



Leading Change. Improving Care for Older Adults.

# The Case for Mobility Assessment in Hospitalized Older Adults

A White Paper from the American Geriatrics Society

## **Heidi L. Wald, MD, MSPH**

SCLHealth, Broomfield, Colorado

## **Ravishankar Ramaswamy, MD, MS, AGSF**

Department of Geriatrics and Palliative Medicine, Icahn School of Medicine at Mount Sinai, New York, New York

## **Michael H. Perskin, MD**

Divisions of GIM & Geriatrics, Department of Medicine, NYU School of Medicine, New York, New York

## **Lloyd Roberts, MD, MHA, MSIA**

The Everett Clinic, Everett, Washington

## **Michael Bogaisky, MD, MPH**

Division of Geriatrics, Department of Medicine, Albert Einstein College of Medicine and Montefiore Medical Center, Bronx, New York

## **Winnie Suen, MD, MSc, AGSF**

Queen's Medical Center, Honolulu, Hawaii

## **Anna Mikhailovich**

American Geriatrics Society, New York, New York

### ABSTRACT

Mobility can be defined as the ability to move or be moved freely and easily. During acute illness and hospitalization, decline in mobility is common and has a large impact on older patients' health, independence, and quality of life. Despite its importance, however, loss of mobility is not a widely recognized outcome of hospital care, and few hospitals routinely assess patients' level of mobility during their hospital stay. In this white paper, the American Geriatrics Society (AGS) discusses the implications of low mobility, defined as being restricted to bed or only transferring from bed to chair. The Society also reviews the currently available mobility measures and interventions and makes recommendations that would move the field forward by promoting routine mobility assessment in older, hospitalized patients, older being defined as those aged 65 years and older.

### METHODS

The AGS Quality and Performance Measurement Committee (QPMC), which leads AGS efforts to influence quality improvement initiatives so that any quality systems adopted reflect the unique healthcare needs of older adults, was charged with developing this AGS white paper. A Writing Group of QPMC members conducted a literature review and consulted with experts in the field on this topic. The draft white paper was reviewed by the full QPMC and underwent peer review by the following organizations: American Physical Therapy Association, Gerontological Advanced Practice Nurses Association, National Alliance for Caregiving, and Society for Hospital Medicine.

The white paper was reviewed and approved by the AGS Executive Committee on behalf of the AGS Board of Directors in April 2018.

### BACKGROUND

Mobility can be defined as the ability to move or be moved freely and easily. Among older persons—individuals aged 65 years and older—mobility impairments are common and are associated with increased risk for additional functional loss. Mobility impairments are dynamic, however, and individuals commonly transition between dependence and independence.<sup>1</sup> During acute illness and hospitalization in particular, decline in mobility is common and has a large impact on older patients' health, independence, and quality of life.<sup>2,3</sup> Loss of mobility is associated with increased length of ventilator days, increased length of hospital stay, and adverse outcomes during and following hospitalization, including falls, declines in activities of

daily living (ADL), and nursing home placement.<sup>3,4</sup> Loss of mobility is critical in the “cascade” to dependency.<sup>5</sup>

Despite its importance, loss of mobility is not a widely recognized outcome of hospital care. Nursing documentation of mobility is fragmented, but few hospitals support robust, standardized, validated assessments of patients’ level of mobility during their hospital stay.<sup>6</sup> Barriers that impede mobility improvement in hospitalized patients include patients’ symptoms, such as weakness and fatigue; restraining devices such as urinary catheters and intravenous lines; fall prevention initiatives; and lack of staffing, processes, and equipment to encourage safe mobility.<sup>7</sup> Several of these barriers reflect a hospital culture that does not value or prioritize mobility.<sup>8</sup> As a result, hospitalized patients spend an excessive portion of their hospitalization in bed rather than seated, standing, or ambulating, regardless of their pre-hospitalization mobility.<sup>7,9</sup>

Mandated assessments and quality measures, if appropriately coupled to important and intervention-sensitive patient outcomes, can provide powerful motivation for improvement in patient care. However, these same assessments and measures can also be a burden when poorly considered or poorly aligned with existing needs and efforts.<sup>10</sup> In this white paper, the AGS lays out its strong support for an increased focus on mobility in acute care and promotes routine assessment of mobility in hospitalized older adults. We anticipate that routine mobility assessment will lead to a new paradigm in which stabilization of or improvement in mobility will be a universal indicator of high-quality hospital care. Here, we summarize the literature on mobility loss during hospitalization and discuss the implications of low mobility, defined as being restricted to bed or only transferring from bed to chair. We also describe the current state of mobility assessment in acute and post-acute care settings and provide a narrative summary of mobility assessment tools and intervention strategies, and make recommendations to promote routine mobility assessment.

### CASE STUDY

Mr. TM is a 75-year-old male with a medical history of diabetes mellitus, coronary artery disease, atrial fibrillation, chronic obstructive pulmonary disease, iron deficiency anemia, and chronic low back pain. He was admitted to a university hospital for syncope. Prior to hospital admission, Mr. TM lived alone, was independent in self-care, and ambulated within the home with a rolling walker. Upon admission, he was found to have heart failure exacerbation and be in atrial fibrillation with rapid ventricular response. He had a 3-week hospital course complicated by pneumonia with bacteremia, pulmonary embolism, cellulitis, and urinary tract infection, during which he was generally confined to bed and attached to multiple medical tethers. He received sporadic physical therapy. On hospital day 18, he was being readied for discharge when it was noted that he could not sit up without assistance. His discharge was delayed; subsequent evaluation resulted in his transfer to a skilled nursing facility on day 21. At the time of discharge to the facility, he required a two-person assist to transfer out of bed, and he was unable to ambulate more than two steps.

Clinicians caring for older adults may recognize this commonplace scenario. The patient entered the hospital with a mild baseline mobility impairment and then developed, over the course of a prolonged hospital stay and bed rest, a marked decline in mobility, threatening his return to independent living. Despite literature supporting the value of the common dictum “discharge planning begins the day of admission,” the lack of coordinated systems and the lack of a culture oriented toward mobility can result in a day-of-discharge “surprise.”<sup>11, 12</sup>

Several features of this case are particularly concerning. First, the predictable loss of mobility in a seriously ill, hospitalized older adult was not recognized. Second, mobility status was not identified as an important outcome of hospital care. Finally, the patient’s mobility loss was not recognized until the day of discharge. Thus, any window for proactive intervention to plan for and mitigate functional loss was closed.

### LOSS OF MOBILITY DURING HOSPITALIZATION

#### Mobility loss is a subset of functional decline

Function is multimodal and may refer to mobility, self-care functions (such as ADLs), and cognitive function. These distinctions are useful for several reasons, as different disease states may result in different patterns of functional disability.<sup>13</sup>

Episodes of hospitalization play a large role in the development of functional disability, described in this case as loss of mobility, in older adults.<sup>14</sup> Among hospitalized older adults, 17% experience functional decline during hospitalization, in addition to the 18% who already have experienced functional decline prior to hospitalization (~18%).<sup>15</sup> As illustrated in the case above, functional disability can occur as a result of prolonged bed rest and acute illness. We believe that mobility assessment has great promise for integration into hospital care because it is so commonly missed and can be readily assessed by frontline staff, and because there is a growing body of evidence on effective intervention strategies.

