Mobility in the Hospitalized Older Adult

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Funding

• The John A. Hartford Foundation
• Veterans Administration (VA) Rehabilitation Research and Development
• National Institutes of Health (NIH)

• Financial Disclosures: None
Commonly Encountered Hazards During Hospitalization

- Delirium
- Pressure Ulcers
- Functional Decline
- Falls
Delirium

- Present on admission in 8-17% of older patients
- Occurs during admission for additional 10-30% of patients
- Costs > $164 billion per year in USA
- Associated with increased rates of hospital death and nursing home placement
- Demonstrated prevention measure:
  - Avoidance of low mobility (bed rest or bed to chair transfers)

Determining the Scope of the Problem
Prevalence and Outcomes of Low Mobility in Hospitalized Older Patients

Cynthia J. Brown, MD,*† Rebecca J. Friedkin, PhD,‡ and Sharan K. Inouye, MD, MPH,*†

OBJECTIVES: To estimate the prevalence of different levels of mobility in a hospitalized older cohort, to measure the degree and rate of adverse outcomes associated with different mobility levels, and to examine the physician activity orders and documented reasons for bedrest in the lowest mobility group.

METHODS: A prospective cohort study.

SETTING: An 800-bed university teaching hospital.

PARTICIPANTS: Four hundred ninety-eight hospitalized medical patients, aged 70 and older.

MEASUREMENTS: Using average mobility level, scored from 0 to 12, the low-mobility group was defined as having a score of 4 or less, intermediate as a score of higher than 4 to 8, and high as higher than 8. Outcomes were functional decline, new institutionalization, death, and death or new institutionalization.

RESULTS: Low and intermediate level of mobility were associated with increased risk of adverse outcomes, accounting for 83 (26%) and 157 (52%) study patients, respectively. Overall, any activity of daily living (ADL) decline occurred in 29% of new institutionalization in 13%, death in 7%, and death or new institutionalization in 33% of patients in this cohort. When compared with the high-mobility group, the low- and intermediate-mobility groups were associated with adverse outcomes in a graded fashion, even after controlling for multiple confounders. The low-mobility group had an adjusted odds ratio (OR) of 5.6 (95% confidence interval [CI] 1.0–29.1) for ADL decline, 7.1 (95% CI 2.5–13.4) for new institutionalization, 34.3 (95% CI 6.1–159.5) for death, and 7.2 (95% CI 1.0–49.7) for death or new institutionalization. The intermediate group had adjusted ORs of 3.4 (95% CI 1.5–8.3), 3.8 (95% CI 1.1–10), 2.5 (95% CI 1.0–5.9), and 6.4 (95% CI 3.4–13.4) for new institutionalization, 34.3 (95% CI 6.1–159.5) for death, and 7.2 (95% CI 1.0–49.7) for death or new institutionalization.

CONCLUSION: Low mobility and bedrest are common in hospitalized older patients and are important predictors of adverse outcomes. This study demonstrated that the adverse outcomes associated with low mobility and bedrest may be viewed as etiologic events leading to complications, such as functional decline. J Am Geriatr Soc 52:1263–1270, 2004.

Key words: mobility; bedrest; hospital complications; geriatrics; aromatase.

Low mobility and bedrest are common occurrences during hospitalization. One study found that older patients were documented to be on bedrest for 23% of 3,500 patient-days studied.1 Another study found that 33% of older hospitalized patients were confined to bed or chair during their three separate hospital stays.2 One report noted that 65% of patients experienced a decline in mobility from their pre-admission baseline to the second hospital day, with most patients failing to improve by discharge.3 These studies constitute the body of literature on the prevalence of low mobility and bedrest in hospitalized patients, yet none of the studies have examined mobility and associated adverse outcomes throughout the entire hospital course.

