non-mechanically ventilated older adults and reported frequencies of respiratory conditions, circulatory conditions, urinary conditions, as well as patients with a diagnosis-related group with major complications or comorbidities. Two other studies by Makam et al.<sup>24, 25</sup> reported diagnosis data based on the Major Diagnostic Category groupings of respiratory, infections, musculoskeletal, circulatory and diagnosis-related group with major complications or comorbidities.

With regard to the comorbidities and co-existing conditions of LTCH patients, researchers reported on a variety of secondary conditions. Interestingly, there was generally little overlap across studies other than diabetes mellitus and cancer. For example, Thrush<sup>26</sup> reported on the frequency of diabetes mellitus, pulmonary conditions, cardiac conditions, cancer, and neurologic conditions, whereas Kahn<sup>27</sup> reported on congestive heart failure, chronic lung diseases, diabetes mellitus and cancer. Koenig et al.<sup>28</sup> reported on ICU length of stay, multiple

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<sup>20</sup> Thrush A, Rozek M, Dekerlegand JL. The clinical utility of the functional status score for the intensive care unit (FSS-ICU) at a long-term acute care hospital: a prospective cohort study. *Physical therapy*. 2012 Dec;92(12):1536-45.

<sup>21</sup> Kahn, Jeremy M., Rachel M. Werner, Guy David, Thomas R. Ten Have, Nicole M. Benson, and David A. Asch. "Effectiveness of long-term acute care hospitalization in elderly patients with chronic critical illness." *Medical Care* 51, no. 1 (2013): 4.

<sup>22</sup> Koenig, Lane, Berna Demiralp, Josh Saavoss, and Qian Zhang. "The role of long-term acute care hospitals in treating the critically ill and medically complex: an analysis of nonventilator patients." *Medical Care* 53, no. 7 (2015): 582.

<sup>23</sup> Makam, Anil N., Oanh Kieu Nguyen, Lei Xuan, Michael E. Miller, and Ethan A. Halm. "Long-Term Acute Care Hospital Use of Non-Mechanically Ventilated Hospitalized Older Adults." *Journal of the American Geriatrics Society* 66, no. 11 (2018): 2112-2119.

<sup>24</sup> Makam, Anil N., Oanh Kieu Nguyen, Benjamin Kirby, Michael E. Miller, Lei Xuan, and Ethan A. Halm. "Effect of Site-Neutral Payment Policy on Long-Term Acute Care Hospital Use." *Journal of the American Geriatrics Society* 66, no. 11 (2018): 2104-2111.

<sup>25</sup> Makam, Anil N., Oanh Kieu Nguyen, Lei Xuan, Michael E. Miller, James S. Goodwin, and Ethan A. Halm. "Factors associated with variation in long-term acute care hospital vs skilled nursing facility use among hospitalized older adults." *JAMA internal medicine* 178, no. 3 (2018): 399-405.

<sup>26</sup> Thrush A, Rozek M, Dekerlegand JL. The clinical utility of the functional status score for the intensive care unit (FSS-ICU) at a long-term acute care hospital: a prospective cohort study. *Physical therapy*. 2012 Dec;92(12):1536-45.

<sup>27</sup> Kahn, Jeremy M., Rachel M. Werner, Guy David, Thomas R. Ten Have, Nicole M. Benson, and David A. Asch. "Effectiveness of long-term acute care hospitalization in elderly patients with chronic critical illness." *Medical Care* 51, no. 1 (2013): 4.

<sup>28</sup> Koenig, Lane, Berna Demiralp, Josh Saavoss, and Qian Zhang. "The role of long-term acute care hospitals in treating the critically ill and medically complex: an analysis of nonventilator patients." *Medical Care* 53, no. 7 (2015): 582.

organ failure, stroke/traumatic brain injury, sepsis, wounds or ulcers, and the presence of 3 or more medical conditions or complications. For the 3 Makam et al. studies<sup>29, 30, 31</sup> frequencies of the following conditions and treatments were included in one or more of the studies: respiratory failure, sepsis, skin/soft tissue/joint infections, chronic skin ulcers, delirium/dementia, transient mechanical ventilation, central venous line, excisional debridement, device/graft/implant complication, complication of care, tracheostomy, dialysis/ hemodialysis, total parenteral nutrition, and feeding tube.

In a study of patients requiring ventilator support, Dunn<sup>32</sup> examined the underlying etiology for these patients, which included cardiac, cardiovascular surgery, respiratory, neurologic, trauma, oncologic, gastrointestinal, infection, sepsis, and renal/endocrine. This study reported comorbidities for these patients as weight, acute care length of stay, respiratory rate, Charlson comorbidity score as well as various laboratory values (e.g., creatinine).

#### **4.5 TEP Discussion**

Following the literature review summary, the measure developer noted that they had recommended to CMS that mobility measures should be the initial focus for LTCH functional outcome measure development based on the literature and discussions with subject matter experts.

One TEP member recommended that the measure developer consider center of gravity data as germane to the stability, safety and functional improvement goals of patients in the LTCH setting, suggesting that this data might provide better detail than the homogenous data captured by a broad measure of change in mobility.

Overall, TEP members agreed that focusing on mobility initially is reasonable and more relevant for LTCH patients.

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<sup>29</sup> Makam, Anil N., Oanh Kieu Nguyen, Lei Xuan, Michael E. Miller, and Ethan A. Halm. "Long-Term Acute Care Hospital Use of Non-Mechanically Ventilated Hospitalized Older Adults." *Journal of the American Geriatrics Society* 66, no. 11 (2018): 2112-2119.

<sup>30</sup> Makam, Anil N., Oanh Kieu Nguyen, Benjamin Kirby, Michael E. Miller, Lei Xuan, and Ethan A. Halm. "Effect of Site-Neutral Payment Policy on Long-Term Acute Care Hospital Use." *Journal of the American Geriatrics Society* 66, no. 11 (2018): 2104-2111.

<sup>31</sup> Makam, Anil N., Oanh Kieu Nguyen, Lei Xuan, Michael E. Miller, James S. Goodwin, and Ethan A. Halm. "Factors associated with variation in long-term acute care hospital vs skilled nursing facility use among hospitalized older adults." *JAMA Internal Medicine* 178, no. 3 (2018): 399-405.

<sup>32</sup> Dunn H, Quinn L, Corbridge S, Kapella M, Eldeirawi K, Steffen A, Collins E. A latent class analysis of prolonged mechanical ventilation patients at a long-term acute care hospital: Subtype differences in clinical outcomes. *Heart Lung*. 2019 May - Jun;48(3):215-221. doi: 10.1016/j.hrtlng.2019.01.001. Epub 2019 Jan 14.

## **SECTION 5. RELIABILITY AND VALIDITY TESTING**

### **5.1 Reliability Testing**

The measure developer presented recent reliability testing results of the mobility scale and the mobility quality measure scores that were completed as part of the endorsement maintenance application to the National Quality Forum (NQF). This included internal consistency analysis, where the unit of analysis is the patient stay, and split-half reliability analysis, where the unit of analysis is the provider.

#### **5.1.1 Internal Consistency Analysis of the Mobility Scale**

Internal consistency of the mobility scale/instrument scores was examined for each patient stay. Internal consistency provides a general assessment of how well the mobility items interrelate within the mobility scale/instrument. This internal consistency analysis is an indicator of the reliability of the mobility scale/instrument and is thus a test of the reliability of the data elements.

Internal consistency was assessed using the Cronbach's alpha coefficient, which is the average correlation of all possible half-scale divisions. Cronbach's alpha is a statistic frequently calculated when testing instrument or scale psychometrics. The Cronbach's alpha reliability estimate ranges from zero to one, with an estimate of zero indicating that there is no consistency of measurement among the items, and one indicating perfect consistency. Many cutoff criteria exist to determine whether a scale shows good consistency or whether the items "hang together" well. Nunnally<sup>33</sup> indicated that Cronbach's alpha should be at least 0.90 for item sets used in decision making.

The measure developer's analysis of the IRF mobility data (15 data elements) showed good reliability statistics, and overall the Cronbach's alpha was 0.97.

The measure developer's analysis of the LTCH mobility data (8 data elements) showed good reliability statistics, and overall the Cronbach's alpha was 0.92.

#### **5.1.2 Split-Half Reliability Analysis of the Quality Measure Score**

Split-half reliability was used to examine the reliability of the computed performance measure scores (unit of analysis was the facility). The computed quality measure score is the risk-adjusted change in mobility score for each facility. For facilities with fewer than 20 patient stays, computed performance measure scores are not displayed to the public, therefore, we only included facilities with 20 or more stays in this analysis.

RTI conducted split-half reliability by randomly splitting each provider's patient stays into two groups and calculating correlations between the computed performance measure scores of the randomly divided groups. When a provider's data, after being randomly divided into two

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<sup>33</sup> Nunnally, J. (1978). *Psychometric methods*. New York, NY: McGraw-Hill.

groups, show similar scores to one another, the performance measure score is more likely to reflect systematic differences in provider quality rather than random variation. The Pearson Product-Moment Correlation ( $r$ ), Spearman Rank Correlation ( $\rho$ ), and Intraclass Correlation Coefficient (ICC) were used to examine the performance measure reliability. Intraclass correlations were also calculated by facility volume quartile to examine whether there were differences in performance measure reliability by facility size.

For the IRF Change in Mobility quality measure, split-half analysis results indicated strong, positive correlations ( $r = 0.916$ ,  $\rho = 0.912$ ,  $ICC = 0.916$ ,  $p < 0.001$ ) between the IRF providers' randomly divided groups' computed quality measure scores, providing strong evidence of measure reliability. ICCs remained strong when stratifying by provider volume quartile, with ICCs for the volume quartiles ranging from 0.833 (20-174 discharges) to 0.969 (568 – 4,416 discharges).

For the LTCH Change in Mobility Among Patients Requiring Ventilator Support quality measure, split-half analysis results indicated positive moderate-to-strong correlations ( $r = 0.714$ ,  $\rho = 0.710$ ,  $ICC = 0.714$ ,  $p = <0.0001$ ) between the LTCH providers' randomly divided groups' computed performance measure scores, providing evidence of measure reliability. ICCs remained moderate-to-strong when stratifying by provider volume quartile, with ICCs for the volume quartiles ranging from 0.600 (20 – 44 discharges) to 0.807 (119 – 547 discharges).

## **5.2 Validity Testing**

An overview of some of the validity testing of the data elements and mobility scale/instrument was also presented to the TEP members. These analyses of the mobility data elements, mobility scale and the mobility quality measure scores were completed as part of the endorsement maintenance application to the National Quality Forum.

### **5.2.1 Data Element-Level Construct Validity**

RTI tested the validity of the IRF mobility data by examining the discharge function scores and whether patients were discharged to a community destination. Results showed that patients with higher discharge scores (from 01 - Dependent to 06 – Independent) were more likely to be discharged to the community, as expected. This occurs for each mobility data element for all score levels, except for the data element Picking up object level 1 which has a slightly higher percentage compared to level 2. Also expected, for each of the mobility data elements, patients who were coded as 06 - Independent, a high percentage were discharged to the community (74.7% for Wheel 50 feet with two turns to 98.2% for 12 Steps). Thus, mobility data were positively associated with discharge destination, as expected. Specifically, patients who had higher observed scores at discharge were more likely to be discharged to a community setting, which supports the validity of the item data measuring functional abilities.

Analyses of the LTCH data showed that patients with higher discharge scores (from 01 - Dependent to 06 – Independent) were more likely to be discharged to the community. There are two exceptions. One exception is level 01, which was slightly higher than levels 02 and 03 for bed mobility and transfer data elements, and the second exception was level 02 was slightly higher than level 03 for walk 50 feet with 2 turns. These findings may reflect that patients with incomplete stays (e.g., patients discharged to acute care) were excluded from this analysis,

because discharge function data are not collected due to the urgent nature of the discharge. As expected, for each of the mobility data elements, among patients who were coded as 06 - Independent, a high percentage were discharged to the community (44.7% to 74.3%). Mobility data elements data were positively associated with discharge destination, as expected. Specifically, we found patients who had higher observed scores at discharge were generally more likely to be discharged to a community setting, which supports the validity of the mobility data measuring functional abilities in this LTCH population.

### **5.2.2 Scale/Instrument-Level Rasch Analysis**

Because functional status is a latent trait—a concept that is not measured directly, but measured based on observations of activity performance—we used the one-parameter Rasch model to gain a better understanding of the mobility scale. More specifically, we examined the order of difficulty of the functional status items (from least challenging to most challenging) that characterize the concepts of mobility. In addition, analyses of fit and response options were conducted.

We used Rasch analysis to determine how well the mobility items work together to measure the construct of mobility. Rasch analysis creates a mobility ruler using log odd units (i.e., logits) centered at the value 0. A “logit” (a contraction of "Log-Odds Unit") is a linear scale. We report LTCH analysis results using a Rasch-derived mobility ruler that was developed using data from LTCHs, IRFs and SNFs. The analysis of the Section GG mobility data show that the placement of each mobility item on the cross-setting mobility “ruler” make sense clinically and are consistent with previous analyses of other functional assessment scale/instruments. That is, the order of items from easy to difficult (item hierarchy), is consistent with task difficulties. The order of the items by difficulty level, with the hardest activity listed first, is as follows:

Walk 150 Feet (most difficult activity)  
Walk 50 Feet with Two Turns  
Toilet Transfer  
Chair/Bed Transfer  
Sit to Stand  
Lying to Sitting  
Sit to Lying  
Roll Left & Right (easiest activity)

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## SECTION 6. INCLUSION/EXCLUSION CRITERIA

### 6.1 Overview of Exclusion Criteria for Selected Quality Measures

During the meeting, the RTI team described the exclusion criteria for the existing LTCH mobility measure and the rationale for the exclusion criteria. The RTI team also reviewed results from recent analyses, including the frequencies, and mean change scores for each criterion.

The existing exclusion criteria for the quality measures were selected because patients with certain conditions may have limited expected improvement, or an unclear trajectory during their LTCH stay. TEP members reviewed the exclusion criteria currently used for the existing LTCH mobility quality measure (*Table 8*) and considered these and other subgroups of patients who should be excluded from the LTCH functional outcome measures. For the current LTCH Functional Outcome Measure: Change in Mobility Among Patients Requiring Ventilator Support (NQF #2632), the inclusion and exclusion criteria were based on environmental scans, input from previous TEPs, and clinical expertise. Additionally, TEP members reviewed observed mobility scores for all Medicare Fee-For-Service patients based on the exclusion criteria for the existing LTCH mobility quality measure (*Table 9*).

**Table 8**  
**Observed change in mobility score for patients requiring ventilator support (NQF #2632)**  
**by exclusion criteria (N=66,137)**

Exclusion criteria	n (%)	Mean	SD	Median
Discharged to Hospice	1,609 (2.4%)	0.5	4.3	0
Excluded Medical Condition				
Coma	4,659 (7.0%)	2.6	6.7	0
Complete Tetraplegia	1,530 (2.3%)	1.3	4.4	0
Locked-In Syndrome	230 (0.3%)	2.2	5.6	0
Severe anoxic brain damage, cerebral edema, or compression of the brain	5,144 (7.8%)	3.8	8	0
Multiple Sclerosis	431 (0.7%)	2.8	6.9	0
Huntington's Disease	39 (0.1%)	4.7	8.5	1
Parkinson's Disease	900 (1.4%)	3.5	6.7	0
Amyotrophic Lateral Sclerosis	518 (0.8%)	2.7	6.7	0
Independent with all Admission Mobility Activities	49 (0.1%)	-12.7	17	0

NOTE: N = number of patient stays; Observed Change in Mobility values are reported as units of change in mobility (possible range: -40 to 40)

SOURCE: RTI analysis of LTCH CARE Data Set, July 2016 – March 2018. (Program reference: 2632\_exclusion)

**Table 9**  
**Observed change in mobility score for Medicare Fee-For-Service patients by exclusion criteria (N=160,612)**

<b>Exclusion criteria</b>	<b>n (%)</b>	<b>Mean</b>	<b>SD</b>	<b>Median</b>
Discharged to Hospice	4,238 (2.7%)	0.1	6.8	0.0
Excluded Medical Condition				
Coma	2,896 (1.8%)	2.3	6.0	6.0
Complete Tetraplegia	1,260 (0.8%)	1.1	3.7	0.0
Locked-In Syndrome	179 (0.1%)	3.1	6.5	0.0
Severe anoxic brain damage, cerebral edema, or compression of the brain	3,221 (2.0%)	4.1	7.9	0.0
Multiple Sclerosis	1,222 (0.8%)	2.9	6.7	0.0
Huntington’s Disease	116 (0.1%)	3.7	7.9	0.0
Parkinson’s Disease	2,752 (1.7%)	4.1	7.7	0.0
Amyotrophic Lateral Sclerosis	348 (0.2%)	3.3	7.0	0.0
Independent with all Admission Mobility Activities	4,594 (2.9%)	-1.4	5.0	0.0

NOTE: N = number of patient stays; Observed Change in Mobility values are reported as units of change in mobility (possible range: -40 to 40)

SOURCE: RTI analysis of LTCH CARE Data Set and Medicare claims data, June 2016 – September 2017. (Program reference: exclusion\_all\_patients)

The RTI team noted that patients with an incomplete stay are excluded from the quality measure because functional assessment data are not available at the time of discharge if the patient is discharged unexpectedly due to a medical emergency, for example.

## **6.2 TEP Discussion**

TEP members preferred minimal exclusions and suggested risk adjustment for some of the medical conditions. They supported exclusion criteria that could be applied consistently across settings, and setting-specific risk adjusters. One TEP member noted that minimizing exclusions helps ensure broad representation of patients in the quality measures, producing quality data that are more useful for stakeholders such as caregivers making facility selection decisions. One TEP member requested additional information about the progressive neurodegenerative disorders that were not included on the list of exclusion criteria under consideration. Several TEP members noted that excluding patients based on the single data element “coma” in the LTCH CARE Data Set strengthens the “signal” of the quality measures.

TEP members recommended consideration of LTCH patients who are covered under the site-neutral payment system because some of these patients may have a very short length of stay (e.g., 5 days), but would not meet the incomplete stay criterion length of stay (i.e., 3 days). Another TEP member cautioned about excluding patients based on the site neutral payment criteria.

Initially, TEP members did not believe the exclusion of patients who were independent with all mobility activities on admission was necessary. However, after the site-neutral payment discussion, several TEP members indicated it should be an exclusion criterion, because some patients covered under the site neutral payment system might be independent performing all mobility activities on admission.

TEP members agreed that it is important to exclude patients with incomplete stays and patients discharged to hospice. Several TEP members noted that patients discharged to hospice might be considered as a type of incomplete stay because the full course of treatment was not completed and cannot be evaluated. One TEP member emphasized that discharge to hospice is not a failure of care in the LTCH setting and noted the importance of excluding these stays consistently across post-acute care settings. TEP members did not support the idea of using imputation methods for generating discharge functional status data for patients with incomplete stays.

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## **SECTION 7. RISK ADJUSTMENT**

### **7.1 Risk-Adjustment Overview**

In order to compare functional outcomes across different LTCHs, we need to adjust for differences in the mix of patients or *case mixes* within those LTCHs. Similar to our risk adjustment approach in the IRF setting, we would adjust for facility-level case mixes by calculating risk adjustment scores to measure how facilities are performing relative to how they would be expected to perform given their case mix. The risk-adjustment model controls for patient risk factors for change in function scores and discharge function scores, such as demographic and clinical characteristics. Using the risk adjustors for the existing LTCH and IRF functional outcome measures and guidance from the TEP and other subject matter experts, we would specify the LTCH model using a regression model, and evaluate the direction and magnitude of the coefficient, statistical significance, and expected clinical relationship with the mobility outcome. This process would estimate the relation between patient factors and the outcome and retain risk adjustors if they were statistically significant or clinically important. Our final model would use a generalized estimating equation to account for clustering at the LTCH level.

After RTI staff discussed the above strategy for developing a risk-adjustment model for use in the LTCH setting, they presented information and analysis on potential risk adjustors and asked for the TEP's feedback on the following:

- What patient factors affect LTCH patients' functional outcomes?
- How might patients be group by primary medical condition for risk-adjustment?
- Are there any data elements on the admission LTCH CARE Data Set that the measure developer should test?
- Should frailty be considered as a risk adjustor?

### **7.2 Risk-Adjustment Variables: LTCH Primary Diagnosis**

As part of the risk adjustment approach, a list of 20 to 30 diagnosis group categories will need to be identified. The LTCH CARE Data Set includes a limited number of primary medical condition(s) categories. Data element I0050 – Indicate the patient's primary medical condition category includes four medical conditions (acute onset respiratory condition, chronic respiratory condition, acute onset and chronic respiratory conditions, and chronic cardiac conditions), and one "other medical condition" category. If the "other medical condition" category is selected, an ICD-10 code is entered in I0050A. Approximately 60% of LTCH patient stays have a medical condition category of "other."

To better understand the mix of "other" medical conditions, we examined the ICD-10 code data entered in I0050A and assigned each patient stay into a Condition Category using the CMS Hierarchical Condition Category (HCC) using the CMS HCC-ICD-10 mappings (<https://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/Risk->

[Adjustors.html](#)). **Table 10** displays the frequency of the top 30 HCCs using data from the LTCH CARE Data Set (item I0050A) and the mean (SD) and median change in mobility scores (8 data elements) by HCC.

A second set of analyses used an analytic file that linked the LTCH CARE Data Set assessment data with Medicare LTCH claims data to better understand the primary medical conditions of patients admitted to LTCH. Using the Diagnosis-Related Group codes to Primary Medical Diagnosis Group mapping developed as part of the Post-Acute Care Payment Reform Demonstration, each Medicare fee-for-service patient stay was assigned to a primary diagnosis group ([https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/Research-Reports-Items/PAC\\_Payment\\_Reform\\_Demo\\_Final.html](https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/Research-Reports-Items/PAC_Payment_Reform_Demo_Final.html)). Some of these groupings may be too broad, for example, the first group includes “Respiratory, Ventilator, and Tracheostomy.” This primary diagnosis group may be further refined and split into two groups using assessment data from the LTCH CARE Data Set, such as identifying the patients admitted to the LTCH on a ventilator.

**Table 11** displays the primary diagnosis groups and the mean (SD) and median change in mobility scores (8 mobility items) by primary diagnosis group. **Table 12** and **Table 13** report the mean (SD) and median admission mobility scores (8 mobility items) and mean (SD) and median discharge mobility scores (8 mobility items), respectively.

