HHS Public Access

Author manuscript

J Appl Gerontol. Author manuscript; available in PMC 2021 April 01.

Published in final edited form as:

J Appl Gerontol. 2020 April ; 39(4): 435–441. doi:10.1177/0733464818770788.

Factors that Contribute to Recovery of Community Mobility after Hospitalization Among Community-Dwelling Older Adults

Elina U. Wells, MD[1], **Courtney P. Williams, MPH**[2], **Richard E. Kennedy, MD, PhD**[3], **Patricia Sawyer, PhD**[3], **Cynthia J. Brown, MD, MSPH**[3,4]

Elina U. Wells: Elina.Wells@palmettohealth.org; Courtney P. Williams: courtneyphillips@uabmc.edu; Richard E. Kennedy: richardkennedy@uabmc.edu; Patricia Sawyer: patriciasawyer@uabmc.edu; Cynthia J. Brown: cynthiabrown@uabmc.edu

[1]Palmetto Health University of South Carolina Family Medicine, Columbia, South Carolina

[2]University of Alabama at Birmingham, Division of Hematology-Oncology, Birmingham, Alabama

[3]University of Alabama at Birmingham, Division of Gerontology, Geriatrics, and Palliative Care, Birmingham, Alabama

[4]Birmingham/Atlanta Veterans Affairs Geriatric Research, Education, and Clinical Center, Birmingham, Alabama

Abstract

This study aimed to determine the proportion of older adults who recovered community mobility after hospitalization and identify factors associated with recovery. Using a random sample of 1000 Medicare beneficiaries ≥ 65 years of age, we identified individuals with at least one hospitalization over 8.5 years of follow-up. Data were collected at baseline and every 6 months, including demographics, function, social support, community mobility measured by the UAB Life-Space Assessment (LSA), and overnight hospital admissions. Recovery was defined as a LSA score no more than five points lower than the pre-hospitalization LSA score at last follow-up. Overall, 339 participants (mean age 75.4 (s.d. 6.6) years, 44% African American, 48% female) had at least one hospitalization. In the full logistic regression model, younger age (p=.007) and religious service attendance (p=.001) remained independently associated with recovery. An understanding of factors associated with recovery after hospitalization may provide a target for future interventions.

Keywords

Mobility; Hospitalization; Life-Space Assessment; Older adult; Disability

Corresponding Author: Cynthia J. Brown, MD, MSPH, University of Alabama at Birmingham, CH19, Room 201/ 1720 2nd Avenue South, Birmingham, Alabama 35294, Phone: (205) 934-9261 Fax: (205) 934-7354.

Conflict of interest

EUW, CPW, REK and PS have no conflicts of interest to report.

Author's contributions

EUW and CJB conceived the study design and the drafting of the manuscript. REK and CPW performed the statistical analysis, conceived the study design and participated in the drafting of the manuscript. PS participated in drafting the manuscript and designing the study and contributed to the intellectual content and coordination. The final version of the manuscript has been read and approved by all authors.

Introduction

Hospitalization among older adults accounts for more than one-third of the total hospitalizations in the United States (Wier & Pfuntner, 2010). Among older adults who are hospitalized, approximately 30% will experience decline in performance of activities of daily living (ADL) as a result of the hospitalization (Covinsky, Palmer, Fortinsky, Counsell, Stewart, & Kresevic, 2003; Hirsch, Sommers, Olsen, Mullen, & Winograd, 1990). Unfortunately, this ADL decline is permanent for many older adults. Boyd et al. showed of those who are discharged from the hospital with new or additional ADL disability, more than one-quarter had still not recovered to their baseline level of function after one year (Boyd, Ricks, Fried, Guralnik, & Bandeen-Roche, 2008). Common hazards of hospitalization for older adults in addition to ADL decline include an increased risk of delirium, pressure ulcers, falls, and nursing home placement when compared to younger patients (Fernandez, Callahan, Likourezos, & Leipzig, 2008; Wilkerson, Iwata, Wilkerson, & Heflin, 2014). Gill et al. showed that hospitalization increased the likelihood of developing new or worsened disability, as well as a reduced likelihood of recovery from disability (Gill, Gahbauer, Murphy, Han, & Allore, 2012). Loss of ADL independence after hospitalization puts patients at risk for institutionalization, re-hospitalization, and death (Sourdet, Lafont, Rolland, Nourhashemi, Andrieu, & Vellas, 2015).

