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Mobility Is Medicine, Too: Creating a Culture of Mobility Amongst Hospitalized Patients With Cancer to Improve Patient Outcomes

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Background: Despite decades of evidence demonstrating the effectiveness of multidisciplinary mobility initiatives in improving patient clinical outcomes, the impact of mobility programs in oncology-specific settings has been ignored.
Objective: The objective of this initiative is to test evidence-based mobility interventions in a cancer care center to create a culture among clinicians that prioritizes patient mobilization.
Methods: We compared postintervention and preintervention outcomes using logistic regression analysis and time-to-event modeling to assess hospital length of stay. Basic statistical methods assessed whether improving mobility influenced clinical outcomes and clinician culture.
Results: Outcome data from 493 in the postintervention arm were compared to 498 patients in the preintervention arm. Patients in the postintervention group had 39% decreased odds of having the rapid response team called (confidence interval [CI] =0.39–0.97; *P* = .03) and 46% decreased odds of being admitted to the intensive care unit (CI = 0.29–1.02; *P* = .05) compared to the preintervention group. No safety issues were associated with these interventions.
Conclusions: Hospitalized patients with cancer are especially prone to considerable debility due to their disease and treatment effects. Our initiative to create a mobility protocol in 1 medical unit resulted in positive clinical outcomes.
Implications for Practice: Findings from this study can be used to increase recognition of the benefits of mobility programs for hospitalized cancer patients.
What is Foundational: Promoting mobility in the hospital often involves collaboration among various healthcare professionals, including nurses, physical therapists, occupational therapists, and physicians. This interdisciplinary approach ensures that patients receive holistic care tailored to their specific needs.

Keywords: Hospital resources, Interdisciplinary, Mobility, Patients with cancer, Quality improvement initiative

Introduction

Prolonged immobilization of patients results in functional decline, increases the risk of hospital-acquired pneumonia, and increases length of stay (LOS).[1–3] Deconditioning and functional decline can occur as early as day 2 of hospitalization, especially in older patients.[4–6] Cancer patients are especially prone to functional decline due to disease and treatment effects.[7] In postoperative patients and those receiving care in the intensive care unit (ICU), evidence links early and frequent mobilization to improved outcomes and decreased LOS.[8–11] Whether similar mobilization efforts in cancer patients achieve these same positive outcomes is unknown. To date, there has only been 1 investigation specifically looking into the effects of a systematic mobility program in hospitalized cancer patients.[12]

Ambulation of the hospitalized patient has been identified as a frequently missed component of care, despite being one of the most effective interventions to prevent complications of immobility.[13] Facilitating ambulation by bedside caregivers requires opening communication lines between different healthcare professionals to help ensure a coordinated approach to patient mobility.[14] Inpatient mobilization requires a multidisciplinary approach involving healthcare providers, physical therapists (PT), nurses, and other relevant staff members working together to create personalized mobilization plans based on each patient's specific needs.[15,16] The entire care team must recognize the importance of patient mobilization and have the knowledge and training to implement appropriate mobilization strategies.

The primary aim of this quality improvement project (QIP) is to create a culture of mobility in which members of the multidisciplinary care team prioritize patient mobility and integrate mobility-based interventions into daily clinical workflows. Previous quality improvement measures at our institution found that a coordinated approach to patient mobilization is often

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lacking. For example, nursing team members may rely on rehab professionals for basic mobility interventions. Medical providers often consult physical therapy for functional assessments only upon discharge planning at the very end of the hospital stay. In the preparatory stages of our project, we found that 80% of the mobility spot checks found patients in beds, regardless of their ambulatory status, signifying that there was an opportunity for education and change, potentially impacting resource utilization and clinical outcomes.

The secondary aims were to assess the impact of the mobility culture on patient outcomes and utilization of hospital resources. Relative to patient outcomes on different hospital floors, the patients on the unit where the QIP was conducted (M12) were noted to have worse patient outcomes such as mortality, LOS, readmission rates, and hospital-acquired complications such as hospital-acquired pneumonia. Admission assessment and documentation of a patient's mobility on M12 were also found to be much lower compared to the hospital benchmark.