**Table 10**  
**Other medical conditions category – Top 30 conditions**

<b>HCC #</b>	<b>HCC label</b>	<b>Frequency</b>	<b>Percent</b>
2	Septicemia, Sepsis, Systemic Inflammatory Response Syndrome/Shock	20,422	10.40
84	Cardio-Respiratory Failure and Shock	15,070	7.67
39	Bone/Joint/Muscle Infections/Necrosis	14,963	7.62
164	Cellulitis, Local Skin Infection	7,967	4.06
157	Pressure Ulcer of Skin with Necrosis Through to Muscle, Tendon, Bone	5,840	2.97
135	Acute Renal Failure	5,459	2.78
176	Complication of Specified Implanted Device or Graft	4,847	2.47
160	Pressure Pre-Ulcer Skin Changes or Unspecified Stage	4,406	2.24
36	Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders	4,243	2.16
18	Diabetes with Chronic Complications	4,237	2.16
161	Chronic Ulcer of Skin, Except Pressure	4,042	2.06
174	Other Injuries	3,806	1.94
33	Intestinal Obstruction/Perforation	3,211	1.64
85	Congestive Heart Failure	3,180	1.62
116	Viral and Unspecified Pneumonia, Pleurisy	2,893	1.47
158	Pressure Ulcer of Skin with Full Thickness Skin Loss	2,558	1.30
114	Aspiration and Specified Bacterial Pneumonias	2,286	1.16
103	Hemiplegia/Hemiparesis	1,889	0.96
38	Other Gastrointestinal Disorders	1,686	0.86
189	Amputation Status, Lower Limb/Amputation Complication	1,619	0.82
167	Major Head Injury	1,605	0.82
108	Vascular Disease	1,469	0.75
7	Other Infectious Diseases	1,373	0.70
57	Schizophrenia	1,321	0.67
105	Late Effects of Cerebrovascular Disease, Except Paralysis	1,263	0.64
21	Protein-Calorie Malnutrition	1,143	0.58
111	Chronic Obstructive Pulmonary Disease	1,127	0.57
3	Bacterial, Fungal, and Parasitic Central Nervous System Infections	1,103	0.56
178	Major Symptoms, Abnormalities	1,078	0.55
136	Chronic Kidney Disease, Stage 9	982	0.50

SOURCE: RTI analysis of LTCH CARE Data Set, April 2016 through December 2017. (Program reference: ltch\_outcome\_diagnosis\_all\_patients)

**Table 11**  
**Observed change in mobility score by diagnosis groups (Medicare FFS patients;**  
**June 2016 – September 2017)**

<b>Diagnosis group</b>	<b>n (%)</b>	<b>Mean</b>	<b>SD</b>	<b>Median</b>
Respiratory, Ventilator, and Tracheostomy	24,719 (22.6%)	6.7	9.7	3.0
Cardio-Respiratory Failure and Shock	20,367 (18.6%)	7.7	9.7	6.0
Cardiovascular – Cardiac Surgery	458 (0.4%)	7.0	9.1	6.0
Cardiovascular – General	5,229 (4.8%)	7.1	9.7	6.0
Septicemia, Sepsis, Systemic Inflamm. Response	11,375 (10.4%)	5.3	8.7	1.0
Skin/Pressure Ulcer	11,056 (10.1%)	4.4	8.1	1.0
Neurological – Surgical	236 (0.2%)	7.2	9.5	5.0
Neurological – Medical	2,392 (2.2%)	6.5	8.3	4.0
Gastrointestinal and Hepatobiliary – Major Surgery	2,249 (2.1%)	8.8	10.0	8.0
Gastrointestinal and Hepatobiliary – Minor Medical	3,214 (2.9%)	7.2	9.7	6.0
e/Joint/Muscle Infections/Necrosis	6,207 (5.7%)	5.5	8.8	3.0
Rheumatic Disorders	109 (0.1%)	8.7	8.7	7.0
Orthopedic – Spinal	173 (0.2%)	9.4	9.2	9.0
Orthopedic – Major Surgical	455 (0.4%)	8.2	8.5	7.0
Surgical/Amputation	5,684 (5.2%)	7.0	9.3	5.0
Kidney & Urinary – Surgical	128 (0.1%)	7.9	9.7	6.0
Kidney & Urinary – Medical	4,382 (4.0%)	7.2	9.4	6.0
Hematologic – Surgical	—	—	—	—
Hematologic – Medical	258 (0.2%)	6.1	9.2	5.0
Infections – Surgical	1,844 (1.7%)	8.0	10.0	6.0
Infections – Medical	1,599 (1.5%)	7.7	9.9	6.0
Diabetes/Other Endocrine Diseases	3,426 (3.1%)	6.5	9.0	5.0
Malnutrition and Fluid/Electrolyte Disorders	636 (0.6%)	6.3	9.4	4.0
Trauma	367 (0.3%)	8.4	9.4	6.0
Cancers	392 (0.4%)	6.4	10.0	5.0
Other – Medical	2,419 (2.2%)	4.5	8.3	0.0

NOTE: N = number of patient stays (matching admission and discharge assessment); when N < 11, data cannot be reported, and a dash is displayed in the table; Observed Change in Mobility values are reported as units of change in mobility (possible range: -40 to 40)

SOURCE: RTI analysis of LTCH CARE Data Set-Medicare FFS Claims, June 2016 through September 2017.  
(Program reference: ltch\_outcome\_diagnosis\_all\_patients)

**Table 12**  
**Admission mobility score by diagnosis groups (Medicare FFS patients; June 2016 – September 2017)**

Diagnosis group	n (%)	Mean	SD	Median
Respiratory, Ventilator, and Tracheostomy	33,900 (24.4%)	12.7	8.7	8.0
Cardio-Respiratory Failure and Shock	27,253 (19.6%)	16.4	9.6	13.0
Cardiovascular – Cardiac Surgery	593 (0.4%)	18.1	10.2	15.0
Cardiovascular – General	6,441 (4.6%)	20.8	11.2	19.0
Septicemia, Sepsis, Systemic Inflamm. Response	14,916 (10.7%)	14.4	9.6	9.0
Skin/Pressure Ulcer	12,625 (9.1%)	17.0	11.1	12.0
Neurological – Surgical	272 (0.2%)	14.4	8.6	11.0
Neurological – Medical	2,839 (2.0%)	15.5	10.6	11.0
Gastrointestinal and Hepatobiliary – Major Surgery	2,831 (2.0%)	18.9	10.5	16.0
Gastrointestinal and Hepatobiliary – Minor Medical	4,008 (2.9%)	19.8	11.5	17.0
Bone/Joint/Muscle Infections/Necrosis	7,045 (5.1%)	17.7	11.2	13.0
Rheumatic Disorders	147 (0.1%)	21.0	11.9	19.0
Orthopedic – Spinal	201 (0.1%)	17.3	9.7	14.0
Orthopedic – Major Surgical	529 (0.4%)	15.7	8.3	14.0
Surgical/Amputation	6,571 (4.7%)	20.0	11.6	17.0
Kidney & Urinary – Surgical	151 (0.1%)	17.1	9.5	14.0
Kidney & Urinary – Medical	5,483 (3.9%)	18.0	10.3	14.0
Hematologic – Surgical	12 (< .01%)	25.0	11.2	24.5
Hematologic – Medical	320 (0.2%)	21.0	11.8	19.0
Infections – Surgical	2,193 (1.6%)	18.9	11.2	15.0
Infections – Medical	1,929 (1.4%)	20.0	12.5	16.0
Diabetes/Other Endocrine Diseases	3,864 (2.8%)	23.8	12.3	22.0
Malnutrition and Fluid/Electrolyte Disorders	784 (0.6%)	18.3	11.2	14.0
Trauma	447 (0.3%)	14.9	8.9	11.0
Cancers	806 (0.6%)	17.8	10.9	14.0
Other – Medical	2,765 (2%)	29.5	16.0	29.0

NOTE: N = number of admission assessments; when N < 11, data cannot be reported, and a dash is displayed in the table; Admission Mobility values are reported as units of change in mobility (possible range: 08 to 48)

Source: RTI analysis of LTCH CARE Data Set-Medicare FFS Claims, June 2016 through September 2017.  
(Program reference: ltch\_outcome\_diagnosis\_all\_patients)

**Table 13**  
**Discharge mobility score by diagnosis groups (Medicare FFS patients; June 2016 – September 2017)**

Diagnosis group	n (%)	Mean	SD	Median
Respiratory, Ventilator, and Tracheostomy	24,781 (22.5%)	20.2	13.3	14.0
Cardio-Respiratory Failure and Shock	20,680 (18.8%)	24.8	13.7	23.0
Cardiovascular – Cardiac Surgery	460 (0.4%)	26.2	13.4	26.0
Cardiovascular – General	5,259 (4.8%)	28.6	13.5	29.0
Septicemia, Sepsis, Systemic Inflamm. Response	11,430 (10.4%)	20.6	14.0	15.0
Skin/Pressure Ulcer	11,122 (10.1%)	21.8	14.0	17.0
Neurological – Surgical	236 (0.2%)	22.1	13.0	18.0
Neurological – Medical	2,412 (2.2%)	22.6	14.0	20.0
Gastrointestinal and Hepatobiliary – Major Surgery	2,266 (2.1%)	28.4	14.0	29.0
Gastrointestinal and Hepatobiliary – Minor Medical	3,236 (2.9%)	27.8	14.0	28.0
Bone/Joint/Muscle Infections/Necrosis	6,251 (5.7%)	23.5	14.0	20.0
Rheumatic Disorders	109 (0.1%)	31.4	13.0	33.0
Orthopedic – Spinal	175 (0.2%)	27.5	13.0	26.0
Orthopedic – Major Surgical	456 (0.4%)	24.5	13.0	22.0
Surgical/Amputation	5,708 (5.2%)	27.5	14.0	27.0
Kidney & Urinary – Surgical	128 (0.1%)	25.2	14.0	26.0
Kidney & Urinary – Medical	4,403 (4.0%)	26.0	14.0	24.0
Hematologic – Surgical	—	—	—	—
Hematologic – Medical	259 (0.2%)	28.5	14.0	30.0
Infections – Surgical	1,852 (1.7%)	27.8	14.0	27.0
Infections – Medical	1,606 (1.5%)	28.7	15.0	29.0
Diabetes/Other Endocrine Diseases	3,435 (3.1%)	30.8	13.0	32.0
Malnutrition and Fluid/Electrolyte Disorders	637 (0.6%)	25.0	14.0	22.0
Trauma	371 (0.3%)	23.7	13.0	22.0
Cancers	395 (0.4%)	28.1	14.0	29.0
Other – Medical	2,461 (2.2%)	35.5	15.0	43.0

NOTE: N = number of discharge assessments; when N < 11, data cannot be reported, and a dash is displayed in the table; Discharge Mobility values are reported as units of change in mobility (possible range: 08 to 48)

SOURCE: RTI analysis of LTCH CARE Data Set-Medicare FFS Claims, June 2016 through September 2017. (Program reference: ltch\_outcome\_diagnosis\_all\_patients)

### 7.3 Candidate Risk-Adjustment Variables: Clinical Assessment Data Elements

In addition to the primary medical condition, clinical assessment data and active diagnosis data available on the LTCH CARE Data Set were examined as candidate risk adjusters. **Table 14** shows the frequency, mean (SD), and mean change in mobility score for relevant admission assessment data. **Table 15** and **Table 16** report the mean (SD) and median admission mobility scores and mean (SD) and median discharge mobility scores for the relevant admission assessment data, respectively. Overall, the results support the use of these assessment

data as risk adjusters. Many of these data are risk adjusters for the IRF mobility quality measures.

**Table 14**  
**Observed change in mobility score by candidate risk-adjusters (Medicare FFS patients; June 2016 – September 2017)**

Candidate risk-adjusters	n (%)	Mean	SD	Median
Ventilator	17,691 (12.0%)	6.7	9.9	2.0
Coma	1,787 (1.2%)	2.3	6.0	0.0
Expression of Ideas and Wants (BB0700)				
Without Difficulty (4)	67,072 (57.3%)	7.5	9.7	6.0
Some Difficulty (3)	22,269 (19.0%)	6.6	9.4	4.0
Frequent Difficulty (2)	12,430 (10.6%)	5.9	9.0	2.0
Rarely/Never Expresses (1)	15,219 (13.0%)	3.9	8.1	0.0
Understanding Others (BB0800)				
Understands (4)	69,156 (59.1%)	7.5	9.7	6.0
Usually Understands (3)	21,852 (18.7%)	6.6	9.3	4.0
Sometimes Understands (2)	13,829 (11.8%)	5.5	8.8	2.0
Rarely/Never Understands (1)	12,147 (10.4%)	3.5	7.7	0.0
CAM+	3,050 (2.1%)	7.6	10.1	4.0
Indoor Mobility (GG0100B)				
Independent (3)	51,249 (43.1%)	8.6	10.1	7.0
Needed Some Help (2)	33,567 (28.3%)	6.7	9.3	5.0
Dependent (1)	23,203 (19.5%)	3.2	7.1	0.0
Not Applicable (9)	5,314 (4.5%)	3.1	6.9	0.0
Unknown (8)	5,438 (4.6%)	5.3	8.9	1.0
Prior Device Use (Manual Wheelchair)	19,684 (13.3%)	5.0	8.1	3.0
Prior Device Use (Motorized Wheelchair)	5,451 (3.7%)	4.2	7.4	2.0
Prior Device Use (Mechanical Lift)	4,994 (3.4%)	2.0	5.3	0.0
No Prior Device Use	92,615 (62.8%)	7.2	9.7	5.0
Urinary Continence (H0350)				
Always Continent (0)	35,406 (29.8%)	8.0	9.8	7.0
Stress Continent (1)	3,023 (2.5%)	7.7	9.6	6.0
Incontinent Less Than Daily (2)	4,479 (3.8%)	7.8	9.8	6.0

(continued)

**Table 14 (continued)**  
**Observed change in mobility score by candidate risk-adjusters (Medicare FFS patients;  
June 2016 – September 2017)**

Candidate risk-adjusters	n (%)	Mean	SD	Median
Incontinent Daily (3)	8,577 (7.2%)	6.7	9.1	5.0
Always Incontinent (4)	19,693 (16.6%)	4.8	8.2	1.0
No Urine Output (5)	4,990 (4.2%)	6.0	9.3	4.0
Not Applicable (9)	42,630 (35.9%)	6.2	9.4	3.0
Bowel Incontinence (H0400)				
Always Continent (0)	44,668 (37.6%)	8.1	9.9	7.0
Occasionally Incontinent (1)	11,072 (9.3%)	7.5	9.7	6.0
Frequently Incontinent (2)	8,543 (7.2%)	6.9	9.5	4.0
Always Incontinent (3)	42,529 (35.8%)	4.9	8.4	1.0
Not Rated (9)	11,972 (10.1%)	6.4	9.4	3.0
Total Parenteral Nutrition	5,752 (3.9%)	7.2	9.9	4.0
Stage 2 Pressure Ulcer				
0	34,174 (70%)	4.9	8.5	1.0
1	10,992 (22.5%)	5.1	8.5	2.0
2	2,553 (5.2%)	4.5	8.2	1.0
3	709 (1.5%)	3.8	7.7	0.0
4	204 (0.4%)	3.5	7.4	0.0
5	82 (0.2%)	2.2	5.9	0.0
6	48 (0.1%)	2.4	4.7	0.0
7	19 (0%)	3.6	6.8	1.0
8	—	—	—	—
9	11 (0%)	4.0	5.5	3.0
Stage 3 Pressure Ulcer				
0	40,143 (82.3%)	5.2	8.6	2.0
1	6,649 (13.6%)	3.9	7.8	0.0
2	1,364 (2.8%)	3.6	7.2	0.0
3	437 (0.9%)	2.8	6.2	0.0

(continued)

**Table 14 (continued)**  
**Observed change in mobility score by candidate risk-adjusters (Medicare FFS patients;  
June 2016 – September 2017)**

Candidate risk-adjusters	n (%)	Mean	SD	Median
4	134 (0.3%)	2.5	5.7	0.0
5	43 (0.1%)	1.3	4.7	0.0
6	—	—	—	—
7	—	—	—	—
8	—	—	—	—
9	—	—	—	—
Stage 4 Pressure Ulcer				
0	40,029 (82.0%)	5.5	8.8	2.0
1	6,603 (13.5%)	2.5	6.4	0.0
2	1,289 (2.6%)	2.0	5.7	0.0
3	518 (1.1%)	1.5	5.1	0.0
4	235 (0.5%)	1.7	5.1	0.0
5	81 (0.2%)	1.0	3.0	0.0
6	22 (0%)	1.4	4.4	0.0
7	14 (0%)	2.2	4.2	0.0
8	—	—	—	—
9	—	—	—	—
Unstageable (Not Rated) Pressure Ulcer				
0	48,379 (99.2%)	4.9	8.4	1.0
1	313 (0.6%)	5.4	8.0	2.0
2	69 (0.1%)	5.8	9.7	1.0
3	19 (0%)	2.7	8.3	0.0
4	—	—	—	—
5	—	—	—	—
6	—	—	—	—
7	—	—	—	—
8	—	—	—	—

(continued)

**Table 14 (continued)**  
**Observed change in mobility score by candidate risk-adjusters (Medicare FFS patients;  
June 2016 – September 2017)**

<b>Candidate risk-adjusters</b>	<b>n (%)</b>	<b>Mean</b>	<b>SD</b>	<b>Median</b>
9	—	—	—	—
Unstageable (Slough) Pressure Ulcer				
0	34,548 (70.8%)	5.3	8.7	2.0
1	9,240 (18.9%)	4.3	8.2	1.0
2	2,789 (5.7%)	3.5	7.2	0.0
3	1,108 (2.3%)	3.0	7.0	0.0
4	515 (1.1%)	3.3	6.8	0.0
5	267 (0.5%)	2.2	5.6	0.0
6	132 (0.3%)	1.6	5.3	0.0
7	66 (0.1%)	3.1	7.5	0.0
8	47 (0.1%)	1.8	5.5	0.0
9	80 (0.2%)	1.0	2.6	0.0
Unstageable (DTI) Pressure Ulcer				
0	31,771 (65.1%)	4.8	8.4	1.0
1	10,396 (21.3%)	5.3	8.7	2.0
2	3,605 (7.4%)	4.8	8.3	1.0
3	1,786 (3.7%)	5.2	8.8	1.0
4	604 (1.2%)	3.9	7.4	0.0
5	292 (0.6%)	2.8	5.8	0.0
6	145 (0.3%)	2.6	7.3	0.0
7	82 (0.2%)	2.7	7.2	0.0
8	45 (0.1%)	1.3	5.0	0.0
9	63 (0.1%)	0.7	2.7	0.0
Other Active Diagnoses (Section I)				
Peripheral Vascular or Arterial Disease (PVD/PAD)	19,105 (13.0%)	6.1	9.0	4.0
Chronic Kidney Disease, Stage 5	13,593 (9.2%)	6.1	9.1	4.0

(continued)

**Table 14 (continued)**  
**Observed change in mobility score by candidate risk-adjusters (Medicare FFS patients;  
June 2016 – September 2017)**

<b>Candidate risk-adjusters</b>	<b>n (%)</b>	<b>Mean</b>	<b>SD</b>	<b>Median</b>
Acute Renal Failure	17,164 (11.6%)	7.0	9.5	4.0
Septicemia, Sepsis, SIRS/Shock	24,551 (16.7%)	5.9	9.2	3.0
CNS Infections, Opportunistic Infections, Bone/Joint/Muscle Infections/Necrosis	18,904 (12.8%)	6.6	9.2	4.0
Diabetes Mellitus	53,084 (36.0%)	6.4	9.2	4.0
Major Lower Limb Amputation	4,919 (3.3%)	4.6	7.5	3.0
Stroke	12,702 (8.6%)	4.6	7.9	1.0
Dementia	12,192 (8.3%)	3.4	7.1	0.0
Hemiplegia or Hemiparesis	5,630 (3.8%)	3.7	6.8	0.0
Paraplegia	4,041 (2.7%)	2.8	6.4	0.0
Complete Tetraplegia	1,043 (0.7%)	1.1	3.7	0.0
Incomplete Tetraplegia	901 (0.6%)	2.6	5.9	0.0
Other Spinal Cord Disorder/Injury	2,524 (1.7%)	5.1	8.2	2.0
Multiple Sclerosis (MS)	1,078 (0.7%)	2.9	6.7	0.0
Huntington's Disease	100 (0.1%)	3.7	7.9	0.0
Parkinson's Disease	2,241 (1.5%)	4.1	7.7	0.0
Amyotrophic Lateral Sclerosis	286 (0.2%)	3.3	7.0	0.0
Other Progressive Neuromuscular Disease	15,988 (10.8%)	3.6	7.0	0.0
Locked-In State	133 (0.1%)	3.1	6.5	0.0
Severe Anoxic Brain Damage, Cerebral Edema, or Compression of Brain	2,326 (1.6%)	4.1	7.9	0.0
Other Severe Neurological Injury, Disease, or Dysfunction	2,326 (1.6%)	4.1	7.9	0.0
Malnutrition	33,830 (22.9%)	6.5	9.3	4.0
Dialysis	14,141 (9.6%)	6.6	9.3	4.0

NOTE: N = number of patient stays (matching admission and discharge assessment); when N < 11, data cannot be reported, and a dash is displayed in the table; Change in Mobility score values are reported as units of change in mobility (possible range: -40 to 40);

SOURCE: RTI analysis of LTCH CARE Data Set-Medicare FFS Claims, June 2016 through September 2017.  
(Program reference: ltch\_outcome\_diagnosis\_all\_patients)

**Table 15**  
**Admission mobility score by candidate risk-adjusters (Medicare FFS patients; June 2016 – September 2017)**

<b>Candidate risk-adjusters</b>	<b>n (%)</b>	<b>Mean</b>	<b>SD</b>	<b>Median</b>
Ventilator	26,012 (17.6%)	9.7	4.3	8.0
Coma	2,867 (1.9%)	8.3	2.0	8.0
Expression of Ideas and Wants (BB0700)				
Without Difficulty (4)	79,430 (54.0%)	21.6	11.7	20.0
Some Difficulty (3)	28,686 (19.5%)	14.2	8.2	11.0
Frequent Difficulty (2)	16,902 (11.5%)	10.9	5.5	8.0
Rarely/Never Expresses (1)	22,000 (15.0%)	8.9	3.5	8.0
Understanding Others (BB0800)				
Understands (4)	82,237 (55.9%)	21.2	11.7	19.0
Usually Understands (3)	28,150 (19.1%)	14.2	8.2	11.0
Sometimes Understands (2)	18,820 (12.8%)	10.8	5.4	8.0
Rarely/Never Understands (1)	17,797 (12.1%)	8.8	3.2	8.0
CAM+	4,259 (2.9%)	12.1	8.0	8.0
Indoor Mobility (GG0100B)				
Independent (3)	63,064 (42.1%)	21.3	12.6	18.0
Needed Some Help (2)	41,713 (27.8%)	17.1	9.0	14.0
Dependent (1)	30,126 (20.1%)	10.1	4.9	8.0
Not Applicable (9)	6,674 (4.5%)	11.3	6.6	8.0
Unknown (8)	8,288 (5.5%)	10.5	5.1	8.0
Prior Device Use (Manual Wheelchair)	23,545 (16.0%)	15.3	8.6	12.0
Prior Device Use (Motorized Wheelchair)	6,425 (4.4%)	14.3	8.4	11.0
Prior Device Use (Mechanical Lift)	6,142 (4.2%)	9.7	3.8	8.0
No Prior Device Use	118,402 (80.3%)	17.4	11.4	13.0
Urinary Continence (H0350)				
Always Continent (0)	40,827 (27.2%)	26.8	12.1	26.0
Stress Continent (1)	3,483 (2.3%)	22.4	10.9	21.0
Incontinent Less Than Daily (2)	5,434 (3.6%)	18.7	9.5	17.0

(continued)

**Table 15 (continued)**  
**Admission mobility score by candidate risk-adjusters (Medicare FFS patients; June 2016 – September 2017)**

<b>Candidate risk-adjusters</b>	<b>n (%)</b>	<b>Mean</b>	<b>SD</b>	<b>Median</b>
Incontinent Daily (3)	10,586 (7.1%)	14.8	8.0	12.0
Always Incontinent (4)	25,618 (17.1%)	11.7	6.1	8.0
No Urine Output (5)	7,365 (4.9%)	15.3	9.5	11.0
Not Applicable (9)	56,609 (37.8%)	12.1	6.6	9.0
<b>Bowel Incontinence (H0400)</b>				
Always Continent (0)	51,978 (34.7%)	25.0	12.1	24.0
Occasionally Incontinent (1)	13,735 (9.2%)	16.7	8.9	14.0
Frequently Incontinent (2)	10,898 (7.3%)	14.0	7.2	11.0
Always Incontinent (3)	57,569 (38.4%)	10.9	5.3	8.0
Not Rated (9)	15,722 (10.5%)	13.7	8.5	10.0
Total Parenteral Nutrition	8,073 (5.5%)	15.4	10.1	11.0
<b>Stage 2 Pressure Ulcer</b>				
0	45,691 (69.9%)	13.0	7.6	9.0
1	14,699 (22.5%)	12.8	7.3	9.0
2	3,475 (5.3%)	12.0	6.7	8.0
3	975 (1.5%)	11.1	5.9	8.0
4	288 (0.4%)	10.8	5.2	8.0
5	124 (0.2%)	10.5	5.9	8.0
6	58 (0.1%)	9.7	4.1	8.0
7	27 (0%)	11.0	6.8	8.0
8	—	—	—	—
9	12 (0%)	9.2	2.2	8.0
<b>Stage 3 Pressure Ulcer</b>				
0	53,884 (82.4%)	13.1	7.6	9.0
1	8,842 (13.5%)	12.0	6.8	8.0
2	1,811 (2.8%)	11.6	6.4	8.0
3	568 (0.9%)	11.0	6.1	8.0