In addition to ADL decline, non-surgical hospitalizations among older adults are associated with a clinically significant decline in life-space with little evidence of recovery even after up to two years of follow-up (Brown, Roth, Allman, Sawyer, Ritchie, & Roseman, 2009). Life-space has been conceptualized as a measure of community mobility, as it reflects the area through which a person moves over a specified period of time (Baker, Bodner, & Allman, 2003). Mobility is defined as “the ability to move one’s own body through space” (Brach, Rosano, & Studenski, 2017) and a decline in mobility often precedes disability with activities of daily living (Shumway-Cook, Ciol, Yorkston, Hoffman, & Chan, 2005). Limitations in community mobility can be measured using the well-validated UAB Study of Aging Life-Space Assessment (LSA) (Brown et al., 2009; Peel, Baker, Roth, Brown, Bodner, & Allman, 2005). With the LSA, mobility is quantified based on the distance through which a person reports moving, ranging from within one’s dwelling to beyond one’s town (Baker, et al., 2003).

A number of studies have explored the predictors of hospital associated ADL decline. These factors include older age, lower pre-admission functional status, cognitive impairment, depression and hospital length of stay (De Saint-Hubert, Schoevaerdts, Cornette, D’Hoore, Boland, & Swine, 2010; Hoogerduijn, Schuurmans, Duijnstee, de Rooij, & Grypdonck, 2007). Other studies have described factors associated with failure to recover pre-hospital ADL function. These include chronic comorbidities such as cardiovascular disease and cancer, inadequate nutrition, and having a greater number of dependencies in instrumental ADLs (Boyd, et al., 2008).

While **prior** work has shown, on average, a persistent life-space decline is observed after hospitalization, we postulated that there is a group of patients who recover to or near their prior level of life-space mobility and that the factors associated with recovery will be similar

to those observed for recovery of ADL ability. Importantly, research has shown that disability among older adults has been recognized to be an episodic and recurrent disorder suggesting hospital associated disability, which includes declines in life-space mobility, may be a target for intervention (Hardy, Dubin, Holford, & Gill, 2005).

The purpose of this study was to determine, among a cohort of previously hospitalized older adults, the proportion who recovered to near pre-hospital levels of community mobility and to identify factors independently associated with recovery.

Research Design

Setting and Participants

The Study of Aging I (SOA I) was designed to understand mobility decline and racial differences in mobility changes associated with aging. Participants were a stratified random sample of 1000 Medicare beneficiaries, age ≥ 65 years, living in the community in in five central Alabama counties. Oversampling was used to achieve balance in terms of race, gender, and rural/urban residence. Baseline in-home interviews were conducted between November 1999 and February 2001 by trained interviewers after obtaining informed consent. Telephone follow-up interviews to assess life-space, overnight hospital stays, and vital status were conducted at 6-month intervals over the 8.5 years of follow-up. If participants were unable to complete follow-up assessments, designated contact persons were interviewed. The Institutional Review Board approved the study protocol (X960304001). Details of the study methods have been described elsewhere (Peel et al., 2005).

Participants (N=339) who had at least one identified hospitalization over the 8.5 years of follow-up were included in these analyses. Persons were censored at the time of nursing home admission or death so that results would be relevant to community-dwelling older adults. Study variables were chosen for inclusion in our models based on prior research in ADL disability as well as factors that have been identified to impact life-space. These factors are described below, in detail.

Study Variables

Life-space Assessment—The primary outcome was the Life-Space Assessment (LSA) score, which is computed based on the distance traveled in terms of five life-space levels (within the dwelling but beyond the room where one sleeps, areas outside the home, within one's neighborhood, within one's town, and out of town), the frequency with which the life-space level is attained, and degree of independence, based on the use of assistive equipment or help from another person during the prior 4 weeks. Scores range from 0–120, with higher scores reflecting greater mobility. LSA scores have been shown to be normally distributed in the UAB Study of Aging population (Sawyer & Allman, 2010) and are reliable when collected in person or by telephone. Life-space scores remain stable over 2 weeks of follow-up (intraclass correlation coefficient = 0.96), but reflect changes, both increases and declines, with longer follow-up or after acute events (Brown et al., 2009; Peel et al., 2005).