Methods

This QIP took place on M12, an inpatient unit at Memorial Sloan Kettering Cancer Center (MSKCC), a large academic center providing care to patients with cancer. M12 primarily cares for patients with hematological malignancies requiring intensive treatments and lengthy hospitalizations. The unit also accommodates patients with solid tumors requiring telemetry monitoring. The QIP began in January 2020 and was implemented on the ward in October 2021. All patients admitted to the unit participated in the mobility initiative except those receiving end-of-life care. Daily mobility goals and interventions were tailored to meet the individual needs of the patient, prioritizing comfort and safety, while continually reassessing and adjusting the plan based on the patient's evolving abilities. Even those with significant limitations were encouraged to perform bed-level or chair-level exercises as tolerated.

A multidisciplinary team consisting of physicians, registered nurses, PT, and occupational therapists partnered with MSKCC's operational excellence team to complete this QIP. We utilized a systematic problem-solving framework known as A3 Thinking, as well as process mapping to visualize current systems, and Plan-Do-Check-Act (PDCA) cycles to test solutions.[17–19] We tested mobility interventions consistently associated with improved patient outcomes and reported in peer-reviewed literature. Our interventions included identification of patient-specific barriers to mobilization, the use of a standardized mobility scale, setting daily mobility goals, proper documentation of the patient's mobility status in the electronic medical record (EMR), and patient, caregiver, and staff education.

The first PDCA cycle included the administration of surveys to patients (n = 18) and clinical staff (n = 77). We sought to identify perceived barriers to the proposed interventions. The differences between staff responses in the pre- and post-intervention periods were examined with a 2-sample *z*-test (significance set at .05).

The second PDCA cycle focused on educating nurses and patient care technicians on the proper use of the Bedside Mobility Assessment Tool (BMAT), including documentation in the EMR. The BMAT provides a standardized way for healthcare providers to assess basic patient mobility in an acute care setting.[20] The BMAT instructs nurses on guiding patients through a 4-step functional task list to determine a level of functional mobility; levels 1–4. BMAT levels determine the selection of the most appropriate safe patient-handling equipment utilized to transfer and assist patients with mobility efforts. This tool has been shown to reduce variation in care related to the risk of patient handling and falls. Validation and reliability of the BMAT tool notes 93% agreement between nursing assessments using BMAT and mobility assessments performed by PT utilizing previously validated tools.[20]

In our EMR, the 4 mobility categories are defined as: level 1 (sit and shake), level 2 (stretch and point), level 3 (stand), and level 4 (walk).[20] Based on BMAT-level, bedside caregivers created individualized mobility goals.

The third and final PDCA cycle included creating centralized areas for communication and tracking patient mobility levels and daily goals. That was done using bedside whiteboards and standardized use of patient mobility-related information in the EMR. Patient whiteboards displayed mobility levels, their daily activity goals, and served as visual prompts for discussion amongst providers and patients during clinical rounds. Modifications to the nursing and rehabilitation documentation fed an electronic dashboard established to monitor BMAT-level documentation and patient activity.

We created a driver diagram, a visual tool to help identify and organize key factors that would aid in achieving our main outcome (Figure 1). Additional strategies to encourage and support patient activity included providing newly admitted patients with tips on how to stay active in the hospital and the importance of mobility (Supplemental Figure 1, http://links.lww.com/CR9/A11), multilingual motivational posters were installed in the hallways along patient ambulation pathways (Supplemental Figure 2, http://links.lww.com/CR9/A12), bed- and chair-based exercise video were produced and included in patient television programming.

Data Sources

Patient demographic and clinical data including BMAT levels was obtained from the EMR. Preimplementation data incorporated all patient mobility documentation data collected from October 1, 2019 to February 28, 2020. Mobility data was also collected during the implementation phase (October 1, 2021 to February 28, 2022).