(continued)

**Table 15 (continued)**  
**Admission mobility score by candidate risk-adjusters (Medicare FFS patients; June 2016 – September 2017)**

Candidate risk-adjusters	n (%)	Mean	SD	Median
4	155 (0.2%)	12.2	7.4	9.0
5	61 (0.1%)	10.4	4.9	8.0
6	16 (0%)	11.7	5.5	9.0
7	—	—	—	—
8	—	—	—	—
9	—	—	—	—
Stage 4 Pressure Ulcer				
0	54,539 (83.4%)	13.1	7.6	9.0
1	8,204 (12.6%)	11.6	6.6	8.0
2	1,557 (2.4%)	11.2	6.0	8.0
3	625 (1.0%)	11.3	6.0	8.0
4	287 (0.4%)	10.8	5.8	8.0
5	93 (0.1%)	11.5	6.5	8.0
6	26 (0%)	9.4	2.3	8.0
7	18 (0%)	11.8	7.4	8.0
8	—	—	—	—
9	—	—	—	—
Unstageable (Not Rated) Pressure Ulcer				
0	64,800 (99.2%)	12.8	7.5	9.0
1	421 (0.6%)	11.6	6.2	8.0
2	89 (0.1%)	12.5	7.1	9.0
3	25 (0%)	12.0	7.3	8.0
4	—	—	—	—
5	—	—	—	—
6	—	—	—	—
7	—	—	—	—
8	—	—	—	—

(continued)

**Table 15 (continued)**  
**Admission mobility score by candidate risk-adjusters (Medicare FFS patients; June 2016 – September 2017)**

<b>Candidate risk-adjusters</b>	<b>n (%)</b>	<b>Mean</b>	<b>SD</b>	<b>Median</b>
9	—	—	—	—
Unstageable (Slough) Pressure Ulcer				
0	45,292 (69.3%)	13.4	7.9	10.0
1	12,803 (19.6%)	12.0	6.7	8.0
2	3,988 (6.1%)	11.2	6.0	8.0
3	1,614 (2.5%)	10.7	5.2	8.0
4	744 (1.1%)	10.7	5.7	8.0
5	385 (0.6%)	10.2	4.7	8.0
6	196 (0.3%)	9.9	4.7	8.0
7	113 (0.2%)	10.1	4.8	8.0
8	77 (0.1%)	9.1	2.6	8.0
9	140 (0.2%)	9.0	2.9	8.0
Unstageable (DTI) Pressure Ulcer				
0	41,877 (64.1%)	13.2	7.7	9.0
1	14,115 (21.6%)	12.7	7.3	9.0
2	5,022 (7.7%)	12.0	6.7	8.0
3	2,502 (3.8%)	11.7	6.4	8.0
4	850 (1.3%)	10.6	5.3	8.0
5	449 (0.7%)	10.0	4.2	8.0
6	233 (0.4%)	10.2	4.4	8.0
7	125 (0.2%)	9.4	3.4	8.0
8	63 (0.1%)	10.0	4.6	8.0
9	112 (0.2%)	9.1	2.2	8.0
Other Active Diagnoses (Section I)				
Peripheral Vascular or Arterial Disease (PVD/PAD)	24,452 (16.6%)	17.0	10.5	13.0
Chronic Kidney Disease, Stage 5	18,783 (12.7%)	16.3	10.3	12.0

(continued)

**Table 15 (continued)**  
**Admission mobility score by candidate risk-adjusters (Medicare FFS patients; June 2016 – September 2017)**

<b>Candidate risk-adjusters</b>	<b>n (%)</b>	<b>Mean</b>	<b>SD</b>	<b>Median</b>
Acute Renal Failure	23,718 (16.1%)	14.9	9.2	11.0
Septicemia, Sepsis, SIRS/Shock	32,284 (21.9%)	14.5	9.5	10.0
CNS Infections, Opportunistic Infections, Bone/Joint/Muscle Infections/Necrosis	23,111 (15.7%)	17.4	11.0	13.0
Diabetes Mellitus	67,240 (45.6%)	16.5	10.5	12.0
Major Lower Limb Amputation	6,036 (4.1%)	15.7	9.1	12.0
Stroke	16,212 (11.0%)	12.5	7.9	8.0
Dementia	15,545 (10.5%)	12.4	7.5	8.0
Hemiplegia or Hemiparesis	6,958 (4.7%)	11.3	6.5	8.0
Paraplegia	4,607 (3.1%)	12.7	6.9	10.0
Complete Tetraplegia	1,250 (0.8%)	9.2	4.1	8.0
Incomplete Tetraplegia	1,099 (0.7%)	10.0	4.8	8.0
Other Spinal Cord Disorder/Injury	2,990 (2.0%)	13.6	8.5	9.0
Multiple Sclerosis (MS)	1,217 (0.8%)	12.1	7.9	8.0
Huntington's Disease	115 (0.1%)	14.6	10.1	9.0
Parkinson's Disease	2,747 (1.9%)	12.5	7.6	8.0
Amyotrophic Lateral Sclerosis	347 (0.2%)	11.5	6.5	8.0
Other Progressive Neuromuscular Disease	19,167 (13.0%)	12.0	7.2	8.0
Locked-In State	178 (0.1%)	10.8	6.6	8.0
Severe Anoxic Brain Damage, Cerebral Edema, or Compression of Brain	3,203 (2.2%)	9.7	4.9	8.0
Other Severe Neurological Injury, Disease, or Dysfunction	3,203 (2.2%)	9.7	4.9	8.0
Malnutrition	44,390 (30.1%)	15.0	9.4	11.0
Dialysis	19,964 (13.5%)	15.8	9.8	12.0

NOTE: N = number of admission assessments; when N < 11, data cannot be reported, and a dash is displayed in the table; Admission Mobility values are reported as units of change in mobility (possible range: 08 to 48)

SOURCE: RTI analysis of LTCH CARE Data Set-Medicare FFS Claims, June 2016 through September 2017. (Program reference: ltch\_outcome\_diagnosis\_all\_patients)

**Table 16**  
**Discharge mobility score by candidate risk-adjusters (Medicare FFS patients; June 2016 – September 2017)**

<b>Candidate risk-adjusters</b>	<b>n (%)</b>	<b>Mean</b>	<b>SD</b>	<b>Median</b>
Ventilator	17,723 (12.0%)	16.6	11.2	11.0
Coma	1,804 (1.2%)	10.7	6.6	8.0
Expression of Ideas and Wants (BB0700)				
Without Difficulty (4)	67,206 (57.4%)	29.7	13.7	31.0
Some Difficulty (3)	22,295 (19.0%)	21.4	12.4	18.0
Frequent Difficulty (2)	12,446 (10.6%)	17.1	10.8	13.0
Rarely/Never Expresses (1)	15,236 (13.0%)	13.0	9.0	8.0
Understanding Others (BB0800)				
Understands (4)	69,293 (59.1%)	29.3	13.8	30.0
Usually Understands (3)	21,881 (18.7%)	21.4	12.4	18.0
Sometimes Understands (2)	13,845 (11.8%)	16.6	10.6	12.0
Rarely/Never Understands (1)	12,158 (10.4%)	12.4	8.4	8.0
CAM+	3,053 (2.1%)	20.4	12.6	17.0
Indoor Mobility (GG0100B)				
Independent (3)	51,345 (43.2%)	31.1	13.8	32.0
Needed Some Help (2)	33,617 (28.3%)	24.5	12.4	23.0
Dependent (1)	23,227 (19.5%)	13.5	8.8	9.0
Not Applicable (9)	5,319 (4.5%)	14.9	9.7	10.0
Unknown (8)	5,443 (4.6%)	16.2	10.5	11.0
Prior Device Use (Manual Wheelchair)	19,720 (13.4%)	20.8	11.8	18.0
Prior Device Use (Motorized Wheelchair)	5,459 (3.7%)	18.9	11.4	14.0
Prior Device Use (Mechanical Lift)	5,003 (3.4%)	11.8	6.7	9.0
No Prior Device Use	92,755 (62.9%)	25.7	14.5	24.0
Urinary Continence (H0350)				
Always Continent (0)	35,481 (29.8%)	35.4	12.2	38.0
Stress Continent (1)	3,025 (2.5%)	30.6	12.9	32.0
Incontinent Less Than Daily (2)	4,490 (3.8%)	27.0	12.6	26.0

(continued)

**Table 16 (continued)**  
**Discharge mobility score by candidate risk-adjusters (Medicare FFS patients; June 2016 – September 2017)**

<b>Candidate risk-adjusters</b>	<b>n (%)</b>	<b>Mean</b>	<b>SD</b>	<b>Median</b>
Incontinent Daily (3)	8,589 (7.2%)	22.0	11.9	20.0
Always Incontinent (4)	19,722 (16.6%)	16.8	10.6	13.0
No Urine Output (5)	4,999 (4.2%)	22.8	13.0	20.0
Not Applicable (9)	42,695 (35.9%)	18.7	11.8	14.0
<b>Bowel Incontinence (H0400)</b>				
Always Continent (0)	44,825 (37.6%)	33.8	12.8	36.0
Occasionally Incontinent (1)	11,119 (9.3%)	24.8	12.7	23.0
Frequently Incontinent (2)	8,591 (7.2%)	21.4	11.8	19.0
Always Incontinent (3)	42,775 (35.8%)	16.0	10.2	12.0
Not Rated (9)	12,041 (10.1%)	20.8	12.8	17.0
Total Parenteral Nutrition	5,766 (3.9%)	23.8	14.1	20.0
<b>Stage 2 Pressure Ulcer</b>				
0	34,390 (70.0%)	18.5	11.8	14.0
1	11,055 (22.5%)	18.5	11.7	14.0
2	2,566 (5.2%)	16.9	11.0	12.0
3	713 (1.5%)	15.4	10.3	10.0
4	205 (0.4%)	14.9	9.6	11.0
5	82 (0.2%)	13.3	9.1	8.0
6	48 (0.1%)	12.3	7.6	8.0
7	19 (0%)	15.4	10.5	12.0
8	—	—	—	—
9	11 (0%)	13.3	7.2	11.0
<b>Stage 3 Pressure Ulcer</b>				
0	40,394 (82.3%)	18.8	11.9	14.0
1	6,682 (13.6%)	16.3	10.7	11.0
2	1,372 (2.8%)	15.6	10.2	11.0
3	438 (0.9%)	14.1	9.3	9.0

(continued)

**Table 16 (continued)**  
**Discharge mobility score by candidate risk-adjusters (Medicare FFS patients; June 2016 – September 2017)**

<b>Candidate risk-adjusters</b>	<b>n (%)</b>	<b>Mean</b>	<b>SD</b>	<b>Median</b>
4	135 (0.3%)	14.7	10.1	10.0
5	45 (0.1%)	12.8	7.1	9.0
6	—	—	—	—
7	—	—	—	—
8	—	—	—	—
9	—	—	—	—
<b>Stage 4 Pressure Ulcer</b>				
0	40,264 (82.0%)	19.2	12.0	15.0
1	6,643 (13.5%)	14.4	9.5	10.0
2	1,301 (2.6%)	13.5	8.1	9.0
3	524 (1.1%)	13.1	7.8	9.0
4	238 (0.5%)	12.8	8.1	8.0
5	81 (0.2%)	12.6	8.0	8.0
6	23 (0%)	10.4	4.6	8.0
7	14 (0%)	15.1	9.0	10.5
8	—	—	—	—
9	—	—	—	—
<b>Unstageable (Not Rated) Pressure Ulcer</b>				
0	48,670 (99.2%)	18.3	11.7	14.0
1	314 (0.6%)	17.2	10.9	13.5
2	69 (0.1%)	18.3	12.0	13.0
3	19 (0%)	15.7	10.2	11.0
4	—	—	—	—
5	—	—	—	—
6	—	—	—	—
7	—	—	—	—
8	—	—	—	—

(continued)

**Table 16 (continued)**  
**Discharge mobility score by candidate risk-adjusters (Medicare FFS patients; June 2016 – September 2017)**

Candidate risk-adjusters	n (%)	Mean	SD	Median
9	—	—	—	—
Unstageable (Slough) Pressure Ulcer				
0	34,735 (70.8%)	19.3	12.1	14.0
1	9,299 (18.9%)	16.8	10.9	12.0
2	2,812 (5.7%)	15.2	9.8	11.0
3	1,120 (2.3%)	14.0	8.9	9.0
4	519 (1.1%)	14.4	9.6	10.0
5	269 (0.5%)	12.7	7.6	9.0
6	133 (0.3%)	11.6	7.1	8.0
7	68 (0.1%)	14.5	9.9	10.0
8	49 (0.1%)	11.6	6.1	8.0
9	82 (0.2%)	10.5	4.7	8.0
Unstageable (DTI) Pressure Ulcer				
0	31,943 (65.1%)	18.5	11.8	14.0
1	10,464 (21.3%)	18.7	11.7	14.0
2	3,632 (7.4%)	17.3	11.2	13.0
3	1,799 (3.7%)	17.3	11.4	12.0
4	605 (1.2%)	15.0	10.0	10.0
5	301 (0.6%)	12.9	8.1	8.0
6	147 (0.3%)	13.0	8.7	8.0
7	82 (0.2%)	12.2	8.2	8.0
8	45 (0.1%)	11.6	7.6	8.0
9	64 (0.1%)	10.2	3.8	8.0
Other Active Diagnoses (Section I)				
Peripheral Vascular or Arterial Disease (PVD/PAD)	19,201 (13.0%)	24.1	13.5	22.0
Chronic Kidney Disease, Stage 5	13,614 (9.2%)	23.8	13.5	21.0

(continued)

**Table 16 (continued)**  
**Discharge mobility score by candidate risk-adjusters (Medicare FFS patients; June 2016 – September 2017)**

<b>Candidate risk-adjusters</b>	<b>n (%)</b>	<b>Mean</b>	<b>SD</b>	<b>Median</b>
Acute Renal Failure	17,189 (11.7%)	23.0	13.3	20.0
Septicemia, Sepsis, SIRS/Shock	24,591 (16.7%)	21.3	13.6	16.0
CNS Infections, Opportunistic Infections, Bone/Joint/Muscle Infections/Necrosis	18,941 (12.8%)	24.9	14.1	23.0
Diabetes Mellitus	53,344 (36.2%)	23.9	13.8	21.0
Major Lower Limb Amputation	4,931 (3.3%)	20.9	11.5	19.0
Stroke	12,722 (8.6%)	17.6	11.9	12.0
Dementia	12,202 (8.3%)	16.4	11.0	11.0
Hemiplegia or Hemiparesis	5,635 (3.8%)	15.4	10.2	11.0
Paraplegia	4,050 (2.7%)	15.8	8.9	12.0
Complete Tetraplegia	1,047 (0.7%)	10.4	6.1	8.0
Incomplete Tetraplegia	906 (0.6%)	12.7	8.4	8.0
Other Spinal Cord Disorder/Injury	2,532 (1.7%)	19.0	12.3	14.0
Multiple Sclerosis (MS)	1,080 (0.7%)	15.2	11.0	10.0
Huntington's Disease	101 (0.1%)	18.8	13.3	12.0
Parkinson's Disease	2,242 (1.5%)	17.1	11.4	12.0
Amyotrophic Lateral Sclerosis	287 (0.2%)	15.0	10.8	8.0
Other Progressive Neuromuscular Disease	16,019 (10.9%)	15.9	10.5	11.0
Locked-In State	134 (0.1%)	14.5	10.9	8.0
Severe Anoxic Brain Damage, Cerebral Edema, or Compression of Brain	2,331 (1.6%)	14.1	10.1	8.0
Other Severe Neurological Injury, Disease, or Dysfunction	2,331 (1.6%)	14.1	10.1	8.0
Malnutrition	33,891 (23.0%)	22.3	13.6	19.0
Dialysis	14,167 (9.6%)	23.7	13.2	21.0

NOTE: N = number of discharge assessments; when N < 11, data cannot be reported, and a dash is displayed in the table; Discharge Mobility values are reported as units of change in mobility (possible range: 08 to 48)

SOURCE: RTI analysis of LTCH CARE Data Set-Medicare FFS Claims, June 2016 through September 2017. (Program reference: ltch\_outcome\_diagnosis\_all\_patients)

## 7.4 Risk-Adjustment Variables: Frailty

### 7.4.1 Frailty Status: Definition and Measurement

According to the 2016 report by the World Health Organization (WHO) Clinical Consortium on Healthy Ageing, *frailty* can be conceptually defined as “a clinically recognizable state in older people who have increased vulnerability, resulting from age-associated declines in physiological reserve and function across multiple organ systems, such that the ability to cope with everyday or acute stressors is compromised” (WHO Clinical Consortium on Healthy Ageing, 2016).<sup>34</sup>

Operationally, measurement of *frailty status* can be divided into assessment of frailty phenotype and frailty index:

- **Frailty phenotype (FP):** Includes assessment items and sometimes a combination of assessment items and ICD codes. Some commonly used frailty phenotype instruments are:
  - i. **Fried phenotype:** Includes a combination of data from clinical assessment and self-report and covers domains such as: weakness (using hand grip strength); slowness (walking speed); low physical activity; exhaustion (self-report); and shrinking muscle mass (unintentional weight loss) (WHO Clinical Consortium on Healthy Ageing, 2016; Fried et al., 2001; Kim and Schneeweiss, 2014).<sup>35,36,37</sup> If three or more of these criteria are present, then an individual can be categorized as being frail.
  - ii. **Rockwood frailty index:** Uses a combination of medical conditions/comorbidities (e.g., congestive heart failure, diabetes, dementia, tumor, pressure ulcers etc.), performance-based assessment (e.g., hand grip strength, gait speed, mini mental status examination etc.), self-reported indicators (e.g., “Do you feel full of energy”, “Do you have serious problems with memory”), and measurements (Calf circumference, Mid arm circumference). The cumulative deficits of all these items are used to categorize frailty status (Gilbert et al., 2018).<sup>38</sup>
  - iii. **FRAIL Scale:** Consist of five domains: fatigue, resistance, ambulation, illness, and loss of weight. Each of the domain is assigned 1 point and the overall score is a sum of scores from five domains. The composite score can be further divided

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<sup>34</sup> WHO Clinical Consortium on Healthy Ageing. Report of consortium meeting 1–2 December 2016 in Geneva, Switzerland. Geneva: World Health Organization; 2017 (WHO/FWC/ALC/17.2). Licensed: CC BY-NC-SA 3.0 IGO.

<sup>35</sup> Ibid.

<sup>36</sup> Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, Seeman T, Tracy R, Kop WJ, Burke G, McBurnie MA; Cardiovascular Health Study Collaborative Research Group. Frailty in older adults: evidence for a phenotype. *J Gerontol A Biol Sci Med Sci.* 2001 Mar;56(3):M146-56.

<sup>37</sup> Kim DH, Schneeweiss S. Measuring frailty using claims data for pharmacoepidemiologic studies of mortality in older adults: evidence and recommendations. *Pharmacoepidemiol Drug Saf.* 2014;23(9):891–901.

<sup>38</sup> Gilbert T, Neuburger J, Kraindler J, et al. Development and validation of a Hospital Frailty Risk Score focusing on older people in acute care settings using electronic hospital records: an observational study. *Lancet.* 2018;391(10132):1775–1782.

into categories: 0=not frail, 1-2=prefrail, and 3-5=frail (Malmstrom, Miller, and Morley, 2014).<sup>39</sup>

- iv. **Vulnerable Elders Survey (VES-13):** Consists of four main components and the overall composite score ranges from 0-10, with a higher score associated with a greater likelihood of poor health outcomes. The main components are age, self-rated health, limitations in physical capability (e.g., difficulty with stooping, lifting 10 pounds), and functional limitations (“getting help with due to difficulty” or “not doing due to health” for shopping, managing money, walking across a room) (Min et al., 2009).<sup>40</sup>
- **Frailty index (FI):** Based on ICD codes (and utilization of services), can be generated using assessment or claims data. Measurement of the ICD code-based frailty index (FI) can follow approaches that are similar to other comorbidities indices (e.g., Charlson Comorbidity Index, Elixhauser comorbidity index) with each of the pre-specified conditions getting either a weighted or unweighted score and the final score is the sum of all the individual scores (Kim and Schneeweiss, 2014).<sup>41</sup>
  - i. **Faurot Frailty Index:** Developed using a combination of data from the Medicare Current Beneficiary Survey, Medicare Part A and B claims, and claims associated with home health, hospice, and durable medical equipment services. The Faurot Frailty Index calculations consist of variables such as: socio-demographics (age, sex), diagnostic codes (e.g., stroke, heart failure, cancer), geriatric syndromes (falls, hip fracture, pneumonia, dehydration, fecal impaction, delirium), services utilization charges (e.g., rehabilitation services, home hospital bed, wheelchair, home oxygen, walker) (Faurot et al., 2015).<sup>42</sup>
  - ii. **Davidoff Frailty Index:** Developed using a combination of data from the Medicare Current Beneficiary Survey, and Medicare Part A and B claims. Functional status information was extracted from the survey data while services used were extracted using a combination of procedure codes, the American Medical Association’s Current Procedural Terminology (CPT) codes, and the Healthcare Common Procedure Coding System (HCPCS) codes. There are three main domains that are part of the Davidoff Frailty Index: functional status, strength, and agility (Davidoff et al., 2013).<sup>43</sup>

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<sup>39</sup> Malmstrom TK, Miller DK, Morley JE. A comparison of four frailty models. *J Am Geriatr Soc.* 2014;62(4):721–726.

<sup>40</sup> Min L, Yoon W, Mariano J, et al. The vulnerable elders-13 survey predicts 5-year functional decline and mortality outcomes in older ambulatory care patients. *J Am Geriatr Soc.* 2009;57(11):2070–2076.

<sup>41</sup> Kim DH, Schneeweiss S. Measuring frailty using claims data for pharmacoepidemiologic studies of mortality in older adults: evidence and recommendations. *Pharmacoepidemiol Drug Saf.* 2014;23(9):891–901.

<sup>42</sup> Faurot KR, Jonsson Funk M, Pate V, et al. Using claims data to predict dependency in activities of daily living as a proxy for frailty. *Pharmacoepidemiol Drug Saf.* 2015;24(1):59–66.

<sup>43</sup> Davidoff AJ, Zuckerman IH, Pandya N, et al. A novel approach to improve health status measurement in observational claims-based studies of cancer treatment and outcomes. *J Geriatr Oncol.* 2013;4(2):157–165.

#### **7.4.2 Differences in Approaches:**

Use of the frailty phenotype (FP) or Rockwood frailty index requires the availability of specific assessment data, including performance-based assessment (e.g., gait speed, hand grip strength) and self-reported data (“Do you feel full of energy?”).

Use of the frailty indexes requires comprehensive data sources, and some of the listed components of these indexes are not available in ICD9/10-based claims data.

