



Inpatient Ambulation

Use of an Ambulation Platform Apparatus

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Ambulation has proven to be an important part of recovery for medical-surgical patients. This study provides original research on the use of a platform apparatus for ambulation of patients on a medical-surgical unit. Outcomes included number of ambulation attempts, distance of ambulation, length of hospital stay, number of staff necessary to ambulate, and discharge destination. Compared with a control group, patients who had access to the ambulation platform apparatus had a shorter length of stay with fewer nurses and other staff needed to ambulate. Staff rated ambulation with the apparatus as easier than without and noted that patients were more willing to ambulate on their own with the ambulation platform apparatus.

Nurses are challenged with increasing patient ratios and acuity levels. Included in the responsibilities for these nurses is patient ambulation. This can be a time-consuming task for nurses and other staff on any inpatient unit. If not conducted in a safe and supportive manner, patient ambulation attempts are an opportunity for patient safety issues including falls, dislodge-

ment of important medical equipment, and injury to the nursing staff.¹ This study was conducted to assess the use, feasibility, patient outcomes, and nurse satisfaction with an ambulation platform apparatus (APA) in a regional hospital in a Midwestern state in the United States.

Background and Significance

Early ambulation of patients has become a standard of nursing care in the inpatient clinical care setting. Postsurgical mobility has been identified as a predictor of positive patient outcomes.¹ The benefits of mobility include decrease in venous stasis, stimulation of circulatory processes, and prevention of deep vein thrombosis and pulmonary embolism.¹ Early activity after surgery and admission to the hospital for chronic illnesses states can increase muscle tone, coordination, and patient independence. Other positive effects of ambulation include gastrointestinal motility and genitourinary and pulmonary functions. Early activity of postsurgical patients has been reported to lead to excellent postoperative pain management and decreased length of stay (LOS) from 4.3 to 2.8 days.¹ Data support that hospitalized geriatric patients, those who independently ambulated, were more likely to increase their ambulation and have a reduction in LOS.²

In support of patient safety and optimal outcomes, how can nurses encourage ambulation of medical and postsurgical (M/S) patients in the most efficient and effective manner possible? Many M/S patients and their nurses deal with patient equipment that can hinder postsurgical mobility. Oxygen tubing, multiple IV lines, chest tubes, and urinary catheters are some of the equipment that must be secured or accounted for during ambulation. As a result, nurses often find themselves

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Platforms for the study were provided by the Livengoode Corporation, Fort Collins, Colorado.

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calling for assistance from other care providers, and appropriately taking the time and attention to make each ambulation experience safe. An APA designed to secure the patient equipment mentioned previously for the nurse-patient team had not been researched prior to this study. With patient equipment secure, the nurse can help the patient with postsurgical ambulation while focusing on the care of the patient. The APA is recommended to remain in the patient's room and can serve as a placement device or holder for medical equipment when the patient is not ambulating. Once it has been set up, the APA remains in the patient's room and becomes a mobile unit from which the patient can have support for each ambulation attempt, with equipment already attached and out of the way. When the equipment-securing barrier is removed, can the nurse more easily ambulate the patient, without additional assistance, and in less time? This study was designed to test 1 such APA and add to the existing evidence base regarding safe and efficient patient ambulation strategies.

A review of the current literature revealed a lack of available studies investigating the use of an APA and subsequent outcomes. Murphy³ calls for studies that will target interventions to assist with patient ambulation supporting more effective ambulation with less staff involvement. To date, no studies testing the efficacy and efficiency of an APA could be found in a literature search supporting the need for the study. Literature does support the need for stabilization of equipment during episodes of ambulation. Nesbitt and colleagues⁴ found a significant difference in patient and nurse satisfaction when using an IV pole walker (IVPW) in comparison to the standard walking method. In this study, an average of 1 less employee was required during ambulation of patients when the IVPW was used, and nurses felt the walker not only facilitated walking, but also was a safer alternative to general practice.