The LSA was collected in person at the baseline in-home assessment and by telephone every 6 months during follow-up interviews.

To assess recovery, we compared the life-space score before hospitalization to the last-reported score after hospitalization. Recovery after hospitalization was defined as having a life-space score that was no more than five points below the pre-hospitalization life-space score.

Hospitalizations were identified by asking participants at each 6-month interview if they had been hospitalized overnight during the preceding 6-month period.

Sociodemographic information—Sociodemographic information collected at baseline included age, race (African American vs. white), sex, residence (urban vs. rural), education, and income. Education and income were dichotomized (education: <12th grade vs. ≥12th grade and income: < $12,000/year vs. ≥$12,000/year), respectively. Income was reported in 9 categories ranging from less than $5,000 to greater than $50,000; for persons who did not provide a category, responses to a question about perceived income were used to impute income categories based on correspondence of income categories and perceived income among participants with answers to both questions.

Comorbidity Count—At baseline a verified comorbidity count was created, giving one point for each disease category of the Charlson Comorbidity Index (Charlson, Pompei, Ales, & MacKenzie, 1987), without consideration of severity. Comorbidities were considered verified if the participant reported the condition and took a medication for the condition, if the condition was reported on a questionnaire sent to the participant's physician, or if the condition was noted on a hospital discharge summary. Other conditions assessed were arthritis, spinal stenosis, incontinence, history of hip fracture, and knee or hip replacement.

Perceived health—Perceived level of health was assessed by asking participants the following question: "In general, would you say your health is poor, fair, good, very good, or excellent?" at baseline and all follow-up interviews. Answers were dichotomized into "Excellent, very good, or good" self-reported health and "Fair or poor".

Social Support—Social support was assessed using an adaptation of the Arthritis Impact Measurement Scale for Social Support (Meenan, Mason, Anderson, Guccione, & Kazis, 1992). Items included in the scale were: "How often did you feel that your family or friends would be around if you needed assistance? How often did you feel that your family or friends were sensitive to your personal needs? How often did you feel that your family or friends were interested in helping you solve problems? How often did you feel that your family or friends understood how getting older has affected you?" Response categories were: always (0), very often (1), sometimes (2), almost never (3), and never (4). Scores were summed, and higher scores indicated less perceived support.

Religious service attendance—Frequency of religious service attendance was assessed at baseline by asking participants: "How often do you usually attend church or other religious meetings?" The options included more than once a week, once a week, a few times

a month, a few times a year, once a year or less, or never. Answers were dichotomized with participants who responded “never” attend were in one group and all others were categorized as “attends religious services”.

Current driving—Current driving was assessed by asking participants: “Do you currently drive?” Options were “yes” or “no”.

Transportation difficulty—Transportation difficulty was assess by asking participants: “Over the past four weeks, have you had any difficulty getting transportation to where you want to go?”, and “Do you limit your activities because you don’t have transportation?” A positive response to either question was defined as having transportation difficulty.

Functional status—Functional status was assessed using activities of daily living (ADLs) and instrumental activities of daily living (IADLs) measured at baseline. The ADL items included were getting out of a bed or chair, showering, dressing, eating, and using the toilet. The six IADL items included using the telephone, doing light housework or heavy housework, preparing meals, shopping, and managing money. For each item, participants were asked, “Do you have any difficulty performing the task?” Composite scores for ADL and IADL were calculated using the count of scores for the individual tasks and ranged from 0–5 for ADL and 0–6 for IADL, with lower scores indicating less reported difficulty with the functional tasks (Baker et al., 2003).

Depression and Cognition—Participants were assessed for depression at the baseline interview using the short form of the Geriatric Depression Scale (GDS), (Yesavage et al., 1982) which performs similarly to the longer version for distinguishing depression (Sheikh & Yesavage, 1986). The instrument is scored from 0 to 15, with scores greater than 5 indicating depressive symptomology.

Cognitive function was measured at baseline using the Mini-Mental State Examination (MMSE) score (Folstein, Folstein, & McHugh, 1975). Scores ranged from 0 to 30.

