

Mobility Technicians

A Viable Solution to Early Ambulation of Total Joint Replacement Patients

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BACKGROUND: Early ambulation of patients with total joint replacement (TJR) has been shown to improve outcomes while reducing length of stay and postoperative complications. Limited physical therapy (PT) resources and late-in-the-day cases may challenge day-of-surgery (POD0) ambulation. At our institution, a Mobility Technician (MT) program, composed of specially trained nurse's aides, was developed to address this issue.

PURPOSE: The purpose of this study was to compare the effectiveness of the MT model with a traditional PT model in the early ambulation of patients with TJR.

METHODS: Patients undergoing unilateral primary TJR at a single institution between June 1, 2014, and October 31, 2018, were included. Ambulation measures were retrospectively assessed between pre- and post-MT program groups.

RESULTS: This study included 11,777 patients with TJR. Following the MT program, number of POD0 ambulations, POD0 ambulation distance, and total distance ambulated all increased while time-to-first ambulation decreased.

CONCLUSION: Preliminary analyses indicate that the MT program has been successful in the early ambulation of patients with TJR.

without further increasing adverse patient outcomes (Guerra et al., 2015; Masaracchio et al., 2017; Wellman et al., 2011). The benefits of early ambulation, however, are not limited to the patient's hospital stay. Ambulating patients earlier also increases their likelihood of discharge directly to home (Cox et al., 2016; Wellman et al., 2011), as opposed to a rehabilitation facility.

COST EFFECTIVENESS OF EARLY AMBULATION

The demonstrable advantages of ambulation have led to further analyses of its financial impact. In addition to reducing LOS, early ambulation has been associated with significant cost savings following TJR (Pua & Pua, 2014; Masaracchio et al., 2017; Tayrose et al., 2013). By reducing the time that patients remain in the hospital, resources are conserved, and costs are minimized. Nonetheless, ensuring that all patients consistently receive early ambulation can be a challenge.

Introduction

BENEFITS OF EARLY AMBULATION

Early ambulation of patients following total joint replacement (TJR) has been shown to have numerous benefits for patients during their hospital stay and after their discharge. From a safety perspective, patients ambulating earlier after TJR are at reduced risk of developing complications associated with venous thromboembolism (VTE), gastrointestinal issues, pneumonia, and urinary retention (Chandrasekaran et al., 2009; Pearse et al., 2007).

In addition, early ambulation of patients with TJR has been shown to accelerate patient readiness for discharge (Karim et al., 2016; Okamoto et al., 2016) and reduce hospital length of stay (LOS) (Pua & Ong, 2014; Tayrose et al., 2013; Wellman et al., 2011). Importantly, early ambulation has been shown to decrease LOS

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CHALLENGES AND PROPOSED SOLUTIONS TO EARLY AMBULATION

For one, physical therapy (PT) staffing hours do not dependably align with the times in which patient ambulation is necessary (late afternoon or evening). Various solutions have been proposed, including extending PT staffing hours or expanding the role of the postoperative recovery nurses. It has previously been shown that, by changing PT staffing hours, early ambulation is more consistent, reduces patient LOS, and reduces cost (Pelt et al., 2016).

Currently, there is no consensus regarding which category of healthcare provider provides ambulation at the best value. One study found that patients with TJR treated by either licensed physical therapists or PT students had the same functional mobility at discharge (Hake et al., 2015). This suggests that there is an opportunity to provide additional training to nonphysical therapists to accomplish more predictable ambulation of patients postoperatively.

THE MOBILITY TECHNICIAN PROGRAM

In 2014, our institution found that 80% of patients reaching the inpatient unit after 2:00 p.m. were not ambulated on day of surgery (POD0) (Geary, 2015). To ensure early ambulation for all patients, we then implemented a Mobility Technician (MT) program. A select group of certified nurse's aides (CNAs) received additional special training from certified physical therapists to ambulate "standard risk" patients properly. Patients who were determined to be at higher risk for falling continued to receive ambulation solely from PT staff. The MTs ambulated patients on the inpatient unit throughout the full day and were present when the PT staff members were unavailable. At this point patients were ambulated three to four times daily. Any ambulation, whether by MTs or PT staff, was documented in the electronic health record. Any difficulties the MTs encountered with patient ambulation in terms of safety or progress were reported to the PT for elevated patient care.