#### Prevalence of low mobility during hospitalization

Among older adults with pre-hospital independence in mobility, at least 16% to 19% experience low mobility during hospitalization.<sup>2, 3, 16</sup> However, because the studies making these estimates have excluded adults admitted with disabling diagnoses and/or significant pre-hospital functional and cognitive impairments, the reported prevalence might underestimate the true extent of low mobility during hospitalization. In what is perhaps a more accurate measure

of low mobility during hospitalization, accelerometer data showed that previously ambulatory, hospitalized older adults spent 13% of their hospital stay sitting, 4% of this time standing or walking, and 83% of this time in bed, even though fewer than 5% of these individuals had physician orders for bed rest.<sup>7</sup>

Patients attribute their lack of mobility to debilitating symptoms such as pain and weakness and to tethers such as urinary catheters and intravenous lines. They also note a fear of falling and a lack of staff available to assist with them getting out of bed. Physicians attribute the lack of patient mobility to lack of patient motivation and a lack of assistive devices such as walkers.<sup>7, 9, 17</sup>

#### Sequelae of low mobility during hospitalization

Immobility rapidly leads to loss of muscle mass and strength and to overall weakness.<sup>18</sup> One study found that knee extensor and flexor strength and stair climbing power declined by 11% to 14% after 10 days of voluntary bed rest in healthy older adults.<sup>18, 19</sup> Other studies have estimated that older adults, who often enter the hospital at lower baseline muscle strength and mass than younger adults, can lose 5% to 10% of muscle strength per week of bed rest during hospitalization.<sup>20, 21</sup>

Immobility in the hospital can also lead to ongoing declines in function. More than a third of adults aged 70 years and older are discharged from the hospital with a major, new disability that was not present before admission.<sup>11</sup> The effects of weakness and deconditioning extend well

beyond the patient's hospitalization: one year after discharge, fewer than a third of older adults with hospital-associated disability have recovered to their pre-hospitalization functional status, and more than a third have died.<sup>22</sup> The odds of nursing home admission are threefold higher among adults with hospital-associated disability than among those with stable functional status (relative to pre-hospitalization functional status) at hospital discharge.

Low mobility during hospitalization also has been shown to be significantly associated with reduction in the Life-Space Assessment (LSA) score,<sup>21</sup> a validated measure of community mobility and social participation.<sup>23</sup> Life space defines the extent of a person's movement, person ranging from within their home to beyond their town or geographic area. Older adults

who were admitted for non-surgical diagnoses and experience a reduction in life space during their hospital stay did not recover to their pre-hospitalization levels of life space, even after two years.

Loss of mobility during hospitalization can adversely affect caregivers' health as well. Serious illness and changing family roles during and after hospitalization increase caregiver stress, leading to depression and anxiety<sup>24</sup> that diminish caregivers' ability to influence the functional recovery of their loved ones.

Together, these impacts significantly diminish the quality of life for individuals and their caregivers, lead to a variety of in-hospital complications such as falls and delirium, contribute to staff injuries, and are associated with increased acute and post-acute care costs.<sup>25, 26</sup>

## CURRENT STATE OF MOBILITY ASSESSMENT IN HOSPITALS

Little reliable data exists to inform our understanding of the state of mobility assessment in hospitals. Although hospital staff may assess their patients' level of mobility during the hospital stay, the validity, reliability, and utility of their assessments are not clear. The state of mobility assessment in hospitals may lack a strategic and systematic focus, and assessments are seldom used to guide implementation of structured programs to increase mobility, outside of physical therapy consultations. As identified by nurses in one study, ambulation of patients is the most frequently missed element of inpatient nursing care, possibly as a result of nursing shortages, lack of confidence, or lack of proper equipment.<sup>27, 28</sup> Thus, some patients do

not receive needed care, and physical therapy consultation is likely overused for interventions that could be done by bedside nurses.<sup>28</sup>

Understanding of the state of mobility assessment in hospitals is further hampered because there is no financial or quality incentive for hospitals to assess and improve on inpatient mobility or functional status. The Joint Commission mandates the use of pressure ulcer and fall risk-assessment tools, such as the Braden Scale<sup>29</sup>, which have mobility assessments embedded in them. Thus, nursing staff may be assessing mobility routinely and repeatedly, but they are not doing so in the standardized or validated manner necessary for mobility

quality measurement or intervention. Further, none of the Joint Commission's core measures touch on inpatient mobility and/or functional status assessment.<sup>30</sup> Likewise, in accordance with the Medicare Access and Children's Health Insurance Program Reauthorization Act of 2015, the Centers for Medicare and Medicaid Services (CMS) instituted a pay-for-performance model known as the Quality Payment Program. Of the 274 quality measures in the Quality Payment Program, none touch on inpatient mobility assessment or improvement.<sup>31</sup> In addition, on the CMS's Hospital Compare website, which allows the public to assess and compare performance among hospitals, none of the 57 measures address inpatient functional status assessment and improvement during the hospital stay.<sup>32</sup>

Despite this poor record, our environmental scan identified several hospitals and health systems that have emphasized mobility assessment. Some health systems have even developed a

stand-alone program of interventions based on routine mobility assessment in hospitals. Johns Hopkins Hospital uses two standardized assessments of patient mobility in the acute care setting: the Johns Hopkins Highest Level of Mobility Scale (JH-HLM), which is recorded by nurses for each patient on every shift, and the Activity Measure for Post-Acute Care (AM-PAC) 6-Clicks, which is recorded on admission, three times weekly by nurses, and on every visit by physical and occupational therapists.<sup>33</sup> These assessments are described further in How to Assess for Low Mobility, below. The Cleveland Clinic has developed and implemented an interdisciplinary mobility care pathway that is based on assessing patients' current and pre-hospital levels of mobility using the AM-PAC 6-Clicks.<sup>33</sup> Nurses at Duke University Hospital use the Banner Mobility Assessment Tool<sup>34</sup> to assess patient mobility every shift and generate an individualized mobility plan.<sup>35</sup>

## MOBILITY ASSESSMENT IN POST-ACUTE CARE

Significant work on mobility assessment has been done in the post-acute care (PAC) setting, which includes long-term acute care (LTAC), inpatient rehabilitation facilities (IRF), skilled nursing facilities (SNF), and home health care (HHC). Each setting has its unique, mandated, standardized mobility assessments, among other measures. However, the Improving Medicare Post-Acute Care Transformation Act of 2014 (IMPACT) has induced an effort to harmonize assessments across PAC settings.<sup>36</sup> IMPACT requires the Secretary of Health and Human Services to report to Congress, within two years following the rollout of data

collection, and review the value of acute care and critically assess hospitals' collection and reporting of "standardized patient assessment data with respect to inpatient hospital services furnished...." These data can inform how hospitals ultimately approach standardized mobility assessments. A mandate to develop related quality measures will follow this effort.

CMS has posted the functional measure set (section GG) of the unified, standardized assessment,<sup>37</sup> along with its accumulated experience with site-specific assessments such as the nursing home Minimum Data Set.



### HOW TO ASSESS MOBILITY IN THE HOSPITAL

The literature includes several mobility assessments and global function measures that include mobility as a component. Many are designed for use in the community, PAC, or rehabilitation setting and may not translate well to use in the hospital. Others, such as ADL scales, contain a unidimensional or bidimensional mobility measure (e.g. walking, transferring) and therefore do not provide enough detail about mobility to identify clinically meaningful changes over the course of a hospital stay. For instance, the popular Timed Get Up and Go (TUG) is limited by a floor effect, or an inability to discriminate a broad range of function among individuals who cannot perform the test; many older hospitalized patients cannot perform TUG because of weakness.

**Table 1** highlights the mobility assessments that we identified from our literature review as potentially suitable for use in the hospital environment. Although we describe the most promising measures in more detail below, we are unable to provide a comprehensive discussion of the pros and cons of each assessment.

Unlike AM-PAC, which was designed to be used during post-acute care rehabilitation, AM-PAC 6-Clicks was created to assess activity limitations in patients in acute-care hospitals. It consists of separate Daily Activity and Mobility Short Forms. The Mobility Short Form's six elements describe whether the patient has difficulty or needs assistance to: turn over in bed; sit down and stand up from a chair with arms; move from lying to sitting on a bed; move from bed to chair; walk in a hospital room; and climb

three to five steps with a railing. The observer characterizes the patient's need for assistance for each activity on a four-level scale from (1 = total assistance/unable; 2 = a lot of assistance; 3 = a little assistance; 4 = none). AM-PAC 6-Clicks was validated in a single-center study.<sup>38</sup> However, it must be licensed from Mediware.com, making adoption by regulatory agencies more burdensome.