A logistic regression model was trained to predict and compare patient outcomes in both periods (preintervention and intervention phases) from various input variables. Our analysis only included patients who would likely benefit from our mobility intervention. Thus, we excluded patients who died within 30 days of their hospital admission or did not have an M12 LOS of at least 48 hours. If patients died within 30 days of their admission, the assumption was made that these patients were too ill to participate and benefit from our mobility intervention. The 8 input variables were: age, sex, underlying cancer type (hematologic or solid), hypertension, coronary artery disease, chronic obstructive lung disease, cerebral vascular accident, and the assigned mobility group of the patient. All variables used were binary, except for age.

Outcome variables were admission to the ICU, rapid response team (RRT) activations, use of high-flow oxygen (optiflow), incidence of deep vein thrombosis, development of pneumonia or lung atelectasis, and death within 60 days of admission. All outcome variables were collected using International Classification of Diseases codes and were binary. Each of the patient outcomes was predicted independently using all input variables (ie, we built 1 regression model per outcome). We did not include BMAT as a predictor variable as it was not reliably documented in the preintervention period. The models were built using Python 3.6.12 and the statistical model package (v0.12.1) with all default parameters for the logit.fit function. To calculate LOS, we performed a survival analysis and generated the survival curve from the Kaplan–Meir estimator. Additionally, we compared the expected to observed LOS ratios in the pre- and post-intervention periods using data from Vizient Analytics (Data from Vizient Procedural Analytics used with permission of Vizient, Inc, Austin, TX. All rights reserved).[21]

