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Feature Article

Factors related to the mobility of hospitalized older adults: A prospective cohort study

Anna Zisberg, PhD, RN [a,*], Anat Syn-Hershko, MA, PT [b]

[a] The Cheryl Spencer Department of Nursing, Faculty of Social Welfare and Health Science, University of Haifa, Mount Carmel, 31905, Israel
[b] Department of Gerontology, Faculty of Social Welfare and Health Science, University of Haifa, Mount Carmel, Israel

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ABSTRACT

A low ambulation rate is common even among acutely ill hospitalized older adults. This prospective observational study conducted among 769 older adults (≥70) hospitalized in acute-care units tested the relationship of satisfaction with hospital environment, sleep-medication consumption, and in-hospital caloric intake to mobility levels during hospitalization on 3 consecutive hospitalization days. Approximately 20% of the patients did not walk, 30% walked only in their room, and 50% mobilized outside their room. A multinomial-logistic regression, controlling for potential intervening factors, showed that sleep-medication avoidance (AOR = 1.99; $p < 0.01$) and higher caloric intake (AOR = 9.69; $p < 0.001$) differentiated patients walking outside the room from non-walking patients. Satisfaction with the physical environment was lower in the non-mobile group than in the other two. Results suggest that hospital environment, sleep-medication consumption, and caloric intake during hospitalization need to be addressed in attempts to improve in-hospital mobility in older adults.

Introduction

The adverse consequences of low mobility in older hospitalized persons are well described.[1–4] In-hospital mobility is one of the major modifiable factors related to functional decline (FD) in and after hospitalization.[5–8] In frail hospitalized older adults, each day of immobility is associated with a 5% loss in muscle strength, which in turn leads to FD.[1] A 5%–10% decline in function might suffice to undermine older adults' ability to climb stairs or even to rise unassisted from bed or the bathtub. Multifactorial in-hospital interventions, led mostly by nurses who incorporate enhanced mobility protocols, have shown significant improvement in outcomes, such as reduction in falls and delirium and preserving basic functioning.[9–11] Correlational results suggest that patient mobility is related to inpatient length of stay (LOS).[12,13] Moreover, a prospective study that controlled for intervening factors showed that patients who increased their walking rate during their hospital stay were discharged on average 1.7 days earlier than those who did not.[14] There is also evidence of the effect of physical therapy mobility intervention on septicemia patients' LOS.[15] Despite a general understanding of mobility's importance, older adults spend as much as 83% of their hospital stay lying in bed.[6,16] The low ambulation rate is common even among patients capable of ambulating independently.[13,17]

A number of personal, organizational, environmental, and care-related factors can influence a patient's mobility level. Physically hostile hospital settings, low caloric intake, and increased sleep-medication consumption have been 'blamed' for contributing to limited mobility during hospitalization[1,18,19]; however, the combined contribution of these factors was not yet established. A recent study examined patient risk factors in a small sample of older adults hospitalized in acute-care units for the elderly.[20] This study showed that prehospital mobility level, orthopedic and neurological diagnosis, ethnicity, and illness severity explained more than 25% of the variance in inpatient ambulation level, leaving much room for additional explanations. No study so far has examined potentially modifiable in-hospital risk factors in a large sample of hospitalized older adults. In this study, we tested the relationship of satisfaction with hospital environment, sleep-medication consumption, and in-hospital caloric intake to in-hospital mobility levels. These were tested while controlling for known intervening factors such as age, baseline functional level, premorbid mobility, risk of malnutrition, medical conditions, and cognitive and emotional status.

Materials and methods

The described study is part of a larger prospective observational research project, Hospitalization Process Effects on Functional

Conflicts of interest: None.

* Corresponding author. Tel.: +972 584877772; fax: +972 48288017.
E-mail address: azisberg@univ.haifa.ac.il (A. Zisberg).

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Outcomes and Recovery (HoPE-FOR), which assessed hospitalization-care processes and functional outcomes in acutely ill hospitalized older adults. The study was conducted in acute-care units, between 2009 and 2011, in two medical centers in Israel. Patients 70 years of age and older were invited to participate if theirs was an emergency admission to an internal-medical unit from the emergency room (ER) due to non-disabling primary diagnosis. Patients with moderate to severe cognitive impairment (those scoring 5 or less on the Short Portable Mental Status Questionnaire [SPMSQ][21]) required the involvement of a surrogate (a family member who serves as the primary caregiver) during the consent process and subsequent interviews. Patients less than 70 years of age, who had complete dependency before hospital admission, who were terminally ill, or who required intensive care unit (ICU) care were excluded; as were patients who could not sign informed consent and who lacked an available surrogate. Of the 2134 eligible patients, 1032 consented to participate in the study; of these, 217 (21%) consented together with a primary caregiver. Of the 1032 participants, 210 (20.3%) didn't complete the study, for various reasons (death, discharge to another unit, request to discontinue participation, severe complications that precluded participation). The eligibility criteria, the recruitment process, and attrition are fully described elsewhere.[22] Study protocols were approved by the two hospitals' Helsinki committees.

