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Barriers to promoting mobility in hospitalized older adults

Gordana Dermody
Edith Cowan University, g.dermody@ecu.edu.au

Christine R. Kovach

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1 **Barriers to Promoting Mobility in Hospitalized Older Adults**

2 **Abstract**

3 Hospitalized older adults who do not receive sufficient mobility are more likely to sustain
4 negative health outcomes including higher rates of mortality and institutionalization. Accordingly
5 the purpose of this secondary data analysis was to examine the nurse-promoted mobility of
6 hospitalized older adults and the association between nurses' barriers and nurse-promoted
7 mobility. In addition, the relationship between patient severity of illness, proxy levels for function
8 and nurse promoted mobility was examined. The final study sample included 61 nurses working
9 in medical units caring for a total of 77 older adults. The findings of this study suggest that
10 nurse-knowledge gaps and attitude barriers could potentially influence the type and frequency of
11 mobility they promote in their older patients. A relationship was found between older patients
12 with impaired mobility, using assistive devices for mobility at home, and those at high risk for
13 falls and nurses promoting more sedentary activity such as chair-sitting, and walking in the
14 room. Interestingly, nurses promoted significantly more sedentary mobility for patients with PT
15 orders.

16 **Background**

17 Hospitalized older adults are at greater risk for functional decline due to natural age-
18 related musculoskeletal changes that are further complicated by co-morbidities, chronic illness
19 and insufficient mobility (Cruz-Jentoft et al., 2010; Pedersen et al., 2013). Promoting mobility
20 including ambulation, sitting in the chair and range-of motion are critical, basic nursing care
21 activities that nurses should be doing routinely (Doenges, Moorhouse, & Murr, 2014). Muscle
22 atrophy and muscle weakness are consequences of immobility (Cruz-Jentoft et al., 2010),
23 leading to hospital readmissions (Fisher, Graham, Krishnan, & Ottenbacher, 2016), hospital-
24 acquired comorbid conditions (Peterson & Braunschweig, 2016), and preventable nursing home
25 admission (Liu et al., 2016). Complications resulting from insufficient mobility while hospitalized

Barriers to Promoting Mobility

26 can place increased burdens on family members and require increased healthcare system
27 resources (D'Ambruoso & Cadogan, 2012).

28 The promotion of mobility is important to prevent functional decline, and other adverse
29 health outcomes (Brown et al., 2016; Du et al., 2015; Fisher, Graham, Ottenbacher, Deer, &
30 Ostir, 2016). However, nurses may experience barriers to promoting mobility in this population,
31 which could explain why hospitalized older patients are not sufficiently mobilized (Catchpole,
32 2013; Doherty-King & Bowers, 2011; Moore et al., 2014). The Knowledge, Attitude and Behavior
33 Framework shows the relationship between interpersonal and external barriers that clinicians
34 may experience, and how these barriers affect the care behavior of clinicians (Cabana et al.,
35 1999; Woolf, 1993). Three overarching barriers include knowledge barriers, attitude barriers and
36 external barriers (Cabana et al., 1999). The central premise is that both interpersonal
37 (knowledge and attitude) and external (patient, interdisciplinary and environmental) barriers may
38 influence nurse-promoted mobility.

39 Studies suggest that nurse-knowledge, and attitudes, and other barriers may be linked to
40 nurse-promoted mobility (Doherty-King & Bowers, 2013; Hoyer, Brotman, Chan, & Needham,
41 2015; Moore et al., 2014). Nurse-knowledge barriers may include not having the training to
42 promote mobility, and lacking knowledge of the geriatric patients' needs for mobility (Hoyer et
43 al., 2015; Lee & Fan, 2012). Nurses have also reported that external factors such as patient
44 condition, sedation, and being attached to medical devices, and care coordination were barriers
45 to promoting mobility in patients in the intensive care unit (Leditschke, Green, Irvine, Bissett, &
46 Mitchell, 2012; Lee & Fan, 2012). Finally, nurse-attitudes and beliefs about promoting mobility
47 may be associated with insufficient promotion of mobility (Moore et al., 2014). Nurses' may have
48 the perception of having a risk for self-injury, experiencing stress, and difficulty managing time
49 to promote mobility (Jolley, Regan-Baggs, Dickson, & Hough, 2014). Our recent study (Author
50 et al., 2017) described the perceived barriers that nurses' reported encounter to promoting
51 mobility in the hospitalized older adult. The most frequent barrier was external barriers including

Barriers to Promoting Mobility

52 inadequate staffing levels, potential for increased workload if mobility was promoted, and risk for
53 self-injury. Other common barriers included time limitations to promote mobility and the
54 perception that patients are resistant to being mobilized by nurses (Author et al., 2017). While
55 the few studies that examined barriers to nurse-promoted mobility are promising, the
56 incongruence between mobility needed and received persists. To minimize or remove barriers
57 to promoting mobility in hospitalized older adults, and to implement sustainable and scalable
58 solutions in the hospital setting, more studies are needed to build the evidence-base. It is
59 important to not only determine the primary barriers nurses' have to promoting mobility, but also
60 to determine how these barriers may be associated with nurse-promoted mobility.