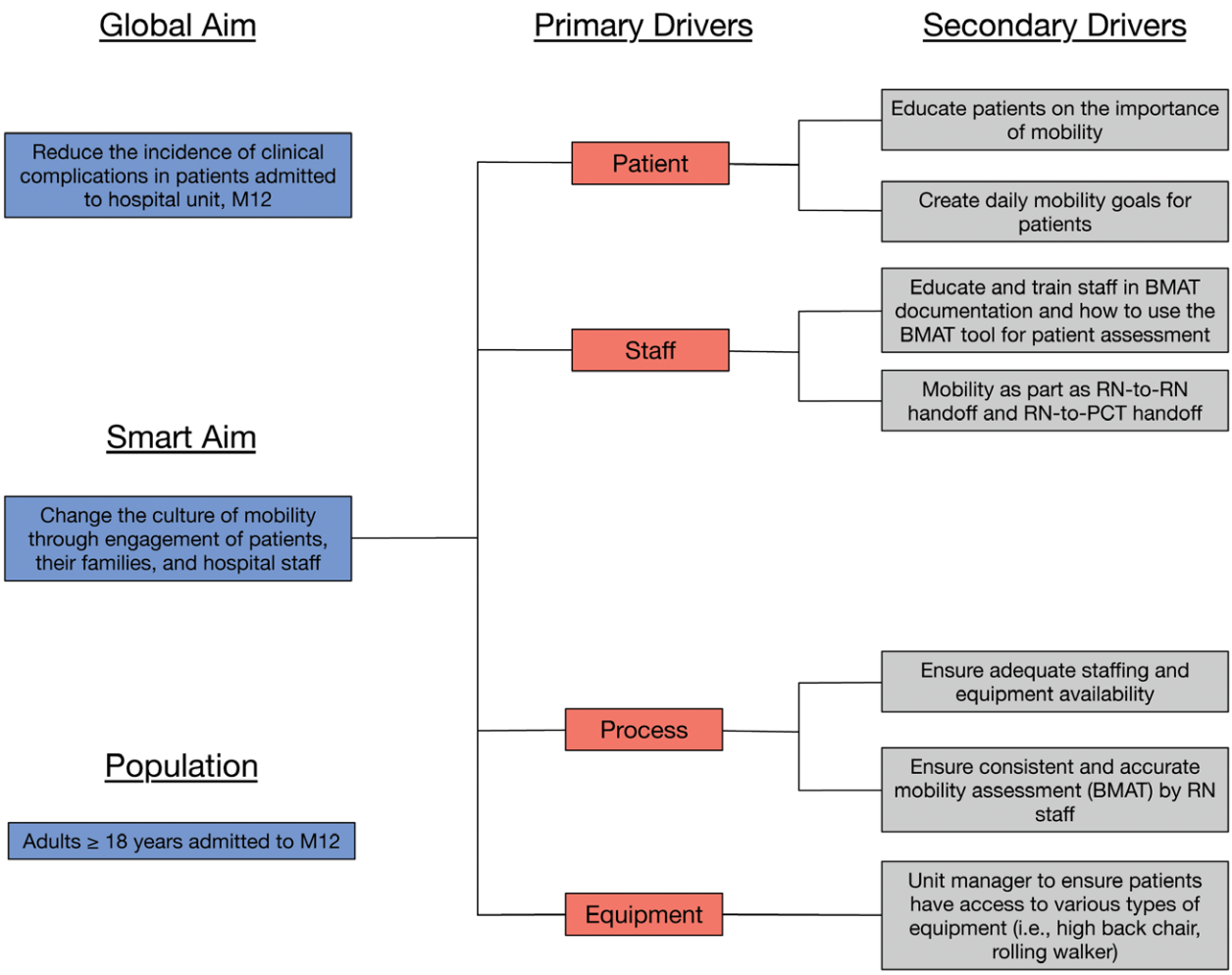

Figure 1. A driver diagram, which is a visual tool to help break down a high-level goal into its component parts and identifies the key drivers (patient, staff, process, and equipment) that contribute to achieving our goal (ie, to change the culture of mobility on Memorial-12).

Results

There were 493 patients enrolled in the mobility postintervention and 498 patients in the comparison (preintervention) group–those admitted to M12 prior to the onset of the QIP. Patients were similar with respect to their demographics and underlying disease, except that patients in the postintervention period were more likely to have a solid tumor malignancy compared to a hematologic malignancy (P = .003) and have coronary artery disease (P = .04) (Table 1).

During the preimplementation period, 100% of the nursing staff members were educated and oriented to the BMAT tool. The percentage of patients that had their BMAT assessed within 24 hours of admission increased from 83.6% during the preintervention to 91.3% in the postintervention period. To gain insights into the effectiveness of our mobility intervention, we compared discharge BMAT scores to admission and found that 367/493 (74%) patients had the same score, 82/493 (17%) had an improved score, and 44/493 (9%) left the hospital with a worse BMAT score than when they were admitted.

Patients in the postintervention group had 39% decreased odds of having an RRT called (confidence interval [CI] = 0.39–0.97; P = .03) and 46% decreased odds of being admitted to the ICU (CI = 0.29–1.02; P = .05) compared to the preintervention group (Table 2). We found no differences in observed LOS (Supplemental Figure 3, http://links.lww.com/CR9/A13); however, the ratio of observed to expected LOS was more favorable in the postintervention group 1.18 versus 1.42; P = .006 (data from Vizient Procedural Analytics used with permission of Vizient, Inc. All rights reserved).

Survey Results

The top 3 barriers to mobilization from the perspective of 15 surveyed patients were: having to be tethered to medical equipment (ie, IV poles, foley catheters) (47%), lack of motivation (33%), and pain (20%) (Figure 2). Staff surveys revealed the chief barriers to patient mobilization were insufficient staffing, patient factors (such as patients being perceived as "too sick" and "less motivated"), and lack of clear activity orders (not shown). Postintervention staff survey findings demonstrated improved levels of providers' comfort with mobilizing patients and the use of mobility equipment (Figure 3A). Our intervention led to staff mobilizing their patients at least once a day and feeling more confident when doing so (Figure 3B and 3C). It also led to enhanced documentation of BMAT scores in the patient's EHR (Figure 3D). Despite staff impression of inpatients being "too sick" and "less motivated," a greater fraction of the staff reported mobilizing patients at least once per day in the postintervention group and felt more confident doing so (Figure 3). There were no safety issues directly or indirectly associated with these interventions.

Table 1.