Another study focused on changing the culture of the nursing staff to incorporate early postoperative ambulation. Kibler et al⁵ found that when patients were informed before their surgeries that they would be expected to get out of bed and ambulate the day of surgery, the support for ambulation on the part of the patient increased. Because of other demands on nursing time, nurses and their assistants in this study were not always able to accomplish early ambulation. As a result, the patients were requesting early ambulation as their presurgical instructions had stressed. In addition to the time constraints on nursing staff for early ambulation, the charting of this process was lacking. The authors initiated a quality improvement project on 4 surgical units and included a revision of evidence-based orders, measuring and posting differences, creat-

ing fields for electronic medical record to document ambulation distances, and education of staff on the benefits of early ambulation. Ambulation on the day of surgery increased from 62% before the intervention to 96% afterward. Total documented feet of ambulation per patient also increased from 176 feet preintervention to 264 feet after the intervention. With this increase, there was no increase in patient fall rates, and there was an associated decrease in paralytic ileus by 37%.⁵

The fact that few studies investigating the use of an APA for ambulation of patients in an inpatient setting were identified supports the need for this study. It is evident from the literature that nurses report that ambulation is an important part of their patients' recovery,¹ but recognized that ambulation is time consuming and dangerous without additional staff assistance. To ensure optimal patient outcomes and safety, research investigating an APA to remove some of the barriers associated with patient ambulation is indicated.

Methods

The study was developed around a change in protocol on 1 M/S unit in a regional hospital in the Midwest United States. The clinical nurse specialist on the unit of study was interested in introducing an APA into practice, but had little evidence to show the efficacy and nursing satisfaction associated with the use. A local company agreed to supply an APA in each room on the M/S unit in order for data to be collected in a preintervention and postintervention format. The device used in the study was designed to provide stabilization for patient ambulation and to serve as a place to anchor medical equipment in place (Figure 1). F1

The study used a quasi-experimental design with nonrandom groups to explore the patient-centered outcomes of postoperative ambulation distance, discharge destination, and LOS. In addition to these outcomes, unit-specific outcomes including number of staff needed for ambulation of patients and the nurses' perception of workload and satisfaction with the platform were measured.

Patient-Centered Research Questions

The study was designed to answer the following research questions:

1. Will use of an APA decrease the LOS when compared with those not using the device?
2. Will the use of the APA increase the ambulation distance of patients?
3. Is the discharge destination different for patients who have and have not used the APA for ambulation?



Figure 1.

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4. Does use of an APA cause disturbance of patient equipment during ambulation?

Unit-Centered Research Questions

- (5) Will use of an APA decrease the number of staff needed to ambulate patients?
- (6) Will use of an APA for patient ambulation increase nurses' satisfaction level?

It should be noted that patient opinion about the use of the APA is not a part of this study. However, research on patient satisfaction with using the apparatus is currently underway to add to the literature on the use of ambulation devices in the inpatient setting.

Institutional review board (IRB) approval was granted by the hospital-level IRB, and each patient consented prior to collecting any data. Patients were

deidentified with numerical data. Patients excluded from the study included those who could not provide consent for the study; patients in any form of traction, unstable fractures (including spinal fractures), upper-extremity fractures with weight-bearing restrictions, or orders for non-weight-bearing status or bed rest; patients actively bleeding; those suffering from a traumatic brain injury with a Rancho level of 5 or greater; patients who were neutropenic or on comfort care; and those receiving chemotherapy within 48 hours of data collection.

Prior to introducing the APA, data were collected for 6 weeks including the number of times each patient ambulated, average distance of ambulation, number of staff needed to ambulate each patient, LOS for each patient, and discharge destination. The 1st of 2 surveys asking nursing staff about their experiences with ambulating patients was also distributed electronically with no identifying information attached to protect anonymity. After this 6-week time frame, the APA company provided a staff training on how to use the platform correctly and safely. One week after the staff training, an APA was placed in each room on the unit. The same outcome data were collected in the subsequent 6 weeks. At the end of this 6-week period, a 2nd staff satisfaction survey was completed electronically.