61 In particular, the development of both practical and theoretical knowledge is critical to
62 addressing this complex phenomenon of the incongruence between mobility needed and
63 received. For example, while organizations have increasingly focused on system-based rapid
64 quality and process improvement to improve the care of hospitalized patients (Sollecito &
65 Johnson, 2013), the association between nurses' barriers and promotion of mobility may have
66 not been investigated enough to make mobility interventions sustainable. For increased nurse-
67 promoted mobility to become a reality, a better understanding of how nursing practice behavior
68 is affected by these barriers is critical (Knowles, et al., 2015). Further, a conceptual
69 understanding of the association of barriers to nurse-promoted mobility is needed to develop
70 tailored and sustainable mobility interventions. Importantly, interventions may be more effective
71 if they are based on a conceptual framework with well-defined concepts (Conn, et al., 2001).

72 Accordingly, the purpose of this secondary data analysis was to examine the association
73 of nurses' knowledge, attitude, and external barriers on the promotion of mobility in hospitalized
74 older patients in non-intensive care units. Measures of physical function, severity of illness,
75 Body Mass Index (BMI), severity of illness, the presence of activity and physical therapy orders
76 were included as descriptive variables. In addition, we examined the relationship between

Barriers to Promoting Mobility

77 patient impairment of mobility, use of mobility assistive devices at home, being classified as risk
78 for falls and nurse-promoted mobility.

79 **Method**

80 **Design, Setting, and Sample.**

81 A cross-sectional descriptive correlational design with convenience sampling was used.
82 Nurses were recruited from two community-based hospitals in the Pacific Northwest. Internal
83 Review Board approval was obtained, and a Health Insurance Portability and Accountability Act
84 (HIPAA) waiver was obtained for de-identified patient-related data. To participate in this study
85 nurses had to work at least 20 hours per week in one of these units: Stroke, cardiac, pulmonary,
86 nephrology, oncology, and general medical units. Night-shift nurses were excluded. Each of
87 these units housed between 30 and 40 acute care beds. These units were selected because
88 hospitalized older adults are commonly admitted to these units for chronic or acute illness.
89 Intensive care and orthopedic units were excluded from this study because nurses may have
90 access to greater resources including safe lifting lift-equipment, staff, and more specific
91 physician's orders.

92 Sample size calculation for linear multiple regression with fixed model, R^2 deviation from
93 zero was completed a priori with G*Power software (2014) with an alpha level of 0.05, three
94 predictor variables (knowledge, attitude, external barriers), medium effect size ($F^2=0.15$), and a
95 statistical power level of .8 requiring a total sample size of 85 (Faul, Erdfelder, Buchner, & Lang,
96 2009; Faul, Erdfelder, Lang, & Buchner, 2007). The rationale for a medium effect size was
97 based on a cross-sectional study by Hoyer et al (2015) who identified clinically relevant
98 differences in barriers to promoting mobility among health providers which included 82 nurses.
99 A total of 101 nurses were recruited.

100 **Measures and Operationalization of Variables**

101 **Independent Variables.**

102 ***Overall Provider Barrier scale.***

Barriers to Promoting Mobility

103 Nurse-knowledge barriers, attitude barriers, and external barriers were the independent
104 variables in this study and were measured with the modified Overall Provider Barrier Scale. The
105 original Overall Provider Barrier scale is a validated 26-question 5-point Likert-scale (strongly
106 disagree-strongly agree) with an internal consistency reliability Cronbach's alpha of 0.87.
107 Discriminant validity psychometric characteristics and item consistency were considered
108 adequate with the correlation coefficient between each item and the subscale and the Overall
109 Provider Barrier scale at 0.40 for most items (Hoyer et al., 2015). The scale was validated on
110 nurses, and contains 3 subscales that were used to operationalize the variables including nurse
111 knowledge (4 items) about training to promote safe mobility; questions about nurse attitude (9
112 items) including perception about patient condition, interdisciplinary communication about
113 promoting mobility, timing of promoting regular mobility, nurses' workload, and nurses
114 confidence and outcome expectancy of promoting mobility, and nurses perceptions about
115 deferring mobility to other disciplines. External barriers influencing nurse-promoted mobility (12
116 items) include environmental barriers such as lack of transfer equipment or inadequate staffing
117 levels; contraindications to promoting mobility and patient resistance; and time constraints to
118 promote regular mobility. Response options for the Overall Provider Barrier Scale included: 1-
119 strongly disagree, 2-disagree, 3-neutral, 4-agree, 5-strongly agree.

120 Three additional questions of interest were added: "Promoting mobility in hospitalized
121 older adults is a priority for the organization I work for" (attitude subscale) "I view the promotion
122 of physical activity in hospitalized older adults as a priority" (attitude subscale); and "I know how
123 to assess the lower leg strength of my older adult inpatients" (knowledge subscale). Nurses
124 were instructed to select responses from the Overall Provider Barriers Scale that most
125 accurately reflected their opinions based on their nursing experience during the past 2 weeks.
126 The modified 29-item 5-point Likert Overall Provider Barriers scale showed adequate reliability
127 with a Cronbach's alpha of 0.88. Item total correlation and the subscale item correlation for the

Barriers to Promoting Mobility

128 29-question scale was considered adequate with most values at 0.40 or above, indicating good
129 discrimination (Carmines & Zeller, 1979).

130 The Clinical Barrier Scale was developed for this study to capture the frequency of
131 patient-specific barriers that nurses encountered during one shift. Nurses used this scale to
132 record the frequency of 12 different clinical barriers to promoting mobility in their older patients
133 as encountered during a regular shift (independent variable): Location of equipment, availability
134 of equipment, knowledge of how to use equipment, availability of staff, searching for staff,
135 conflicting priorities, workload, patient condition, patient preference, patient family preference no
136 activity order, conflicting activity order. A 5-point frequency response option (1 = never, 2 =
137 rarely, 3 = sometimes, 4 = often, and 5 = always) was used, and this scale was considered
138 reliable with a measure of Cronbach's alpha of 0.90.