Body mass index—Body Mass Index (BMI) was calculated using data on height and weight collected during the baseline in home assessment. BMI was chosen as a proxy for nutritional status as prior studies have shown albumin to be associated with poor recovery of ADL ability.

Statistical Analysis—Bivariate analyses (chi-square and t-tests) were used to compare the characteristics of participants who recovered after hospitalization to those who did not recover. Multivariable logistic regression was used to assess the association between recovery after hospitalization and baseline characteristics. Independent variables were added to the model in a stepwise fashion, with socio-demographic variables added first, comorbidity and health efficacy measures added next, and function and physical measures added at the final step. Odds ratios and 95% confidence intervals were generated from the logistic regression models. JMP version 10.0.2 (SAS Inc, 2012) was used for statistical analyses.

Results

Of the 1000 community-dwelling older adults in our cohort, 339 (33.9%) experienced a hospitalization. The average age of this subgroup was 75.4 (s.d. 6.6) years, 44% were African American and 48% were female. The demographics of the hospitalized population are shown in Table 1. A minority, 33.6% (114/339) achieved a recovery after their hospitalization. Participants who recovered tended to be younger and more likely to attend religious services when compared to those who did not recover after hospitalization.

Factors associated with recovery of life-space after hospitalization are shown in Table 2. The first model included demographics, with younger age and female gender being significant predictors of recovery. In the second model, dichotomized religious service attendance was significantly associated with recovery after hospitalization, while age remained significant. In the full model only age and religious service attendance predicted recovery after hospitalization.

To further explore the impact of religious service attendance, we categorized religious service attendance into three categories: Category 1 attended more than once a week, once a week or a few times a month (n=721); Category 2 attended a few times a year, once a year or less (n=138); and Category 3 Never attended (n=140). We re-ran the analysis with these 3 categories, using the “Never” group as the reference. For the smaller model (with demographics and comorbidity), the odds for the second group (less frequent but not never) was 4.441 (95% CI 1.463 – 13.481), and for the third group (few times a month or more) was 3.354 (95% CI 1.298 – 8.670). For the larger model (including function and mental health), the odds were 5.246 (95% CI 1.668 – 16.504) and 3.783 (95% CI 1.404 – 10.193), respectively. These differences were not statistically significant.

Finally, we compared pre- and post-hospitalization scores over a set time period to assure that participants were followed for a long enough period of time to contribute meaningfully to the data. We found the number of hospitalizations decreases over time because the number of subjects still enrolled also decreased. The mean number of hospitalizations showed some dips and an isolated spike at the beginning of the study, but overall there was not a trend for more hospitalizations to occur early or late in the study (data not shown). All subjects in the analysis were assessed at least once and at least 6 months following hospitalization. So while some subjects only had a small amount of data (a few observations prior to hospitalization or a few after hospitalization), participants were observed for a sufficient time to detect differences in recovery.

Discussion

Among those who were hospitalized, only one-third recovered, meaning the last reported LSA score after hospitalization was no more than five points below the pre-hospitalization life-space score. Multivariable logistic regression showed that only younger age and religious service attendance were independently associated with recovery after hospitalization. In addition, it appears that the threshold for benefit from religious service attendance is low; it seems to be an effect of never vs. any.

Life-space has been previously used to assess resilience in community mobility in older adults (Sawyer & Allman, 2010). Those who remain resilient in community mobility may have resources to help recover from adverse events in life. A literature review of resilience by van Kessel identified most adversities investigated tended to be “ongoing life experiences rather than a specific life event” such as hospitalization (van Kessel, 2013). Yet for older adults, single events such as hospitalization can result in a decreased ability to independently perform their ADLs and participate in their community, thus negatively impacting their quality of life (Boyd et al., 2009; Brown et al., 2009; Gill, Allore, Gahbauer, & Murphy, 2010). Thus, our study expands the literature to include factors associated with recovery after a single adverse event, such as hospitalization.