Participants

In the current study, of 822 participants who successfully completed data collection by the time of discharge, 18 (2.2%) were excluded because their LOS was shorter than 2 days, and 35 (4.3%) more were excluded because they were missing data for the main variables under consideration; the final sample was 769 (Table 1).

Measures

In-hospital mobility levels were assessed through daily interviews, using a modified mobility index developed by Brown and colleagues.[6,23] Patients reported their mobility frequency for the previous 24-h period. Based on their scores, they were assigned to one of three groups: low mobility, defined as total bed rest or transferring from bed to chair up to twice a day; moderate mobility, defined as in-room ambulation only; and high mobility, defined as ambulation at least once a day outside the room. Premorbid mobility level was defined as time spent on a comprehensive list of activities and assessed using the Yale Physical Activity Survey (YPAS).[24]

Baseline functional status was assessed using a self-reported modified Barthel Index,[25] and cognitive status was estimated using Pfeiffer's SPMSQ.[21] Anxiety symptoms were evaluated using the Short Anxiety Screening Test (SAST).[26] This instrument conforms to the criteria for General Anxiety Disorder as outlined in the DSM-V. A SAST score greater than or equal to 24 out of 40 indicates a positive screening for anxiety.

Data regarding patient nutritional status was assessed on admission using the Malnutrition Universal Screening Tool (MUST),[27] rating malnutrition risk from low (0) to high (≥2). Participants' in-hospital food intake was estimated based on self-report of quantities consumed at each of three main meals. The score was calculated based on the relative caloric value of each meal and summarized as the mean of proportions of daily caloric intake.[28]

Hospital physical environment was assessed using the subscales of the Perceived Hospital Environment Quality Index (PHEQI),[29] which estimates participants' perceptions of the hospital's physical condition (e.g., furniture arrangement, space to move).

Medication sedative load (MSL) was established by applying a sedative-load formula based on information on the type and number of sleep medications consumed during the month before hospitalization.[30] Calculated similarly was in-hospital MSL, based on data from in-person interviews during the hospital stay.

The Charlson Comorbidity Index[31] and Acute Physiology and Chronic Health Evaluation II (APACHE II)[32] were used to assess severity of chronic and acute health conditions. In addition, demographic information was collected at the time of admission to the study.

Procedure

Study participants were recruited within 48 h after admission. Patients were interviewed by a trained research assistant regarding their premorbid and admission physical, cognitive, and emotional status and medication consumption; during 3 consecutive days participants were interviewed regarding their last 24-h mobility level, nutrition, and sleep-medication consumption. On discharge day, data were collected regarding patient evaluation of the hospital environment. Data regarding illness severity and comorbidities at admission were retrieved from participants' medical records.

Statistical analysis

All study variables were tested for their distributions. Non-normally distributed variables, in-hospital and premorbid MSL (kurtosis >3), were dichotomized for further analysis. All potential predictors of in-hospital mobility were evaluated in a univariate analysis by applying an analysis of variance (F) for continuous data and a χ^2 test for categorical data. Post-hoc paired comparison was performed to identify which groups were significantly different. Variables that differed significantly in the univariate analysis were included in all logistic-regression models. Multinomial-logistic regression was used to test the data when low mobility served as a reference group; in addition, logistic regression was performed to compare the high- and the moderate-mobility groups. Odds-ratio scores (ORs) and their associated 95% CIs were calculated to

Table 1
Descriptive statistics of the sample and main study variables.

Sample characteristics	Total sample ($N = 769$)
Age, mean ± SD	78.6 ± 5.8
Gender (female), no. (%)	394 (51.2)
Family status (married), no. (%)	415 (54.0)
Education, in y, mean ± SD	10.4 ± 5.2
Living at home, no. (%)	688 (89.5)
Source of data (patient), no. (%)	646 (84.0)
SPMSQ (0–10), mean ± SD	8.1 ± 2.2
Charlson Index (0–33), mean ± SD	2.5 ± 2.1
APACHE II score (0–71), mean ± SD	11.5 ± 4.2
LOS in hospital, d median (interquartile range)	5 ± (3–7)
Total baseline ADL, mean ± SD	87.9 ± 20.2
YPAS Index (0–136), mean ± SD	26 ± 25.9
Risk of malnutrition (range 0–2)	0.90 ± 0.89
Anxiety symptoms (≥24)[a]	184 (23.9)
Mean of proportions of daily caloric intake (range 0–1)	0.58 ± 0.25
Prior to admission MSL (range 0–6)	0.99 ± 1.27
In-hospital MSL[b] (range 0–4)	0.76 ± 0.99
Hospital environment: physical (range 1–5)	3.86 ± 0.64

ADL – activities of daily living, APACHE – Acute Physiology, Age, and Chronic Health Evaluation, LOS – length of stay, MSL – medication sedative load, SPMSQ – Short Portable Mental Status Questionnaire, YPAS – Yale Physical Activity Survey.

[a] Sinoff's Short Anxiety Screening Test.

[b] The total in-hospital MSL score was calculated as an average score for all available time-points.