Findings

A statistician was consulted for data analysis. Comparison of outcome variables was conducted using a longitudinal (repeated-measures) count model. Correlated data models were used to account for the longitudinal nature of the data, as patients were observed during multiple ambulation events. Generalized estimating equations were applied using the exchangeable working correlation structure. Because all dependent variables were counts of events, Poisson-response models were applied to account for the right-skewness inherent in counts. There were 193 participants in the study, 107(55%) in the control group and 86 (45%) in the APA group. In the control group, 96 patients (90%) consented, 7 (6%) declined, and 4 patients (4%) were excluded. In the APA group, patients 73 (85%) consented, 11 (13%) declined, and 2 patients (2%) were excluded. Demographics of each group did not vary in terms of reason for admission, age, gender, and acuity level.

Results Stratified by Research Question

1. *Will use of an APA decrease the LOS when compared with those not using the device?* Averages showed a shorter LOS for patients who were able to use the APA (19.1 ± 6.7) than those who did have access to the APA (25.3 ± 86.5). Variances were also less when the APA was in use, suggesting patients using the device had shorter LOS. Based on a longitudinal (repeated-measures) count model, there is evidence of a marginally significant difference in mean LOS between the control and APA groups ($P = .076$, $z = -1.77$). Accounting for repeated observation of the same subjects, there is evidence of a marginally significant change in LOS.
2. *Will the use of the APA increase the ambulation distance of patients?* Based on a longitudinal (repeated-measures) count model, there was no evidence of a significant difference in mean ambulation distance between the control (375.4 ± 895.7) and APA groups (423.5 ± 959.7) ($P = .595$, $z = 0.53$).
3. *Is the discharge destination different for patients who have and have not used the APA for ambulation?* There was not a statistical significance in the discharge destination of patients using an APA and those who did not.
4. *Does use of an APA cause disturbance of patient equipment during ambulation?* There were no instances of equipment dislodgement during ambulation attempts with or without the use of the APA.
5. *Will use of an APA decrease the number of staff needed to ambulate patients?* When the APA was in use, ambulation attempts required fewer staff per ambulation episode. When the APA was used, no ambulation event required more than 2 staff members. Based on a longitudinal (repeated-measures) count model, there was evidence of a significant difference in mean number of staff required between the preintervention and postintervention groups ($P < .0001$, $z = -4.43$). Accounting for repeated observation of the same subjects, there is evidence of a significant change in the number of staff required to ambulate patients when the APA was used. Average numbers of staff were calculated for the time periods where the APA was in place and not in place. To assess the significance of any differences in average number of staff needed to ambulate patients with and without the device, a correlated model was applied using the counts of number of staff as the dependent variable, controlling for patient age and gender. Based on a longitudinal (repeated-measures) count model, there is evidence of a significant difference in mean number of staff required between the preintervention and postintervention groups ($P < .0001$, $z = -4.43$). Accounting for repeated observation of the same subjects, evidence

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of a significant change in the number of staff required was identified (Table 1).

6. *Will use of an APA for patient ambulation increase nurses' satisfaction level?* In order to assess the staff's opinions of using the APA, 2 electronic surveys were sent to 30 RNs and certified nursing assistants on the unit of study prior to using the device. On the preintervention survey (see Table, Supplemental Digital Content 1, <http://links.lww.com/JONA/A403>), only 12 responses (40%) were obtained. After the nursing staff had used the device for 6 weeks, the postintervention survey (see Table, Supplemental Digital Content 2, <http://links.lww.com/JONA/A404>) response rate increased to 27 (90%). It is noteworthy to point out that staff seemed to be more eager to share their opinions and evaluation of ambulation after having access to the device reflected by the increased rate of survey response return. Staff were asked to rank how difficult in general it was for them to ambulate patients prior to having access to the APA, with 75% of respondents ranking ambulation difficulty of 5 or higher on a 1- to 10-point scale (1 = least and 10 = most difficult). The same staff were asked to rank ambulation difficulty again after they had used the APA to ambulate patients with 70% (n = 19) of staff ranking the difficulty at 5 or less on the same 1- to 10-point scale. It is noteworthy to mention that prior to using the APA no one ranked ambulation at the easiest rankings of 1, 2, or 3. After having the APA in place, 50% (n = 14) ranked ambulation difficulty at a 3 or less on the 1- to 10-point 10 scale.