#### **7.4.3 Frailty Index using Assessment and Claims (ICD) Data**

The features of three frailty indexes and comparisons of some of their characteristics are shown in *Table 17*. The three frailty indexes are: the hospital frailty risk score (HFS), JEN frailty index (JFI), and the frailty syndrome. All these frailty indexes can be generated using ICD-10 codes.

**Table 17**  
**Comparison between claims-based frailty indexes**

	<b>Hospital frailty risk score (HFS)</b>	<b>JEN frailty index (JFI)</b>	<b>Frailty syndrome</b>
Specifications	<p>Developed and validated in the U.K, using the electronic health records (EHR).</p> <p>ICD-10 codes associated with pre-specified conditions. Points were developed for each of the conditions and final score is a cumulative of all the individual scores.</p> <p>Range:            &lt;5: Low risk for Frailty            5–15: Intermediate Risk            &gt;15: High risk for Frailty</p>	<p>Developed and validated in Medicare fee-for-service claims data and the Veterans Health Administration (VHA) data.</p> <p>The 13 JFI domains are: minor ambulatory limitations, severe ambulatory limitations, chronic mental illness, chronic developmental disability, dementia, sensory disorders, self-care impairment, syncope, cancer, chronic medical disease, pneumonia, renal disorders, and other systemic disorders.</p> <p>Unweighted scores from each of the domains are summed and divided into categories:            Low Frailty (score 0–3)            Moderate Frailty (4–5)            High Frailty (6–7)            Very High Frailty (≥8)</p> <p>OR</p> <p>High Frailty (&gt;7) vs not</p>	<p>Developed and validated in the U.K, using the Hospital Episode Statistics (HES) data.</p> <p>ICD-10 codes associated with: Anxiety and Depression, Delirium, Dementia, Functional Dependence, Falls and Fractures, Incontinence, Mobility problems, Pressure Ulcers, and Senility.</p> <p>Prevalence of these conditions are aggregated by age categories: 65–74; 75–84; &gt;85 years.</p>
Strengths	<p>Methods can be replicated in the claims data (associated with acute, post-acute stays).</p> <p>Validation against well-established Fried frailty phenotype and Rockwood frailty index.</p>	<p>Validated in Medicare and VHA claims data.</p> <p>Used by Medicare Payment Advisory Commission (MedPAC)/Urban Institute reports on PAC sequence of care and PAC unified payment system reports.</p>	<p>Methods can be replicated in the claims data (associated with acute, post-acute stays).</p>

(continued)

**Table 17 (continued)**  
**Comparison between claims-based frailty indexes**

	<b>Hospital frailty risk score (HFS)</b>	<b>JEN frailty index (JFI)</b>	<b>Frailty syndrome</b>
Limitations	<p>UK-based population, no validation work in the Medicare claims data.</p> <p>Developed for patients &gt; 75 years of age.</p>	<p>Proprietary algorithm/software program, thus replicability with accuracy (without licensing agreement) is not feasible.</p>	<p>Method for developing a composite score based on cumulative prevalence of the conditions is not developed.</p>
References	<p><b>Technical:</b>  <a href="#">Supplement to: Gilbert T, Neuburger J, Kraindler J, et al. Development and validation of a Hospital Frailty Risk Score focusing on older people in acute care settings using electronic hospital records: an observational study. Lancet 2018; published online April 26. <a href="http://dx.doi.org/10.1016/S0140-6736(18)30668-8">http://dx.doi.org/10.1016/S0140-6736(18)30668-8</a></a></p> <p><b>Main Article:</b>  <a href="#">Gilbert T, Neuburger J, Kraindler J, et al. Development and validation of a Hospital Frailty Risk Score focusing on older people in acute care settings using electronic hospital records: an observational study. Lancet 2018; published online April 26. <a href="http://dx.doi.org/10.1016/S0140-6736(18)30668-8">http://dx.doi.org/10.1016/S0140-6736(18)30668-8</a></a></p>	<p><a href="#">Bruce Kinoshian, Darryl Wieland, Xiliang Gu, Eric Stallard, Ciaran S. Phibbs and Orna Intrator BMC Health Services Research. 2018;18:908 <a href="https://doi.org/10.1186/s12913-018-3689-2">https://doi.org/10.1186/s12913-018-3689-2</a></a></p> <p><a href="#">Doug Wissoker and Bowen Garrett. Designing a Unified Prospective Payment System for Postacute Care. Research Report by Urban Institute. June 2016.</a></p>	<p><a href="#">Soong J, Poots AJ, Scott S, Donald K, Woodcock T, Lovett D, Bell D. Quantifying the prevalence of frailty in English hospitals. BMJ Open. 2015 Oct 21;5(10):e008456. doi: 10.1136/bmjopen-2015-008456</a></p> <p><a href="https://bmjopen.bmj.com/content/bmjopen/suppl/2015/10/21/bmjopen-2015-008456.DC1/bmjopen-2015-008456supp.pdf">https://bmjopen.bmj.com/content/bmjopen/suppl/2015/10/21/bmjopen-2015-008456.DC1/bmjopen-2015-008456supp.pdf</a></p>

\*NOTE: The criteria that were used to review frailty index using claims data: institutional setting, and variables that can be extracted using claims associated with acute and post-acute stays.

#### 7.4.4 Analytic Approach

To examine the association between frailty status and functional status, we used the LTCH CARE Data Set data linked with LTCH (MedPAR) claims data for patients discharged between June 1, 2016 through September 30, 2017. Patient-level frailty status was determined using ICD-10 codes in the LTCH CARE Data Set and MedPAR claims data.

We used the method described by Gilbert<sup>44</sup> that computes the Hospital Frailty Score (HFS) index and categorizes individual-level frailty status into three groups: Low risk for Frailty, Intermediate Risk, and High risk for Frailty.

*Tables 18–23* provides prevalence data for frailty-related conditions, the distribution of frailty status categories, and the mean (SD) and median change in mobility scores (8 mobility items) by frailty group.

**Table 18**  
**Prevalence of individual conditions (hospital frailty score top 15), LTCH patients discharged between June 1, 2016 through September 30, 2017**

ICD-10 Code & Description	n (%)
J96: Respiratory failure, not elsewhere classified	56,294 (43.5%)
E87: Other disorders of fluid, electrolyte and acid-base balance	48,511(37.5%)
N18: Chronic renal failure	43,436 (33.6%)
L89: Decubitus ulcer	36,696 (28.4%)
N17: Acute renal failure	33,103 (25.6%)
N39: Other disorders of urinary system (includes urinary tract infection and urinary incontinence)	31,329 (24.2%)
R13: Dysphagia	28,632 (22.1%)
D64: Other anaemias	27,094(21%)
Z99: Dependence on enabling machines and devices	25,116 (19.4%)
B96: Other bacterial agents as the cause of diseases classified to other chapters (secondary code)	24,642 (19.1%)
Z87: Personal history of other diseases and conditions	24,530 (19.0%)
A41: Other septicaemia	23,842 (18.4%)
F32: Depressive episode	20,840 (16.1%)
B95: Streptococcus and staphylococcus as the cause of diseases classified to other chapters	20,719 (16.0%)
J18: Pneumonia, organism unspecified	18,847 (14.6%)

<sup>44</sup> Gilbert T, Neuburger J, Kraindler J, et al. Development and validation of a Hospital Frailty Risk Score focusing on older people in acute care settings using electronic hospital records: an observational study. *Lancet*. 2018;391(10132):1775–1782.

**Table 19**  
**Overall frailty status categories using Hospital Frailty Score Index, LTCH patients discharged between June 1, 2016 through September 30, 2017**

Frailty Status Categories	Frequency	Percent	Cumulative Frequency	Cumulative Percent
<5: Low Risk for Frailty	21,943	16.97	21,943	16.97
5–15: Intermediate Risk for Frailty	79,478	61.47	101,421	78.45
>15: High Risk for Frailty	27,868	21.55	129,289	100.00

**Table 20**  
**Frailty status categories by LTCH primary diagnosis\***

	Respiratory, ventilator and tracheostomy	Neurological – Surgical	Neurological – Medical	Cardiovascular – Cardiac surgery	Cardiovascular – General	Gastrointestinal and hepatobiliary – Major surgical
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
<5: Low risk for Frailty	3,405 (13.35%)	48 (18.90%)	306 (11.64%)	104 (21.40%)	1,327 (23.30%)	740 (30.15%)
5-15: Intermediate Risk	15,694 (61.54%)	143 (56.30%)	1,245 (47.37%)	340 (69.96%)	3,582 (62.89%)	1,471 (59.94%)
>15: High risk for Frailty	6,403 (25.11%)	63 (24.80%)	1,077 (40.98%)	42 (8.64%)	787 (13.82%)	243 (9.90%)

**Table 21**  
**Observed mobility scores by frailty status categories in LTCH patients**

Variable	Statistic	<5: Low risk for frailty	5-15: Intermediate risk	>15: High risk for frailty
		Admission Mobility Score	N	19,979
	Mean	25.1	17.7	12.3
	SD	13	10.8	7.2
	50%	23	14	8
Discharge Mobility Score	N	20,049	73,631	25,932
	Mean	33.1	24.7	16.6
	SD	13.5	13.8	11
	50%	36	23	11
Observed Mobility Change	N	19,917	73,181	25,705
	Mean	8	7	4.3
	SD	9.9	9.6	8
	50%	6	5	1

**Table 22**  
**Risk for Frailty Status Category and Mobility Change Score\***

Frailty status categories	Parameter estimate	SE	t value	Sig.
Low Risk for Frailty (<5)	1.71	0.09	18.47	<.0001
Intermediate Risk Frailty (5-15)	1.53	0.07	22.20	<.0001
High Risk for Frailty (>15)	REF.	.	.	.

REF.=Reference category.

\* estimate reflects effect of risk after adjusting for all quality measure covariates

**Table 23**  
**Risk for frailty status category and mobility discharge score\***

Frailty status categories	Parameter estimate	SE	t value	Sig.
Low Risk for Frailty (<5)	8.81	0.12	76.60	<.0001
Intermediate Risk Frailty (5-15)	3.89	0.09	45.47	<.0001
High Risk for Frailty (>15)	REF.	.	.	.

REF.=Reference category.

\* estimate reflects effect of risk after adjusting for all quality measure covariates

## 7.5 Future Candidate Risk Adjustors

RTI noted that CMS finalized the adoption of new standardized patient assessment data elements with data collection beginning in 2020 in the FY 2020 IPPS/LTCH PPS final rule (84 FR 42524 through 42590), available at <https://www.govinfo.gov/content/pkg/FR-2019-08-16/pdf/2019-16762.pdf>, and that some of these data elements may be examined in the future as risk adjustors. These data elements address topics such as vision, hearing, cognitive function, nutritional approaches and screening for possible depression.

## 7.6 Risk-Adjustment Stratification Approach

RTI described a risk-adjustment approach that would identify 5 to 7 aggregated diagnosis groups (strata), risk-adjustment models for each of these strata, and the use of weights (based on the national distribution of LTCH patients) to create a risk-adjusted change in mobility score. RTI noted that this approach recognizes the diversity of patients treated in LTCHs, which the TEP had previously noted.

## 7.7 TEP Discussion

### 7.7.1 Risk Adjustors: Primary Diagnosis

Some TEP members thought the primary diagnosis groupings seemed reasonable, and one suggested additional analysis to further explore aggregation to create fewer condition

categories. One TEP member observed that stratifying in LTCH is difficult because small numbers make achieving statistical significance challenging.

### **7.7.2 Risk Adjustors: Admission Assessment Data**

One TEP member noted the absence of behavioral health and substance abuse data and suggested additional consideration of their impact on patient motivation to improve function. During discussion of candidate risk adjustment categories, one TEP member noted the difficulty of administering the CAM and suggested additional examination of that data. Another suggested that the measure developer considers tube feedings as a risk adjustor, and RTI noted that this data would be available in 2020 based on the recent adoption of standardized patient assessment data elements.

After noting that risk adjustment includes prior device use, another TEP member noted the increasing complexity of device use subcategories that would need to accompany the proliferation of additional devices such as power-assist wheelchairs.

One TEP member asked about using acute care length of stay as a risk adjuster. TEP members were unsure if they could get accurate acute care length of stay or ICU length of stay data at the time of the LTCH admission. Another TEP member observed that while payment in other post-acute care settings depends on the accuracy of data coding on the data set, the same is not true for LTCH, and wondered if LTCH data may contain more errors. TEP members discussed the need for training and data validation to ensure data accuracy.

The TEP members agreed that a granular approach to risk adjusting for pressure ulcers seemed reasonable.

### **7.7.3 Risk Adjustors: Frailty**

TEP members agreed that frailty has a significant influence on recovery, but they were cautious about using frailty as a risk adjustor owing to concerns about additional administrative burden associated with what they perceived as marginal improvement to an analytical model.

Regarding the assessment of data elements for frailty, TEP members observed that some frailty data elements are available, but are not comprehensive and they are not captured consistently across facilities. They suggested that specific measurement of frailty might be error prone. They consider frailty to be an accumulation of comorbid conditions.

Regarding the utility of frailty as risk adjustor, TEP members agreed that pre-morbid frailty status might be a better predictor of recovery than frailty at the time of the LTCH admission, when frailty status would be overwhelmed by the severity of acute illness. TEP members noted the challenge of consistently determining the point in time for capturing relevant data and were cautious about relying on data from prior settings.

Regarding the feasibility of capturing data for frailty measurement, TEP members questioned the feasibility of capturing useful self-reported frailty data in LTCH settings, noting that additional administrative burden. One TEP member expressed concern about the availability of reliable ICD codes captured by other clinicians.

**APPENDIX A:  
TEP IN-PERSON MEETING AGENDA**

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# Development of Functional Outcome Quality Measures for Long-Term Care Hospitals

## Agenda

### Technical Expert Panel (TEP) Meeting Long-Term Care Hospital Function Outcome Measure

Location:  
Sheraton Baltimore Washington Airport Hotel  
1100 Old Elkridge Landing Rd, Linthicum Heights, MD 21090  
Calvert Ballroom Salon 2

8:30am–3:30pm ET, Monday, August 19, 2019

#### —Morning Session—

<b>Time</b>	<b>Agenda Item</b>	
<b>8:30–9:00am</b>	Welcome and Introductions Technical Expert Panel Charter Review of Agenda	RTI/CMS RTI RTI
<b>9:00–9:30am</b>	The Long-Term Care Hospital Quality Reporting Program IMPACT Act Overview	RTI RTI
<b>9:30–10:15am</b>	Functional Outcome Quality Measures	RTI
<b>10:15–10:30am</b>	<i>Break</i>	
<b>10:30–11:15am</b>	Reliability and Validity Testing	RTI
<b>11:15–11:45am</b>	Exclusion Criteria	RTI
<b>11:45am–12:45pm</b>	<i>Lunch</i>	

#### —Afternoon Session—

<b>12:45–1:15pm</b>	Risk Adjustors: Primary Diagnosis	RTI
<b>1:15–2:00pm</b>	Risk Adjustors: Admission Assessment Data	RTI
<b>2:00–2:15pm</b>	<i>Break</i>	
<b>2:15–3:15pm</b>	Risk Adjustors: Admission Assessment Data (cont'd) Risk Adjustors: Frailty	RTI RTI
<b>3:15–3:30pm</b>	Wrap-up	CMS/RTI

If you have any questions, please contact Anne Deutsch at RTI – [ADeutsch@rti.org](mailto:ADeutsch@rti.org) / 919-597-5144.

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**APPENDIX B:**  
**DEVELOPMENT OF FUNCTIONAL OUTCOME QUALITY MEASURES FOR  
LONG-TERM CARE HOSPITALS (LTCHS)**  
**TECHNICAL EXPERT PANEL (TEP) PRESENTATION  
AUGUST 19, 2019**

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## Development of Functional Outcome Quality Measures for Long-Term Care Hospitals (LTCHs)

### Technical Expert Panel (TEP) Meeting

August 19, 2019 8:30 AM – 3:30 PM ET

RTI International

Development and Maintenance of Symptom Management Measures, HHSM-500-2013-130151

RTI International is a registered trademark and a trade name of Research Triangle Institute

www.rti.org

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## Welcome & Introductions: TEP Members

**Dawn DeVries, DHA, MPA, CTRS**  
Grand Valley State University  
Associate Professor, Program Chair  
Patient/Carer Perspective

**Caitlin Gillooley, MS**  
American Hospital Association  
Senior Associate Director, Policy

**Jean DeLeon, MD**  
UTSW/ Lifecare Dallas LTACH  
Professor in Physical Medicine and  
Rehabilitation; Medical Director of Wound  
Care

**William Reilly, MSOTR/L**  
Spaulding Hospital for Continuing Medical  
Care; Spaulding Nursing and Therapy  
Center  
Director of In-Patient Rehab (LTACH/SNF)

**Bud Langham, PT**  
EncompassHealth  
Chief Clinical Officer

**Cres Motta, PT**  
RML Specialty Hospital  
Manager, Rehabilitation Services

**Jim Smith, PT**  
Utica College  
Professor of Physical Therapy

**Carrie O'Connell, RN, BSN**  
Wellsley Healthcare Software  
EVP of Clinical Informatics

**Margaret Stuart, PT, DPT, NCS**  
NeuroRehab Center, Director of Clinical Services  
and Medical Outpatient Clinic

**Amanda Dawson, PhD & MA**  
Select Medical  
VP Research

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## Welcome & Introductions

### CMS

Tara McMullen, PhD  
Mary Pratt, RN  
Lorraine Wickiser, RN  
Alan Levitt, MD

### RTI Leadership

Laura Smith, PhD  
Laurie Coots, PhD

### RTI

Anne Deutsch, RN, PhD, CRRN  
Tri Le, PhD  
Lauren Palmer, PhD  
Amol Karmarkar, PhD  
Terry Eng, RN, PhD  
Sarra Sabouri, MPH  
Magda Ignaczak, BS  
Bob Bailey, BA  
Kate Foster, BA

### Consultant

John Votto, DO FCCP

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## TEP Charter

- The TEP Charter orients members to their roles and responsibilities.
- The TEP is the second part of the measure conceptualization process.
- A TEP is a group of stakeholders and experts who contribute direction and thoughtful input to the measure developer.

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## Agenda

8:30-9:00 am	Welcome and Introductions Technical Expert Panel Charter Review of Agenda
9:00-9:30 am	LTCH Quality Reporting Program IMPACT Act Overview
9:30-10:15 am	Functional Outcome Quality Measures
10:30-11:15 am	Reliability and Validity Testing
11:15-11:45 am	Exclusion Criteria
12:45-1:15 pm	Risk Adjustors: Primary Diagnosis
1:15-2:00 pm	Risk Adjustors: Admission Assessment Data
2:15-3:15 pm	Risk Adjustors: Admission Assessment Data Risk Adjustors: Frailty
3:15-3:30 pm	Wrap-up

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## Meeting Objectives

- To obtain input on functional outcome quality measures that may be used in Long-Term Care Hospitals (LTCHs):
  - Functional Outcome Measure: Change in Mobility Score
  - Functional Outcome Measure: Discharge Mobility Score
- To specify the target population(s), including the inclusion and exclusion criteria.
- To identify the case-mix adjustment variables and the approach for case-mix adjustment.

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## Background

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## Definition: Quality Measure

**Quality Measures** quantify health care processes, outcomes, patient perceptions, and organizational structure and/or systems that are associated with the ability to provide high-quality health care and/or that relate to one or more quality goals for health care.

The following terms are also sometimes used: performance measure, quality metric, quality indicator, performance indicator.

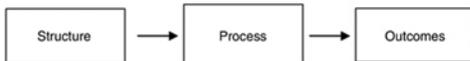
Centers for Medicare and Medicaid Services. (2018) What is Quality?  
<https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/MMS/What-is-a-Quality-Measure-SubPage.html>

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## Donabedian's Model

Quality can be evaluated based on structure, process, and outcomes:

- **Structure measures** track whether a particular mechanism or system is in place
- **Process measures** track performance of a particular action
- **Outcome measures** consider the end results of care, such as morbidity and mortality resulting



<https://jamanetwork.com/journals/jama/article-abstract/374139>

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## Quality Measure Specifications: Key Components

- Measure name/title
- Measure description
- Target population
- Denominator
- Numerator
- Exclusion criteria
- Data sources
- Data elements, codes
- Unit of measurement or analysis
- Sampling
- Risk adjustment
- Time windows
- Measure results
- Calculation algorithm

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## Long-Term Care Hospital Quality Reporting Program Overview

- Section 3004(a) of the *Affordable Care Act of 2010* amended section 1886(m)(5) of the Social Security Act requiring the Secretary to establish quality reporting requirements for LTCHs
- Under the LTCH QRP, CMS requires Medicare-certified LTCHs to submit quality data
- Requirement applies to all patients receiving inpatient services in a facility certified as a hospital and designated as an LTCH under Medicare

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## Long-Term Care Hospital Quality Reporting Program Overview (cont'd)

- For fiscal year (FY) 2014, and each year after, if an LTCH does not submit the required quality data, the LTCH will be subject to a 2-percentage-point reduction in the applicable fiscal year (FY) annual payment update
- In addition, the *Improving Medicare Post-Acute Care Transformation Act of 2014* requires the submission of standardized data by LTCHs, inpatient rehabilitation facilities, skilled nursing facilities, and home health agencies

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## CMS Meaningful Measures

MEANINGFUL MEASURES Initiative



For additional information visit:

<https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/QualityInitiativesGeneralInfo/MMF/General-info-Sub-Page.html>

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## LTCH QRP Measures: Assessment-Based

Measure Title	Data Collection Start Date	Public Reporting Start Date
Percent of Residents or Patients with Pressure Ulcers That are New or Worsened (Short Stay)*	October 1, 2012	December 2016
Percent of Residents or Patients Who Were Assessed and Appropriately Given the Seasonal Influenza Vaccine (NQF #0680)*	October 1, 2014	December 2017
Application of Percent of Residents Experiencing One or More Falls with Major Injury (Long Stay) (NQF #0674)	April 1, 2016	September 2018
Percent of Long-Term Care Hospital Patients with an Admission and Discharge Functional Assessment and a Care Plan That Addresses Function (NQF #2631)	April 1, 2016	September 2018
Application of Percent of Long-Term Care Hospital Patients with an Admission and Discharge Functional Assessment and a Care Plan That Addresses Function (NQF #2631)	April 1, 2016	September 2018

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## LTCH QRP Measures: Assessment-Based (cont'd)

Measure Title	Data Collection Start Date	Public Reporting Start Date
Functional Outcome Measure: Change in Mobility Among Long-Term Care Hospital Patients Requiring Ventilator Support (NQF #2632)	April 1, 2016	Fall 2020
Drug Regimen Review Conducted with Follow-Up for Identified Issues-Post Acute Care (PAC) Long-Term Care Hospital (LTCH) Quality Reporting Program (QRP)	July 1, 2018	Fall 2020
Changes in Skin Integrity Post-Acute Care: Pressure Ulcer/Injury	July 1, 2018	Fall 2020
Compliance with Spontaneous Breathing Trial (SBT) by Day 2 of the LTCH Stay	July 1, 2018	Future
Ventilator Liberation Rate	July 1, 2018	Future

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## LTCH QRP Measures: CDC NHSN

Measure Title	Data Collection Start Date	Public Reporting Start Date
NHSN Catheter-Associated Urinary Tract Infection (CAUTI) Outcome Measure (NQF #0138)	October 1, 2012	December 2016
NHSN Central Line-Associated Bloodstream Infection (CLABSI) Outcome Measure (NQF #0139)	October 1, 2012	December 2016
Influenza Vaccination Coverage among Healthcare Personnel (NQF #0431)	October 1, 2014	December 2017
NHSN Facility-wide Inpatient Hospital-onset <i>Clostridium difficile</i> Infection (CDI) Outcome Measure (NQF #1717)	January 1, 2015	December 2017

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## LTCH QRP Measures: Medicare Fee-For-Service Claims-Based

Measure Title	Data Collection Start Date	Public Reporting Start Date
Medicare Spending Per Beneficiary – Post Acute Care (PAC) Long-Term Care Hospital (LTCH) Quality Reporting Program (QRP)	N/A	September 2018
Discharge to Community-Post Acute Care (PAC) Long-Term Care Hospital (LTCH) Quality Reporting Program (QRP)	N/A	September 2018
Potentially Preventable 30-Day Post-Discharge Readmission Measure for Long-Term Care Hospital (LTCH) Quality Reporting Program (QRP)	N/A	September 2018

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## Long-Term Care Hospital Quality Reporting Program Current Measures

- CMS adopted 15 measures for the LTCH QRP:
  - 8 Assessment-Based Measures
    - Data collected with the LTCH Continuity Assessment Record and Evaluation (CARE) Data Set
  - 4 Centers for Disease Control and Prevention (CDC) measures
    - Data collected through the CDC's National Healthcare Safety Network (NHSN)
  - 3 Medicare Fee-For-Service claims-based measures
    - No additional data are required to be submitted
- One of the measures for the LTCH QRP is a mobility functional outcome measure for patients requiring ventilator support.