A number of in-hospital programs have been developed to reduce the observed ADL loss, such as the Nurses Improving Care for Health System Elders (NICHE) program, which provides nurses with resources and guidance to improve the care of hospitalized older adults (Capezuti, 2012). Acute Care for Elders (ACE) Units focus on daily assessment of physical, cognitive, and psychosocial function as well as interdisciplinary discharge planning (Counsell, 2000). The Hospital Elder Life Program (HELP) is a multicomponent intervention that targets physical and cognitive function and has been demonstrated to reduce delirium and falls (Inouye, 1990). Although these and other programs have been successful in reducing observed rates of functional decline after hospitalization, ADL decline continues to occur for many older adults.

A qualitative study by Greyson and colleagues suggested that our current medical interventions may overlook “social gaps” in post-discharge care, which included social isolation and lack of support from friends and family (Greysen, 2014) Social support has been critical in the ability to recover from adversity across several studies, (van Kessel, 2013) and social networks appear to be key to successful aging (Robinson & Jon F, 2004). Studies suggest that older adults who value spirituality and participate in religious services are better able to cope with adverse events because of their network of social support (Christensen, 2009; Manning, 2013; Moxey, McEvoy, Bowe, & Attia, 2011; Robinson & Jon F, 2004). Our finding that religious service attendance was significantly associated with recovery, but social support was not suggests that attendance may reflect a different aspect of social support or the positive influence of a social network that provides the motivation and possibly the means to resume community mobility. This finding is similar to that of Latham, et. al. who found among older adults with severe mobility limitation, social relationships served as facilitators of both partial and complete recovery (Latham, Clarke, & Pavela, 2015).

This study has a number of strengths including the racially balanced, population-based sample of community-dwelling older adults we prospectively followed for more than 8 years. Another strength is the use of the Life-Space Assessment, which is easily administered and detects both increases and decreases in community mobility and participation in society over time. However, our study has limitations. Data collected after baseline was by self-report, including information regarding hospitalization. However, hospitalization is a significant event, and we expect that participants would remember if they had been hospitalized in the prior 6 months. Another limitation involves the lack of

assessment of social support beyond religious service attendance. Finally, it is recognized that Life-space declines over time as a participant ages, which might be hypothesized as the reason for our results. However, prior studies have demonstrated the observed decline over time with age is small, approximately 1.0 LSA point/year (Brown, Kennedy, Lo, Williams, & Sawyer, 2016). A cut point of 5 points or more was chosen, as this is a clinically meaningful decline. Even if we factor in the expected 1 point per year loss, we would expect participants to have some recovery in the months after their hospitalization. Thus, the 5-point or greater loss is reflective of more than just the loss expected with aging.

Conclusions

At present, there is a lack of evidence-based therapies that can be implemented following hospitalization to accelerate functional recovery (Deer, Dickinson, Fisher, Ju, & Volpi, 2016). Using a large, diverse number of community-dwelling older adults as sample population, we identified only younger age and religious service attendance as factors that were independently associated with recovery of life-space mobility after hospitalization. Despite all the variables we measured, it is possible that we “missed” the most important variable that predicts resilience. However, we think it is more complicated than that explanation. We expect that resilience of community mobility is made up of a number of factors, the importance of which differs depending on the person. Therefore, when we examine social support, or transportation, these factors may be very important for some and less for others, so we do not see statistical significance for either. This should be explored with a more homogeneous sample, as we currently do not have the evidence to support this hypothesis. An understanding of the factors associated with recovery after hospitalization may provide a target for future interventions, such as improved social support after hospital discharge through the use of patient navigators or health coaches (Balaban, Galbraith, Burns, Vialle-Valentin, Larochelle, & Ross-Degnan, 2015; Watkins, Hall, & Kring, 2012).

Acknowledgments

CJB has received grant funding from the NIH and VA and has served as a consultant for Novartis.

Funding

This study was supported in part by a grant from the National Institute on Aging (R01 AG015062) to CJB. The sponsor had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

References

Baker PS, Bodner EV, Allman RM. 2003; Measuring life-space mobility in community-dwelling older adults. J Amer Geriatr Soc. 51(11):1610–4. [PubMed: 14687391]

Balaban, RB; Galbraith, Aa; Burns, ME; Vialle-Valentin, CE; Larochelle, MR; Ross-Degnan, D. A Patient Navigator Intervention to Reduce Hospital Readmissions among High-Risk Safety-Net Patients: A Randomized Controlled Trial; Journal of General Internal Medicine. 2015. 21–23.