139 ***Other measures.***

140 Several additional measures were collected as descriptive variables. Proxy measures for
141 patient's physical function as routinely assessed and documented in the patients chart by
142 nurses included: Modified Timed Up-and-Go test (0=no rise; 1=rise with one; 2=rise with two;
143 3=unable to rise), whether or not patient had impairment of mobility (yes/no), home-use of
144 assistive devices (yes/no), and fall risk (yes/no). These measures are routinely documented by
145 nurses at this hospital as part of the patient assessment every shift. Physicians' activity order
146 (yes/no), and the presence of an order for physical therapy (yes/no) was also captured by chart
147 audit. Demographic data and a Body Mass Index (BMI) were obtained for each patient. Body
148 weight was converted to Kilograms (Kg), and height converted to Centimeters² (cm²). The
149 formula used to calculate BMI is weight (Kg)/height (cm²) (Jensen et al., 2014). The All Patient
150 Refined-DRG (APR-DRG) Severity of Illness Scale was used to obtain the measures of illness
151 severity. There are four severity of illness subclasses: 1=minor; 2=moderate; 3=major;
152 4=extreme. The APR-DRGs is reported to be able to estimate the global impairment of older

Barriers to Promoting Mobility

153 adults (Pilotto et al., 2011). Patients with increased severity of illness may have greater co-
154 morbidities and may be more likely to have poor health outcomes (Beveridge et al., 2015).

155 **Dependent Variables.**

156 ***Self-Recorded Mobility Log.***

157 Nurses' mobility-promoting behavior was the dependent variable in this study and was
158 measured using the self-recorded mobility log, which was developed based on nurses' informal
159 feedback on how to best capture the mobility that was promoted in patients during one shift.

160 Nurses' mobility-promoting behavior was operationalized as the type and frequency of mobility
161 promoted using ordinal scaling including: Walking in hall, walking in room, repositioning in bed,
162 promotion of active/passive range-of-motion, and sitting in the chair. Each instance of promoted
163 mobility was documented in the Self-Recorded Mobility Log by asking nurses to select the type
164 of mobility from a drop-down list. Nurses were able to add additional mobility-promotion
165 instances, which were captured as frequency. If nurses selected "ambulation in hall" nurses
166 entered the distance ambulated in feet. Nurses were educated to use markers (10 foot
167 increments) in each unit's hallway to track the ambulation distances.

168 **Procedures and Data Analysis**

169 Informational meetings were held on the hospital units in the breakroom during which
170 nurses learned about the study purpose, were recruited, and informed consent was obtained by
171 the researcher. All training and instruction for nurses was conducted by the same researcher.
172 Nurses received 30 minutes of training from the researcher on how to complete the web-based
173 Self-Recorded Mobility Log and the Overall Provider Barrier Scale. Nurses' completed this
174 training in the hospital setting, and they remained on-the-clock during the training. Methodologic
175 challenges of conducting research in the hospital setting commonly include problems with
176 enrollment, consenting, and completion of surveys, patient and environmental conditions that
177 may impede participating in the study to generate useful knowledge (Lehman, 2009). Therefore,
178 the researcher met informally with nurses who were interested in participating in the study to

Barriers to Promoting Mobility

179 discuss the best mechanism to completing the survey and the mobility log. Nurses agreed that
180 the completion of the survey and mobility would be best accomplished by using a one-time
181 electronic method (i.e. e-mail with a link). Accordingly, nurses were sent a link to the Overall
182 Provider Barriers Scale and Self-Recorded Mobility log toward the end of their shift. However,
183 nurses were not informed on what day they would be receiving the link to complete data
184 collection. To minimize the burden and attrition, nurses remained “on the clock” while
185 completing the data collection immediately after their shift. For feasibility reasons and to limit
186 confounding and Hawthorne effects, nurses completed the self-recorded mobility logs on all
187 adult patients in their care. Each nurse had between 1-4 patients for the entire duration of their
188 8-hour day shift. Because this study targeted nurses caring for hospitalized patients 65 years
189 and older, data for patients under 65 were not included in this analysis.

190 First, nurses completed the Overall Provider Barrier Scale, followed by the Self-
191 Recorded Mobility Log and the patient-specific 12-question Clinical Barrier Scale. Nurses used
192 unit hallway markers placed in 10 foot increments to provide a more accurate measurement of
193 distance ambulated and mitigate recall bias. Nurses had access to the mobility documentation
194 in the electronic health record, which also minimized recall bias. To ensure consistency and
195 protect private health information, Research Electronic Data Capture (REDCap) was used to
196 distribute, manage and collect the survey and log data, and extract patient demographics and
197 other clinically relevant information.

198 **Data Analyses**

199 All data were de-identified, cleaned and entered into SPSS version 24 for data analysis.
200 Data were summarized as means (standard deviations) and frequencies (percent), and range of
201 scores for sample characteristics, nurse-promoted mobility (walk in the hall, walk in room, chair-
202 sitting, bed-mobility, range of motion), the patient-specific 12-question Clinical Barrier Scale,
203 and the Overall Provider Barrier responses (knowledge, attitude, and external barriers).
204 Negative response-options from the Overall Provider Barrier Scale were reverse coded for

Barriers to Promoting Mobility

205 analysis. Likert scale responses were treated as interval data (Allen & Seaman, 2007;
206 Baggaley & Hull, 1983). A Spearman *rho* correlation coefficient between impaired mobility, use
207 of mobility assistive devices at home, risk for falls and nurse-promoted mobility was reported.