Hospitalization has been shown to be associated with adverse outcomes such as high rates of functional disability, increased lengths of stay, and increased likelihood of nursing home placement upon discharge.4–5 One study found older patients to be more at risk for medical and intragroup complications during hospitalization, which may contribute to these adverse outcomes. It has also been suggested that use of bedrest during hospitalization may be more...
Prevalence and Outcomes

- 498 hospitalized medical patients, age $\geq 70$ years
- Mobility scale based on nurse report:
  - degree of assistance needed
  - number of times transferred and ambulated
- Average of mobility observations for each patient, scores trichotomized
  - Low mobility: bed rest or bed to chair
  - Intermediate mobility
  - High mobility
Prevalence of Low Mobility

• Bed rest present at some point for 33% of hospitalized older patients

• 16% patients experienced low mobility throughout hospitalization
## Risk of Adverse Outcomes by Mobility Level

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Low Mobility</th>
<th>Intermediate Mobility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any decline in ADLs</td>
<td>5.6</td>
<td>2.5</td>
</tr>
<tr>
<td>New Institutionalization at Discharge</td>
<td>6.0</td>
<td>2.9</td>
</tr>
<tr>
<td>Death</td>
<td>34.3</td>
<td>10.1</td>
</tr>
<tr>
<td>Death or New Institutionalization</td>
<td>7.2</td>
<td>3.3</td>
</tr>
</tbody>
</table>

Adjusted for ADLs, Demographics, APACHE II, Charlson and ICU/CCU stay; Odds Ratio compared to High mobility group \((P < .006)\)
Conclusions

• Low mobility common and associated with adverse outcomes even after controlling for illness severity and comorbidities
• However, little known about barriers to mobility
Barriers to Hospital Mobility

Brown CJ, Williams BR, Woodby LL, Davis LL, Allman RM.
Model of Potential Barriers

Patient-related factors
- Illness severity
- Comorbid conditions
- Altered mental status
- Patients symptoms

Treatment-related factors
- Hospital devices
- Admitting diagnosis
- Side effects of medications

Institution-related factors
- Staffing patterns
- Environment encourages bed rest
- Lack of ambulatory devices

Attitudinal factors
- Attitude toward mobility
- Expectation of hospital stay
- Concern about falls
Methods

• **Participants:**
  • 10 patients, age \( \geq 75 \) years admitted to medical wards at UAB Hospital
  • Patient’s nurse & physician also recruited (n=29)

• **Questionnaire Development:**
  • Semi-structured interview guide
  • New themes incorporated into interview
  • Interviews audiotaped, transcribed and examined for common themes
"I don’t believe they are going to get me out of bed while I am here. If I said I really needed to get out of bed, they try to do what you want them to do. But evidently they don’t think it is that important."

- a Patient
“We try to encourage the doctors to order physical therapy because we don’t have time to ambulate patients in the hallway like the doctor expects.”

- a Nurse
“I think it is just that patients, when they are in the hospital, they feel they are supposed to be in bed. And they are more comfortable there and a lot of times they can see the TV better.”

- a Doctor
• Suggests modifiable and non-modifiable reasons for low mobility
• Important step in development of successful interventions to minimize low mobility
Measurement of Hospital Mobility
The Underrecognized Epidemic of Low Mobility During Hospitalization of Older Adults

Cynthia J. Brown, MD, MSPH,*† David T. Redden, PhD,*‡ Kellie L. Flood, MD,*† and Richard M. Allman, MD*‡

OBJECTIVES: To examine the proportion of time spent in three levels of mobility: lying, sitting, and standing or walking by a cohort of hospitalized older persons as measured by validated wireless accelerometers.

METHODS: A prospective, observational cohort study.

SETTING: One hundred fifty-bed Department of Veterans Affairs hospital.

PARTICIPANTS: Forty-five hospitalized medical patients, aged 65 and older who were not delirious, did not have dementia, and were able to walk in the 2 weeks before admission were eligible.

MEASUREMENTS: Wireless accelerometers were attached to the thigh and ankle of patients for the first 7 days after admission, until hospital discharge, whichever came first. The raw proportion of time spent lying, sitting, and standing or walking was determined for each hour after hospital admission using a previously validated algorithm.

RESULTS: Forty-five male patients (mean age 74 ± 8 years) wore accelerometers for a mean of 5.9 days (range 3-9.6); the average time spent prone was 8.3% (range 0.6%-24.2%); lying was 7.6% (6.0%-15.9%); sitting was 36.0% (26.8%-48.6%); and standing or walking was 48.1% (41.1%-58.4%).