Cost Savings

This study provides initial data on the efficiency, outcomes, and use of an APA. The results of this study show promise to support the use of such an APA in the inpatient hospital M/S setting. On this particular unit of the hospital, LOS was estimated at an average of 2.9 days. In the study, patients in the control group had an average LOS of 25.3 hours. The LOS in the

APA group decreased from 25.3 hours to 19.1 hours, a difference of 6.2 hours. The cost of care on a M/S unit at the study site was estimated at approximately \$2,418 per day (\$100.75/hour) not including medications and additional costs for specific procedures. If every patient on a similar unit was able to decrease his/her LOS by approximately 6 hours it would translate to a savings of about \$625 per patient. For this study, there were 96 patients in the control group. If those patients were able to decrease their admission time by 6.2 hours each, the cost savings in a 6-week period would be approximately \$60,000. Annualized over a year's time, this could result in a potential cost savings of \$520,000 a year. The cost of the APA used in the study is between \$4,000 and \$5,000. The device can be sanitized and reused as standard medical equipment for a number of patients similar to an IV pole or hospital bed. These numbers predict a potential cost savings exceeding \$400,000 per year for 1 unit of 1 inpatient hospital.

In addition to a shorter LOS, patients in the APA group required fewer staff to ambulate each patient. Staff also reported that it took longer to prepare a patient for ambulation without having all the medical equipment already secured to the APA prior to ambulation. Although this was not an outcome variable of the study it bears mentioning. Use of fewer staff to support the ambulation of patients also has the potential to translate to a significant cost savings. The average hourly registered nursing wage at the research hospital is \$31.71. After the APA was in place, no recorded ambulation attempts on the pilot unit required more than 2 staff members. This information coupled with the report from staff that the time to prepare patients for each ambulation attempt was less supports the perception from study participants that the device was value added.

Limitations

Of note, the staff involved in the study reported that they were not able to keep track all ambulation attempts and distances when the APA was in use because some patients would freely ambulate on their own with the device. This issue complicated accurate data collection. This study does report data collected in terms of number of ambulation attempts and distance of ambulation as recorded by staff. In future studies, the use of pedometer data might be helpful in collecting complete numbers of ambulation attempts. It is without argument that data could have been affected by a number of factors not related to use of the device, including the time periods chosen for pre-intervention and postintervention measurement. Individual patient factors could contribute to how often and how far each patient ambulates in the hospital

Table 1. Number of Staff Needed to Ambulate

	No Ambulation Platform	With Ambulation Platform
0 Staff members	207	222
1 Staff member	182	62
2 Staff members	48	10
3 Staff members	1	0
>3 Staff members	1	0

setting. Statistical measures were used to compare the control and intervention patient groups, and no differences were found. However, this cannot negate the fact that the decrease in LOS could have been impacted by other interventions or circumstances in addition to the APA. Similarly, staff may have had increased motivation to ambulate a patient related to participation in the study and the presence of the APA. Staff members may be more or less willing to perform specific duties such as ambulation for reasons not reported in this study and not related to the use of an APA. Although impossible to control for individual attitudes and abilities of each staff person, the study was conducted during a time frame where no unusual staffing changes were made in personnel or ratios. Generalization of study findings is limited by 1 unit in 1 hospital.

Conclusion

In conclusion, an APA has promise to support increased ambulation among M/S patients. The potential for cost savings to patients, insurance companies, and hospital staffing models are important to consider in light of the results of the study. Staff members were positive about the use of the APA, and the majority reported that the device made ambulation of patients easier. The use of the device to assist in ambulation of patients has the potential to increase job satisfaction, decrease avoidable back injuries and falls, and allow for safer, easier, and more effective ambulation of patients. In the face of rising healthcare costs and decreasing reimbursement, the use of an APA appears to have a place in supporting patient care and quality.

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