Boyd CM, Ricks M, Fried LP, Guralnik JM, Xue Q-L, Xia J, Bandeen-Roche K. 2009; Functional decline and recovery of activities of daily living in hospitalized, disabled older women: the Women’s Health and Aging Study I. Journal of the American Geriatrics Society. 57(10):1757–66. DOI: 10.1111/j.1532-5415.2009.02455.x [PubMed: 19694869]

Brach, J, Rosano, C, Studenski, SA. Mobility. In: Halter, JB, Ouslander, JG, Studenski, S, High, KP, Asthana, S, Supiano, MA, Ritchie, CS, editors. Hazzard's Geriatric Medicine and Gerontology Textbook. 7. New York: McGraw-Hill Education; 2017. 1775–1790.

Brown CJ, Roth DL, Allman RM, Sawyer P, Ritchie CS, Roseman JM. 2009; Trajectories of life-space mobility after hospitalization. Ann Intern Med. 150(6):372–8. [PubMed: 19293070]

Brown CJ, Kennedy RE, Lo AX, Williams CP, Sawyer P. 2016; Impact of Emergency Department Visits and Hospitalization on Mobility Among Community-Dwelling Older Adults. Am J Med. 129(10):1124.

Capezuti E, Boltz M, Cline D, Dickson VV, Rosenberg MC, Wagner L, et al. 2012; Nurses Improving Care for Healthsystem Elders - a model for optimising the geriatric nursing practice environment. J Clin Nurs. 21(21–22):3117–25. [PubMed: 23083387]

Charlson ME, Pompei P, Ales KL, MacKenzie CR. 1987; A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis. 40(5):373–83. [PubMed: 3558716]

Christensen SA. 2009; The relationship between spirituality and successful aging. Dissertation Abstracts International: Section B. The Sciences and Engineering. 70(3-B)

Counsell SR, Holder CM, Liebenauer LL, Palmer RM, Fortinsky RH, Kresevic DM, et al. 2000; Effects of a multicomponent intervention on functional outcomes and process of care in hospitalized older patients: a randomized controlled trial of Acute Care for Elders (ACE) in a community hospital. J Am Geriatr Soc. 48(12):1572–81. [PubMed: 11129745]

Covinsky KE, Palmer RM, Fortinsky RH, Counsell SR, Stewart AL, Kresevic D, et al. 2003; Loss of independence in activities of daily living in older adults hospitalized with medical illnesses: increased vulnerability with age. J Am Geriatr Soc. 51(4):451–458. [PubMed: 12657063]

Deer RR, Dickinson JM, Fisher SR, Ju H, Volpi E. 2016; Identifying Effective and Feasible Interventions to Accelerate Functional Recovery from Hospitalization in Older Adults: A Randomized Controlled Pilot Trial. Contemp Clin Trials. 49:6–14. [PubMed: 27178766]

DeSaint-Hubert M, Schoevaerdtsi D, Cornette P, D'Hoore W, Boland B, Swine C. 2010; Predicting functional adverse outcomes in hospitalized older patients: A systematic review of screening tools. J Nutr Health Aging. 14(5):394. [PubMed: 20424808]

Fernandez HM, Callahan KE, Likourezos A, Leipzig RM. 2008; House staff member awareness of older inpatients' risks for hazards of hospitalization. Arch Intern Med. 168(4):390–6. [PubMed: 18299494]

Folstein MF, Folstein SE, McHugh PR. 1975; "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res. 12(3):189–98. [PubMed: 1202204]

Gill TM, Allore HG, Gahbauer EA, Murphy TE. 2010; Change in disability after hospitalization or restricted activity in older persons. JAMA. 304(17):1919–28. [PubMed: 21045098]

Gill TM, Gahbauer EA, Murphy TE, Han L, Allore HG. 2012; Risk factors and precipitants of long-term disability in community mobility: a cohort study of older persons. Ann Intern Med. 156(2):131–40. DOI: 10.7326/0003-4819-156-2-201201170-00009 [PubMed: 22250144]

Greysen SR, Hoi-Cheung D, Garcia V, Kessell E, Sarkar U, Goldman L, et al. 2014; "Missing Pieces" – Functional, Social, and Environmental Barriers to Recovery for Vulnerable Older Adults Transitioning From Hospital to Home. J Am Geriatr Soc. 62(8):1556–1561. [PubMed: 24934494]