JH-HLM was designed for in-hospital use.<sup>31</sup> With this scale, nurses rate patients on the highest level of mobility they achieve, as observed by the nurses over the course of each shift.<sup>33</sup> Levels of mobility include lying in bed, movement in bed, sitting, transferring to a chair, standing, walking 10 or more steps, walking 25 or more feet, and walking more than 250 feet. The scale is intended to be a record of patients' actual mobility levels, rather than of maximal ability levels under testing conditions. JH-HLM requires limited training and takes about a minute to complete.<sup>39</sup> Both AM-PAC 6-Clicks and JH-HLM have shown excellent inter-rater and test-retest reliability among both physical therapists and nurses. They also have demonstrated convergent validity among nurses when compared with other validated tests (grip strength, Katz Activities of Daily Living Scale, 2-minute walk test, five-times sit-to-stand test).<sup>40</sup>

The Hierarchical Assessment of Balance and Mobility (HABAM), was designed for use in hospitalized patients. This a formal bedside assessment in take an average of 2.6 minutes to complete and rates patients on their balance while sitting, standing, and walking; their independence for transfers; the maximal



distance they are able to walk; and the amount of aid they require when walking. HABAM has been validated against the Barthel Index, one of the most widely used assessments of functional independence. However, two independent studies have noted ceiling effects, or the inability of an assessment tool to discriminate well among higher-performing participants. In these studies, approximately one quarter of participants achieved the maximum possible HABAM score at admission.<sup>41, 42</sup>

The de Morton Mobility Index was developed specifically for use among hospitalized older adults. It consists of a formal, structured assessment that rates patients and tabulates a summary score based on 15 items encompassing bed and chair mobility, static standing balance, maximal distance patients can walk before requiring rest, and dynamic balance. The de Morton Mobility Index can be used with minimal training and does not require expert raters. There are no published data on the time it takes to complete the assessment and rating process. Validation studies have shown reasonable inter-rater reliability and good validity across several different measures of validity. As highlighted by the developers, the de Morton Mobility Index can identify meaningful changes in mobility between admission and discharge, and development and validation studies have shown no floor or ceiling effects.<sup>41, 43</sup>

The Banner Mobility Assessment Tool (BMAT) is a structured test of patient mobility developed

for use by nurses in the hospital. Patients are assessed for their ability to independently perform a series of maneuvers: sit up from a semi-reclined position; reach their arm past their midline to shake the assessor's hand; lift their leg off the ground and extend it at the knee while sitting, then point their toe; stand and walk in place at the bedside; and take one step forward and back. The tool contains recommendations for safe patient-handling techniques based on the patient's observed level of mobility. A validation study by the developers of BMAT demonstrated good inter-rater reliability and good agreement with mobility level as assessed by a physical therapist in an independent evaluation. BMAT has not been validated externally.<sup>34</sup>

The Minimum Data Set 3.0 v1.14, which is used to assess nursing home residents, contains two measures of mobility function. In section G, the patient's ability to lie down, sit, stand, transfer, and walk is rated on a five-level scale from independent to fully dependent. This measure has been validated<sup>44</sup> and is used to assign Resource Utilization Group codes for payment. In Section GG, which was developed for the Post-Acute Care Payment Reform Demonstration (PAC-PRD) project, the patients' ability in each of five domains (sit, stand, transfer, walk 50 feet, and walk 150 feet) is rated on a six-level scale from independent to fully dependent. Section G will eventually be phased out in favor of Section GG. Neither of these measures has been tested in hospitalized populations.

### IMPLEMENTING INTERVENTIONS TO PREVENT MOBILITY LOSS IN THE HOSPITAL: THE WHO, WHAT, WHEN, WHERE, AND HOW

The goal of mobility assessment is to improve patient care through interventions to support mobility. However, the evidence supporting mobility interventions in the acute-care setting, while growing, can be difficult to interpret because it includes a variety of interventions and outcomes measures. For the purposes of this paper, we will focus on evidence that specifically addresses mobility for the medical and surgical population, as opposed to that in the critical-care setting. While multicomponent interventions, such as Acute Care for the Elderly (ACE) services, can include mobility interventions and may improve select functional outcomes dissemination of these interventions can be difficult in a setting with constrained resources. Thus, this paper focuses on interventions targeting mobility alone. This section is informed by several systematic reviews; the most recent was published in 2017.<sup>45, 46, 47, 48</sup>

#### The who

The studies assessed by the systematic reviews of mobility interventions for non-intensive care unit (ICU) patients have taken several approaches. Some have focused interventions among patients with specific diagnoses such as respiratory disease, deep venous thrombosis, or diabetes. Others have evaluated interventions among frail elders. Some studies have stratified patients and delivered interventions of different types and intensity based on patients' mobility level. Still others have looked at unselected medical populations. Two reviewers have concluded that interventions should target

patients at moderate to high risk for mobility loss, such as those at advanced age or experiencing prolonged hospitalization or ICU stays, rather than an unselected population.<sup>38, 41</sup> In particular, de Morton reanalyzed data from two trials and noted that patients requiring assistance to ambulate at the time of hospitalization were more likely than other older patients to benefit from additional exercise.<sup>48, 49</sup>

Other stakeholders in improving inpatient mobility include nurses, nurse's aides, physical therapists, occupational therapists, speech therapists, providers (including hospitalists), social workers, and discharge planners. Changing inpatient hospital culture to prioritize patient mobility from the time of hospital admission will primarily benefit patients. However, each of these other stakeholders plays an integral part in changing that culture. For example, inpatient providers and nursing leadership will likely be the architects who would develop such programs for their hospitals, and nurses, nursing aides, and therapists will conduct mobility assessments and interventions.

It would be difficult to standardize programs to improve patient mobility across all hospitals, because hospital cultures widely vary, and each program should fit an individual hospital's culture. However, overcoming a fear of falls, and even realizing that promoting mobility might prevent such falls,<sup>50</sup> is a culture shift that must occur across all hospitals. Likewise, the success and sustainability of any mobility program, regardless of hospital, rests on

several factors: inculcating the importance of mobility assessment at the time of admission; designating a management-level “champion” who will promulgate this message and provide the necessary resources to implement and sustain the program; the ability of the program to benefit all stakeholders, perhaps in different ways; a minimal amount of additional work associated with the program; and an ability of stakeholders, particularly nurses and therapists, to screen patients for appropriate provider referrals.<sup>9, 51</sup>

### The what

Systematic reviews have identified several types of mobility interventions and several outcome categories. The term “early progressive mobility” is most commonly associated with an American Association of Critical Care Nurses protocol developed for ICUs. However, this term describes several hospital-based mobilization protocols that progress from basic to more advanced mobility, based on the patient’s pre-morbid function and mobility at the time of assessment in the hospital. A typical progression would begin with bed exercises and progress through sitting, standing, and aerobic exercises like walking, and climbing stairs. Some interventions also add resistance training, balance and flexibility, patient education, or behavioral interventions. Typical outcomes in mobility intervention studies include cardio-respiratory performance, mobility, functional status, healthcare utilization, and/or quality of life.