A Comparison of the Pre- and Post-intervention Groups on Various Demographic and Baseline Variables

Characteristic	Preintervention Group (N = 498)	Postintervention Group (N = 493)	*P* value
Average age- N (%)	63.58	64.37	.11
Sex- N (%)			
M	295 (59%)	271 (55%)	.34
F	203 (41%)	222 (45%)	
Race- N (%)			
Caucasian	341 (68.5%)	363 (73.6%)	–
Non-Caucasian	157 (31.5%)	130 (26.4%)	
Underlying cancer -N (%)			
Solid malignancy	194 (39%)	243 (49%)	.003
Heme malignancy	304 (61%)	250 (51%)	
Hypertension	277 (55.6%)	280 (57%)	.42
Coronary artery disease	82 (16.5%)	108 (22%)	.04
Chronic obstructive pulmonary disease	27 (5.42%)	32 (6.5%)	.50
Cerebral vascular accident	6 (1.2%)	11 (2.2%)	.10
Average BMAT score on admission	3.29	3.65	<.0001

A *P* value of <.05 suggests statistical significance.
Abbreviation: BMAT, Bedside Mobility Assessment Tool.

Table 2.

Odds Ratios and *P* Values for Each of the 8 Predictors on the 2 Outcome Variables, RRT and ICU, Comparing the 2 Groups Pre- and Post-intervention

Predictor	Odds Ratio	95% CI	*P* value
Rapid response team (RRT)			
Age	0.99	(0.98–1.01)	.35
Sex	1.13	(0.72–1.78)	.60
Solid tumor	0.71	(0.45–1.12)	.14
Hypertension	1.74	(1.04–2.91)	.035
Coronary artery disease	1.04	(0.59–1.84)	.90
Chronic obstructive lung disease	1.73	(0.79–3.79)	.17
Cerebrovascular accident	2.65	(0.72–9.77)	.14
Postintervention group (mobility)	0.61	(0.39–0.96)	.03
ICU admission			
Age	1.01	(0.99–1.04)	.37
Sex	1.00	(0.54–1.88)	.98
Solid tumor	1.27	(0.69–2.33)	.44
Hypertension	1.29	(0.62–2.70)	.50
Coronary artery disease	2.20	(1.12–4.31)	.02
Chronic obstructive lung disease	2.50	(1.04–5.87)	.04
Cerebrovascular accident	1.09	(0.14–8.70)	.93
Postintervention group (mobility)	0.54	(0.29–1.00)	.05

A *P* value of < .05 suggests statistical significance.
Abbreviation: CI, confidence interval.

Discussion

Mobility interventions deployed in various clinical settings have consistently demonstrated positive clinical outcomes for hospitalized patients.[3,22] This QIP sought to improve the culture of mobility in a hematologic oncology unit by implementing effective evidence-based mobility interventions. We sought to enable a meaningful change specifically without additional personnel required to carry out proposed interventions. To promote success, we obtained buy-in and support from leadership, clinicians, and healthcare staff to embrace and consistently apply the mobility initiatives we developed. Prior to implementation of this QIP, there was no standardized protocol in our hospital to mobilize patients and we lacked a uniform interdisciplinary approach to mobility.[23] As a result, care teams did not have a common language for describing and exchanging mobility-related information in daily clinical use.

While there were changes in attitudes towards patient mobility of both staff and patients, this QIP did not show significant improvements in such important patient outcomes as mortality and observed LOS. However, over the course of our observation, the multidisciplinary mobility program resulted in significantly reduced rate of rapid responses team activation, ICU admissions, and risk-adjusted LOS. We surmise that individuals being treated for cancer may be a unique population when it comes to mobilization. Another explanation for that apparent lack of efficacy is the wide range of LOS and the complex nature of our patient population, including LOS necessitated by the length of treatment protocol, rather than clinical fitness for discharge. Hospitalized cancer patients (as compared to noncancer patients) experience a range of physical, physiological, and emotional changes that impact mobility and functional status, which is further complicated by the underlying disease and the long-term treatment received.[7]

Limitations

This study has several limitations. Not being randomized may have led to confounding biases that could have impacted our