CONCLUSION: This is the first study to continuously monitor mobility levels early during hospital stays. On average, older hospitalized patients spent most of their time lying in bed, despite an ability to walk independently. J Am Geriatr Soc 2009.

Key words: geriatrics; aged; frail elderly; hospitalization; rehabilitation

During hospitalization for acute illness, an estimated 23% to 35% of older adults experience low mobility, defined as being limited to a bed or chair.1-3 Hospitalization occurs infrequently, with only 27% of patients walking in the hallways during hospitalization.1 Low mobility is associated with adverse outcomes, including functional decline and need for new nursing home placement, even after controlling for illness severity and comorbidity.1 Redefinition of young adults demonstrates low plasma volume, orthostatic intolerance, and a loss of muscle mass within 24 hours of assuming the supine position.3 For older adults, the effects of bed rest are even more profound. One study found a significant decrease in total protein synthesis, strength, and lower extremity muscle mass in a group of healthy older adults placed on bed rest for 10 days.4 Previous studies examining the prevalence of different levels of mobility have been based on chart review of physicians’ orders, brief surveys of patient location, periodic nursing reports, or direct observation of hallways.5-7 These methods of assessing hospital mobility have several limitations. Chart documentation of mobility may be missing. Mobility, particularly transferring or walking, may be a brief activity easily missed by nursing staff or brief surveys of location. This is particularly true if the patient is independent with the activity. Although direct observation of hallways is an excellent method for assessing hallway ambulation, it misses any mobility that occurs within a patient’s room.

Accelometers have been extensively used in research to measure mobility, physical activity, and gait parameters in older adults.8,9 For example, studies have examined changes in gait pattern associated with aging and with falls in older adults.10 In the community, levels of physical activity have been measured for up to 7 days using wearable accelerometers.
• 45 hospitalized VA medical patients, age > 65 years admitted to medical wards
  – Ambulatory 2 weeks prior to admission
  – Cognitively intact
  – English speaking
  – Monitors attached within 48 hours of admission

• Mean proportion of time spent lying, sitting, and standing/walking determined for each hour after hospital admission
Results

• Mean length of stay 5.1 days
• Generated 2592 one-hour periods of data
• No patient in bed entire hospital stay
• 83% of hospital stay spent lying in bed
• Time spent standing/walking
  – Ranged from 0.2% to 21%
  – Median time was 3% or 43 minutes/day
Hourly Mobility Levels

Admission Day and Time

Day 1 12pm  Day 2 12am  Day 2 12pm  Day 3 12am  Day 3 12pm  Day 4 12am  Day 4 12pm

Lying  Sitting  Standing/Walking
Conclusions

• First study to document mobility continuously over initial 7 days of hospitalization
• Found hospital patients spending at least 80% of time in bed
• On average, less than 43 minutes a day standing or walking
• Results duplicated:
  • Fisher et al. 57 minutes/day ambulatory
  • Pedersen et al. 1.1 hours/day standing/walking
Developing an Intervention
Previous Out of Bed Protocols

• Transporters used to walk patients during quiet periods, especially nights, week-ends\(^1\)
  – Pilot study, demonstrated feasibility only
• Nurse driven protocol of progressive ambulation among patients with pneumonia\(^2\)
  – No functional outcomes assessed

Mobilizing Older adult patients Via a Nurse-driven intervention (MOVIN)

Nurse-driven intervention with 5 components:
1. Psychomotor skills training for nurses
2. Communication tools
3. Ambulation pathways
4. Ambulation resources
5. Ambulation culture
Results

Figure 1. (A) Ambulation frequency. (B) Ambulation distance. (C) Numeric documentation.
• Developed a progression model for loaded sit-to-stand exercise
• Tested feasibility in patients ≥ 65 years and found:
  • 83% could perform in hospital
  • Progression or regression possible for all patients
  • No indication of adverse events (pain)
Methods

• 100 patients from Birmingham VAMC
  – Not delirious or demented, walking 2 weeks PTA

• Randomly assigned to Mobility Program (MP) or Usual Care (UC)