The STRIDE study assessed early inpatient mobility assessment and intervention at a Veterans’ Hospital. In the intervention group, a physical therapist performed mobility

assessments on patients within 24 hours of hospital admission, and recreation therapy assistants ambulated patients with a goal of 20 minutes each hospital day. Physical therapists also provided patients with education on the importance of ambulation. Compared with demographically matched controls, patients in the intervention group demonstrated improvements in length of stay and discharge disposition (home vs SNF). However, the STRIDE study had a relatively small sample size (N = 92), and it did not directly address the patient’s functional status at discharge.<sup>52</sup>

Brown and colleagues randomized 100 older hospitalized patients to a progressive mobility protocol that was delivered by research assistants for 20 minutes up to twice a day. This protocol was coupled with a behavioral intervention consisting of daily goal-setting, identification of barriers to mobilization and solutions to address them, and a diary for self-monitoring. Brown and colleagues found that the intervention did not improve ADLs, but that it did improve community mobility, as measured by the LSA, at 30 days post discharge. In contrast, patients assigned to usual care experienced a clinically meaningful decline in community mobility.<sup>53</sup>

The SIT to STAND program, developed to prevent loss of muscle strength among hospitalized men, was a strength-training program that employed a progressive model of loaded sit-to-stand exercises. This intervention has been shown to be feasible in a cohort study, but it has not been tested yet in a randomized controlled trial.<sup>54</sup>

The Hospital Elder Life Program (HELP), a widely disseminated multicomponent

intervention program designed to prevent delirium and functional decline during hospitalization, includes mobility as one of its core interventions.<sup>55, 56, 57</sup> The program utilizes trained volunteers and staff to have patients walking three times a day. HELP has been shown to decrease delirium, falls, and length of stay, and more than 20 published studies have demonstrated its safety, effectiveness, and cost-effectiveness.

Johns Hopkins Hospital has instituted a nursing-led, inpatient mobility program designed to be implemented without additional staffing. The program consists of several discrete components, including a standardized measure of patient mobility, a record of actual levels of patient mobility assessed three times per day, the development of standards for determining which patients can mobilize safely, daily goal-setting to increase mobility for all patients, and training of clinical staff in techniques for safe ambulation or mobilization of patients from bed to chair. A 12-month pilot study in two inpatient general medicine wards demonstrated that the Johns Hopkins mobility program reduced hospital length of stay, increased the number of days in which patients ambulated, and increased the proportion of patients whose mobility levels improved during the course of their hospital stay.<sup>42</sup>

The interdisciplinary mobility care pathway implemented by the Cleveland Clinic involves several systematic changes, including the development of a protocol to assess all patients' safety for engaging in mobility activities in the hospital, assessments of the patients' current and pre-hospital mobility levels, and educating and training of clinical staff on safe patient-

handling techniques and on when mobility assessments could be done by nursing staff versus physical therapists. As with the Johns Hopkins intervention, the Cleveland Clinic program relied on existing staffing levels.<sup>33</sup>

### The when and where

The average hospital stay is short and therefore limits the opportunity for inpatient intervention. Thus, early interventions should be identified. While many studies have focused exclusively on intervention within 48 hours of hospitalization, however, more and more protocols are adding home-based interventions up to 30 days after discharge to increase the dose of the intervention. One review suggests that combining inpatient and home-based mobility interventions may have more of an impact, compared with shorter interventions, but may be more difficult to implement.

Courtney and others randomized 128 older hospitalized patients to usual care or to an intervention consisting of walking, upper- and lower-extremity resistance training, and balance and flexibility exercises two to three times a week, beginning within 72 hours of hospitalization. The intervention continued three to four times a week at home for 24 weeks following discharge. A 4-week follow-up assessment identified improvements in walking outcomes and ADLs and reductions in emergency primary-care visits and hospital admissions.<sup>58</sup>

### The how

As discussed above, physical therapists are the mainstay of mobility programs, but reflexive consultation of physical therapists may lead to

their overuse and to delays in appropriate care. With the involvement of nurses in daily care and the workforce constraints of trained therapists, nurses can play a critical role in mobility assessment and intervention. Indeed, several studies have assessed partial or complete nursing supervision of mobility activities. However, there are diverging opinions within the nursing community regarding the role of nurses in ambulating patients. Nurses who see it as their role to encourage patient independence and well-being tend to work collaboratively with therapists, whereas nurses who do not identify mobility as their responsibility will defer to others for direction.<sup>59</sup> Further, direct observation demonstrates that nurses typically engage only a subset of their patients in mobility efforts, and most of these efforts are low-level, of short duration, and usually initiated by patients.<sup>60</sup> To accommodate time and workload constraints for physical therapists and nurses, successful mobility programs can have nurses conduct mobility assessments and use nursing assistants to ambulate patients.<sup>61</sup>

An early, nursing-driven mobility protocol in the ICU and Step-Down settings improved the proportions of mobile patients within 72 hours of hospital admission, from 6.2% of ICU patients and 15.5% of Step-Down patients before protocol implementation to 20.2% of ICU patients and 71.8% of Step-Down patients after the protocol implementation. A key element of the program's success was the use of ongoing education to change the culture among nurses and physicians, who initially felt that most patients were too ill to be mobilized. As Physicians and nurses began to prioritize mobility in their patient-care plans as they saw the benefits of early mobilization. Although

our review focuses specifically on interventions for medical and surgical populations, it is interesting to note that the success of this early-mobility program in the ICU has permeated throughout the hospital, which will now be instituting early-mobility programs in other units.<sup>62</sup>

A five-component systems intervention dubbed MOVIN was aimed at nurses and incorporated<sup>63</sup>: psychomotor skills training, communication tools, ambulation pathways, ambulation resources such as equipment, and ambulation cultural intervention. A pilot study found that MOVIN increased the frequency of ambulation and the distance walked by patients in a single medical unit.

Several studies also suggest that family support can help prevent functional and cognitive decline among geriatric inpatients.<sup>64, 65</sup> This patient- and family-centered approach deserves more attention.

### Implementation facilitators and barriers

Any discussion of mobility interventions must address the important factors in incorporating this work into the time- and resource-constrained environment of the hospital. The Consolidated Framework for Implementation Research (CFIR) outlines several components necessary for a successful mobility intervention: the intervention itself, the inner setting, the individuals implementing the intervention, the external setting, and quality-improvement processes.<sup>66</sup> Any mobility assessment in acute care must be low burden and appropriate for the acutely ill population. The inner setting must facilitate implementation by establishing a culture in which function is seen as an

important outcome of care and by ensuring availability of appropriate equipment and documentation tools. The individual staff members who implement assessment must have the appropriate skills, authority, and resources, and the education and motivation of individual patients should be prioritized.<sup>67</sup> The external environment must evolve; the regulatory stance

of zero tolerance for falls is directly in opposition to a need to get weak patients up and moving. Hospitals will need to see a clear business case for mobility assessment. The use of quality improvement methods will facilitate sustained change in practice to embed new protocols in workflow.

## RECOMMENDATIONS TO PROMOTE A PATH FORWARD

### Circling back to the case

During the 3-week hospitalization of Mr. TM described above, discharge was delayed because the functional losses attendant to his clinical course were not addressed. His presenting problem of atrial fibrillation with rapid ventricular response and subsequent pneumonia, along with the management of multimorbidity, superseded considerations of his loss of mobility. Clinical scenarios such as this are all too common, but with proper processes in place, they should not be. If the hospital team had prioritized mobility assessment and provided interventions to improve Mr. TM's mobility, he might have gone home rather than to sub-acute rehabilitation.

Loss of mobility in the setting of acute hospital care leads to higher levels of care, increased stress on patients and families, and increased healthcare costs. The view that mobility is not an important measure for routine assessment to assist with care planning, discharge planning,

and measurement of hospital-care outcomes suggests an oversight on the part of many stakeholders, including healthcare providers, regulators, and quality organizations. In contrast, in the geriatrics community, the maintenance of physical function is recognized as critical to quality of life in the older population, and the impact of mobility loss around the time of an acute illness has been well recognized.

With the seven recommendations below, we propose that focused efforts be made to promote standard mobility assessment during acute-care episodes. Novel processes should be implemented in a manner that leverages existing resources and current data collection, without adding undue burden to already constrained hospital resources, to make such innovation feasible. We hypothesize that if mobility measurement and improvement are done in a thoughtful manner, they will substantially contribute toward improving the patient experience and the health of the population at a reduced cost.



### Recommendation #1

#### **Promote mobility assessment in acute care.**

CMS should incentivize the use of standard, validated mobility assessment in acute care. Ideally this measurement would be harmonized with other mandated assessments to minimize the burden on the care provider. Although important information on the best and most efficient methods is still needed, the evidence supports common-sense intervention today.