The MT program was developed to provide a novel, cost-effective solution for early patient ambulation in contrast to extending PT staffing hours. This is particularly important in the rapid recovery environment, as we transition to shorter LOS and outpatient surgery. This study aimed to compare the effectiveness of the MT model to a traditional PT model in the early ambulation of patients with TJR.

Materials and Methods

STUDY DESIGN AND PATIENT SELECTION

After obtaining approval from the Institutional Review Board, a retrospective chart review was completed. All patients with TJR undergoing unilateral, primary total hip replacement (THR), or total knee replacement (TKR) between June 1, 2014, and October 31, 2018, were included in the study. Patients readmitted within 90 days post-discharge or undergoing bilateral THR or bilateral TKR or revision surgery were excluded. Patients were divided into pre-MT (June 1, 2014, to

December 31, 2014) and post-MT, grouped by year (2015–2018). Pre-MT data acquisition was limited by data collection capabilities prior to June 2014.

DETERMINATION OF AMBULATION PROVIDER

Upon arrival to the postoperative inpatient unit, patients were asked to perform an Egress Test and were graded by their primary nurse to determine their level of fall risk (Smith, 2008). The Egress Test evaluates the patient's postoperative ability to move from a seated to a standing position, to march in place for three steps, and to advance their surgical leg forward and backward in a sagittal plane. If a patient had two failed attempts at the Egress Test, then a PT assessed the patient for further ambulation readiness through their first mobilization. Once successful, a MT assumed responsibility for patient mobility, unless the patient remained at high risk for fall. High risk patients were ambulated exclusively by the PT.

OUTCOMES

The outcomes compared between cohorts included: number of POD0 ambulations; distance ambulated on POD0; total ambulation distance prior to discharge; time to the first ambulation; and LOS. Time to the first ambulation was determined by comparing the first ambulation time to time of arrival on the inpatient floor. The number of POD0 ambulations included any ambulation prior to 11:59 p.m. on the day of surgery. Only ambulation distances greater than 10 ft were considered.

LOS was calculated as the total time from admission to hospital until discharge from the hospital. Inpatient falls, 90-day complications directly affected by ambulation efforts (VTE, urinary retention, gastrointestinal complications, and pneumonia), and 30-day readmissions were also assessed.

STATISTICAL ANALYSES

Descriptive analyses were conducted to assess frequencies and distributions of all the variables. Pearson χ^2 and Mann-Whitney *U* tests were utilized. All analyses were conducted using IBM SPSS Statistics v.22.

Results

STUDY PARTICIPANTS

After exclusions, a total of 11,774 (pre-MT: 1,297; post-MT: 10,477) patients were included. There were 2,414 post-MT patients in 2015, 3,009 patients in 2016, 2,784 in 2017, and 2,270 in 2018. The average age was consistent throughout the study period at 66 years. The average body mass index was 30.3 kg/m² over the observed date range.

EARLY AMBULATION OUTCOMES

Post-MT patients were ambulated significantly earlier than pre-MT patients, with time-to-first ambulation ranging from 5.5 hours earlier to 9 hours earlier across the 4 years. This difference was significant for each year

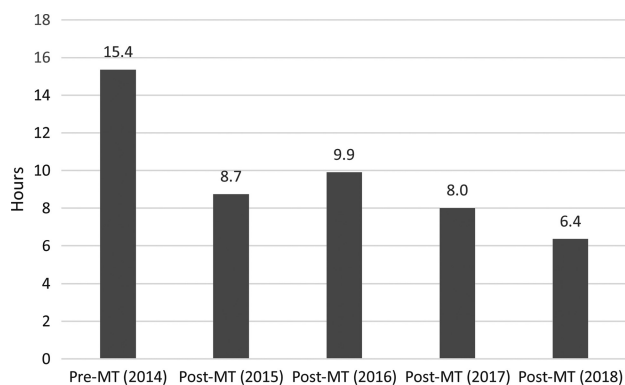


FIGURE 1. Mean time-to-first ambulation. In every year following MT program implementation, patients ambulated significantly earlier after surgery compared with pre-MT patients (pre-MT: 15.4 hours; 2015 post-MT: 8.7 hours; 2016 post-MT: 9.9 hours; 2017 post-MT: 8.0 hours; 2018 post-MT: 6.4 hours, $p < .001$). Note. MT = Mobility Technician.

after implementation as compared with the pre-MT implementation period, $p < .001$ (see Figure 1). Similarly, the average number of POD0 ambulations (see Figure 2) was significantly greater in the post-MT groups, $p < .001$. Moreover, Figure 3 demonstrates that the mean total distance of ambulation on POD0 more than doubled in years 1 and 2 following implementation of the MT program and more than tripled in years 3 and 4. This difference was statistically significant, $p < .001$.