Hardy SE, Dubin JA, Holford TR, Gill TM. 2005; Transitions between states of disability and independence among older persons. Am J Epidemiol. 161(6):575–584. [PubMed: 15746474]

Hirsch CH, Sommers L, Olsen A, Mullen L, Winograd CH. 1990; The natural history of functional morbidity in hospitalized older patients. J Am Geriatr Soc. 38:1296–1303. [PubMed: 2123911]

Hoogerduijn JG, Schuurmans MJ, Duijnstee MS, de Rooij SE, Grypdonck MF. 2007; A systematic review of predictors and screening instruments to identify older hospitalized patients at risk for functional decline. J Clin Nurs. 16(1):46–57. [PubMed: 17181666]

Inouye SK, Bogardus STJr, Charpentier PA, Leo-Summers L, Acampora D, Holford TR, Cooney LM Jr. 1990; A multicomponent intervention to prevent delirium in hospitalized older patients. N Engl J Med. 340(9):669–76.

Latham K, Clarke PJ, Pavela G. 2015; Social Relationships, Gender, and Recovery From Mobility Limitation Among Older Americans. J Gerontol B Psychol Sci Soc Sci. 70(5):769–781. [PubMed: 25583597]

Manning LK. 2013; Navigating hardships in old age: exploring the relationship between spirituality and resilience in later life. Qual Health Res. 23(4):568–75. [PubMed: 23282796]

Moxey A, McEvoy M, Bowe S, Attia J. 2011; Spirituality, religion, social support and health among older Australian adults. Australas J Ageing. 30(2):82–8. DOI: 10.1111/j.1741-6612.2010.00453.x [PubMed: 21672117]

Peel C, Baker PS, Roth DL, Brown CJ, Bodner EV, Allman RM. 2005; Assessing Mobility in Older Adults: The UAB Study of Aging Life-Space Assessment. Phys Ther. 85(10):1008–1019. [PubMed: 16180950]

Robinson JD, Jon FN. 2004; Grounding research and medical education about religion in actual physician-patient interaction: church attendance, social support, and older adults. Health Commun. 16(1):63–85. DOI: 10.1207/S15327027HC1601_5 [PubMed: 14979852]

Sawyer, P, Allman, RM. New Frontiers in Resilient Aging. Fry, PS, Keyes, CLM, editors. Cambridge: Cambridge University Press; 2010.

Sheikh JI, Yesavage JA. 1986; Geriatric Depression Scales (GDS). Recent evidence and development of a shorter version. Clin Gerontol. 5:165–174.

Shumway-Cook A, Ciol MA, Yorkston KM, Hoffman JM, Chan L. 2005; Mobility Limitations in the Medicare Population: Prevalence and Sociodemographic and Clinical Correlates. J Amer Geriatr Soc. 53(7):1217–1221. DOI: 10.1111/j.1532-5415.2005.53372.x [PubMed: 16108942]

Sourdet S, Lafont C, Rolland Y, Nourhashemi F, Andrieu S, Vellas B. 2015; Preventable Iatrogenic Disability in Elderly Patients During Hospitalization. J Am Med Dir Assoc. 16(8):674–81. DOI: 10.1016/j.jamda.2015.03.011 [PubMed: 25922117]

van Kessel G. 2013; The ability of older people to overcome adversity: a review of the resilience concept. Geriatric Nursing(New York, N.Y.). 34(2):122–7. DOI: 10.1016/j.gerinurse.2012.12.011

Watkins L, Hall C, Kring D. 2012; Hospital to Home. Prof Case Manag. 17(3):117–123. DOI: 10.1097/NCM.0b013e318243d6a7 [PubMed: 22488341]

Wier L, Pfuntner A. 2010Statistical Brief # 103 Hospital Utilization among Oldest. :1–11.