### Recommendation #2

**Advocate for more research funding.** Federal agencies, including the Agency for Healthcare Research and Quality and the National Institutes of Health units such as the National Institute on Aging, should prioritize additional translational research in mobility assessment, quality measurement, and implementation of mobility intervention programs.

### Recommendation #3

**Develop consensus on standard methods to assess mobility.** CMS and other stakeholders should promote the development of consensus around an assessment that is validated and clinically meaningful to providers and patients. Many mobility assessment tools exist but are either not validated or not appropriate for acute care.

### Recommendation #4

**Minimize the burden of mobility measurement.** To ensure successful implementation, workflow and documentation must be optimized and redundancy minimized

by specifying the roles of different health care professionals such as nurses and physical therapists, using existing clinical data points in the electronic health record, and using innovative technological solutions.

### Recommendation #5

**Evaluate feasibility of a mobility quality measure.** CMS should develop a mobility quality measure to incentivize hospitals, staff, and providers to actively intervene to prevent of mobility loss among hospitalized older adults.

### Recommendation #6

#### **Shift from the current regulatory focus on falls in acute care to a focus on safe mobility.**

In the face of little evidence supporting strategies for fall prevention in acute care, the focus on fall prevention at all costs has important unintended consequences on patient mobility. Falls or falls with injury should be reconsidered as quality indicators in the absence of a balancing measure for mobility.

### Recommendation #7:

#### **Develop resources for acute-care providers.**

The AGS and strategic partners should consider the creation of tools, processes, and strategies to assist providers and hospitals with rapid, efficient, and sustainable implementation of evidence-based practices for mobility assessment and intervention in real-world settings.



### CONCLUSION

In summary, low mobility in acute care hospitals is associated with adverse outcomes both in the hospital and in the weeks to months following hospitalization. At its worst, mobility loss is associated with increased odds of mortality and institutionalization.<sup>2, 10</sup> Thus, there is significant need for mobility improvement programs. Although mobility loss is both common and predictable, however, it remains both poorly recognized and inadequately addressed. Several mobility assessments are available, and there are some promising model programs, but there is no consensus on mobility assessment in inpatient settings, nor has there been a mandate for implementation of such tools. Thus, implementation of mobility interventions in acute-care settings is sporadic. The AGS supports the development and implementation of standardized mobility assessment of older adults in acute care. In addition, AGS supports evaluation of the feasibility of developing a quality measure to assess both the mobility outcomes of older adults in acute care and the success of mobility interventions.

### ACKNOWLEDGEMENTS

#### Conflicts of Interest

None

#### Author Contributions

All authors contributed to this paper

#### Sponsor's Role

None

The authors would like to thank Sei J. Lee, MD, MAS, Caroline S. Blaum, MD, MS, and the AGS Quality and Performance Measurement Committee, science writer Frances McFarland, PhD, MA, as well as Nancy E. Lundebjerg, MPA, and the AGS Executive Committee, for their feedback on previous versions of this work and for editing the manuscript. We are grateful to Debra Saliba, MD, MPH, and Cynthia J. Brown, MD, MSPH, for their expertise and guidance during the early stages of planning this project. We would also like to acknowledge the following individuals and organizations for their participation in the peer-review process: James Tompkins, PT, DPT, American Physical Therapy Association; Valerie K. Sabol, PhD, ACNP-BC, GNP-BC, ANEF, FAANP, Gerontological Advanced Practice Nurses Association; C. Grace Whiting, JD, National Alliance for Caregiving; and Robert S. Young, MD, Society for Hospital Medicine.

### REFERENCES

1. Manini TM. Mobility decline in old age: A time to intervene. *Exerc Sport Sci Rev*. 2013;41(1):2.
2. Zisberg A, Shadmi E, Sinoff G, Gur-Yaish N, Sruelovici E, Admi H. Low Mobility During Hospitalization and Functional Decline in Older Adults. *J Am Geriatr Soc*. 2011;59(2):266-273.
3. Brown CJ, Friedkin RJ, Inouye SK. Prevalence and outcomes of low mobility in hospitalized older patients. *J Am Geriatr Soc*. 2004;52(8):1263-1270.
4. Lord RK, Mayhew CR, Korupolu R, et al. ICU early physical rehabilitation programs: financial modeling of cost savings. *Crit Care Med*. 2013;41(3):717-724.
5. Graf C. Functional Decline in Hospitalized Older Adults: It's often a consequence of hospitalization, but it doesn't have to be." *Am J Nurs*. 2006;106(1):58-67.
6. Ettinger WH. Can Hospitalization-Associated Disability Be Prevented? *JAMA*. 2011;306(16):1800-1801.
7. Brown CJ, Redden DT, Flood KL, Allman RM. The underrecognized epidemic of low mobility during hospitalization of older adults. *J Am Geriatr Soc*. 2009;57(9):1660-1665.
8. Czaplijski Tom, Marshburn D, Hobbs T, Bankard S, Bennett W. Creating a culture of mobility: an interdisciplinary approach for hospitalized patients. *Hosp Top*. 2014;92(3):74-79.
9. Hoyer EH. Barriers to Early Mobility of Hospitalized General Medicine Patients: Survey Development and Results. *Am J Phys Med Rehab*. 2015;94(4):304-312.
10. Damberg CL, Sorbero ME, Lovejoy SL, Wertheimer S, Waxman D. An Evaluation of the Use of Performance Measures in Health Care. Rand Corporation. [http://www.rand.org/pubs/technical\\_reports/TR1148.html](http://www.rand.org/pubs/technical_reports/TR1148.html). Published 2011. Accessed March 21, 2017.
11. Covinsky KE, Pierluissi E, Johnston CB. Hospitalization-associated disability: "She was probably able to ambulate, but I'm not sure." *JAMA*. 2011;306(16):1782-1793.
12. Cherlin EJ, Curry LA, Thompson JW, et al. Features of High Quality Discharge Planning for Patients Following Acute Myocardial Infarction. *J Gen Intern Med*. 2013;28(3):436-443.
13. Stineman MG, Jette A, Fiedler R, Granger C. Impairment-specific dimensions within the Functional Independence Measure. *Arch Phys Med Rehabil*. 1997;78(6):636-643.
14. Gill TM, Allore HG, Holford TR, Guo Z. Hospitalization, restricted activity, and the development of disability among older persons. *JAMA*. 2004;292(17):2115-2124.
15. Covinsky KE, Palmer RM, Fortinsky RH, et al. Loss of independence in activities of daily living in older adults hospitalized with medical illnesses: increased vulnerability with age. *J Am Geriatr Soc*. 2003;51(4):451-458.
16. Zisberg A, Shadmi E, Gur-Yaish N, Tonkikh O, Sinoff G. Hospital-associated functional decline: the role of hospitalization processes beyond individual risk factors. *J Am Geriatr Soc*. 2015;63(1):55-62.
17. Brown CJ, Williams BR, Woodby LL, Davis LL, Allman RM. Barriers to mobility during hospitalization from the perspectives of older patients and their nurses and physicians. *J Hosp Med*. 2007;2(5):305-313.
18. Creditor MC. Hazards of hospitalization of the elderly. *Ann Intern Med*. 1993;118(3):219-223.
19. Kortebein P, Symons TB, Ferrando A, et al. Functional impact of 10 days of bed rest in healthy older adults. *J Gerontol A Biol Sci Med Sci*. 2008;63(10):1076-1081.
20. Liu B, Almaawiy U, Moore JE, Chan WH, Straus SE, MOVE ON Team. Evaluation of a multisite educational intervention to improve mobilization of older patients in hospital: protocol for mobilization of vulnerable elders in Ontario (MOVE ON). *Implement Sci*. 2013;8:76.
21. Brown CJ, Roth DL, Allman RM, Sawyer P, Ritchie CS, Roseman JM. Trajectories of Life-Space Mobility After Hospitalization. *Ann Intern Med*. 2009;150(6):372-378.
22. Boyd CM, Landefeld CS, Counsell SR, et al. Recovery of activities of daily living in older adults after hospitalization for acute medical illness. *J Am Geriatr Soc*. 2008;56(12):2171-2179.
23. Baker PS, Bodner EV, Allman RM. Measuring life-space mobility in community-dwelling older adults. *J Am Geriatr Soc*. 2003;51(11):1610-4.
24. Li H, Melnyk BM, McCann R, et al. Creating avenues for relative empowerment (CARE): a pilot test of an intervention to improve outcomes of hospitalized elders and family caregivers. *Res Nurs Health*. 2003;26(4):284-99.
25. Reuben DB, Seeman TE, Keeler E et al. The effect of self-reported and performance-based functional impairment on future hospital costs of community-dwelling older persons. *Gerontologist*. 2004;44(3):401-407.
26. Fortinsky RH, Covinsky KE, Palmer RM, Landefeld CS. Effects of functional status changes before and during hospitalization on nursing home admission of older adults. *J Gerontol A Biol Sci Med Sci*. 1999;54(10):M521-M526.
27. Kalisch BJ, Lee S, Dabney BW. Outcomes of inpatient mobilization: a literature review. *J Clin Nurs*. 2014;23(11-12):14861501.
28. Kalisch BJ, Xie B. Errors of Omission: Missed Nursing Care. *West J Nurs Res*. 2014;36(7):875-90.