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## Improving Medicare Post-Acute Care Transformation (IMPACT) Act of 2014

Requires Standardized Patient Assessment Data Across Post-Acute Care that will enable:

- Quality care and improved outcomes
- Data Element uniformity
- Comparison of quality and data across post-acute care (PAC) settings
- Improved, person-centered, goals-driven discharge planning
- Exchangeability of data
- Coordinated care

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## IMPACT Act of 2014

The IMPACT Act requires...

- post-acute care providers to report standardized patient assessment data, data on quality measures, and data on resource use
- the data to be interoperable across post-acute care and other providers
- modification of the post-acute care item sets...to enable assessment data comparison across all such providers
- public reporting of provider performance (quality of care)
- evaluate payment systems that establish payment rates according to characteristics of individuals instead of according to the post-acute care setting

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## Standardized Patient Assessment Data

### Requirements for reporting assessment data:

- Providers must submit standardized assessment data through PAC assessment instruments under applicable reporting provisions
- Data must be submitted at the time of admission and discharge for each patient, or more frequently as required

### Data categories:

- Functional status
- Cognitive function and mental status
- Special services, treatments, and interventions
- Medical conditions and co-morbidities
- Impairments
- Other categories required by the Secretary

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## Review of Existing Functional Outcome Measures

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## International Classification of Functioning, Disability, and Health

- World Health Organization's (WHO) International Classification of Functioning, Disability, and Health (ICF) provides a standard language and framework for describing health and health-related states to describe changes in body function and structure.
- Within the ICF, *functioning* is an umbrella term that refers to all body functions and structure, activities and participation, and *disability* is a global term that refers to impairments, activity limitations and participation restrictions.

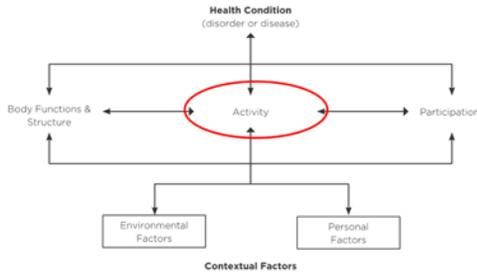
23

## ICF Definitions

- **Impairments** refer to problems, such as a significant deviations or loss, of body functions or structures. The abnormality of body structure, appearance, and organ or system function can result from any cause. Impairments occur at the organ level (e.g., dysphagia, hemiparesis).
- **Activity limitations** may occur as a consequence of an impairment and can be described in terms of a person's functional abilities or the nature and extent of function at the individual level. For example, activity limitations at the level of the person could include bathing, dressing, communicating, walking, or grooming.
- **Participation restrictions** may occur as a consequence of impairments that impact work, family, and social roles, and determine the nature and extent of a person's involvement in life and various activities. Participation reflects the interaction with and adaptation to one's surroundings.
- **Environmental factors** include environmental barriers and facilitators such as climate and terrain, social attitudes, or physical elements (e.g., built environment) such as curbs and steps.

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## International Classification of Functioning, Disability, and Health



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## Data Elements on PAC Assessments Self-Care

Data Element Identifier	Data Element Label	Long-Term Care Hospital CARE Data Set Version 4.00 July 2018	Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI) Version 2.0 Oct 2018	Minimum Data Set (MDS) 3.0 Version 1.16.0 Oct 2018	Outcome and Assessment Information Set (OASIS-D) Jan 2019
GG0130A	Eating	✓	✓	✓	✓
GG0130B	Oral hygiene	✓	✓	✓	✓
GG0130C	Toileting hygiene	✓	✓	✓	✓
GG0130D	Wash upper body	✓	—	—	—
GG0130E	Shower/bathe self	—	✓	✓	✓
GG0130F	Upper body dressing	—	✓	✓	✓
GG0130G	Lower body dressing	—	✓	✓	✓
GG0130H	Putting on/taking off footwear	—	✓	✓	✓

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## Data Elements on PAC Assessments Mobility

Data Element Identifier	Data Element Label	Long-Term Care Hospital CARE Data Set Version 4.00 July 2018	Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI) Version 2.0 Oct 2018	Minimum Data Set (MDS) 3.0 Version 1.16.0 Oct 2018	Outcome and Assessment Information Set (OASIS-D) Jan 2019
GG0170A	Roll left and right	✓	✓	✓	✓
GG0170B	Sit to lying	✓	✓	✓	✓
GG0170C	Lying to sitting on side of bed	✓	✓	✓	✓
GG0170D	Sit to stand	✓	✓	✓	✓
GG0170E	Chair/bed-to-chair transfer	✓	✓	✓	✓
GG0170F	Toilet transfer	✓	✓	✓	✓
GG0170G	Car transfer	—	✓	✓	✓
GG0170I	Walk 10 feet	✓	✓	✓	✓
GG0170J	Walk 50 feet with two turns	✓	✓	✓	✓
GG0170K	Walk 150 feet	✓	✓	✓	✓

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## Data Elements on PAC Assessments Mobility (cont'd)

Data Element Identifier	Data Element Label	Long-Term Care Hospital CARE Data Set Version 4.00 July 2018	Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI) Version 2.0 Oct 2018	Minimum Data Set (MDS) 3.0 Version 1.16.0 Oct 2018	Outcome and Assessment Information Set (OASIS-D) Jan 2019
GG0170L	Walking 10 feet on uneven surface	—	✓	✓	✓
GG0170M	1 step (curb)	—	✓	✓	✓
GG0170N	4 steps	—	✓	✓	✓
GG0170O	12 steps	—	✓	✓	✓
GG0170P	Picking up object	—	✓	✓	✓
GG0170Q	Does the patient/resident use a wheelchair and/or scooter?	✓	✓	✓	✓
GG0170R	Wheel 50 feet with two turns	✓	✓	✓	✓
GG0170RR	Indicate the type of wheelchair or scooter used.	✓	✓	✓	✓
GG0170S	Wheel 150 feet	✓	✓	✓	✓
GG0170SS	Indicate the type of wheelchair or scooter used.	✓	✓	✓	✓

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## IRF Functional Outcome Measures: Change in Mobility (NQF #2634)

- **Description:** This measure estimates the risk-adjusted change in mobility score between admission and discharge among IRF patients age 21 and older. The change in mobility score is calculated as the difference between the discharge mobility score and the admission mobility score.
- **Data Elements:** 15 mobility activities; 6-level rating scale or a code indicating an activity was not attempted
- **Target Population:** The number of IRF patient stays, except those that meet the exclusion criteria.

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## Change in Mobility: Included Mobility Items

- GG0170A. Roll left and right
- GG0170B. Sit to lying
- GG0170C. Lying to sitting on side of bed
- GG0170D. Sit to stand
- GG0170E. Chair/bed-to-chair transfer
- GG0170F. Toilet transfer
- GG0170G. Car transfer



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## Change in Mobility: Included Mobility Items (cont'd)

- GG0170I. Walk 10 feet
- GG0170J. Walk 50 feet with two turns
- GG0170K. Walk 150 feet
- GG0170L. Walking 10 feet on uneven surfaces
- GG0170M. 1 step (curb)
- GG0170N. 4 steps
- GG0170O. 12 steps
- GG0170P. Picking up object



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## Change in Mobility: Risk Adjustment

- Patients treated in IRFs vary in terms of primary diagnosis, demographic characteristics, and coexisting conditions
- Patients may have different expected improvement in function on the basis of these factors. Therefore, this outcome measure is risk-adjusted
- Risk adjustment controls for specific patient characteristics (e.g., age or diagnosis) that may affect patients' outcomes so that facility data may be compared



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## IRF Functional Outcome Measures: Mobility Exclusion Criteria for the Mobility Measures

1. Patients with incomplete stays
2. Patients with the following medical conditions on admission: coma, persistent vegetative state, complete quadriplegia, locked-in syndrome, or severe anoxic brain damage, cerebral edema or compression of brain
3. Patients younger than age 21
4. Patients discharged to hospice
5. Patients who are not Medicare Part A or Medicare Advantage beneficiaries
6. Patients who are independent with all mobility activities at the time of admission (*this exclusion applies only to NQF #2634, Change in Mobility Score*)

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## Mobility: Risk Adjustment Variables

1. Age group
2. Admission mobility score (continuous)
3. Admission mobility score (squared)
4. Primary diagnosis group
5. Interaction between admission mobility and primary diagnosis group
6. Prior acute or IRF primary diagnosis – surgical
7. Prior functioning: indoor ambulation
8. Prior functioning: stair negotiation
9. Prior functioning: cognition
10. Prior mobility/device aids
11. Stage 2 pressure ulcer
12. Stage 3, 4, or unstageable pressure ulcer/injury
13. Cognitive function
14. Communication impairment
15. Bladder incontinence
16. Bowel incontinence
17. Swallowing ability
18. Total parenteral nutrition
19. History of falls
20. Low body mass index
21. Comorbidities

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## Change in Mobility: Risk Adjustors

Table A-5  
Risk-Adjustment Covariates for the Change in Self-Care, Change in Mobility, Discharge Self-Care, and Discharge Mobility Measures (NQF #2633, NQF #2634, NQF #2635, and NQF #2636)

Covariate	Covariate Category	IRF-PAI Item(s) and Calculations <sup>a</sup>	Change in Self-Care (NQF #2633)	Change in Mobility (NQF #2634)	Discharge Self-Care (NQF #2635)	Discharge Mobility (NQF #2636)
Model Intercept			✓	✓	✓	✓
Age Group	<35 years	Truncate (Item 12 – Item 6) = age; If age < 35 years = 1; else = 0	✓	✓	✓	✓
Age Group	35–44 years	Truncate (Item 12 – Item 6) = age; If age 35–44 years = 1; else = 0	✓	✓	✓	✓
Age Group	45–54 years	Truncate (Item 12 – Item 6) = age; If age 45–54 years = 1; else = 0	✓	✓	✓	✓
Age Group	55–64 years	Truncate (Item 12 – Item 6) = age; If age 55–64 years = 1; else = 0	✓	✓	✓	✓
Age group (reference category)	65–74 years (reference category)	Truncate (Item 12 – Item 6) = age; If age 65–74 years = 1; else = 0	n/a	n/a	n/a	n/a
Age Group	75–84 years	Truncate (Item 12 – Item 6) = age; If age 75–84 years = 1; else = 0	✓	✓	✓	✓
Age Group	85–90 years	Truncate (Item 12 – Item 6) = age; If age 85–90 years = 1; else = 0	✓	✓	✓	✓

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## Change in Mobility: Detailed Information

- A summary of this quality measure can be accessed on the NQF website: <http://www.qualityforum.org/qps/2634>.
- More detailed specifications for this quality measure, including risk adjustment testing and selection information, can be downloaded from: <http://www.qualityforum.org/ProjectTemplateDownload.aspx?SubmissionID=2634>.



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## IRF Functional Outcome Measures: Discharge Mobility Score (NQF #2636)

- **Description:** This measure estimates the percentage of IRF patients who meet or exceed an expected discharge mobility score.
- **Numerator:** The numerator is the number of patients in an IRF with an observed discharge mobility score that is equal to or higher than a calculated expected discharge mobility score. Data elements: 15 mobility activities; 6-level rating scale or a code indicating an activity was not attempted.
- **Denominator:** IRF patients included in this measure are at least 21 years of age, except those that meet the exclusion criteria.

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## Discharge Mobility: Numerator/Denominator

Numerator

The number of patients in an IRF with a discharge mobility score that is equal to or higher than the calculated expected discharge mobility score.

Denominator

The total number of Medicare Part A and Medicare Advantage patient stay-level IRF-PAI records with a discharge date in the measure target period, which do not meet the exclusion criteria.

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## Discharge Mobility: Included Mobility Items

- GG0170A. Roll left and right
- GG0170B. Sit to lying
- GG0170C. Lying to sitting on side of bed
- GG0170D. Sit to stand
- GG0170E. Chair/bed-to-chair transfer
- GG0170F. Toilet transfer
- GG0170G. Car transfer

The data required to calculate this measure are the same as the "Change in Mobility" measure (NQF #2634).



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## Discharge Mobility: Included Mobility Items (cont'd)

- GG0170I. Walk 10 feet
- GG0170J. Walk 50 feet with two turns
- GG0170K. Walk 150 feet
- GG0170L. Walking 10 feet on uneven surfaces
- GG0170M. 1 step (curb)
- GG0170N. 4 steps
- GG0170O. 12 steps
- GG0170P. Picking up object



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## Discharge Mobility: Quality Measure Exclusions

### This quality measure has five exclusion criteria:

1. Patients with incomplete stays
2. Patients in a coma, persistent vegetative state, complete tetraplegia, locked-in state, severe anoxic brain damage, cerebral edema, or compression of brain
3. Patients younger than 21 years
4. Patients discharged to hospice
5. Patients who are not Medicare beneficiaries

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## Discharge Mobility: Detailed Information

- A summary of this quality measure can be accessed on the NQF website: <http://www.qualityforum.org/qps/2636>.

- More detailed specifications for this quality measure, including risk adjustment testing and selection information, can be downloaded from: <http://www.qualityforum.org/ProjectTemplateDownload.aspx?SubmissionID=2636>.



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## IRF Functional Outcome Measures Change in Self-Care (NQF #2633)

**Description:** This measure estimates the risk-adjusted change in self-care score between admission and discharge among IRF patients age 21 and older. The change in self-care score is calculated as the difference between the discharge self-care score and the admission self-care score.

**Data Elements:** 7 self-care activities; 6-level rating scale or a code indicating an activity was not attempted

**Target Population:** The number of IRF patient stays, except those that meet the exclusion criteria

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## Change in Self-Care: Included Self-Care Items

- GG0130A. Eating
- GG0130B. Oral hygiene
- GG0130C. Toileting hygiene
- GG0130E. Shower/bathe self
- GG0130F. Upper body dressing
- GG0130G. Lower body dressing
- GG0130H. Putting on/taking off footwear



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## IRF Functional Outcome Measures: Self-Care Exclusion Criteria for the Self-Care Measures

1. Patients with incomplete stays
2. Patients with the following medical conditions on admission: coma, persistent vegetative state, complete quadriplegia, locked-in syndrome, or severe anoxic brain damage, cerebral edema or compression of brain
3. Patients younger than age 21
4. Patients discharged to hospice
5. Patients who are not Medicare Part A or Medicare Advantage beneficiaries
6. Patients who are independent with all self-care activities at the time of admission (*this exclusion applies only to NQF #2633, Change in Self-Care Score*)

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## Change in Self-Care: Risk Adjustment Variables

- |  |  |
|--|--|
| 1. Age group   | 9. Prior mobility/device aids                        |
| 2. Admission self-care score (continuous)                              | 10. Stage 2 pressure ulcer                           |
| 3. Admission self-care score (squared)                                 | 11. Stage 3, 4, or unstageable pressure ulcer/injury |
| 4. Primary diagnosis group   | 12. Cognitive function                               |
| 5. Interaction between admission self-care and primary diagnosis group | 13. Communication impairment                         |
| 6. Prior acute or IRF primary diagnosis – surgical                     | 14. Bladder incontinence                             |
| 7. Prior functioning: self-care  | 15. Bowel incontinence                               |
| 8. Prior functioning: indoor ambulation                                | 16. Swallowing ability                               |
|  | 17. Comorbidities                                    |

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## Change in Self-Care: Detailed Information

- A summary of this quality measure can be accessed on the National Quality Forum (NQF) website: <http://www.qualityforum.org/qps/2633>.
- More detailed specifications for this quality measure, including risk adjustment testing and selection information, can be downloaded from: <http://www.qualityforum.org/ProjectTemplateDownload.aspx?SubmissionID=2633>.



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## IRF Functional Outcome Measures Discharge Self-Care Score (NQF #2635)

**Description:** This measure estimates the percentage of IRF patients who meet or exceed an expected discharge self-care score.

**Numerator:** The numerator is the number of patients in an IRF with an observed discharge self-care score that is equal to or higher than a calculated expected discharge self-care score. Data elements: 7 self-care activities; 6-level rating scale or a code indicating an activity was not attempted

**Denominator:** IRF patients included in this measure are at least 21 years of age, except those that meet the exclusion criteria.

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## Discharge Self-Care: Numerator/Denominator

Numerator

The number of patients in an IRF with a discharge self-care score that is equal to or higher than the calculated expected discharge self-care score.

Denominator

The total number of Medicare Part A and Medicare Advantage patient stay-level IRF-PAI records with a discharge date in the measure target period, which do not meet the exclusion criteria.

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## Discharge Self-Care: Included Self-Care Items

- GG0130A. Eating
- GG0130B. Oral hygiene
- GG0130C. Toileting hygiene
- GG0130E. Shower/bathe self
- GG0130F. Upper body dressing
- GG0130G. Lower body dressing
- GG0130H. Putting on/taking off footwear



The data required to calculate this measure are the same as the "Change in Self-Care" measure (NQF #2633).



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## Discharge Self-Care Calculation

1. Calculate the observed discharge self-care score
2. Identify the excluded stays
3. Calculate the expected discharge self-care score
4. Calculate the difference in observed and expected discharge self-care scores
5. Determine the denominator count
6. Determine the numerator count
7. Calculate the facility-level discharge self-care percent
8. Round the value to one decimal space



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## Discharge Self-Care: Risk Adjustment Variables

1. Age group
2. Admission self-care score (continuous)
3. Admission self-care score (squared)
4. Primary diagnosis group
5. Interaction between admission self-care and primary diagnosis group
6. Prior acute or IRF primary diagnosis – surgical
7. Prior functioning: self-care
8. Prior functioning: indoor ambulation
9. Prior mobility/device aids
10. Stage 2 pressure ulcer
11. Stage 3, 4, or unstageable pressure ulcer/injury
12. Cognitive function
13. Communication impairment
14. Bladder incontinence
15. Bowel incontinence
16. Swallowing ability
17. Comorbidities

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## Discharge Self-Care: Detailed Risk Adjustment Information

Table A-5  
Risk-Adjustment Covariates for the Change in Self-Care, Change in Mobility, Discharge Self-Care, and Discharge Mobility Measures (NQF #2633, NQF #2634, NQF #2635, and NQF #2636)

Covariate	Covariate Category	HF-FAI Items) and Calculations*	Change in Self-Care (NQF #2633)	Change in Mobility (NQF #2634)	Discharge Self-Care (NQF #2635)	Discharge Mobility (NQF #2636)
Model Intercept			✓	✓	✓	✓
Age Group	<35 years	Truncate (Item 12 - Item 6) = age; If age <35 years = 1; else = 0	✓	✓	✓	✓
Age Group	35-44 years	Truncate (Item 12 - Item 6) = age; If age 35-44 years = 1; else = 0	✓	✓	✓	✓
Age Group	45-54 years	Truncate (Item 12 - Item 6) = age; If age 45-54 years = 1; else = 0	✓	✓	✓	✓
Age Group	55-64 years	Truncate (Item 12 - Item 6) = age; If age 55-64 years = 1; else = 0	✓	✓	✓	✓
Age group (reference category)	65-74 years	Truncate (Item 12 - Item 6) = age; If age 65-74 years = 1; else = 0	n/a	n/a	n/a	n/a
Age Group	75-84 years	Truncate (Item 12 - Item 6) = age; If age 75-84 years = 1; else = 0	✓	✓	✓	✓
Age Group	85-90 years	Truncate (Item 12 - Item 6) = age; If age 85-90 years = 1; else = 0	✓	✓	✓	✓

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## LTCH Functional Outcome Measure: Change in Mobility Among Patients Requiring Ventilator Support (NQF #2632)

**Description:** This measure estimates the risk-adjusted change in mobility score between admission and discharge among LTCH patients requiring ventilator support at admission. The change in mobility score is calculated as the difference between the discharge mobility score and the admission mobility score.

**Data Elements:** 8 mobility activities rated on a 6-level rating scale or code indicating an activity was not attempted

**Target Population:** The denominator includes all LTCH patients requiring ventilator support on admission who are least 21 years of age, except those that meet the exclusion criteria.

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## LTCH Functional Outcome Measure: Change in Mobility Among Patients Requiring Ventilator Support (NQF #2632)

- **Six patient-level exclusion criteria include:**
  1. Patients with incomplete stays (e.g., medical emergency, against medical advice, patients who die, length of stay < 3 days)
  2. Patients discharged to hospice
  3. Patients with progressive neurological conditions, including amyotrophic lateral sclerosis, multiple sclerosis, Parkinson's disease, and Huntington's chorea
  4. Patients in coma, persistent vegetative state, complete tetraplegia, and locked-in syndrome
  5. Patients younger than age 21
  6. Patients who are coded as independent on all the mobility items at admission

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## Risk Adjustment LTCH Change in Mobility Measure (NQF #2632)

- Regression intercept and coefficients are used to calculate an expected change in mobility score for each patient
- The risk adjustment model includes 22 covariates covering these factors:

Age group	Pressure ulcers
Prior functioning (before the current illness/injury)	Primary medical condition
Prior device use	Comorbidities
Communication impairment	

- In this calculation, the intercept and coefficient values were constant for each patient, while risk adjustor values were specific to the patient.

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## Risk Adjustment: Intercept & Risk-Adjustor Coefficient Values - LTCH Change in Mobility Measure (NQF #2632)

Risk Adjustor	Category	Values
Model Intercept		12.6294
Age Group	<55 years	2.9821
Age Group	55-64 years	2.1077
Age Group	65-74 years (reference category)	--
Age Group	75-84 years	-1.6863
Age Group	85+ years	-3.3091
Communication Impairment	Moderate to Severe	-1.9412
Prior functioning: indoor ambulation	Dependent	-4.2700
Prior functioning: indoor ambulation	Some help	-1.9684
Prior Device Use	Manual Wheelchair or Motorized and/or Scooter	-2.0660
Prior Device Use	Mechanical Lift	-2.4056
Primary Medical Condition Category	Chronic respiratory condition	-2.2277
Primary Medical Condition Category	Acute onset and chronic respiratory conditions	-0.5331
Primary Medical Condition Category	Chronic cardiac condition	-1.2701
Primary Medical Condition Category	Other medical condition	-0.8384
Stage 3, 4, or unstageable pressure ulcer/injury	Presence	-1.7629
Comorbidities	Severe and Metastatic Cancers	-0.1293
Comorbidities	Dialysis and Chronic Kidney Disease, Stage 5	-0.6848
Comorbidities	Diabetes Mellitus (DM)	-0.5808
Comorbidities	Major Lower Limb Amputation	-1.7373
Comorbidities	Stroke, Hemiplegia or Hemiparesis	-3.5778
Comorbidities	Dementia	-1.3576
Comorbidities	Paraplegia, Incomplete Tetraplegia, Other Spinal Cord Disorder/Injury	-5.3440

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## Development of New LTCH Functional Outcome Quality Measures: Environmental Scan

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## Literature review: Items/Instruments used in Intensive Care Units

[Epub. 2018 Dec 22. doi: 10.1093/ptj/ptj158. [Epub ahead of print]

### International Classification of Functioning, Disability and Health Domains of 60 Physical Functioning Measurement Instruments Used During Adult Intensive Care Unit Stay: A Scoping Review.