Wilkerson LM, Iwata I, Wilkerson MD, Heflin MT. 2014; An educational intervention to improve internal medicine interns' awareness of hazards of hospitalization in acutely ill older adults. J Amer Geriatr Soc. 62(4):727–33. DOI: 10.1111/jgs.12733 [PubMed: 24617325]

Yesavage JA, Brink TL, Rose TL, Lum O, Huang V, Adey M, Leirer VO. 1982; Development and validation of a geriatric depression screening scale: a preliminary report. J Psychiatr Res. 17(1):37–49. [PubMed: 7183759]

Table 1

Characteristics of hospitalized participants (n=339)

Variable	Recovered after Hospitalization (n=114)	Did Not Recover after Hospitalization (n=225)
Age, Years *, Mean (SD)	74. 3 (6.2)	75.9 (6.8)
Race, African American, N (%)	52 (45.6)	98 (43.6)
Gender, Female, N (%)	63 (55.3)	100 (44.4)
Rural residence, N (%)	61 (53.5)	96 (42.7)
Education <12th grade, N (%)	51 (44.7)	91 (40.4)
Income <$12,000, N (%)	47 (41.2)	81 (36.0)
Comorbidity count, Mean (SD)	2.3 (1.5)	2.4 (1.5)
Perceived health (excellent, very good, or good), N (%)	71 (62.3)	126 (56.0)
Low social support, (N (%)	93 (81.6)	194 (86.2)
Attend religious services *, N (%)	108 (94.7)	187 (83.1)
Current driver, N (%)	81 (71.1)	175 (77.8)
Transportation Difficulty, N (%)	21 (18.4)	27 (12.0)
ADLs, Mean (SD)	1.5 (2.1)	1.2 (1.8)
IADLs, Mean (SD)	1.1 (1.5)	1.1 (1.5)
GDS score, Mean (SD)	2.3 (2.1)	2.3 (2.4)
MMSE score, Mean (SD)	25.9 (4.4)	25.8 (4.0)
BMI, Mean (SD)	28.0 (6.3)	28.0 (7.7)

* p-value <0.05

ADL=Activities of Daily Living; IADLs = Instrumental ADLs; GDS = Geriatric Depression Scale; MMSE = Mini Mental State Examination; BMI = Body Mass Index

Table 2

Independent contribution of variables to recovery of life-space mobility

Variable	Model 1 Demographics alone Odds Ratio (95% CI)	Model 2 Demographics and Comorbidities Odds Ratio (95% CI)	Model 3 Demographics, comorbidities, and physical function Odds Ratio (95% CI)
Age, Years	0.95 (0.91, 0.99) *	0.95 (0.91, 0.99) *	0.94 (0.90, 0.98) *
Race, African American	0.99 (0.58, 1.68)	0.85 (0.59, 1.48)	0.92 (0.49, 1.72)
Gender, Female	1.73 (1.07, 2.83) *	1.47 (0.87, 2.47)	1.46 (0.86, 2.48)
Rural residence	1.58 (0.96, 2.59)	1.48 (0.89, 2.47)	1.44 (0.85, 2.44)
Education <12th grade	1.23 (0.70, 2.17)	1.40 (0.76, 2.58)	1.44 (0.75, 2.77)
Income <$12,000	1.00 (0.55, 1.83)	0.97 (0.50, 1.85)	1.01 (0.52, 1.96)
Comorbidity count[a]		0.97 (0.82, 1.14)	0.95 (0.80, 1.13)
Perceived health (excellent, very good, or good)		1.49 (0.86, 2.56)	1.71 (0.95, 3.08)
Low social support		0.75 (0.39, 1.44)	0.75 (0.38, 1.46)
Attend religious services		3.54 (1.39, 9.06) *	4.04 (1.52, 10.75) *
Current driver		0.69 (0.33, 1.44)	0.82 (0.38, 1.78)
Transportation difficulty		1.38 (0.61, 3.13)	1.38 (0.60, 3.21)
ADLs[b]			1.29 (0.98, 1.70)
IADLs[c]			0.97 (0.77, 1.23)
GDS score[d]			0.98 (0.87, 1.11)
MMSE score[e]			1.00 (0.92, 1.08)
BMI			0.99 (0.95, 1.03)

* p-value < 0.05

[a] Used the Charlson Comorbidity Index

[b] Activities of Daily Living

[c] Instrumental ADLs

[d] Geriatric Depression Scale; Max score is 15; > 5 is a positive screen for depressive symptoms

[e] Mini Mental State Examination; Max score is 30; 27–30 indicates normal cognition