29. Kozier B, Erb G, Snyder S, Berman A. *Fundamentals of Nursing: Concepts, Process, and Practice*. 8th ed. Upper Saddle River, NJ: Pearson Education; 2008.
30. The Joint Commission. Measures. [https://www.jointcommission.org/core\\_measure\\_sets.aspx](https://www.jointcommission.org/core_measure_sets.aspx). Accessed February 20, 2018.
31. Centers for Medicare & Medicaid Services. Quality Payment Program. <https://www.cms.gov/Medicare/Quality-Payment-Program/Quality-Payment-Program.html>. Accessed February 20, 2018.
32. Medicare.gov. Hospital Compare. <https://www.medicare.gov/hospitalcompare/Data/Data-Updated.html#>. Accessed February 20, 2018.
33. Friedman M, Stilphen MA. Establishing a Culture of Mobility in the Hospital Setting: Continuing the Conversation. PowerPoint presented at: American Physical Therapy Association Combined Sections Meeting 2015; February 4-7, 2015; Indianapolis, IN.
34. Boynton T, Kelly L, Perez A et al. Banner Mobility Assessment Tool For Nurses: Instrument Validation. *Am J SPHM*. 2014;4(3):86-92.
35. Duke Occupational & Environmental Safety Office. SPHM Champion and Coach Toolkit. <http://www.safety.duke.edu/ergonomics/sphm/sphm-champion-and-coach-toolkit>. Accessed March 16, 2018.
36. Improving Medicare Post-Acute Transformation Act of 2014, Pub. L. 113-185, 128 Stat. 1952 (1801 U.S.C. 6001 et seq.).
37. Centers for Medicare and Medicaid Services. Minimum Data Set (MDS) – Version 3.0. Resident Assessment and Care Screening. <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/NursingHomeQualityInits/Downloads/MDS-30-SECTIONS-A-AND-GG-DOCUMENT.pdf>. Published October 1, 2016. Accessed March 16, 2018.
38. Jette DU, Stilphen M, Ranganathan VK, Passek SD, Frost FS, Jette AM. Validity of the AM-PAC “6 Clicks” Inpatient Daily Activity and Basic Mobility Short Forms. *Phys Ther*. 2014;94(3):379-391.
39. Pottenger BC, Pronovost PJ, Kreif J, Klein LM, Hobson DB, Young DL, Hoyer EH. Towards Improving Hospital Workflows: An Evaluation of Resources to Mobilize Patients. *Journal of Nursing Management*. 2018. (In Press).
40. Hoyer EH, Young DL, Klein LM, et al. Toward a Common Language for Measuring Patient Mobility in the Hospital: Reliability and Construct Validity of Interprofessional Mobility Measures. *Phys Ther*. 2018;98(2):133-142.
41. de Morton NA, Davidson M, Keating JL. Validity, responsiveness and the minimal clinically important difference for the de Morton Mobility Index (DEMMI) in an older acute medical population. *BMC Geriatr*. 2010;10:72.
42. MacKnight C, Rockwood K. Rasch analysis of the hierarchical assessment of balance and mobility (HABAM). *J Clin Epidemiol*. 2000;53(12):1242-1247.
43. de Morton NA, Berlowitz DJ, Keating JL. A systematic review of mobility instruments and their measurement properties for older acute medical patients. *Health Qual Life Outcomes*. 2008;6:44.
44. Morris JN, Moore T, Jones R, et al. Validation of Long-Term and Post-Acute Care Quality Indicators. Abt Associates. <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/NursingHomeQualityInits/Downloads/NHQIFinalReport.pdf>. Published June 10, 2003. Accessed April 5, 2017.
45. Kosse NM, Dutmer AL, Dasenbrock L, Bauer JM, Lamoth CJ. Effectiveness and feasibility of early physical rehabilitation programs for geriatric hospitalized patients: a systematic review. *BMC Geriatr*. 2013;13:107.
46. de Morton NA, Keating JL, Jeffs K. Exercise for acutely hospitalised older medical patients. *Cochrane Database Syst Rev*. 2007;(1):CD005955.
47. Pashikanti L, Von Ah D. Impact of early mobilization protocol on the medical-surgical inpatient population: an integrated review of literature. *Clin Nurse Spec*. 2012;26(2):87-94.
48. Kanach FA, Pastva AM, Hall KS, Pavon JM, Morey MC. Effects of Structured Exercise Interventions for Older Adults Hospitalized with 8 Acute Medical Illness: A Systematic Review. *J Aging Phys Act*. 2018;26(2):284-303.
49. de Morton NA, Jones CT, Keating JL, et al. The effect of exercise on outcomes for hospitalised older acute medical patients: an individual patient data meta-analysis. *Age Ageing*. 2007;36(2):219-222.
50. Growdon ME, Shorr RI, Inouye SK. The Tension Between Promoting Mobility and Preventing Falls in the Hospital. *JAMA Intern Med*. 2017;177(6):759-760.
51. Morris PE. Moving Our Critically Ill Patients: Mobility Barriers and Benefits. *Crit Care Clin*. 2007;23(1):1-20.
52. Hastings SN, Sloane R, Morey MC, Pavon JM, Hoening H. Assisted Early Mobility for Hospitalized Older Veterans: Preliminary Data from the STRIDE Program. *J Am Geriatr Soc*. 2014;62(11):2180-2184.
53. Brown CJ, Foley KT, Lowman JD Jr, et al. Comparison of Posthospitalization Function and Community Mobility in Hospital Mobility Program and Usual Care Patients: A Randomized Clinical Trial. *JAMA Intern Med*. 2016;176(7):921-927.
54. Pedersen MM, Petersen J, Bean JF, et al. Feasibility of progressive sit-to-stand training among older hospitalized patients. *Peer J*. 2015;3:e1500.