208 Analyses for the five mobility measures were stratified by whether a doctor's activity
209 order was present. A generalized linear mixed model (GLMM) was used to handle the clustering
210 of patients (with physician activity orders) within nurses. GLMM is a statistical approach to
211 analyze non-normal data when random effects are present (Bolker et al., 2009). GLMM was
212 used to examine the association between three nurse-barriers from the Overall Provider Barrier
213 Scale (knowledge barriers, attitude barriers and external barriers), PT orders, and three
214 outcome mobility measures (frequency of walking in the hall, frequency of walking in the room,
215 and frequency of chair-sitting). There were 10 questions in the Overall Provider Barrier Scale
216 (knowledge, attitude, external barriers) that had missing values representing a total of 0.004% of
217 the data. Little's Missing Completely at Random (MCAR) test was not significant ($p = .992$), and
218 the hypothesis that data were missing completely at random was accepted (Little, 1988). The
219 GLMM technique appropriately handles missing data as well as the correlation among patients
220 seen by the same nurse. Knowledge, attitude, external barriers, along with the presence of
221 physical therapy orders were specified as fixed effects in the model. Patients without activity
222 orders or with bedrest orders were not included in the final analysis, reducing the number of
223 nurses to 61 and patients to 77. The frequency of bed-mobility and range-of-motion was not
224 examined. All significance testing was done using an adjusted alpha level of 0.02 (0.05 / 3
225 dependent variables examined). The IBM SPSS Statistics software (version 24) was used to
226 perform all analyses.

227 **Results**

228 **Sample Characteristics.**

229 Of the 101 nurses signing the informed consent, 85 completed the study. The two main
230 reasons for attrition were being "too busy" and changes in employment status. The 85 remaining

Barriers to Promoting Mobility

231 nurses cared for 176 patients of which 98 patients were aged 65 and older. Data for patients
232 under 65 were not included in the analysis. Patient cases with no activity order or bedrest orders
233 were removed, with 61 nurses and 77 patients included in the analysis. Nurse characteristics
234 are shown in *Table 1*; and patient characteristics are shown in *Table 2*. Nurses had a mean age
235 of 40.48 ($SD=11.6$). The patients' mean age was 78.4 ($SD = 7.9$). Among the 77 older patients
236 30% were overweight ($BMI \geq 25$) and 35% of the patients were obese ($BMI \geq 30$). About 64% of
237 patients were classified as having "major" (44%) or "extreme" (19%) severity of illness based on
238 the APR-DRG severity of illness classification system.

239 **Description of Mobility and Nurses' Perceived Barriers**

240 The most frequently encountered clinical barriers to promoting mobility for patients in the
241 nurses' care during one shift included: Nurse-workload ($M=3.15$ $SD=1.4$); patient preference
242 ($M=3.07$, $SD=1.18$); searching for assistance from staff ($M=2.92$, $SD=1.3$); having conflicting
243 priorities ($M=2.90$, $SD=1.3$); and patient condition ($M=2.89$, $SD=1.1$). Nurse-promoted mobility
244 during one day-shift is show in *Table 3*. Nurses most frequently assisted patients to the chair in
245 the room, or walked patients to the bed and/or bathroom. Most of the 77 patients were not
246 ambulated in the hall and of those who did, they ambulated 200 feet or less per shift. Nearly
247 80% of older patients in this study had physician's orders for physical activity without
248 restrictions, and 63% of patients had an order to be seen by a physical therapist while
249 hospitalized.

250 **Generalized Linear Mixed Model to Compare Nurse-Barriers, PT order and the** 251 **Frequency of Nurse-Promoted Mobility.**

252 *Table 4* summarizes results from comparing nurse-barriers including knowledge barriers,
253 attitude barriers, external barriers, PT orders, and the frequency of nurse promoted mobility
254 including chair-sitting, walking in the room and in the hall. A significant association was found
255 between nurse-knowledge barriers ($p<0.01$), attitude barriers ($p<0.05$) and walking in the hall.
256 Increased nurse-knowledge barriers and nurse-attitude barriers were significantly associated

Barriers to Promoting Mobility

257 with lower frequencies of walking in the hall. The presence of PT orders was significantly
258 associated with greater frequencies of walking in the room ($p < 0.01$). Nurses who cared for
259 patients with PT orders promoted walking in the room significantly more frequent (i.e. to and
260 from the bathroom). However, there was no significant association between PT orders and
261 frequency of walking in the hall. Only 23.4% of patients were ambulated in the hall by nurses.
262 Although not significant, nurse knowledge barriers were associated with chair-sitting ($p = 0.065$)
263 and walking in the room ($p = 0.094$). Nurses with knowledge and attitude barriers tended to
264 promote more sedentary activity (i.e. walking to and from the bathroom and chair-sitting).