The total distance ambulated during the hospital stay was significantly greater in the post-MT groups except for in 2018 (pre-MT: 1,193.2 ft; 2015 post-MT: 1,699.5 ft; 2016 post-MT: 1,389.6 ft; 2017 post-MT: 1,512.2 ft; 2018 post-MT: 1,197.7 ft, $p < .001$). Maximum distance ambulated during any one ambulation event was also significantly greater in the post-MT groups except for in 2018 (pre-MT: 410.6 ft; 2015 post-MT: 626.9 ft; 2016 post-MT: 534.7 ft; 2017 post-MT: 616.8 ft; 2018 post-MT: 426.5 ft, $p < .001$).

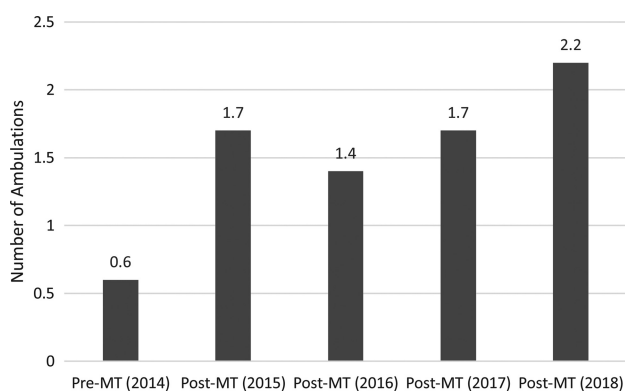


FIGURE 2. Mean number of ambulations on POD0. Following MT program implementation, the mean number of times that patients ambulated on POD0 was significantly greater (pre-MT: 0.6; 2015 post-MT: 1.7; 2016 post-MT: 1.4; 2017 post-MT: 1.7; 2018 post-MT: 2.2, $p < .001$). Note. MT = Mobility Technician; POD0, day of surgery.

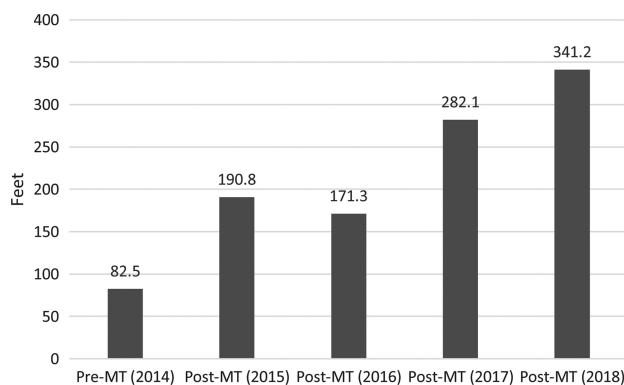


FIGURE 3. Mean distance ambulated on POD0. Following MT program implementation, the mean total distance that patients ambulated on POD0 increased significantly (pre-MT: 82.5 ft; 2015 post-MT: 190.8 ft; 2016 post-MT: 171.3 ft; 2017 post-MT: 282.1 ft; 2018 post-MT: 341.2 ft, $p < .001$). Note. MT = Mobility Technician; POD0, day of surgery.

SECONDARY OUTCOMES

The LOS steadily declined over the observed period (pre-MT: 2.7 days; 2015 post-MT: 2.4 days; 2016 post-MT: 2.3 days; 2017 post-MT: 2.1 days; 2018 post-MT: 1.8 days, $p < .001$). The complication rates across the study period are reported in Table 1. As seen, overall 90-day complication rates significantly increased between the pre- and post-MT implementation periods. These rate differences seem primarily affected by an increase in postoperative urinary retention, which significantly increased in the post-MT groups until 2018. All other complication rates were similar (see Table 1). The 30-day readmission rate decreased beginning with year 2 after implementation. The number of falls did not differ significantly during the pre- or post-MT implementation periods (pre-MT: 0.1%; 2015 post-MT: 0.2%; 2016 post-MT: 0.3%; 2017 post-MT: 0.2%; 2018 post-MT: 0.2%, $p = .770$). When evaluating injuries of patients who fell, two periprosthetic fractures were observed in the post-MT group. No fractures were seen in the pre-MT group. This was not statistically significant. There were no reports of wound dehiscence or dislocation secondary to falls.