55. Inouye SK, Bogardus ST, Charpentier PA, et al. A multicomponent intervention to prevent delirium in hospitalized older patients. *N Engl J Med.* 1999;340(9):669-676.
56. Inouye SK, Bogardus ST, Baker DI, Leo-Summers L, Cooney LM. The Hospital Elder Life Program: A model of care to prevent cognitive and functional decline in hospitalized older patients. *J Am Geriatr Soc.* 2000;48(12):1697-1706.
57. Hshieh TT, Yue J, Oh E, et al. Effectiveness of multi-component non-pharmacologic delirium interventions: A Meta-analysis. *JAMA Intern Med.* 2015;175(4):512-520.
58. Courtney MD, Edwards HE, Chang AM, et al. Improved functional ability and independence in activities of daily living for older adults at high risk of hospital readmission: a randomized controlled trial. *J Eval Clin Pract.* 2012;18(1):128-134.
59. Doherty-King B, Bowers BJ. Attributing the responsibility for ambulating patients: A qualitative study. *Int J Nurs Stud.* 2013;50(9):1240-1246.
60. Doherty-King B, Yoon JY, Pecanac K, Brown R, Mahoney J. Frequency and duration of nursing care related to older patient mobility. *J Nurs Scholarsh.* 2014;46:20-27.
61. Padula CA, Hughes C, Baumhover L. Impact of a nurse-driven mobility protocol on functional decline in hospitalized older adults. *J Nurs Care Qual.* 2009;24(4):325-331.
62. Drolet A, DeJulio P, Harkless S et al. Move to improve: the feasibility of using an early mobility protocol to increase ambulation in the intensive and intermediate care settings. *Phys Ther.* 2013;93(2):197-207.
63. King BJ, Steege LM, Winsor K, VanDenbergh S, Brown CJ. Getting Patients Walking: A Pilot Study of Mobilizing Older Adult Patients via a Nurse-Driven Intervention. *J Am Geriatr Soc.* 2016;64(10):2088-2094.
64. Boltz M, Resnick B, Chippendale T, Galvin J. Testing a family-centered intervention to promote functional and cognitive recovery in hospitalized older adults. *J Am Geriatr Soc.* 2014;62(12):2398-23407.
65. Martínez-Velilla N, Garrués-Irisarri M, Ibañez-Beroiz B, et al. An exercise program with patient's involvement and family support can modify the cognitive and affective trajectory of acutely hospitalized older medical patients: a pilot study. *Ageing Clin Exp Res.* 2016;28(3):483-490.
66. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implement Sci.* 2009;4:50.
67. Miller JM, Sabol VK, Pastva AM. Promoting Older Adult Physical Activity Throughout Care Transitions Using an Interprofessional Approach. *J Nurse Pract.* 2017;13(1):64-71.
68. Seaby L, Torrance G. Reliability of a physiotherapy functional assessment used in a rehabilitation setting. *Physiother Can.* 1989;41:264-271.
69. de Morton NA, Davidson M, Keating JL. The de Morton Mobility Index (DEMMI): an essential health index for an ageing world. *Health Qual Life Outcomes* 2008;6:63.
70. Smith R. Validation and reliability of the Elderly Mobility Scale. *Physiotherapy.* 1994;80:744-747.
71. Huang M, Chan KS, Zanni JM, et al. Functional Status Score for the ICU: an international clinimetric analysis of validity, responsiveness, and minimal important difference. *Crit Care Med.* 2016;44(12):e1155-e1164.
72. Aberg AC, Lindmark B, Lithell H. Development and reliability of the General Motor Function Assessment Scale (GMF)—a performance-based measure of function-related dependence, pain and insecurity. *Disabil Rehabil.* 2003;25:462-472.
73. Rockwood K, Howlett S, Stadnyk K. Responsiveness of goal attainment scaling in a randomized controlled trial of comprehensive geriatric assessment. *J Clin Epidemiol.* 2003;56:736-743.
74. MacKnight C, Rockwood K. A hierarchical assessment of balance and mobility. *Age Ageing.* 1995;24:126-130.
75. Johns Hopkins Medicine. OACIS: Resources—Instruments and Methods. Available at [http://www.hopkinsmedicine.org/pulmonary/research/outcomes\\_after\\_critical\\_illness\\_surgery/oacis\\_instruments.html](http://www.hopkinsmedicine.org/pulmonary/research/outcomes_after_critical_illness_surgery/oacis_instruments.html). Accessed April 5, 2017.
76. Gage B, Ingber MJ, Morley M et al. Post-Acute Care Payment Reform Demonstration: Final Report Volume 4 of 4. RTI International, 2012 [online]. Available at [https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/Downloads/PAC-PRD\\_FinalRpt\\_Vol4of4.pdf](https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/Downloads/PAC-PRD_FinalRpt_Vol4of4.pdf). Accessed April 5, 2017.
77. Gerety MB, Mulrow CD, Tuley MR et al. Development and validation of a physical performance instrument for the functionally impaired elderly: the Physical Disability Index (PDI). *J Gerontol.* 1993;48:M33-M38.
78. Winograd CH, Lemsky CM, Nevitt MC et al. Development of a physical performance and mobility examination. *J Am Geriatr Soc.* 1994;42:743-749.
79. Mancini M., Horak F. B. The relevance of clinical balance assessment tools to differentiate balance deficits. *Eur J Phys Rehabil Med.* 2010;46:239-248.

**TABLE 1. Mobility Assessments Potentially Suited for Use in the Acute-Care Hospital Setting**

Validated	Population Tested	Outcome Tested	Setting for Which Assessment was Designed or Tested	Elements	Time to Perform Assessment	Cost	Barriers to Implementation	Potential for Integration into EMR	Who Conducts the Assessment
<b>AM-PAC 6 Clicks</b>									
<i>Jette DU, Stilphen M, Ranganathan VK et al. Validity of the AM-PAC "6-Clicks" Inpatient Daily Activity and Basic Mobility Short Forms. Phys Ther 2014;94:379-391.</i>									
Yes	Hospital	Mobility	Hospital	Bed mobility, sitting and standing from chair, transfer from bed, moving from chair, climbing stairs, walking in hospital room	Minutes	Licensing fee	Proprietary	Yes	PT/ OT/ Nurses
<b>Banner Mobility Assessment Tool (BMAT)</b>									
<i>Boynnton T, Kelly L, Perez a et al. Banner Mobility Assessment Tool For Nurses: Instrument Validation. Am J SPHM. 2014; 4(3): 86-92</i>									
Yes	Acute care medical-surgical and ICU patients	Mobility	Hospital	Lying to sit, raise arm across midline, raise leg and extend knee, bend ankle and point toes, stand, walk in place, advance step	UTD*	Free	Provides recommendation for safe patient handling which must be customized to individual hospital environments	Yes	Nurses
<b>Clinical Outcomes Variable Scale</b>									
<i>Seaby L, Torrance G. Reliability of a physiotherapy functional assessment used in a rehabilitation setting. Physiother Can. 1989;41:264-271.</i>									
Yes	Stroke, TBI, geriatric	Discharge mobility status and rehab LOS	Inpatient rehab	13-item scale of motor skills rated from 1 (completely dependent) to 7 (completely independent)	UTD*	Free	Time to complete assessment; assessor training	Yes	PT/OT
<b>de Morton Mobility Index</b>									
<i>de Morton NA, Davidson M, Keating JL. Validity, responsiveness and the minimal clinically important difference for the de Morton Mobility Index (DEMMI) in an older acute medical population. BMC Geriatr. 2010;10:72.</i>									
<i>de Morton NA, Davidson M, Keating, JL. The de Morton Mobility Index (DEMMI): An essential health index for an ageing world. Health Qual Life Outcomes. 2008;6:63.</i>									
Yes	Acute care, older adults	Mobility	Hospital, rehab	Independent bed mobility, transfer to and from chair, static balance, walking, dynamic balance	Minutes	Free	Copyrighted—DEMMI may be printed or reproduced without alteration (retaining this copyright notice)	Yes	Staff
<b>Elderly Mobility Scale</b>									
<i>Smith R. Validation and reliability of the Elderly Mobility Scale. Physiotherapy. 1994;80:744-747.</i>									
Yes	Acutely hospitalized older adults	Mobility	Acute inpatient hospital	Seven-item scale: lying to sitting, sitting to lying, sit to stand, stand, gait, timed walk, functional reach	5 minutes	Free	Ceiling effect in inpatient setting	Yes	Nurses/PT/ OT/aides

Table 1 continues on the next page.