265 Exploratory Mobility-Related Correlations

266 There were significant relationships between impaired mobility, use of assistive devices,
267 fall risk, and nurse-promoted mobility. A negative relationship was found between impaired
268 mobility and walking in the room ($\rho(75) = -0.229, p < 0.05$). Use of assistive devices and
269 frequency walking in the hall ($\rho(75) = -0.252, p < 0.05$), and distance ambulated ($\rho(75) =$
270 $-0.276, p < 0.05$) were negatively associated. However, assistive devices and chair-sitting was
271 positively associated ($\rho(75) = 0.237, p > 0.05$). Negative relationships were found between fall
272 risk and frequency walking in the hall ($\rho(75) = -0.275, p < 0.05$), distance ambulated ($\rho(75) =$
273 $-0.320, p < 0.05$), and walking in the room ($\rho(75) = -0.360, p < 0.05$). Patients with impaired
274 mobility, assistive devices, and at risk for falls tended to be sedentary.

275 Discussion

276 A commonly reported finding in the literature is that hospitalized older adults are
277 predominately engaged in low levels of mobility, which results in preventable functional decline
278 (Boltz, Capezuti, Shabbat, & Hall, 2010; D'Ambruso & Cadogan, 2012; Fisher et al., 2011;
279 Garrison, Mansukhani, & Bohn, 2013; Zisberg & Syn-Hershko, 2016). All 77 patient had activity
280 orders without restrictions, yet only low levels of mobility were promoted. Nurses' report of high
281 workload, varied patient preferences, and patient condition could be some of the reasons that
282 are responsible for low levels of nurse-promoted mobility in hospitalized older adults. For

Barriers to Promoting Mobility

283 patients that have impaired mobility, or patients at increased risk for falls, nurses may need to
284 search for assistance from staff to mobilize patients. The need and timing for additional
285 assistance to promote mobility could be problematic if staff are not available when the nurse is
286 ready to promote mobility, and when the patient is willing to be mobilized. Nurses may have
287 other priorities that could have a higher value to them, which could be why conflicting priorities
288 was considered a barrier to promoting mobility. The findings of this study are similar to other
289 studies where nurses have reported staffing concerns, heavy workload, and difficulty prioritizing
290 mobility as barriers to promoting mobility (Barber et al., 2015; Doherty-King & Bowers, 2011;
291 Jolley et al., 2014; Lee & Fan, 2012; Moore et al., 2014). If the goal is for nurses to promote
292 mobility in this population, patient preference and patient condition in addition to impairment of
293 mobility and fall risk may be important potential barriers that need to be considered.

294 Some of the existing literature on barriers to nurse-promoted mobility has focused on the
295 complexities of the hospital environment, and to a lesser extent on the older adult's physical
296 condition. The findings of this study suggest that existing impairment of mobility, using assistive
297 devices for mobility at home, and being at risk for falls is a combination of patient factors that
298 may have implications for the type and frequency of nurse-promoted mobility. Older patients
299 with impaired mobility may require nurses to seek the help of other staff to ambulate patients in
300 the hall. In this study over 60% of patient were classified as having major or extreme severity of
301 illness. However, very little is known about barriers to engaging in mobility from the patient's
302 perspective. It is conceivable that patients may be—for various reasons—resistant to nurse-
303 promoted mobility. However, patient preferences or potential resistance to engage in the
304 promotion of mobility is understudied, and more research is needed to examine the barriers that
305 older patients experience to engaging in mobility during hospitalization, and how these barriers
306 can be addressed. Improving patient engagement to be mobilized is important, and nurses need
307 to be knowledgeable on how to engage patients and significant others to participate in mobility
308 activities (Burke & Doody, 2012; Moore et al., 2014).

Barriers to Promoting Mobility

309 Furthermore, role confusion may be a barrier to nurse-promoted mobility. For example,
310 the literature describes that nurses' may defer basic nurse-promoted mobility to other disciplines
311 such as physical therapists (Doherty-King & Bowers, 2013; Moore et al., 2014). Nurses may
312 hold the view that promoting mobility is within the domain of their scope of practice, and should
313 not be deferred to other disciplines (Author et al., 2017). However, the findings of this analysis
314 show that nurses who cared for patients who had a physical therapist order tended to mobilize
315 patients in the room (to and from the bathroom/chair) more frequently. This finding may suggest
316 that nurses inadvertently defer ambulation in the hall to the physical therapist. There was no
317 significant association between PT orders and frequency of walking in the hall; this could be
318 because ambulation frequency was low overall. In addition, the findings of this study suggest
319 that nurses may have knowledge gaps and attitudes that could potentially influence whether or
320 not they promote ambulation in the hall, and to what extent. Developing a unit-based culture of
321 mobility, and fostering interdisciplinary collaboration, may address some of the barriers that
322 nurses experience. Based on patient-care complexities, nurses may feel overwhelmed or ill-
323 prepared to ambulate patients. More research is needed to examine the implications of
324 interdisciplinary collaboration, and the role of the member of each discipline on the care
325 processes and workflow that are necessary to promote mobility (Barber et al., 2015; Lee & Fan,
326 2012; Moore et al., 2014).

327 **Limitations**

328 Because of the non-experimental study design there are several limitations including
329 sampling approach, sample size, methods and measurement. A small convenience sample from
330 one geographic region was utilized for this study. Because we stratified the nurse-promoted
331 mobility by whether physicians' activity order was present excluding patient cases with bedrest
332 orders, the sample size for nurses was reduced, potentially impacting the findings of this study
333 which was initially powered for 85 nurses. We did not control for all potentially confounding
334 variables. However, to handle clustering and PT orders, we used GLMM to analyze the

Barriers to Promoting Mobility

335 associations between nurse barriers, PT orders and nurse promoted mobility. Although GLMM
336 applied to non-experimental observational research does not permit inferences about causality,
337 the findings of this study add to the existing literature building the evidence-base.