Gonzalez-Seguel E<sup>1</sup>, Gomez EJP, Moreno-Ocasio O<sup>2</sup>

<sup>1</sup> Author information

#### Abstract

**BACKGROUND:** There has been a recent surge in the creation and adaptation of instruments to measure physical functioning (PF) in the intensive care unit (ICU). A key step to selecting the right measurement instrument is to understand the core constructs that it is measuring in terms of the International Classification of Functioning, Disability and Health (ICF) domains.

**PURPOSE:** The purpose of this study was to map the ICF domains and subdomains included in the PF measurement instruments in adult patients during the ICU stay systematically.

**DATA SOURCES:** A systematic search was carried out in Cochrane CENTRAL, PubMed, CINAHL and LILACS as well as a hand search up to May 17, 2017.

**STUDY SELECTION:** Study selection included all types of research articles that used at least 1 PF measurement instrument in adult patients within the ICU.

**DATA EXTRACTION:** Study design, year of publication, study population and the measurement instruments reported were recorded. A consensus of experts analyzed the ICF domains included in each instrument.

**DATA SYNTHESIS:** One hundred and eighty-one articles containing 60 PF measurement instruments used during the ICU stay were found. Twenty-six ICF domains were identified, 40 instruments included Mobility, and 13 included Muscle Function.

**LIMITATIONS:** Studies not written in English or Spanish were excluded.

**CONCLUSIONS:** There are numerous PF measurement instruments used in adult ICU patients. The most frequent ICF domain that is measured is Mobility. This study highlights the ICF domains contained in the instruments that can be used clinically, providing a complete database of instruments that could facilitate selection of the most appropriate measure based on the patients' needs.

PMID: 30969519 DOI: 10.1093/ptj/ptj158

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## Items/Instruments used in ICU (Gonzalez-Seguel, 2019)

- Summary of F. Gonzalez-Seguel et al, 2019 (in press)
- Analyzed 60 physical functioning measurement instruments used in ICU
  - 33 scales/scores
  - 9 questionnaires
  - 18 biophysical instruments
- Mapped items to the ICF domains
- Mobility is included in 38 of 60 instruments
  - 27 scales/scores
  - 8 questionnaires
  - 3 biophysical instruments
    - Also analyzed mobility subdomains due to widespread inclusion of mobility
- No other domain is included in more than 11 of 60 instruments

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## ICF Domains of the 42 Physical Functioning Scales, Scores and Questionnaires (Gonzalez-Seguel, 2019)

ICF Component	ICF Domain	N of Scales/Scores that Included Measure, of 33 Examined	N of Questionnaires that Included Measure, of 9 Examined
Body Functions	Functions of joints and bones [b710-b729]	0	0
	Muscle functions [b730-b749]	11	0
	Movement functions [b750-b789]	9	1
	Respiratory muscle functions [b445]	2	0
	Exercise tolerance functions [b455]	8	0
	Respiration functions [b440]		1
	Other body function	6	5
Body Structures	Structures related to movement [s710-s799]	0	0
	Muscles of respiration [s4303]	0	0
Activities and Participation	General tasks and demands [d2]	1	7
	Mobility [d4]	27	8
	Self-care [d5]	2	8
	Domestic life [d6]	1	6
Environmental Factors	Community, social and civic life	2	5
	Other activities and participation	2	5
	Products and technology for personal use in daily living [d115]	2	2

## ICF Mobility Subdomains (Gonzalez-Seguel, 2019)

Mobility Subdomains	Number of Instruments that included measure, of the 38 instruments that measured mobility
Lying Down (d4100)	16
Sitting (d4103)	12
Standing (d4104)	18
Bending (d4105)	2
Shifting the Body's CoG (d4106)	2
Rolling Over (d4107)b	8
Maintaining a Lying Position (d4150)	6
Maintaining a Sitting Position (d4153)	15
Maintaining a Standing Position (d4154)	10
Transferring Oneself While Sitting (d4200)	16
Transferring Oneself While Lying (d4201)	2
Fine Hand Use - Picking Up (d4400)	2
Reaching (d4452)	1
Walking Short Distances (d4500)	24
Walking on Different Surfaces (d4502)	1
Walking, Other Specified (d4508)c	11
Climbing (d4551)	2
Jumping (d4553)	1
Moving Around Using Equipment: Wheelchair	8

## Items/Instruments used in Critical Care (Parry, 2017)

**Author:**  
Selina M. Parry et al

**Title:**  
Evaluating physical functioning in critical care: considerations for clinical practice and research, 2017 (open access)



## Items/Instruments used in Critical Care (Parry, 2017)

- **Summary of Parry et al 2017**
- Analyzed 11 instruments for measuring physical functioning in the ICU
- Examined factors that influence measurement
- Noted the importance of establishing the purpose of assessment such as intervention efficacy
- Noted changes in relevance and feasibility of instruments across the recovery trajectory
- Offered a stage-based recommendation for selecting an instrument
  - Prior to ICU admission
  - At ICU admission
  - During ICU
- Similar to Gonzalez, Parry mapped items to the ICF framework

## Mapping Mobility Items to ICF Framework (Parry, 2017)

Mobility Subdomains	Number of Instruments that included activity, of 11 instruments examined
Lying down [d4100]	9
Sitting [d4103]	10
Standing [d4104]	3
Maintaining a lying position [d4150]	2
Maintaining a sitting position [d4153]	8
Maintaining a standing position [d4154]	8
Transferring one-self while sitting [d4200]	6
Fine hand use (picking up) [d4400]	1
Jumping [d4553]	1
Walking short distances [d4500]	9
Walking, other specified [d4508]	3
Climbing [d4551]	1
Moving around using equipment [d465]	1

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## Items/Instruments used in LTCH/ICU (Parry, 2015)

**Author:**  
Selina M. Parry et al.

**Title:**  
Assessment of impairment and activity limitations in the critically ill: a systematic review of measurement instruments and their clinimetric properties, 2015 (on line)



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## Items/Instruments used in ICU (Parry, 2015)

### Summary of Parry et al. 2015

- Reviewed 33 measures used to evaluate function in the critically ill population
- Of 26 function measures, 12 were evaluated for their clinimetric properties
- Found that excellent reliability had been established for five instruments specifically developed for use in the ICU setting:
  - CPAX
  - PFIT-s
  - Perme mobility scale
  - ICU mobility scale
  - Surgical intensive care unit optimal mobility scale (SOMS)

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## Development and Initial Testing of the Data Elements

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## Data Elements: Development and Initial Testing

Initial reliability and validity testing included testing of the self-care and mobility data elements, as well as data elements that are used as risk adjusters for the functional outcome measures.

The Post-Acute Care Payment Reform Demonstration included reliability and validity testing of the data elements, including inter-rater reliability testing, case study (video) reliability testing, Rasch analysis, comparisons with similar functional assessment data elements used in IRFs, SNFs and HHAs.

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## Testing Results

- Results of the testing conducted as part of the Post-Acute Care Payment Reform Demonstration are reported in 3 volumes:
  - Volume 1: Development of the CARE Item Set (August 2012)
  - Volume 2: Reliability Testing (August 2012)
  - Volume 3: CARE Item Set and Current Assessment Comparisons (September 2012)
- Available at: <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Post-Acute-Care-Quality-Initiatives/CARE-Item-Set-and-B-CARE.html>

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## Reliability Testing

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## Mobility Scale/Instrument Analysis – Internal Consistency (unit of analysis is patient stays)

We examined internal consistency of the mobility scale/instrument to assess how well mobility data elements interrelate within the mobility scale.

Internal consistency was assessed using Cronbach's alpha coefficient:

- Ranges from 0 to 1, with 0 indicating no consistency of measurement among the items, and 1 indicating perfect consistency.
- Nunnally (1978) indicated that Cronbach's alpha should be at least 0.90 for item sets used in decision making.

**Results:** Analysis of the mobility data showed good reliability statistics. The overall Cronbach's alpha was 0.97 (IRF – 15 mobility data elements) and 0.92 (LTCH – 8 mobility data elements).

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### Computed Performance Measure Score Reliability – Split-half Reliability (unit of analysis is providers)

- We randomly split each provider’s patient stays into two groups and calculated correlations between computed scores of the randomly divided groups.
- Scores for IRFs with fewer than 20 patient stays are not displayed to the public, so we used facilities with 20 or more stays in this analysis.
- We used Pearson Product-Moment Correlation (r), Spearman Rank Correlation (ρ), and Intraclass Correlation Coefficient (ICC) to measure internal reliability.
- Intraclass correlations were also calculated by facility volume quartile to look for differences in performance measure reliability by IRF size.

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### Computed Performance Measure Score Reliability – IRF Results

**Computed Performance Measure Score Reliability (Unit of analysis is provider):** Split-half analysis results indicated strong, positive correlations ( $r = 0.916$ ,  $\rho = 0.912$ ,  $ICC = 0.916$ ,  $p < 0.001$ ) between the IRF providers’ randomly divided groups’ computed performance measure scores for the Change in Mobility performance measure, providing strong evidence of measure reliability.

**Table 3. Interclass Correlation Coefficient by IRF Volume, Calendar Year 2017 (N=1,117)**

Volume Quartile	Number of IRFs	ICC
Quartile 1: 20 - 174	280	0.833
Quartile 2: 175 - 295	278	0.936
Quartile 3: 296 - 566	280	0.951
Quartile 4: 568 - 4,416	279	0.969
<b>Total</b>	<b>1,117</b>	<b>0.916</b>

Note: Providers with <20 stays during the 12-month testing period are excluded.  
Source: RTI analysis of IRF-PAI January – December 2017 (Program reference: MV52)

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### Computed Performance Measure Score Reliability – LTCH Results: NQF #2632

**Computed Performance Measure Score Reliability (Unit of analysis is provider):** Split-half analysis results indicated positive moderate-to-strong correlations ( $r = 0.714$ ,  $\rho = 0.710$ ,  $ICC = 0.714$ ,  $p = <0.0001$ ) between the LTCH providers’ randomly divided groups’ computed performance measure scores on the Change in Mobility Among Patients Requiring Ventilator Support performance measure, providing evidence of measure reliability.

**Table 3. Interclass Correlation Coefficient by LTCH Volume, July 2016 – March 2018 (N=343)**

Volume Quartile	Number of LTCHs	ICC
Quartile 1: 20 – 44	89	0.600
Quartile 2: 45 - 76	86	0.704
Quartile 3: 77 - 118	83	0.733
Quartile 4: 119 - 547	85	0.807
<b>Total</b>	<b>343</b>	<b>0.714</b>

Note: Providers with < 20 stays during the 21-month testing period are excluded.  
Source: RTI analysis of LTCH CARE Data Set July 2016 – March 2018 (Program reference: 2632\_reliability)

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### Validity Testing

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### Data Element Construct Validity – Observed Discharge Mobility Scores and Discharge Destination (unit of analysis is patient stays)

- We tested the validity of mobility data by examining discharge function scores and whether patients were discharged to a community destination.
- IRFs provide intensive rehabilitation services to patients with a goal of maximizing patient functioning so that the patient can be discharged home and avoid institutionalization.
- IRF patients who have higher abilities are more likely to be discharged to home or another community-based setting compared to patients discharged to another post-acute care setting.
- Therefore, we tested the construct validity of the mobility data by examining the relation between discharge mobility scores and being discharged to the community, after excluding incomplete stays.

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### Data Element Construct Validity – Observed Discharge Functional Ability and Discharge Destination - Results

- Patients with higher discharge scores (from 01 - Dependent to 06 - Independent) are more likely to be discharged to the community for all items and all levels with one exception. For the activity Picking Up Object, Level 1, which has a slightly higher percentage compared to Level 2
- A high percentage of patients who were coded 06 - Independent were discharged to the community for each of the mobility data elements:
  - 74.7% for Wheel 50 feet with two turns
  - 98.2% for 12 Steps.
- Mobility item data were positively associated with discharge destination. Patients who had higher observed scores at discharge were more likely to be discharged to a community setting.

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### Data Element Construct Validity – Observed Discharge Functional Ability and Discharge Destination – IRF Results

#### Mobility Examples from Table 5

Observed Discharge Mobility Data Element Scores and Discharge Location (n=437,619)

GG017083: Mobility - Sit to Lying		
01-Dependent	2,004 (30.0%)	
02-Substantial/maximal assistance	5,056 (36.8%)	
03-Partial/moderate assistance	22,852 (56.2%)	
04-Supervision or touching assistance	59,331 (72.3%)	
05-Setup or clean-up assistance	13,075 (76.3%)	
06-independent	256,067 (93.6%)	
GG0170C3: Mobility - Lying to Sitting on Side of Bed		
01-Dependent	1,990 (30.1%)	
02-Substantial/maximal assistance	5,258 (37.1%)	
03-Partial/moderate assistance	22,569 (56.1%)	
04-Supervision or touching assistance	61,051 (72.5%)	
05-Setup or clean-up assistance	13,321 (76.9%)	
06-independent	254,227 (93.7%)	

(See pages 16 – 19 of 2634\_nqf\_testing\_01-07-2019 final)

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### Data Element Construct Validity – Observed Discharge Functional Ability and Discharge Destination – LTCH Results

Table 5. Observed Discharge Mobility Data Element Scores and Discharge Location (n=40,748)

	Number (Percent) Discharged to Community (Percent Bars shown)
GG0170A3: Mobility – Roll Left and Right	
01-Dependent	1557 (10.6%)
02-Substantial/maximal assistance	448 (8.1%)
03-Partial/moderate assistance	567 (8.7%)
04-Supervision or touching assistance	659 (13.5%)
05-Setup or clean-up assistance	595 (24.5%)
06-Independent	2955 (44.7%)
GG0170B3: Mobility – Sit to Lying	
01-Dependent	1808 (10.3%)
02-Substantial/maximal assistance	381 (7.5%)
03-Partial/moderate assistance	591 (9.6%)
04-Supervision or touching assistance	789 (16.8%)
05-Setup or clean-up assistance	648 (28.2%)
06-Independent	2564 (51.9%)

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### Data Element Construct Validity – Observed Discharge Functional Ability and Discharge Destination – LTCH Results

GG0170C3: Mobility – Lying to Sitting on Side of Bed		
01-Dependent	1886 (10.2%)	
02-Substantial/maximal assistance	349 (7.2%)	
03-Partial/moderate assistance	577 (9.8%)	
04-Supervision or touching assistance	836 (17.9%)	
05-Setup or clean-up assistance	648 (28.7%)	
06-Independent	2485 (54.4%)	

GG0170D3: Mobility – Sit to Stand		
01-Dependent	2244 (10.0%)	
02-Substantial/maximal assistance	269 (7.1%)	
03-Partial/moderate assistance	512 (10.6%)	
04-Supervision or touching assistance	1115 (23.7%)	
05-Setup or clean-up assistance	729 (36.9%)	
06-Independent	1912 (66.3%)	

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### Scale/Instrument Construct Validity – Observed Discharge Mobility Scores and Discharge Destination (unit of analysis is patient stays)

We tested the validity of the scale/instrument scores by examining the discharge mobility scale scores and whether patients were discharged to a community destination.

We ran a logistic regression model to examine the association between discharge mobility scores and the odds of a community discharge.

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### Scale/Instrument Construct Validity – Observed Discharge Mobility Scores and Discharge Destination (unit of analysis is patient stays) – IRF Results

**Table 6. Coefficient and Odds Ratio for Discharge to Community Model (n=437,19)**

Independent Variable	Value	95% Confidence Interval
Observed Discharge Mobility Score		
Coefficient	0.069	
Odds Ratio	1.072	1.071 – 1.072

Note: Observed discharge mobility score range = 15 – 90; Incomplete stays were excluded.  
Source: RTI analysis of IRF-PAI, January – December 2017. (Program reference: LP63).

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### Scale/Instrument Construct Validity – Observed Discharge Mobility Scores and Discharge Destination (unit of analysis is patient stays) – LTCH Results

**Table 6. Coefficient and Odds Ratio for Discharge to Community Model (n=44,052)**

Independent Variable	Value	95% Confidence Interval
Discharge Mobility Item Score		
Coefficient	0.126	
Odds Ratio	1.134	1.129 – 1.138

Note: Observed Discharge Mobility score range = 8 – 48; Incomplete stays were excluded.  
Source: RTI analysis of LTCH CARE Data Set, July 2016 – March 2018. (Program reference: 2632\_validity).

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**Scale/Instrument Construct Validity – Data Element (Item) Difficulty Ordering Using Rasch Analysis (unit of analysis is patient assessment data)**

- Rasch analysis uses item data to determine how well items in a scale/instrument function together to measure a construct.
- This methodology places the items of interest on a "ruler" to enable evaluations of how well the items work together, how difficult each item is relative to the other items in the scale/instrument, and how items are ordered from easy to difficult.
- By applying this analysis to the mobility items, we were able to develop a mobility "ruler" using data from IRFs, skilled nursing facilities and long-term care hospitals.
- Result is a "ruler" that allows comparability of mobility item functioning within and across settings.

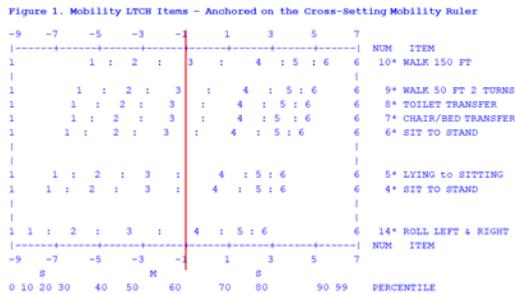
85

**Scale/Instrument Construct Validity – Data Element (Item) Difficulty Ordering Using Rasch Analysis (unit of analysis is patient assessment data) – LTCH Results**

- Walk 150 Feet (most difficult activity)
  - Walk 50 Feet with Two Turns
    - Toilet Transfer
- Chair/Bed Transfer
  - Sit to Stand
  - Lying to Sitting
    - Sit to Lying
- Roll Left & Right (easiest activity)

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**Scale/Instrument Construct Validity – Data Element (Item) Difficulty Ordering Using Rasch Analysis (unit of analysis is patient assessment data) – LTCH Results**



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**Data Element (Item) and Scale/Instrument Validity - Response Option Assessment Using Rasch Analysis (unit of analysis is patient assessment data)**

- Rasch analysis reports the number and percent of patients by score level (from 06 - Independent to 01 - Dependent) for each item and the average mobility ability (i.e., scale-level ability) of those patients.
- This allows us to determine whether the 6-point rating scale is operating as intended for the mobility items.
- In general, we expect that patients who have lower ability overall would have lower ability levels (i.e., lower scores) for each item.
- Therefore, the average mobility ability calibration (scale-level ability measure reported in logits) associated with the more dependent scores would be lower than those associated with the more independent scores.

Citation: Wright BD, Linacre JM (1994) Reasonable mean-square fit values. Rasch Measurement Transactions. 8:3 p.370. <http://www.rasch.org/rmt/rmt83b.htm>

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## Data Element (Item) and Scale/Instrument Validity - Response Option Assessment Using Rasch Analysis (unit of analysis is patient assessment data) – IRF Results

Table 8. Distribution of Combined Admission and Discharge Scores and Average Ability Estimate by Response Code for Each Mobility Item (n=320,893)

Item	Score (Response Code)*	Number of Patients	Percent of Patients by Item	Average Mobility Ability of Patients (-9 to +7 Logit Scale)
Sit to Lying	1	16188	5	-7.41
	2	31191	10	-4.34
	3	71571	23	-1.91
	4	81766	26	0.32
	5	12244	4	1.92
	6	102182	32	4.52
Lying to Sitting on Side of Bed	1	15826	5	-7.46
	2	33649	11	-4.3
	3	73012	23	-1.85
	4	80855	26	0.4
	5	11929	4	2.02
	6	100635	32	4.57
Sit to Stand	1	20263	7	-6.33
	2	29276	9	-3.98
	3	83433	27	-1.61
	4	93128	30	1.17
	5	9941	3	2.97
	6	73902	24	5.33

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## Data Element (Item) and Scale/Instrument Validity - Response Option Assessment Using Rasch Analysis (unit of analysis is patient assessment data) – LTCH Results

Table 8. Distribution of Combined Admission and Discharge Scores and Average Ability Estimate by Response Code (n = 321,392)

Data element	Score (Response Code)* Higher Score = Higher Ability	Number of Patients	Percent of Patients by Data Element	Average Mobility Ability of Patients (-9 to +7 Logit Scale; Higher Value = Higher Ability)
Roll Left & Right	01	85,931	27	-8.36
	02	40,922	13	-5.76
	03	49,646	15	-3.49
	04	40,625	13	-0.85
	05	20,852	6	1.26
	06	83,546	26	3.94
Sit to Lying	01	73,037	26	-8.30
	02	36,730	13	-5.06
	03	47,268	17	-2.67
	04	38,920	14	0.99
	05	19,248	7	1.97
	06	67,883	24	4.64
Lying to Sitting on Side of Bed	01	67,477	25	-8.25
	02	35,396	13	-4.93
	03	46,091	17	-2.50
	04	38,989	14	0.29
	05	18,521	7	2.19
	06	64,693	24	4.77

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## Quality Measure Specification: Exclusion Criteria

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## Inclusion/Exclusion Criteria Discussion

- Exclusion criteria are applied in order to maintain the validity of measure scores.
- Determining exclusion criteria involves considering patients with certain conditions who are expected to show limited or less predictable improvement or decline.
- Are there subgroups of patients who should be excluded from the LTCH functional outcome quality measure calculations?
- The number of exclusion criteria should be limited

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## Inclusion/Exclusion Criteria LTCH Change in Mobility Measure (NQF #2632)

Observed Change in Mobility Score in Mobility Units by Exclusion Criteria (N=66,137)

Exclusion Criteria	n (%)	Mean	SD	25 <sup>th</sup> Percentile	50 <sup>th</sup> Percentile (Median)	75 <sup>th</sup> Percentile
Discharged to Hospice	1,609 (2.4%)	0.5	4.3	0.0	0.0	0.0
Excluded Medical Condition						
Coma	4,659 (7.0%)	2.6	6.7	0.0	0.0	0.0
Complete Tetraplegia	1,530 (2.3%)	1.3	4.4	0.0	0.0	0.0
Locked-In Syndrome	230 (0.3%)	2.2	5.6	0.0	0.0	1.0
Severe anoxic brain damage, cerebral edema, or compression of the brain	5,144 (7.8%)	3.8	8.0	0.0	0.0	4.0
Multiple Sclerosis	431 (0.7%)	2.8	6.9	0.0	0.0	3.0
Huntington's Disease	39 (0.1%)	4.7	8.5	—	1.0	—
Parkinson's Disease	900 (1.4%)	3.5	6.7	0.0	0.0	4.0
Amyotrophic Lateral Sclerosis	518 (0.8%)	2.7	6.7	0.0	0.0	3.0
Independent with all Admission Mobility Data elements	49 (0.1%)	-12.7	17	—	0.0	—

Note: N = number of patient stays; Observed Change in Mobility values are reported as units of change in mobility (possible range: -40 to 40)  
Source: RTI analysis of LTCH CARE Data Set, July 2016 – March 2018. (Program reference: 2632\_exclusion)

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## Inclusion/Exclusion Criteria LTCH Medicare Fee For Service Patients

Observed Change in Mobility Score in Mobility Units by Exclusion Criteria (N=160,612)

Exclusion Criteria	n (%)	Mean	SD	25 <sup>th</sup> Percentile	50 <sup>th</sup> Percentile (Median)	75 <sup>th</sup> Percentile
Discharged to Hospice	4,238 (2.7%)	0.1	6.8	-1.0	0.0	1.0
Excluded Medical Condition						
Coma	2,896 (1.8%)	2.3	6.0	0.0	6.0	14.0
Complete Tetraplegia	1,260 (0.8%)	1.1	3.7	0.0	0.0	0.0
Locked-In Syndrome	179 (0.1%)	3.1	6.5	0.0	0.0	3.0
Severe anoxic brain damage, cerebral edema, or compression of the brain	3,221 (2.0%)	4.1	7.9	0.0	0.0	5.0
Multiple Sclerosis	1,222 (0.8%)	2.9	6.7	0.0	0.0	4.0
Huntington's Disease	116 (0.1%)	3.7	7.9	0.0	0.0	6.5
Parkinson's Disease	2,752 (1.7%)	4.1	7.7	0.0	0.0	7.0
Amyotrophic Lateral Sclerosis	348 (0.2%)	3.3	7.0	0.0	0.0	4.0
Independent with all Admission Mobility Data elements	4,594 (2.9%)	-1.4	5.0	0.0	0.0	0.0

Note: N = number of patient stays; Observed Change in Mobility values are reported as units of change in mobility (possible range: -40 to 40)  
Source: RTI analysis of LTCH CARE Data Set, June 2016 – September 2017. (Program reference: lch\_outcome\_diagnosis\_exclusions)

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## Exclusion Criteria: Patients with Incomplete Stays

Discharge functional status data are not available for patients with **incomplete stays** (e.g., discharged to short-stay acute care hospital, inpatient psychiatric hospital, or patient who died during the LTCH stay)

### RESEARCH METHODS AND REPORTING

OPEN ACCESS

#### Statistical methods to compare functional outcomes in randomized controlled trials with high mortality

Elizabeth Colantuoni,<sup>1,2</sup> Daniel O Scharfstein,<sup>1,2</sup> Chenguang Wang,<sup>3</sup> Mohamed D Hashem,<sup>1,4</sup> Andrew Leroux,<sup>2</sup> Dale M Needham,<sup>1,4,5</sup> Timothy D Girard<sup>6</sup>

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Mortality is a common primary endpoint in randomized controlled trials of patients with a high severity of illness, such as critically ill patients. However, researchers are increasingly evaluating functional outcomes, such as quality of life. Importantly, in such trials some patients may die before the assessment of a functional outcome, resulting in the functional outcome

controlled trials evaluating treatments for seriously ill patients, such as those with critical illness receiving care on an intensive care unit (ICU). In such trials mortality is a common primary outcome measure. However, given the high value that patients place on outcomes other than mortality, including cognition, physical function, and quality of life, such functional outcomes are increasingly being evaluated as coprimary or key secondary outcomes in such trials.<sup>1-3</sup> When evaluating the effects of treatments on primary and key secondary outcomes, regulators expect that key principles (eg, intention to treat) be adhered to and statistical procedures be defined a priori.