**TABLE 1. Mobility Assessments Potentially Suited for Use in the Acute-Care Hospital Setting/continued**

Validated	Population Tested	Outcome Tested	Setting for Which Assessment was Designed or Tested	Elements	Time to Perform Assessment	Cost	Barriers to Implementation	Potential for Integration into EMR	Who Conducts the Assessment
<b>General Motor Function Assessment Scale</b>									
<i>Aberg AC, Lindmark B, Lithell H. Development and reliability of the General Motor Function Assessment Scale (GMF)-a performance-based measure of function-related dependence, pain and insecurity. Disabil Rehabil. 2003;25:462-472.</i>									
Yes	Skilled nursing facility	ADL performance	Skilled nursing facilities, validated for in-home rehab	Evaluated on three dimensions: dependence, pain, insecurity	UTD*	Free	Evaluator training	Doubtful	Physiotherapist
<b>Goal Attainment Scale</b>									
<i>Rockwood, K, Howlett S, Stadnyk K. Responsiveness of goal attainment scaling in a randomized controlled trial of comprehensive geriatric assessment. J Clin Epidemiol. 2003;56:736-743.</i>									
Yes	Various, including geriatric	Various; goals set by patient and clinician	Outpatient rural geriatric adults	Each therapy goal quantified on a five-point (-2 to +2) scale. Each goal can be weighted based on importance. Goals are summed and given a t-score. Mean is 50.	Minutes	Free	None, but no apparent literature using the GAS in acute elderly inpatients	Yes	Nurses/ PT/ OT/aides
<b>Hierarchical Assessment of Balance and Mobility (HABAM)</b>									
<i>MacKnight C, Rockwood K. A Hierarchical Assessment of Balance and Mobility. Age Ageing. 1995;24:126-130.</i>									
Yes	Older adults in the hospital	Mobility and balance in frail older adults	Older adults in hospital originally; later tested in ambulatory clinic, home visits, ER	6-level rating on balance, 8-level rating on transfers, 14 level rating on mobility	Minutes	Free	Rating criteria too complex to memorize, requires paper or electronic form	Yes	Nurses/ PT/OT
<b>Johns Hopkins Highest Level of Mobility [JH-HLM] Scale</b>									
<i>Johns Hopkins Medicine. OACIS: Resources—Instruments and Methods. Available at <a href="http://www.hopkinsmedicine.org/pulmonary/research/outcomes_after_critical_illness_surgery/oacis_instruments.html">http://www.hopkinsmedicine.org/pulmonary/research/outcomes_after_critical_illness_surgery/oacis_instruments.html</a>. Accessed April 5, 2017.</i>									
Yes	Hospital	To set individual mobility goals, standardize mobility description across disciplines	Hospital	Walk, stand, chair, bed	Minutes	Free, need to ask permission	Fill out request for use	Yes	Multiple disciplines: nursing, rehab therapists, physicians, etc.

Table 1 continues on the next page.



**TABLE 1. Mobility Assessments Potentially Suited for Use in the Acute-Care Hospital Setting/continued**

Validated	Population Tested	Outcome Tested	Setting for Which Assessment was Designed or Tested	Elements	Time to Perform Assessment	Cost	Barriers to Implementation	Potential for Integration into EMR	Who Conducts the Assessment
<b>Minimum Data Set 3.0 v1.14, Section G—Functional Status</b>									
<i>Morris JN, Moore T, Jones R et al. Validation of Long-Term and Post-Acute Care Quality Indicators. Abt Associates, 2003 [online]. Available at <a href="https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/NursingHomeQualityInits/Downloads/NHQIFinalReport.pdf">https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/NursingHomeQualityInits/Downloads/NHQIFinalReport.pdf</a>. Accessed April 5, 2017.</i>									
Yes	Skilled nursing facility	Decline and improvement in mobility, Inter-rater reliability	Skilled nursing facilities	Five-level scale (Independent to Fully Dependent) rating bed mobility, transferring, walking in room, walking in corridor, locomotion on unit, locomotion off unit	UTD*	Free	Not developed for acute care	Yes	Nurses PT/OT
<b>Minimum Data Set 3.0 v1.14, Section GG—Functional Abilities and Goals</b>									
<i>Gage B, Ingber MJ, Morley M et al. Post-Acute Care Payment Reform Demonstration: Final Report Volume 4 of 4. RTI International, 2012 [online]. Available at <a href="https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/Downloads/PAC-PRD_FinalRpt_Vol4of4.pdf">https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/Downloads/PAC-PRD_FinalRpt_Vol4of4.pdf</a>. Accessed April 5, 2017.</i>									
Yes	Post-acute-care settings	Mobility change; other functional changes	Skilled nursing facilities	Six-level scale (Independent to Fully Dependent) rating sit to lying, lying to sit, sit to stand, transferring, walking 50 feet, walking 150 feet or self-propelling in a wheelchair	UTD*	Free	Not developed for acute care	Yes	Nurses/ PT/ OT
<b>Physical Disability Index</b>									
<i>Gerety MB, Mulrow CD, Tuley MR et al. Development and validation of a physical performance instrument for the functionally impaired elderly: the Physical Disability Index (PDI). J Gerontol. 1993;48:M33-M38.</i>									
Yes	Skilled nursing facility patients without severe cognitive impairment	Physical disability	Skilled nursing facilities	54 items on four domains: strength, balance, mobility, range of motion	60 +/- 21 minutes	Free	Evaluator training; time to administer test	Could be done. Authors note that Indexis best utilized in a research setting.	PT/OT

Table 1 continues on the next page.

**TABLE 1. Mobility Assessments Potentially Suited for Use in the Acute-Care Hospital Setting/continued**

Validated	Population Tested	Outcome Tested	Setting for Which Assessment was Designed or Tested	Elements	Time to Perform Assessment	Cost	Barriers to Implementation	Potential for Integration into EMR	Who Conducts the Assessment
-----------	-------------------	----------------	---	----------	----------------------------	------	----------------------------	------------------------------------	-----------------------------

**Physical Performance and Mobility Examination**

Winograd CH, Lemsky CM, Nevitt MC et al. Development of a physical performance and mobility examination. *J Am Geriatr Soc.* 1994;42:743-749.

Yes	Patients older than 65 years with impaired mobility (unable to walk more than 100 yards or recent reported mobility decline) admitted to medical units of hospital; validated in older adults hospitalized in medical and surgical services at a University and VA Hospital	Other validated measures of functional status: ADLs, self-reported physical functioning of the Medical Outcomes study (MOS-PFR), IADLs.	Hospital (medical / surgical)	Observer-administered, performance-based instrument that assesses six domains of physical function and mobility in hospitalized older patients: bed mobility, transfer skills, multiple stands, standing balance, step up one step, and timed 6-meter walk. Adds value beyond self-reported ADLs, not greatly influenced by mood or mental status. Option of a dichotomous pass-fail or three-level high pass, low pass, fail, both with high inter-rater reliability. In the three-level scale, little to no ceiling or floor effects.	10 minutes (5 to 20 minutes range)	Appears to be free to use	Validated in community-dwelling older adults; need staff training for scoring (other than self-report)	Yes; answer options can be available on EMR for clinician to check off	Various disciplines
-----	---	---	-------------------------------	---	------------------------------------	---------------------------	--	--	---------------------

**Timed Up and Go (TUG)**

Mancini M., Horak F. B. The relevance of clinical balance assessment tools to differentiate balance deficits. *Eur J Phys Rehabil Med.* 2010;46:239-248.

Yes	Community	Fall risk	Ambulatory	Observation; time	Minutes	Free	None	Excellent	Various disciplines
-----	-----------	-----------	------------	-------------------	---------	------	------	-----------	---------------------

\*UTD=unable to determine from available literature

ADL, activity of daily living; EMR, electronic medical record; ER, emergency room; IADL, instrumental activity of daily living; ICU, intensive care unit; LOS, length of stay; LTACH, long-term acute-care hospital; OT, occupational therapist; PT, physical therapist; TBI, traumatic brain injury; UTD, unable to determine.