338 In addition, hospital unit-based culture and practices may vary, such as work-flow
339 patterns, which could have introduced biases. Another limitation is the variability between
340 patient's severity of illness, disease processes, and comorbidities potentially influencing nurse-
341 promoted mobility. To minimize recall bias nurses had access to the patients' medical record.
342 Yet, maturation or inaccuracies could be additional limitations. Nurse-age, gender, and
343 experience were not were not included in the a-priory sample size calculation.

344 Although the findings of this study suggest this to be unlikely, some nurses may have felt
345 that they should promote (or report) more mobility to provide favorable responses in the mobility
346 log. In addition, nurses may have become fatigued from completing the mobility logs on
347 multiple patients which could have led to inaccuracies. The use of Likert scales may have
348 resulted in raters providing neutral responses, which could be problematic in terms of
349 understanding the study findings. Further, based on the literature on nurses' barriers 3
350 questions of relevance were added to the scale. This may limit the comparisons to other studies
351 using this measure. Future studies should conduct a psychometric analysis of the Overall
352 Provider Barrier Scale with a larger sample size. Due to these limitations, the generalizability of
353 this study is limited and findings should be viewed with caution. While many limitations exist, we
354 believe that the findings from this study make valuable contributions to the existing science, and
355 also shed light on existing gaps in barriers that nurse's encounter and how these barriers may
356 be associated with nurse-promoted mobility.

357 **Future Research to Advance the Science**

358 Care coordination for hospitalized patients has become increasingly complex for nurses
359 (Catchpole, 2013; Ebright, Patterson, Chalko, & Render, 2003). Insufficient mobility during
360 hospitalization has been linked to problems with care-coordination (Brown et al., 2009; Doherty-

Barriers to Promoting Mobility

361 King & Bowers, 2013; Doherty-King, Yoon, Pecanac, Brown, & Mahoney, 2014). Reports of
362 staffing concerns, heavy workload, increased risk for self-injury, lack of time, and difficulty
363 prioritizing mobility speak to the interdisciplinary collaboration that is necessary to promote
364 sufficient mobility in this population. Nurse-led care coordination models at the bedside should
365 be tested as a possible solution to overcome barriers to nurse-promoted mobility (Lamb et al.,
366 2015). In collaboration with the American Nurses Association and the American Academy of
367 Nursing, the Care Coordination Task Force (CCTF) has proposed the development of
368 innovative care coordination practice models that could be valuable to improve the promotion of
369 mobility (*Policy agenda for nurse-led care coordination*, 2015). In addition, patient engagement
370 in mobility during hospitalization is an important line of inquiry. Little is known in terms of
371 barriers to engaging in mobility from the patients' perspective (Leditschke et al., 2012), and how
372 to engage older patient in the promotion of their own mobility.

373 **Conclusion**

374 While greater recognition of this problem is apparent in the literature, the problem of
375 insufficient mobility in hospitalized older adults is far from over. Functional decline is
376 preventable; yet, nurses primarily engage older adults in low levels of mobility. Our study
377 suggests that a variety of barriers may impede the work of nurses to promote walking in the hall.
378 The identification of barriers that nurses' may encounter is key to developing, testing and
379 implementing sustainable solutions to overcome barriers, and to engage hospitalized older
380 adults in greater levels of mobility and prevent functional decline.

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References

385 Allen, E., & Seaman, C. A. (2007). Likert Scales and Data Analyses. *Quality Progress*, 40,
386 64-65.

Barriers to Promoting Mobility

- 387 Baggaley, A. R., & Hull, A. L. (1983). The effect of nonlinear transformations on a Likert scale.
388 *Eval Health Prof*, 6(4), 483-491. doi:10.1177/016327878300600408
- 389 Barber, E. A., Everard, T., Holland, A. E., Tipping, C., Bradley, S. J., & Hodgson, C. L. (2015).
390 Barriers and facilitators to early mobilisation in Intensive Care: a qualitative study. *Aust*
391 *Crit Care*, 28(4), 177-182; quiz 183. doi:10.1016/j.aucc.2014.11.001
- 392 Beveridge, C., Knutson, K., Spampinato, L., Flores, A., Meltzer, D. O., Van Cauter, E., & Arora,
393 V. M. (2015). Daytime Physical Activity and Sleep in Hospitalized Older Adults:
394 Association with Demographic Characteristics and Disease Severity. *J Am Geriatr Soc*,
395 63(7), 1391-1400. doi:10.1111/jgs.13520
- 396 Bolker, B. M., Brooks, M. E., Clark, C. J., Geange, S. W., Poulsen, J. R., Stevens, M. H. H., &
397 White, J.-S. S. (2009). Generalized linear mixed models: a practical guide for ecology
398 and evolution. *Trends in Ecology & Evolution*, 24(3), 127-135.
399 doi:<http://dx.doi.org/10.1016/j.tree.2008.10.008>
- 400 Boltz, M., Capezuti, E., Shabbat, N., & Hall, K. (2010). Going home better not worse: older
401 adults' views on physical function during hospitalization. *Int J Nurs Pract*, 16(4), 381-388.
402 doi:10.1111/j.1440-172X.2010.01855.x
- 403 Brown, C. J., Foley, K. T., Lowman, J. D., Jr., MacLennan, P. A., Razjouyan, J., Najafi, B., . . .
404 Allman, R. M. (2016). Comparison of Posthospitalization Function and Community
405 Mobility in Hospital Mobility Program and Usual Care Patients: A Randomized Clinical
406 Trial. *JAMA Intern Med*, 176(7), 921-927. doi:10.1001/jamainternmed.2016.1870
- 407 Brown, C. J., Roth, D. L., Allman, R. M., Sawyer, P., Ritchie, C. S., & Roseman, J. M. (2009).
408 Trajectories of life-space mobility after hospitalization. *Ann Intern Med*, 150(6), 372-378.
- 409 Burke, K. G., & Doody, O. (2012). Nurses' perceptions of their role in rehabilitation of the older
410 person. *Nurs Older People*, 24(2), 33-38. doi:10.7748/nop2012.03.24.2.33.c8956