Discussion

The demand for TJR surgeries continues to increase in the United States. It is predicted that between 2005 and 2030, THR and TKR will grow by 174% and 673%, respectively (Kurtz et al., 2007). Developing protocols that promote early ambulation and accelerate the recovery for patients with TJR in the immediate postoperative period is imperative.

Prior to implementing MTs, our facility followed a traditional PT-driven patient ambulation model. With implementation of the MT program, there was a significant decrease in time-to-first ambulation, and significant increases in both the average number of ambulations and the total distance ambulated by patients prior to discharge. By increasing the frequency and distance of ambulations, we aimed to reduce the risk of patients developing postoperative complications. Although we

TABLE 1. 90-DAY COMPLICATION AND 30-DAY READMISSION RATES

	Pre-MT (2014)	Post-MT (2015)	Post-MT (2016)	Post-MT (2017)	Post-MT (2018)	p Value
Overall	0.2%	2.0%	3.0%	3.7%	0.8%	<.001
VTE	0.2%	0.5%	0.3%	0.3%	0.3%	.655
Urinary retention	0.0%	1.3%	2.3%	3.2%	0.2%	<.001
GI bleed	0.0%	0.3%	0.3%	0.1%	0.1%	.106
Pneumonia	0.0%	0.1%	0.1%	0.1%	0.1%	.757
Falls	0.1%	0.2%	0.3%	0.2%	0.2%	.770
Falls with injury	0.1%	0.04%	0.03%	0.04%	0.0%	.882
30-day readmission	3.6%	3.6%	3.4%	2.4%	2.0%	.001

Note. GI = gastrointestinal; MT = Mobility Technician; VTE = venous thromboembolism.

failed to show this definitively, we did demonstrate that the MT model was not inferior to the traditional PT-driven model. A confounding factor to consider while measuring the number of ambulations and overall ambulation distance was a multifactorial decrease in LOS. This provided less time in the hospital to achieve the same ambulation distances as in previous years.

Specially trained MTs are able to ambulate patients earlier because they are available around the clock and outside of traditional PT hours. Further, their role is specifically focused on patient ambulation. In patients with TJR, the time lapse between inpatient floor admission and first ambulation was reduced by more than half following the addition of MTs. Not only did the MT program significantly reduce the time elapsed before initial ambulation, but it also increased the total number of POD0 ambulations by roughly two-fold. Earlier and more consistent ambulation directly influenced an increase in walking capacity and aided in the reduction of LOS. Although post-MT patients had a reduced average LOS in comparison to the pre-MT cohorts, the difference was not statistically significant. Other studies incorporating early ambulation have found similar results. Patients achieved discharge goals earlier, however, LOS was not significantly different (Karim et al., 2016; Okamoto, et al., 2016). This trend suggests that there are additional underlying factors that need to be considered when assessing LOS.

It is important to note that, although PT staffing and hours remained the same, productivity by PT staff improved by redirecting their efforts to more complex patients and utilizing MTs to ambulate “standard risk” patients. Dividing the healthcare team roles in this manner ensures that those patients requiring additional assistance from PT receive treatment promptly. Anecdotally, PT job satisfaction improved, because they were left to more complex and challenging tasks. Additionally, previous CNAs who became MTs had improved job satisfaction due to their further training and increased responsibilities. Patients mobilized sooner and more frequently and were ambivalent to whether PT staff or MTs provided that service. This study demonstrates the success of MTs in the early ambulation of patients with TJR and offers a new straightforward model for clinical practice guidelines to facilitate earlier, and more frequent patient ambulation.

This study has several limitations. For instance, its retrospective design lends itself to selection bias and observer bias. Moreover, a multifactorial approach to patient outcome improvement makes evaluation of the MT program in solidarity impossible. Lastly, the cost-effectiveness of implementing a program such as this was not assessed; thus, further analyses are necessary to determine this.

Conclusion

Implementation of the MT program resulted in a significantly higher number of total ambulations on POD0 for all patients with TJR. Following the implementation of the MT program, patients’ time-to-first ambulation was reduced by half, and patients ambulated nearly two times as far prior to discharge from the hospital. These preliminary analyses demonstrate that the MT program has been successful in the early ambulation of both patients with THR and TKR.

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