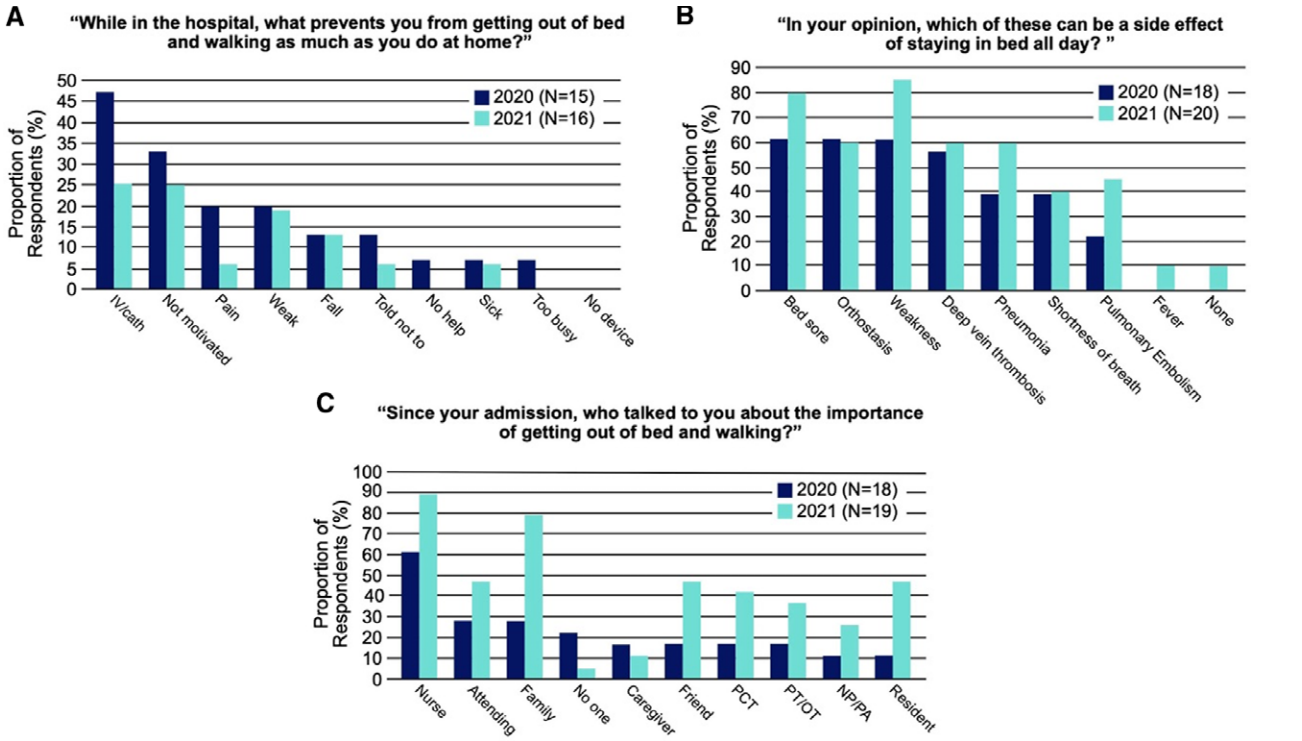

Figure 2. Comparing responses from pre- and post-intervention patients to assess: (A) their perceived barriers to mobilization, (B) their knowledge of the side-effects of immobility, and (C) the current culture of mobility (who and how many people including healthcare workers and family are talking to patients about their mobility).