Barriers to Promoting Mobility

- 411 Cabana, M. D., Rand, C. S., Powe, N. R., Wu, A. W., Wilson, M. H., Abboud, P. A., & Rubin, H.
412 R. (1999). Why don't physicians follow clinical practice guidelines? A framework for
413 improvement. *Jama*, 282(15), 1458-1465.
- 414 Carmines, E. C., & Zeller, R. A. (1979). *Reliability and validity assessment* (Vol. 17). Beverly
415 Hills, CA: Sage Publications.
- 416 Catchpole, K. (2013). Spreading human factors expertise in healthcare: untangling the knots in
417 people and systems. *BMJ Qual Saf*, 22(10), 793-797. doi:10.1136/bmjqs-2013-002036
- 418 Cruz-Jentoft, A. J., Baeyens, J. P., Bauer, J. M., Boirie, Y., Cederholm, T., Landi, F., . . .
419 Zamboni, M. (2010). Sarcopenia: European consensus on definition and diagnosis:
420 Report of the European Working Group on Sarcopenia in Older People. *Age Ageing*,
421 39(4), 412-423. doi:10.1093/ageing/afq034
- 422 D'Ambruoso, S., & Cadogan, M. (2012). Recognizing hospital-acquired disability among older
423 adults. *J Gerontol Nurs*, 38(12), 12-15. doi:10.3928/00989134-20121024-88
- 424 Doenges, M. E., Moorhouse, M. F., & Murr, A. C. (2014). *Nursing care plans: Guidelines for*
425 *individualizing client care across the life span* (9th ed.). Philadelphia, PA: F.A. Davis.
- 426 Doherty-King, B., & Bowers, B. (2011). How nurses decide to ambulate hospitalized older
427 adults: development of a conceptual model. *Gerontologist*, 51(6), 786-797.
428 doi:10.1093/geront/gnr044
- 429 Doherty-King, B., & Bowers, B. J. (2013). Attributing the responsibility for ambulating patients: a
430 qualitative study. *Int J Nurs Stud*, 50(9), 1240-1246. doi:10.1016/j.ijnurstu.2013.02.007
- 431 Doherty-King, B., Yoon, J. Y., Pecanac, K., Brown, R., & Mahoney, J. (2014). Frequency and
432 duration of nursing care related to older patient mobility. *J Nurs Scholarsh*, 46(1), 20-27.
433 doi:10.1111/jnu.12047
- 434 Du, W. J., Tan, J. P., Yi, F., Zou, Y. M., Gao, Y., Zhao, Y. M., & Wang, L. N. (2015). Physical
435 activity as a protective factor against depressive symptoms in older Chinese veterans in

Barriers to Promoting Mobility

- 436 the community: result from a national cross-sectional study. *Neuropsychiatr Dis Treat*,
437 11, 803-813. doi:10.2147/ndt.s80295
- 438 Ebright, P. R., Patterson, E. S., Chalko, B. A., & Render, M. L. (2003). Understanding the
439 complexity of registered nurse work in acute care settings. *J Nurs Adm*, 33(12), 630-638.
- 440 Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using
441 G*Power 3.1: tests for correlation and regression analyses. *Behav Res Methods*, 41(4),
442 1149-1160. doi:10.3758/brm.41.4.1149
- 443 Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: a flexible statistical power
444 analysis program for the social, behavioral, and biomedical sciences. *Behav Res*
445 *Methods*, 39(2), 175-191.
- 446 Fisher, S. R., Goodwin, J. S., Protas, E. J., Kuo, Y. F., Graham, J. E., Ottenbacher, K. J., &
447 Ostir, G. V. (2011). Ambulatory activity of older adults hospitalized with acute medical
448 illness. *J Am Geriatr Soc*, 59(1), 91-95. doi:10.1111/j.1532-5415.2010.03202.x
- 449 Fisher, S. R., Graham, J. E., Krishnan, S., & Ottenbacher, K. J. (2016). Predictors of 30-Day
450 Readmission Following Inpatient Rehabilitation for Patients at High Risk for Hospital
451 Readmission. *Phys Ther*, 96(1), 62-70. doi:10.2522/ptj.20150034
- 452 Fisher, S. R., Graham, J. E., Ottenbacher, K. J., Deer, R., & Ostir, G. V. (2016). Inpatient
453 Walking Activity to Predict Readmission in Older Adults. *Arch Phys Med Rehabil*, 97(9
454 Suppl), S226-231. doi:10.1016/j.apmr.2015.09.029
- 455 Garrison, G. M., Mansukhani, M. P., & Bohn, B. (2013). Predictors of thirty-day readmission
456 among hospitalized family medicine patients. *J Am Board Fam Med*, 26(1), 71-77.
457 doi:10.3122/jabfm.2013.01.120107
- 458 Hoyer, E. H., Brotman, D. J., Chan, K. S., & Needham, D. M. (2015). Barriers to early mobility of
459 hospitalized general medicine patients: survey development and results. *Am J Phys Med*
460 *Rehabil*, 94(4), 304-312. doi:10.1097/phm.000000000000185