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## Quality Measure Specification: Risk Adjustors

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## Risk Adjustment Discussion

- What patient factors affect LTCH patients' functional outcomes?
  - How might LTCH patients be grouped into primary medical conditions for risk-adjustment?
  - Any data elements on the admission LTCH CARE Data Set that we should consider?
  - Should we examine frailty as a risk adjustor?

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## Primary Medical Conditions and Comorbidities

- Primary medical condition
  - Etiologic diagnosis (underlying condition that started the episode of care (reason for acute care hospitalization)
  - For patients requiring invasive ventilator support at the time of admission, use
- Comorbidities
  - Clinical assessment data (e.g., admission mobility score, cognitive function scores, number and type of pressure ulcers)

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**TABLE 11-3** The top 20 MS-LTC-DRGs made up over 60 percent of LTCH discharges in 2016

MS-LTC-DRG	Description	Discharges	Share of cases	Share of for-profit cases	Share of non-profit cases
189	Pulmonary edema and respiratory failure	17,539	14.0%	13.8%	15.0%
207	Respiratory system diagnosis with ventilator support 96+ hours	14,443	11.5	10.9	15.0
871	Septicemia without ventilator support 96+ hours with MCC	7,938	6.3	6.7	4.3
339	Osteomyelitis with MCC	3,418	2.7	2.7	2.7
592	Skin ulcers with MCC	3,351	2.7	2.8	2.0
177	Respiratory infections and inflammations with MCC	3,092	2.5	2.6	1.8
949	Aftercare with CC/MCC	2,960	2.4	2.3	2.8
208	Respiratory system diagnosis with ventilator support <96 hours	2,790	2.2	2.1	2.6
682	Renal failure with MCC	2,516	2.0	2.0	1.8
981	Extensive OR procedure unrelated to principal diagnosis with MCC	2,451	2.0	1.9	2.3
166	Other respiratory system OR procedures with MCC	1,959	1.6	1.6	1.5
559	Abscesses, musculoskeletal system, and connective tissue with MCC	1,929	1.5	1.6	1.2
370	Skin debridement with MCC	1,746	1.4	1.5	0.8
853	Infectious and parasitic diseases with OR procedure with MCC	1,731	1.4	1.5	0.9
314	Other circulatory system diagnoses with MCC	1,679	1.3	1.4	1.2
919	Complications of treatment with MCC	1,640	1.3	1.3	1.2
862	Postoperative and posttraumatic infections with MCC	1,624	1.3	1.3	1.5
463	Wound debridement and skin graft except hand, for musculo-connective tissue disorders with MCC	1,551	1.2	1.3	1.0
291	Heart failure and shock with MCC	1,535	1.2	1.3	1.0
4	Tracheostomy with ventilator support 96+ hrs or primary diagnosis except face, mouth and neck without major OR procedure	1,534	1.2	1.2	1.4
Top 20 MS-LTC-DRGs		84,369	61.7	61.6	61.8

Note: MS-LTC-DRG (Medicare severity diagnosis related group), LTCH (long-term care hospital), MCC (major complication or comorbidity), CC (complication or comorbidity), OR (operative event), MS-LTC-DRGs are for remote sites for OCH facilities. The sum of column component does not equal the total due to rounding.

Source: MedPAC analysis of Medicare Provider Analysis and Review data from CMS.

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## Long-Term Acute Care Hospital Use of Non-Mechanically Ventilated Hospitalized Older Adults

Anil N. Makani, MD, MAS,<sup>1,2</sup> Oanh Kieu Nguyen, MD, MAS,<sup>1,2</sup> Lei Xuan, PhD,<sup>1</sup> Michael E. Miller, MS,<sup>1</sup> and Ethan A. Halm, MD, MPH<sup>1,2</sup>

Table 1. Cohort Characteristics

Characteristic	Transferred to LTAC (n=1,831)
Patient factors before hospitalization, n (%)	
Age	
65-69	265 (14.5)
70-74	359 (19.6)
75-79	356 (19.4)
80-84	409 (22.3)
85	442 (24.1)
Female	1106 (54.9)
White	1374 (75.0)
Prior LTAC use	189 (10.3)
Prior skilled nursing facility use	278 (15.2)
Wheelchair use	357 (19.5)
Patient index hospitalization factors	
Length of hospital stay, median (IQR)	8 (5-13)
Intensive care unit stay ≥ 3 days, n (%)	911 (49.8)
Primary diagnosis	
DRG resource intensity weight, median (IQR)	1.91 (1.47-2.58)
DRG with major complication or comorbidity assignment, n (%)	1,378 (75.3)
Medical diagnosis (vs surgical), n (%)	1,322 (72.2)
Respiratory MDC, n (%)	366 (21.1)
Circulatory MDC, n (%)	296 (16.2)
Urinary MDC, n (%)	148 (8.1)
Secondary diagnoses, n (%) <sup>a</sup>	
Respiratory failure	612 (33.4)
Septic	681 (37.2)
Skin, soft tissue, or joint infection	522 (28.5)
Chronic skin ulcer	493 (26.9)
Delirium or dementia	488 (26.7)
Select intensive treatments and procedures, n (%)	
Transient mechanical ventilation (<96 hours)	127 (6.9)
Cervical vertebrae line	466 (25.5)
Excisional debridement	76 (4.2)

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**A latent class analysis of prolonged mechanical ventilation patients at a long-term acute care hospital: Subtype differences in clinical outcomes\***

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**Table 7**  
 Etiology of PMV by class\*

n(%)	Class 1 (n = 73)	Class 2 (n = 105)	Class 3 (n = 71)	Total
Cardiac	9 (12.3)	9 (8.6)	9 (12.7)	27 (10.8)
CV Surgery	3 (4.1)	31 (29.5)	18 (25.4)	52 (20.9)
Respiratory	28 (38.4)	20 (19)	16 (22.5)	64 (25.7)
Neurologic	13 (17.8)	14 (13.3)	3 (4.2)	30 (12)
Trauma	7 (9.6)	8 (7.6)	6 (8.5)	21 (8.4)
Oncologic	1 (1.4)	6 (5.7)	7 (9.9)	14 (5.6)
GI	5 (6.8)	11 (10.5)	4 (5.6)	20 (8)
Infection/Sepsis	6 (8.2)	6 (5.7)	7 (9.9)	19 (7.6)
Renal/Endocrine	1 (1.4)	0(0)	1 (1.4)	2 (0.8)

CV Surgery = cardiovascular surgery.  
 GI = Gastrointestinal.  
 \*Significant differences amongst the classes at  $p < .05$ .

**LTCH Primary Diagnoses Analysis**  
 Other Medical Conditions Category – Top 30 Conditions

HCC #	HCC Label	Frequency	Percent
2	Septicemia, Sepsis, Systemic Inflammatory Response Syndrome/Shock	20422	10.40
84	Cardio-Respiratory Failure and Shock	15070	7.67
39	Bone/Joint/Muscle Infections/Necrosis	14963	7.62
164	Cellulitis, Local Skin Infection	7967	4.06
157	Pressure Ulcer of Skin with Necrosis Through to Muscle, Tendon, Bone	5840	2.97
135	Acute Renal Failure	5459	2.78
176	Complication of Specified Implanted Device or Graft	4847	2.47
160	Pressure Pre-Ulcer Skin Changes or Unspecified Stage	4406	2.24
36	Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders	4243	2.16
18	Diabetes with Chronic Complications	4237	2.16
161	Chronic Ulcer of Skin, Except Pressure	4042	2.06
174	Other Injuries	3806	1.94
33	Intestinal Obstruction/Perforation	3211	1.64
85	Congestive Heart Failure	3180	1.62
116	Viral and Unspecified Pneumonia, Pleurisy	2893	1.47

**LTCH Primary Diagnoses Analysis**  
 Other Medical Conditions Category – Top 30 Conditions

HCC #	HCC Label	Frequency	Percent
158	Pressure Ulcer of Skin with Full Thickness Skin Loss	2558	1.30
114	Aspiration and Specified Bacterial Pneumonias	2286	1.16
103	Hemiplegia/Hemiparesis	1889	0.96
38	Other Gastrointestinal Disorders	1686	0.86
189	Amputation Status, Lower Limb/Amputation Complication	1619	0.82
167	Major Head Injury	1605	0.82
108	Vascular Disease	1469	0.75
7	Other Infectious Diseases	1373	0.70
57	Schizophrenia	1321	0.67
105	Late Effects of Cerebrovascular Disease, Except Paralysis	1263	0.64
21	Protein-Calorie Malnutrition	1143	0.58
111	Chronic Obstructive Pulmonary Disease	1127	0.57
3	Bacterial, Fungal, and Parasitic Central Nervous System Infections	1103	0.56
178	Major Symptoms, Abnormalities	1078	0.55
136	Chronic Kidney Disease, Stage 9	982	0.50

**Admission, Discharge and Change in Mobility**

- See LTCH Analysis Potential Risk Adjustors:
  - Table 1. Observed Change in Mobility Score by Diagnosis Group
  - Table 2. Observed Admission Mobility Score by Diagnosis Group
  - Table 3. Observed Discharge Mobility Score by Diagnosis Group
  - Table 4. Observed Change in Mobility Score by Admission Assessment Data
  - Table 5. Observed Admission Mobility Score by Admission Assessment Data
  - Table 6. Observed Discharge Mobility Score by Admission Assessment Data



### Admission, Discharge & Change in Mobility (Table 4)

Candidate Risk-Adjusters	n (%)	Mean	SD	Median
<b>Stage 3 Pressure Ulcer</b>				
0	40143 (82.3%)	5.2	8.6	2.0
1	6649 (13.6%)	3.9	7.8	0.0
2	1364 (2.8%)	3.6	7.2	0.0
3	437 (0.9%)	2.8	6.2	0.0
4	134 (0.3%)	2.5	5.7	0.0
5	43 (0.1%)	1.3	4.7	0.0
6-9	-	-	-	-
<b>Stage 4 Pressure Ulcer</b>				
0	40029 (82.0%)	5.5	8.8	2.0
1	6603 (13.5%)	2.5	6.4	0.0
2	1289 (2.6%)	2.0	5.7	0.0
3	518 (1.1%)	1.5	5.1	0.0
4	235 (0.5%)	1.7	5.1	0.0
5	81 (0.2%)	1.0	3.0	0.0
6	22 (0%)	1.4	4.4	0.0
7	14 (0%)	2.2	4.2	0.0
8-9	-	-	-	-
<b>Unstageable (Not Rated) Pressure Ulcer</b>				
0	48379 (99.2%)	4.9	8.4	1.0
1	313 (0.6%)	5.4	8.0	2.0
2	69 (0.1%)	5.8	9.7	1.0
3	19 (0%)	2.7	8.3	0.0
4-9	-	-	-	-

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### Admission, Discharge & Change in Mobility (Table 4)

Candidate Risk-Adjusters	n (%)	Mean	SD	Median
<b>Unstageable (Slough) Pressure Ulcer</b>				
0	34548 (70.8%)	5.3	8.7	2.0
1	9240 (18.9%)	4.3	8.2	1.0
2	2789 (5.7%)	3.5	7.2	0.0
3	1108 (2.3%)	3.0	7.0	0.0
4	515 (1.1%)	3.3	6.8	0.0
5	267 (0.5%)	2.2	5.6	0.0
6	132 (0.3%)	1.6	5.3	0.0
7	66 (0.1%)	3.1	7.5	0.0
8	47 (0.1%)	1.8	5.5	0.0
9	80 (0.2%)	1.0	2.6	0.0
<b>Unstageable (DTI) Pressure Ulcer</b>				
0	31771 (65.1%)	4.8	8.4	1.0
1	10396 (21.3%)	5.3	8.7	2.0
2	3605 (7.4%)	4.8	8.3	1.0
3	1786 (3.7%)	5.2	8.8	1.0
4	604 (1.2%)	3.9	7.4	0.0
5	292 (0.6%)	2.8	5.8	0.0
6	145 (0.3%)	2.6	7.3	0.0
7	82 (0.2%)	2.7	7.2	0.0
8	45 (0.1%)	1.3	5.0	0.0
9	63 (0.1%)	0.7	2.7	0.0

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### Admission, Discharge & Change in Mobility (Table 4)

Candidate Risk-Adjusters	n (%)	Mean	SD	Median
<b>Other Active Diagnoses (Section I)</b>				
Peripheral Vascular or Arterial Disease (PVD/PAD)	19105 (13.0%)	6.1	9.0	4.0
Chronic Kidney Disease, Stage 5	13593 (9.2%)	6.1	9.1	4.0
Acute Renal Failure	17164 (11.6%)	7.0	9.5	4.0
Septicemia, Sepsis, SIRS/Shock	24551 (16.7%)	5.9	9.2	3.0
CNS Infections, Opportunistic Infections, Bone/Joint/Muscle Infections/Necrosis	18904 (12.8%)	6.6	9.2	4.0
Diabetes Mellitus	53084 (36.0%)	6.4	9.2	4.0
Major Lower Limb Amputation	4919 (3.3%)	4.6	7.5	3.0
Stroke	12702 (8.6%)	4.6	7.9	1.0
Dementia	12192 (8.3%)	3.4	7.1	0.0
Hemiplegia or Hemiparesis	5630 (3.8%)	3.7	6.8	0.0
Paraplegia	4041 (2.7%)	2.8	6.4	0.0
Complete Tetraplegia	1043 (0.7%)	1.1	3.7	0.0
Incomplete Tetraplegia	901 (0.6%)	2.6	5.9	0.0
Other Spinal Cord Disorder/Injury	2524 (1.7%)	5.1	8.2	2.0
Multiple Sclerosis (MS)	1078 (0.7%)	2.9	6.7	0.0
Huntington's Disease	100 (0.1%)	3.7	7.9	0.0
Parkinson's Disease	2241 (1.5%)	4.1	7.7	0.0
Amyotrophic Lateral Sclerosis	286 (0.2%)	3.3	7.0	0.0
Other Progressive Neuromuscular Disease	15988 (10.8%)	3.6	7.0	0.0
Locked-In State	133 (0.1%)	3.1	6.5	0.0
Severe Anoxic Brain Damage, Cerebral Edema, or Compression of Brain	2326 (1.6%)	4.1	7.9	0.0
Other Severe Neurological Injury, Disease, or Dysfunction	2326 (1.6%)	4.1	7.9	0.0
Malnutrition	33830 (22.9%)	6.5	9.3	4.0
Dialysis	14141 (9.6%)	6.6	9.3	4.0

### Frailty Status: Conceptual Definition

According to the 2016 report by the World Health Organization (WHO) Clinical Consortium on Healthy Ageing, frailty can be conceptually defined as:

- "a clinically recognizable state in older people who have increased vulnerability, resulting from age-associated declines in physiological reserve and function across multiple organ systems, such that the ability to cope with everyday or acute stressors is compromised" (WHO Clinical Consortium on Healthy Ageing, 2016\*)

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## Frailty Measurement: Clinical Assessment Data

**Fried phenotype:** Requires combination of data from clinical assessment and self-report.

- Covers domains such as:
- weakness (grip strength)
- slowness (walking speed)
- low physical activity
- exhaustion (self-report)
- shrinking muscle mass (unintentional weight loss)
- ([WHO Clinical Consortium on Healthy Ageing, 2016](#); [Fried et al., 2001](#); [Kim and Schneeweiss, 2014](#) ☞).

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## Frailty Measurement: Clinical Assessment Data

Table A4.1 Variables used to construct Fried score

ITEM	DETAILS	Rules
<b>Nutritional status</b>	Weight loss > 5kg in preceding year	"Yes" - weight_loss_gt5_12mths = 1
<b>Strength</b>	Grip strength, lowest 20% in this population	Max grip strength value from left and right grip strength values. Lowest 20% of values from population stratified by gender and BMI = 1. Male BMI <=24, 24.1-26, 26.1-28, 28+. Female BMI <=23, 23.1-26, 26.1-29, 29+.
<b>Energy</b>	Do you feel full of energy? "no"	"No" - energy
<b>Mobility</b>	Gait speed 2.4m walk, lowest 20%	Slowest 20% of values stratified by gender and height = 1. Male Height <=173,>173. Female Height <=159,>159. If not able to walk 2.4m then given value of 1.
<b>Physical activity</b>	EuroQol-5D questions mobility, self-care, usual activities	Sum EQ5D values for self-care, mobility and usual activities. Score >=7/9 = 1.

[https://www.thelancet.com/cms/10.1016/S0140-6736\(18\)30668-8/attachment/a5f78a5c-b75b-496e-acbc-329f84a11e37/mmc1.pdf](https://www.thelancet.com/cms/10.1016/S0140-6736(18)30668-8/attachment/a5f78a5c-b75b-496e-acbc-329f84a11e37/mmc1.pdf) ☞

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## Frailty Measurement Claims & Assessment-based

**Rockwood frailty index:** Uses a combination of medical conditions/comorbidities (e.g., congestive heart failure, diabetes), performance-based assessment (e.g., hand grip strength, gait speed), self-reported indicators (e.g., "Do you feel full of energy?") ([Gilbert et al., 2018](#) ☞).

Table A4.2 Variables used to construct Rockwood Index

ITEM	AMOS Construction
<b>COPD</b>	"Yes" - chronic_pulmonary_disease = 1
<b>Cerebrovascular disease</b>	"Yes" - cerebrovascular_disease = 1
<b>Congestive heart failure</b>	"Ye" - congestive_heart_failure = 1
<b>Diabetes</b>	"Yes" - diabetes = 1
<b>Dementia</b>	"Yes" - dementia = 1
<b>Liver Disease</b>	3 - liver_disease = 1
<b>Myocardial infarction</b>	"Yes" - myocardial_infarct = 1
<b>Renal disease</b>	"Yes" - rel_disease = 1

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## Rockwood Frailty Index: Claims & Assessment-based

<b>Sleep loss over worry</b>	0 = 0 / 1 = 0.5 / 2/3 = 1 - at_sleep
<b>Feel depressed</b>	0 = 0 / 1,2 = 0.5 / 3 = 1 - at_depressed
<b>Help feeding</b>	0,1 - feed_bi = 1
<b>Help dressing</b>	0,1 - dressing_j = 1
<b>Help bathing</b>	0 - bath_bi = 1
<b>Help grooming</b>	0 - groom_bi = 1
<b>Bladder incontinence</b>	0,1 - incontin_bi = 1
<b>Bowel incontinence</b>	0,1 - incomb_bi = 1
<b>Help transferring</b>	0,1,2 - transfer_j = 1
<b>Help up/down stairs</b>	0,1 - stairs_j = 1
<b>Help with mobility</b>	0,1,2 - mob_bi = 1

[https://www.thelancet.com/cms/10.1016/S0140-6736\(18\)30668-8/attachment/a5f78a5c-b75b-496e-acbc-329f84a11e37/mmc1.pdf](https://www.thelancet.com/cms/10.1016/S0140-6736(18)30668-8/attachment/a5f78a5c-b75b-496e-acbc-329f84a11e37/mmc1.pdf) ☞

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## Frailty Measurement Self-reported Frailty Components

**Self-reported Frailty Components:** Grip strength, weight loss, walking speed, exhaustion, and physical activity. These components were extracted from a standardized questionnaire for the British Regional Heart Study (Papachristou et al., 2017).

- Questions for these self-reported frailty components:
- (1) Inability to grip with hands (e.g., opening a jam jar) → **Grip Strength**
- (2) Decrease of weight in the last 4 years → **Weight Loss**
- (3) Slow walking pace → **Walking Speed**
- (4) Not feeling full of energy → **Exhaustion**
- (5) being less or much less active compared with a man who spends 2 hours on most days on activities such as walking, gardening, household chores, or do-it-yourself projects → **Physical Activity**

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5270459/>

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## Frailty Measurement Self-reported Frailty Components

(1) Inability to grip with hands (e.g., opening a jam jar) → **Grip Strength**

301 Please indicate if you have difficulty doing any of the following activities:

	No difficulty	Some difficulty	Unable to do or need help
a Reaching or extending your arms above shoulder level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b Pulling or pushing large objects like a living room chair	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c Walking across a room	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d Getting in and out of bed on your own	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e Getting in and out of a chair on your own	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f Dressing and undressing yourself on your own	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g Bathing or showering	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h Feeding yourself, including cutting food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i Getting to and using the toilet on your own	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j Lifting and carrying something as heavy as 10 lbs. (eg a bag of groceries)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k Shopping for personal items such as toilet items or medicine by yourself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l Doing light housework (eg washing up)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m Preparing your own meals by yourself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
n Using the telephone by yourself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
o Taking medications by yourself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
p Managing money (e.g. paying bills etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
q Using public transport on your own	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
r Driving a car on your own	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
s Gripping with hands (eg. opening a jam jar)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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[https://www.ucl.ac.uk/epidemiology-health-care/sites/epidemiology-health-care/files/q30\\_2010-2012.pdf](https://www.ucl.ac.uk/epidemiology-health-care/sites/epidemiology-health-care/files/q30_2010-2012.pdf)

## Frailty Measurement Self-reported Frailty Components

(2) Decrease of weight in the last 4 years → **Weight Loss**

Has your weight changed in the last four years?