• Assessments by blinded assessors

• One month telephone follow-up

• Physicians blinded to assure no change in usual care (e.g. activity orders, PT consults)
<table>
<thead>
<tr>
<th>Mobility Program (MP)</th>
<th>Usual Care (UC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Twice daily walks with assistance</td>
<td>• Twice daily friendly visits</td>
</tr>
<tr>
<td>• Provision of rolling walker, if needed &amp; safe</td>
<td>• Provision of folders; document friendly messages and track visitors</td>
</tr>
<tr>
<td>• Provision of folder; document goals; track sitting, walking</td>
<td></td>
</tr>
<tr>
<td>• Daily motivational interviewing; focus on goals &amp; barriers</td>
<td></td>
</tr>
</tbody>
</table>
Assessments and Analyses

In-Hospital
• ADL ability
• Baseline LSA
• Depression
• APACHE II
• Charlson Comorbidity
• Chart review for LOS, PT consults

One month follow-up
• ADL ability
• Post-hospital LSA

Analyses
• Multiple imputations methods used for missing values
## Baseline Characteristics

<table>
<thead>
<tr>
<th>N = 100</th>
<th></th>
<th>Usual Care</th>
<th>Walking Program</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>73.4 ± 7.0</td>
<td>74.4 ± 6.9</td>
<td></td>
<td>0.48</td>
</tr>
<tr>
<td>Gender, male</td>
<td>49 (98%)</td>
<td>48 (96%)</td>
<td></td>
<td>0.56</td>
</tr>
<tr>
<td>Race, black</td>
<td>8 (16%)</td>
<td>11 (22%)</td>
<td></td>
<td>0.44</td>
</tr>
<tr>
<td>LOS, mean</td>
<td>3.6 ± 2.4</td>
<td>4.6 ± 4.0</td>
<td></td>
<td>0.13</td>
</tr>
<tr>
<td>median</td>
<td>3.0</td>
<td>3.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDS</td>
<td>5.0 ± 3.0</td>
<td>4.7 ± 3.2</td>
<td></td>
<td>0.63</td>
</tr>
<tr>
<td>Charlson Comorbidity</td>
<td>4.1 ± 2.6</td>
<td>4.4 ± 2.4</td>
<td></td>
<td>0.55</td>
</tr>
<tr>
<td>APACHE</td>
<td>15.3 ± 11.8</td>
<td>14.3 ± 10.6</td>
<td></td>
<td>0.67</td>
</tr>
<tr>
<td>PT Ordered</td>
<td>17 (34%)</td>
<td>22 (44%)</td>
<td></td>
<td>0.30</td>
</tr>
</tbody>
</table>
Results

- In hospital, 3 falls in 2 patients reported – all in UC group
- 8 participants did not complete study; 2 UC and 6 MP
  - Death (n=3; 2MP, 1UC)
  - Medical complications (n=4, 4MP)
  - Patient refusal (n=1, 1UC)
<table>
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<th>Usual Care</th>
<th>Mobility Program</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline ADL</td>
<td>8.7 ± 0.33</td>
<td>8.4 ± 0.27</td>
<td>0.49</td>
</tr>
<tr>
<td>Post-Hospital ADL</td>
<td>8.2 ± 0.32</td>
<td>8.2 ± 0.30</td>
<td>0.99</td>
</tr>
</tbody>
</table>

P-values for group differences between pre and post hospital outcomes adjusted for baseline, age, gender, race.
<table>
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<th></th>
<th>Usual Care</th>
<th>Mobility Program</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline LSA</td>
<td>51.5 (2.99)</td>
<td>53.9 (4.15)</td>
<td>0.46</td>
</tr>
<tr>
<td>Post-Hospital LSA</td>
<td>41.8 (3.15)</td>
<td>52.6 (4.39)</td>
<td>.02</td>
</tr>
</tbody>
</table>

P-values for group differences between pre and post hospital outcomes adjusted for baseline, age, gender, race.
• Older adults spend significant proportion of hospital stay in bed.
• Many barriers to hospital mobility modifiable.
• Our small RCT demonstrates feasibility, safety and efficacy of hospital mobility program.
• Mobility may be important component of delirium prevention in hospital.
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