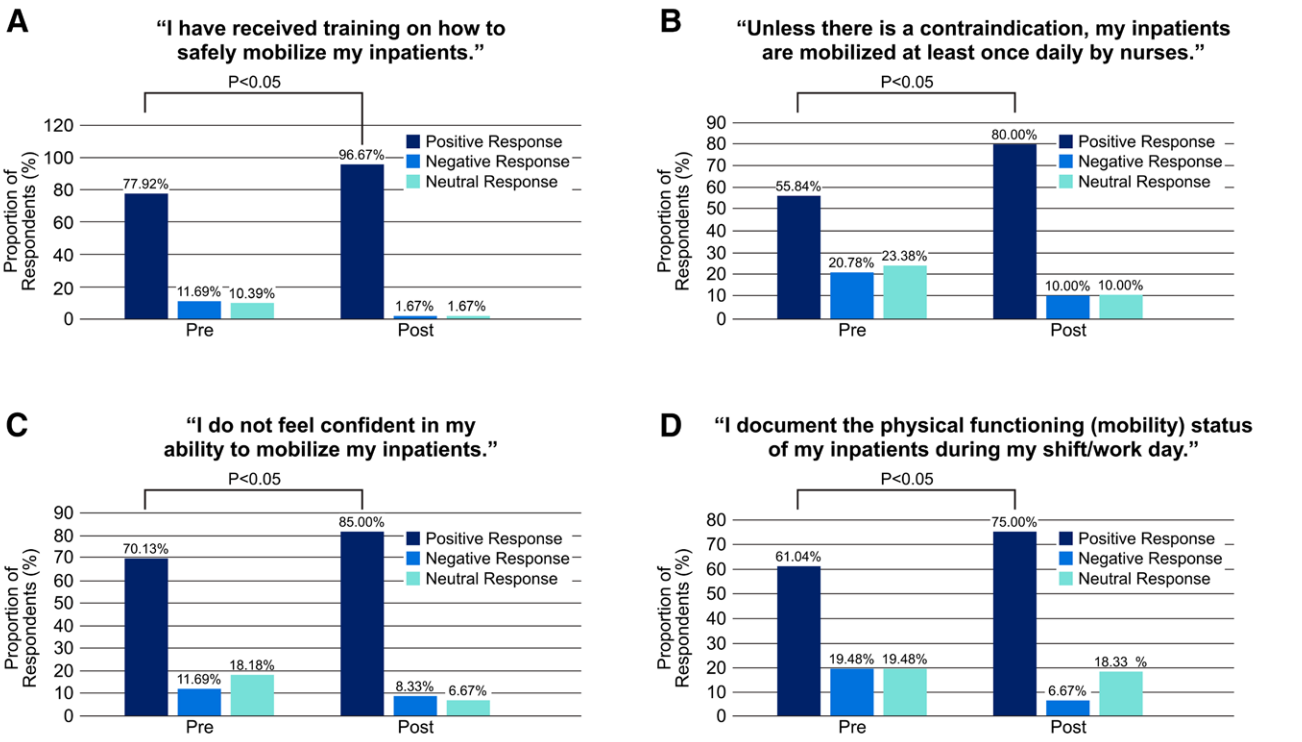

Figure 3. Comparing responses from pre- and post-intervention nurses to assess: (A) their knowledge on how to safely mobilize patients, (B) whether they were more likely to mobilize their patients at least once/day, (C) their confidence in mobilizing patients, and (D) whether they were more likely to document patient mobility-related information in the EMR. EMR indicates electronic medical record.

study results. Our study period occurred at the height of the COVID-19 pandemic. There were staff shortages and evolving infectious disease protocols, thus a recently developed patient mobility program may not have had the priority it could have enjoyed in normal circumstances. Finally, the lack of a system-wide standardized mobility protocol at our institution made it

challenging to compare mobility data accurately across time. For example, we could not compare BMAT scores between the 2 study periods as we found a significant difference in BMAT score documentation compliance.

Conclusion

Inpatient mobility programs in cancer care settings have received little attention in the literature. The results of the only other inpatient mobility initiative focusing specifically on cancer patients were recently published by Aronson et al[12] What distinguishes our intervention from theirs is that we sought to enable a meaningful change without the expense of additional personnel. Indeed, not every institution has the resources to hire mobility aides or rehabilitate assistants. Our experience convinced us that gains in both subjective patient experience and objective outcomes can be achieved by educating providers and empowering patients and their caregivers. The challenges faced by hospitalized oncology patients are multifactorial. Cancer treatments can often lead to various complications requiring long-term hospitalizations, such as infections, pain, nausea, fatigue, and cytopenias. Managing treatment-related sequelae, and those associated with immobility, requires an individualized plan in a system that supports a culture of mobility. Our hope is that the modest successes revealed in this study will bring increasing recognition of the benefits of mobility programs for hospitalized cancer patients, and lead to more mobility-related research.

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Data supplements

Supplemental digital content for this article is available at http://links.lww.com/CR9/A11, http://links.lww.com/CR9/A12, and http://links.lww.com/CR9/A13.

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