Barriers to Promoting Mobility

- 461 Jensen, M. D., Ryan, D. H., Apovian, C. M., Ard, J. D., Comuzzie, A. G., Donato, K. A., . . .
462 Tomaselli, G. F. (2014). 2013 AHA/ACC/TOS guideline for the management of
463 overweight and obesity in adults: a report of the American College of
464 Cardiology/American Heart Association Task Force on Practice Guidelines and The
465 Obesity Society. *Circulation*, *129*(25 Suppl 2), S102-138.
466 doi:10.1161/01.cir.0000437739.71477.ee
- 467 Jolley, S. E., Regan-Baggs, J., Dickson, R. P., & Hough, C. L. (2014). Medical intensive care
468 unit clinician attitudes and perceived barriers towards early mobilization of critically ill
469 patients: a cross-sectional survey study. *BMC Anesthesiol*, *14*, 84. doi:10.1186/1471-
470 2253-14-84
- 471 Lamb, G., Newhouse, R., Beverly, C., Toney, D. A., Cropley, S., Weaver, C. A., . . . Peterson,
472 C. (2015). Policy agenda for nurse-led care coordination. *Nurs Outlook*, *63*(4), 521-530.
- 473 Leditschke, I. A., Green, M., Irvine, J., Bissett, B., & Mitchell, I. A. (2012). What are the barriers
474 to mobilizing intensive care patients? *Cardiopulm Phys Ther J*, *23*(1), 26-29.
- 475 Lee, C. M., & Fan, E. (2012). ICU-acquired weakness: what is preventing its rehabilitation in
476 critically ill patients? *BMC Med*, *10*, 115. doi:10.1186/1741-7015-10-115
- 477 Lehman, C. A. (2009). Practical issues in conducting hospital-based research. *Perioperative
478 Nursing Clinics*, *4*(3), 269-276.
- 479 Little, R. J. A. (1988). A test of missing completely at random for multivariate data with missing
480 values. *Journal of the American Statistical Association*, *83*(404), 1198-1202.
- 481 Liu, S. K., Montgomery, J., Yan, Y., Mecchella, J. N., Bartels, S. J., Masutani, R., & Batsis, J. A.
482 (2016). Association Between Hospital Admission Risk Profile Score and Skilled Nursing
483 or Acute Rehabilitation Facility Discharges in Hospitalized Older Adults. *J Am Geriatr
484 Soc*, *64*(10), 2095-2100. doi:10.1111/jgs.14345
- 485 Moore, J. E., Mascarenhas, A., Marquez, C., Almaawiy, U., Chan, W. H., D'Souza, J., . . .
486 Straus, S. E. (2014). Mapping barriers and intervention activities to behaviour change

Barriers to Promoting Mobility

- 487 theory for Mobilization of Vulnerable Elders in Ontario (MOVE ON), a multi-site
488 implementation intervention in acute care hospitals. *Implement Sci*, 9, 160.
489 doi:10.1186/s13012-014-0160-6
- 490 Pedersen, M. M., Bodilsen, A. C., Petersen, J., Beyer, N., Andersen, O., Lawson-Smith, L., . . .
491 Bandholm, T. (2013). Twenty-four-hour mobility during acute hospitalization in older
492 medical patients. *J Gerontol A Biol Sci Med Sci*, 68(3), 331-337.
493 doi:10.1093/gerona/gls165
- 494 Peterson, S. J., & Braunschweig, C. A. (2016). Prevalence of Sarcopenia and Associated
495 Outcomes in the Clinical Setting. *Nutr Clin Pract*, 31(1), 40-48.
496 doi:10.1177/0884533615622537
- 497 Pilotto, A., Franceschi, M., DiBara, M., Rengo, F., Berabei, R., Lorenzoni, L., . . . Greco, A.
498 (2011). The ability of the all patient refined (APR) and centers for Medicare (CMS)
499 diagnosis related groups (DRG) systems to evaluate clinical and functional outcomes of
500 hospitalized elderly patients: a multicenter, prospective study. *Journal of Public Health
501 and Epidemiology*, 3(6), 248-253.
- 502 *Policy agenda for nurse-led care coordination*. (2015). Retrieved from
503 [http://www.nursingworld.org/DocumentVault/Health-Policy/ANAs-Policy-Agenda-for-
504 Nurse-Led-Care-Coordination.pdf](http://www.nursingworld.org/DocumentVault/Health-Policy/ANAs-Policy-Agenda-for-Nurse-Led-Care-Coordination.pdf)
- 505 Woolf, S. H. (1993). Practice guidelines: a new reality in medicine. III. Impact on patient care.
506 *Arch Intern Med*, 153(23), 2646-2655.
- 507 Zisberg, A., & Syn-Hershko, A. (2016). Factors related to the mobility of hospitalized older
508 adults: A prospective cohort study. *Geriatr Nurs*, 37(2), 96-100.
509 doi:10.1016/j.gerinurse.2015.10.012
- 510