- Not changed  1  
 Increased  2  
 Decreased  3  
 Both increased and decreased  4  
 Don't know  5

(3) Slow walking pace → **Walking Speed**

Which of the following best describes your usual walking pace?

- Slow  1  
 Steady average  2  
 Fast  3

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[https://www.ucl.ac.uk/epidemiology-health-care/sites/epidemiology-health-care/files/q30\\_2010-2012.pdf](https://www.ucl.ac.uk/epidemiology-health-care/sites/epidemiology-health-care/files/q30_2010-2012.pdf)

## Frailty Measurement Self-reported Frailty Components

(4) Not feeling full of energy → **Exhaustion**

302 Your Feelings  
 Please tell us about how you have been feeling in the past week:

	Yes	No
a Are you basically satisfied with your life?	<input type="checkbox"/>	<input type="checkbox"/>
b Do you feel that your life is empty?	<input type="checkbox"/>	<input type="checkbox"/>
c Are you afraid that something bad is going to happen to you?	<input type="checkbox"/>	<input type="checkbox"/>
d Do you feel happy most of the time?	<input type="checkbox"/>	<input type="checkbox"/>
e Have you dropped many of your activities and interests?	<input type="checkbox"/>	<input type="checkbox"/>
f Do you prefer to stay at home, rather than going out to do new things?	<input type="checkbox"/>	<input type="checkbox"/>
g Do you often feel helpless?	<input type="checkbox"/>	<input type="checkbox"/>
h Do you feel pretty worthless the way you are now?	<input type="checkbox"/>	<input type="checkbox"/>
i Do you feel full of energy?	<input type="checkbox"/>	<input type="checkbox"/>
j Do you think that the most people are better off than you are?	<input type="checkbox"/>	<input type="checkbox"/>
k Are you in good spirits most of the time?	<input type="checkbox"/>	<input type="checkbox"/>

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[https://www.ucl.ac.uk/epidemiology-health-care/sites/epidemiology-health-care/files/q30\\_2010-2012.pdf](https://www.ucl.ac.uk/epidemiology-health-care/sites/epidemiology-health-care/files/q30_2010-2012.pdf)

## Frailty Measurement Self-reported Frailty Components

(5) being less or much less active compared with a man who spends 2 hours on most days on activities such as walking, gardening, household chores, or do-it-yourself projects → **Physical Activity**

Compared with a man who spends two hours on most days on activities such as: walking, gardening, household chores, DIY projects, how physically active would you consider yourself?

- Much more active  1
- More active  2
- Similar  3
- Less active  4
- Much less active  5

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[https://www.ucl.ac.uk/epidemiology-health-care/sites/epidemiology-health-care/files/isp30\\_2010.2012.pdf](https://www.ucl.ac.uk/epidemiology-health-care/sites/epidemiology-health-care/files/isp30_2010.2012.pdf)

## Frailty Measurement: Claims ICD-10 based

- **Hospital Frailty Risk Score (HFS):** Developed and validated in the U.K, using the electronic health records (EHR).
- ICD-10 associated with pre-specified conditions. Points were developed for each of the conditions and final score is a cumulative of all the individual scores.
- Frailty Status Categories:
  - <5: Low risk for Frailty
  - 5-15: Intermediate Risk
  - >15: High risk for Frailty

[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(18\)30668-8/fulltext#seccite150](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(18)30668-8/fulltext#seccite150)

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## Hospital Frailty Risk Score (HFS) -- Individual Conditions

ICD 10 Code	Description	Points
F00	Dementia in Alzheimer's disease	7.1
G81	Hemiplegia	4.4
G30	Alzheimer's disease	4.0
I69	Sequelae of cerebrovascular disease (secondary code)	3.7
R29	Other symptoms and signs involving the nervous and musculoskeletal systems (R29-6 Tendency to fall)	3.6
N39	Other disorders of urinary system (includes urinary tract infection and urinary incontinence)	3.2
F05	Delirium, not induced by alcohol and other psychoactive substances	3.2
W19	Unspecified fall	3.2
S00	Superficial injury of head	3.2
R31	Unspecified haematuria	3.0
B96	Other bacterial agents as the cause of diseases classified to other chapters (secondary code)	2.9
R41	Other symptoms and signs involving cognitive functions and awareness	2.7
R26	Abnormalities of gait and mobility	2.6
R07	Other cerebrovascular diseases	2.6
R56	Comas, not elsewhere classified	2.6
R40	Somnolence, stupor and coma	2.5
T83	Complications of genitourinary prosthetic devices, implants and grafts	2.4
S06	Intracranial injury	2.4
S42	Fracture of shoulder and upper arm	2.3
E87	Other disorders of fluid, electrolyte and acid-base balance	2.3
M25	Other joint disorders, not elsewhere classified	2.3
E86	Volume depletion	2.3
R54	Senility	2.2
F01	Unspecified dementia	2.1
W18	Other fall on same level	2.1
Z75	Problems related to medical facilities and other health care	2.0
F03	Vascular dementia	2.0
S80	Superficial injury of lower leg	2.0
I01	Cellulitis	2.0
H54	Blindness and low vision	1.9
E53	Deficiency of other B group vitamins	1.9
T80	Problems related to social environment	1.9
G20	Parkinson's disease	1.9
R55	Syncope and collapse	1.8
S32	Fracture of rib(s), sternum and thoracic spine	1.8
K59	Other functional intestinal disorders	1.8

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## Hospital Frailty Risk Score (HFS) -- Individual Conditions

ICD 10 Code	Description	Points
M17	Acute renal failure	3.3
L89	Decubitus ulcer	3.2
Z22	Carrier of infectious disease	3.2
B95	Streptococcus and staphylococcus as the cause of diseases classified to other chapters	3.2
L87	Ulcer of lower limb, not elsewhere classified	3.0
R44	Other symptoms and signs involving general sensations and perceptions	3.0
R26	Duodenal ulcer	3.0
R95	Hypotension	3.0
K10	Unspecified renal failure	3.0
A41	Other septicaemia	3.0
Z87	Personal history of other diseases and conditions	3.0
R96	Respiratory failure, not elsewhere classified	3.0
Z59	Exposure to unspecified factor	3.0
M19	Other arthrosis	3.0
G40	Epilepsy	3.0
M81	Osteoporosis without pathological fracture	3.0
S32	Fracture of femur	3.0
S12	Fracture of lumbar spine and pelvis	3.0
J35	Other disorders of parathyroid internal secretion	3.0
R84	Abnormal results of function studies	3.0
R18	Chronic renal failure	3.0
R33	Retention of urine	3.0
M69	Unknots and unspecified causes of morbidity	3.0
N28	Other disorders of kidney and ureter, not elsewhere classified	3.0
R32	Unspecified urinary incontinence	3.0
G13	Other degenerative diseases of nervous system, not elsewhere classified	3.0
Z95	Nepotomical condition	3.0
S09	Other and unspecified injuries of head	3.0
R85	Symptoms and signs involving emotional state	3.0
G45	Transient cerebral ischaemic attacks and related syndromes	3.0
Z74	Problems related to care provider dependency	3.0
M79	Other soft tissue disorders, not elsewhere classified	3.0
W06	Fall involving bed	3.0
S01	Open wound of head	3.0
J04	Other bacterial intestinal infections	3.0
A09	Diarrhoea and gastroenteritis of presumed infectious origin	3.0

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### Hospital Frailty Risk Score (HFS) -- Individual Conditions

ICD 10 Code	Description	Points
J18	Pneumonia, organism unspecified	1.1
J69	Pneumonitis due to solids and liquids	1
R47	Speech disturbances, not elsewhere classified	1
E55	Vitamin D deficiency	1
Z93	Artificial opening status	1
R02	Gangrene, not elsewhere classified	1
R03	Symptoms and signs concerning food and fluid intake	0.9
H91	Other hearing loss	0.9
W70	Fall on and from stairs and steps	0.9
W01	Fall on same level from slipping, tripping and stumbling	0.9
E05	Thyrotoxicosis [hyperthyroidism]	0.9
R44	Siccosis	0.9
R13	Dysphagia	0.8
Z99	Dependence on enabling machines and devices	0.8
U90	Agent resistant to penicillin and related antibiotics	0.8
M80	Osteoporosis with pathological fracture	0.8
R92	Other diseases of digestive system	0.8
I63	Cerebral infarction	0.8
K50	Calculus of kidney and ureter	0.7
F10	Mental and behavioural disorders due to use of alcohol	0.7
Y84	Other medical procedures as the cause of abnormal reaction of the patient	0.7
R00	Abnormalities of heart beat	0.7
J22	Unspecified acute lower respiratory infection	0.7
Z73	Problems related to life-management difficulty	0.6
R79	Other abnormal findings of blood chemistry	0.6
Z93	Personal history of risk-factors, not elsewhere classified	0.5
S52	Open wound of forearm	0.5
F32	Depressive episode	0.5
M49	Spinal stenosis (secondary code only)	0.5
E83	Disorders of mineral metabolism	0.4
M15	Polyarthrosis	0.4
D64	Other anaemias	0.4
I08	Other local infections of skin and subcutaneous tissue	0.4
R11	Nausea and vomiting	0.3
R52	Other noninfective gastroenteritis and colitis	0.3
R50	Fever of unknown origin	0.1

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### Frailty Status Among LTCH Patients: Data Analysis

- To examine the association between frailty status with functional status in LTCH, we merged the LTCH CARE data with LTCH claims (MedPAR) data for patients discharged between June 1, 2016 through September 30, 2017.
- Individual-level frailty status was determined using ICD-10 codes from claims associated with the LTCH stay
- We used the method described by Gilbert (2018) that calculates and categorizes individual-level frailty status into three groups:
  - Low risk for frailty,
  - Intermediate risk for frailty
  - High risk for frailty.

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### Prevalence of Individual Conditions (Hospital Frailty Score) Top 15

ICD-10 Code & Description	n (%)
J96: Respiratory failure, not elsewhere classified	56,294 (43.5%)
E87: Other disorders of fluid, electrolyte and acid-base balance	48,511 (37.5%)
N18: Chronic renal failure	43,436 (33.6%)
L89: Decubitus ulcer	36,696 (28.4%)
N17: Acute renal failure	33,103 (25.6%)
N39: Other disorders of urinary system (includes urinary tract infection and urinary incontinence)	31,329 (24.2%)
R13: Dysphagia	28,632 (22.1%)
D64: Other anaemias	27,094 (21.0%)
Z99: Dependence on enabling machines and devices	25,116 (19.4%)
B96: Other bacterial agents as the cause of diseases classified to other chapters (secondary code)	24,642 (19.1%)
Z87: Personal history of other diseases and conditions	24,530 (19.0%)
A41: Other septicemia	23,842 (18.4%)
F32: Depressive episode	20,840 (16.1%)
B95: Streptococcus and staphylococcus as the cause of diseases classified to other chapters	20,719 (16.0%)
J18: Pneumonia, organism unspecified	18,847 (14.6%)

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### Overall Frailty Status Categories using Hospital Frailty Score Index

FRAILTY GROUPS	Frequency	Percent	Cumulative Percent
<5: Low Risk for Frailty	21,943	16.97	16.97
5-15: Intermediate Risk for Frailty	79,478	61.47	78.45
>15: High Risk for Frailty	27,868	21.55	100.00

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Frailty Status Categories for Selected LTCH Primary Diagnoses				
FRAILTY GROUPS	Respiratory, Ventilator and Tracheostomy	Neurological - Surgical	Neurological - Medical	Cardiovascular - Cardiac Surgery
	N (%)	N (%)	N (%)	N (%)
<5: Low risk for Frailty	3,405 (13.35%)	48 (18.90%)	306 (11.64%)	104 (21.40%)
5-15: Intermediate Risk	15,694 (61.54%)	143 (56.30%)	1,245 (47.37%)	340 (69.96%)
>15: High risk for Frailty	6,403 (25.11%)	63 (24.80%)	1,077 (40.98%)	42 (8.64%)

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Frailty Status Categories for Selected LTCH Primary Diagnoses					
FRAILTY GROUPS	Cardio-Respiratory Failure and Shock	Septicemia, Sepsis, Systemic Inflammatory Response Syndrome/ Shock	Bone/ Joint/ Muscle Infections/ Necrosis	Skin/ Pressure Ulcer	Diabetes/ Other Endocrine Diseases
	N (%)	N (%)	N (%)	N (%)	N (%)
<5: Low risk for Frailty	3,357 (14.24%)	854 (6.93%)	1,260 (18.81%)	1,255 (10.39%)	732 (19.95%)
5-15: Intermediate Risk	15,622 (66.25%)	7,235 (58.74%)	3,970 (59.25%)	7,297 (60.41%)	2,461 (67.06%)
>15: High risk for Frailty	4,601 (19.51%)	4,227 (34.32%)	1,470 (21.94%)	3,528 (29.21%)	477 (13%)

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Observed Mobility Scores by Frailty Status Categories in LTCH Patients				
Variable		<5: Low Risk for Frailty	5-15: Intermediate Risk for Frailty	>15: High Risk for Frailty
Admission Mobility Score	N	19,979	73,424	25,753
	Mean	25.1 (13.0)	17.7 (10.8)	12.3 (7.2)
	Median	23	14	8
Discharge Mobility Score	N	20,049	73,631	25,932
	Mean	33.1 (13.5)	24.7 (13.8)	16.6 (11.0)
	Median	36	23	11
Observed Mobility Change	N	19,917	73,181	25,705
	Mean	8 (9.9)	7 (9.6)	4.3 (8.0)
	Median	6	5	1

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Risk for Frailty Category and Mobility Scores				
Risk for Frailty Category and Mobility Change Score*				
Frailty Status Categories	Parameter Estimate	SE	t value	Sig.
Low Risk for Frailty (<5)	1.71	0.09	18.47	<.0001
Intermediate Risk Frailty (5-15)	1.53	0.07	22.20	<.0001
High Risk for Frailty (>15)	REF.	.	.	.

Risk for Frailty Category and Mobility Discharge Score*				
Frailty Status Categories	Parameter Estimate	SE	t value	Sig.
Low Risk for Frailty (<5)	8.81	0.12	76.60	<.0001
Intermediate Risk Frailty (5-15)	3.89	0.09	45.47	<.0001
High Risk for Frailty (>15)	REF.	.	.	.

REF.=Reference category.  
\* estimate reflects effect of risk after adjusting for all quality measure covariates

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## Questions for Discussion

- Do you assess frailty status of your patients using these or other data elements/instruments?
- If so, how are these data used?
- If frailty status was a risk-adjustor, should data reflect the patient's status *prior to the current illness/exacerbation/injury* or should data reflect the patient's status *at the time of admission to the LTCH*?
- What data (self-report, clinical assessment data, ICD-10 codes) are feasible to collect to measure frailty in the LTCH population?

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## Final LTCH QRP New and Modified Items Effective Date: October 1, 2020

### ADMISSION

#### Section B Hearing, Speech, and Vision

##### B0200. Hearing

- Enter Code
- Ability to hear** (with hearing aid or hearing appliances if normally used)
0. **Adequate** – no difficulty in normal conversation, social interaction, listening to TV
  1. **Minimal difficulty** – difficulty in some environments (e.g., when person speaks softly or setting is noisy)
  2. **Moderate difficulty** – speaker has to increase volume and speak distinctly
  3. **Highly impaired** – absence of useful hearing

##### B1000. Vision

- Enter Code
- Ability to see in adequate light** (with glasses or other visual appliances)
0. **Adequate** – sees fine detail, such as regular print in newspapers/books
  1. **Impaired** – sees large print, but not regular print in newspapers/books
  2. **Moderately impaired** – limited vision; not able to see newspaper headlines but can identify objects
  3. **Highly impaired** – object identification in question, but eyes appear to follow objects
  4. **Severely impaired** – no vision or sees only light, colors or shapes; eyes do not appear to follow objects

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##### B1300. Health Literacy

How often do you need to have someone help you when you read instructions, pamphlets, or other written material from your doctor or pharmacy?

- Enter Code
0. **Never**
  1. **Rarely**
  2. **Sometimes**
  3. **Often**
  4. **Always**
  5. **Patient unable to respond**

#### Section C Cognitive Patterns

**C0100. Should Brief Interview for Mental Status (C0200-C0500) be Conducted?**  
Attempt to conduct interview with all patients.

- Enter Code
0. **No** (patient is rarely/never understood) → Skip to XXXX
  1. **Yes** → Continue to C0200, Repetition of Three Words

##### Brief Interview for Mental Status (BIMS)

##### C0500. BIMS Summary Score

Enter Score

Add scores for questions C0200-C0400 and fill in total score (00-15)  
Enter 99 if the patient was unable to complete the interview

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#### Section D Mood

##### D0150. Patient Mood Interview (PHQ-2 to 9)

Say to patient: "Over the last 2 weeks, have you been bothered by any of the following problems?"

If symptom is present, enter 1 (yes) in column 1, Symptom Presence.

If yes in column 1, then ask the patient: "About how often have you been bothered by this?"

Read and show the patient a card with the symptom frequency choices. Indicate response in column 2, Symptom Frequency.

1. Symptom Presence	2. Symptom Frequency	1. Symptom Presence	2. Symptom Frequency
0. No (enter 0 in column 2)	0. Never or 1 day	<input type="checkbox"/>	<input type="checkbox"/>
1. Yes (enter 0-3 in column 2)	1. 2-6 days (several days)	<input type="checkbox"/>	<input type="checkbox"/>
9. No response (leave column 2 blank)	2. 7-11 days (half or more of the days)	<input type="checkbox"/>	<input type="checkbox"/>
	3. 12-14 days (nearly every day)	<input type="checkbox"/>	<input type="checkbox"/>

↓Enter Scores in Boxes↓

A. Little interest or pleasure in doing things

B. Feeling down, depressed, or hopeless

If either D0150A2 or D0150B2 is coded 2 or 3, CONTINUE asking the questions below. If not, END the PHQ interview.

C. Trouble falling or staying asleep, or sleeping too much

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Section J Health Conditions	
<b>J0510. Pain Effect on Sleep</b>	
Enter Code <input type="checkbox"/>	Ask patient: "Over the past 5 days, how much of the time has pain made it hard for you to sleep at night?" 0. Does not apply – I have not had any pain or hurting in the past 5 days → Skip to XXXX 1. Rarely or not at all 2. Occasionally 3. Frequently 4. Almost constantly 8. Unable to answer
<b>J0520. Pain Interference with Therapy Activities</b>	
Enter Code <input type="checkbox"/>	Ask patient: "Over the past 5 days, how often have you limited your participation in rehabilitation therapy sessions due to pain?" 0. Does not apply – I have not received rehabilitation therapy in the past 5 days 1. Rarely or not at all 2. Occasionally 3. Frequently 4. Almost constantly 8. Unable to answer

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<b>J0530. Pain Interference with Day-to-Day Activities</b>	
Enter Code <input type="checkbox"/>	Ask patient: "Over the past 5 days, how often have you limited your day-to-day activities (excluding rehabilitation therapy sessions) because of pain?" 1. Rarely or not at all 2. Occasionally 3. Frequently 4. Almost constantly 8. Unable to answer

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Section K Swallowing/Nutritional Status	
<b>K0520. Nutritional Approaches</b> Check all of the following nutritional approaches that apply on admission.	
	1. On Admission Check all that apply ↓
A. Parenteral/IV feeding	<input type="checkbox"/>
B. Feeding tube (e.g., nasogastric or abdominal (PEG))	<input type="checkbox"/>
C. Mechanically altered diet – require change in texture of food or liquids (e.g., pureed food, thickened liquids)	<input type="checkbox"/>
D. Therapeutic diet (e.g., low salt, diabetic, low cholesterol)	<input type="checkbox"/>
Z. None of the above	<input type="checkbox"/>

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Section N Medications		
<b>N0415. High-Risk Drug Classes: Use and Indication</b>		
1. Is taking Check if the patient is taking any medications by pharmacological classification, not how it is used, in the following classes 2. Indication noted If column 1 is checked, check if there is an indication noted for all medications in the drug class	1. Is taking	2. Indication noted
	Check all that apply ↓	Check all that apply ↓
A. Antipsychotic	<input type="checkbox"/>	<input type="checkbox"/>
E. Anticoagulant	<input type="checkbox"/>	<input type="checkbox"/>
F. Antibiotic	<input type="checkbox"/>	<input type="checkbox"/>
H. Opioid	<input type="checkbox"/>	<input type="checkbox"/>
I. Antiplatelet	<input type="checkbox"/>	<input type="checkbox"/>
J. Hypoglycemic (including insulin)	<input type="checkbox"/>	<input type="checkbox"/>
Z. None of the above	<input type="checkbox"/>	<input type="checkbox"/>

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Section O Special Treatments, Procedures, and Programs	
<b>O0110. Special Treatments, Procedures, and Programs</b>	
Check all of the following treatments, procedures, and programs that apply on admission.	
	a. On Admission Check all that apply ↓
<b>Cancer Treatments</b>	
A1. Chemotherapy	<input type="checkbox"/>
A2. IV	<input type="checkbox"/>
A3. Oral	<input type="checkbox"/>
A10. Other	<input type="checkbox"/>
B1. Radiation	<input type="checkbox"/>

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<b>Respiratory Therapies</b>	
C1. Oxygen Therapy	<input type="checkbox"/>
C2. Continuous	<input type="checkbox"/>
C3. Intermittent	<input type="checkbox"/>
C4. High-concentration	<input type="checkbox"/>
D1. Suctioning	<input type="checkbox"/>
D2. Scheduled	<input type="checkbox"/>
D3. As Needed	<input type="checkbox"/>
E1. Tracheostomy care	<input type="checkbox"/>
G1. Non-Invasive Mechanical Ventilator	<input type="checkbox"/>
G2. BIPAP	<input type="checkbox"/>
G3. CPAP	<input type="checkbox"/>

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<b>Other</b>	
H1. IV Medications	<input type="checkbox"/>
H2. Vasoactive medications	<input type="checkbox"/>
H3. Antibiotics	<input type="checkbox"/>
H4. Anticoagulation	<input type="checkbox"/>
H10. Other	<input type="checkbox"/>
I1. Transfusions	<input type="checkbox"/>

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<b>O0110. Special Treatments, Procedures, and Programs</b>	
Check all of the following treatments, procedures, and programs that apply on admission.	
	a. On Admission Check all that apply ↓
J1. Dialysis	<input type="checkbox"/>
J2. Hemodialysis	<input type="checkbox"/>
J3. Peritoneal dialysis	<input type="checkbox"/>
O1. IV Access	<input type="checkbox"/>
O2. Peripheral	<input type="checkbox"/>
O3. Midline	<input type="checkbox"/>
O4. Central (e.g., PICC, tunneled, port)	<input type="checkbox"/>

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## Risk-Adjustment Approach

- Stratify into 5 to 7 diagnosis groups
  - Ventilator
  - Orthopedic/trauma
  - Neurologic conditions
  - Complex wounds
  - Other
- Apply strata-specific risk-adjustment model
- Weight strata based on the national distribution of patient stays to create the facility risk-adjusted score

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## Fictitious Data Example

Strata	Mean expected Change	National distribution	Weighted
Ventilator	6.5	20%	1.3
Orthopedic/trauma	8.0	10%	0.8
Neurologic conditions	7.0	30%	2.1
Complex wounds	9.0	10%	0.9
Cardiac/Respiratory (not ventilator)	8.5	20%	1.7
Post-surgical	10.0	10%	1.0
			Total: 7.8

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## Concluding Remarks & Meeting Summary

- Any final comments or recommendations to guide development of the functional outcome quality measures for LTCHs?
- Next steps

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**THANK YOU!**

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