

Spring 2017

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Emma, DNP, RN-BC, ONC, E. (2017). Improved Outcomes Associated With an Early Mobilization Protocol Among Hip and Knee Replacement Patients., (). Retrieved from https://hsrc.himmelfarb.gwu.edu/son_dnp/1

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Improved Outcomes Associated With an Early Mobilization Protocol

Among Hip and Knee Replacement Patients

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In partial fulfillment of the requirements for the Doctor of Nursing Practice Degree

Abstract

Background: According to the National Association of Orthopedic Nurses (NAON), research indicates that evidence-based practice for post-operative hip and knee replacement patients includes early mobilization several hours following surgery. Findings indicate that early mobilization on the day of surgery directly correlates to decreased pain, increased distance ambulated and decrease in length of stay (LOS) in the hospital.

Objectives: The aim of this research was to validate findings in the literature indicating that improved patient outcomes (pain, distance ambulated and LOS) are associated with implementation of an Early Mobilization Protocol among post-operative total hip and knee replacement patients.

Methods: The study used a non-experimental correlation design. A retrospective review of electronic medical records was conducted to identify if an Early Mobilization Protocol had positive clinical outcomes on three dependent variables: pain, distance ambulated and LOS at John T. Mather Memorial Hospital. Pre-intervention data from 2014 was compared to post-intervention data in 2015, among post-operative total hip and knee replacement patients.

Results: Average pain score from post-intervention data decreased 50% from 4.8 to 2.4. Total distance ambulated increased 132% from 282 feet to 654 feet. In addition, LOS decreased one full day from 3.4 days to 2.4 days.

Conclusions: An Early Mobilization Protocol significantly improved clinical outcomes by decreasing pain, increasing distance ambulated and decreasing LOS among post-operative total hip and knee replacement patients.

Improved Outcomes Associated With an Early Mobilization Protocol

Among Hip and Knee Replacement Patients

Background

Traditionally, patients who experienced total hip or knee replacement surgery began ambulation on post-operative day one, which contributed to negative clinical outcomes including: increased pain and LOS (Cox, Cormack, Prendergast, Celestino, et al., 2016). Recently, the National Association for Orthopedic Nurses (NAON) endorsed clinical practice guidelines that include the following: 1) Collaborative, inter-professional approach to early patient mobilization within 6 hours post-operatively; 2) Structured standards for pain management; and 3) Involvement of nursing in patient ambulation (Morris, Benetti, Marro, & Rosenthal, 2010). Evidence indicates that day of surgery mobilization of the post-operative hip and knee replacement patient, in conjunction with improved surgical anesthetics, significantly decreased pain scores and LOS (Yager, & Stichler, 2015). In 2015, clinicians at John T. Mather Memorial Hospital integrated new evidence-based knowledge into clinical practice by implementing an Early Mobilization Protocol post-operatively on the day of surgery for hip and knee replacement patients. The goal was to improve clinical outcomes; therefore, the aim of this research study was to evaluate the effectiveness of an Early Mobilization Protocol on pain scores, distance ambulated and LOS among post-operative hip and knee replacement patients. Thereby, validating research evidence published in professional literature.

Problem Statement

Outcomes research among hip and knee replacement patients indicate that lack of early mobilization, on the day of surgery, places patients at risk for poor outcomes, such as: increased pain, limited ability to ambulate and increased overall LOS (Veesart, 2015).

Purpose

The purpose of this research study was to compare pain scores, distance ambulated and LOS pre-intervention and post-intervention of Early Mobilization Protocol among hip and knee replacement patients. Evidence-based clinical practice guidelines, endorsed by the NAON, indicate that early mobilization results in significant improvements in pain, distance ambulated and LOS.

Specific Aims

1. Demonstrate that patients mobilized within the first six hours after surgery experience optimal outcomes.
2. Ensure that total knee and total hip replacement patient order sets have been ordered by practitioners for standardization of consistency of orders, based on best practice.
3. Record pain scores per hospital policy.
4. Record the distance in feet the patient ambulated after every ambulation.
5. Record LOS for each patient from time of arrival on orthopedic unit, until discharge from the hospital.

Hypothesis

Early mobilization of knee and hip replacement patients will result in decreased pain scores, increased distance ambulated and decreased LOS over a 3 day post-operative period as compared to traditional protocols with delayed post-operative ambulation.

Research Question

Among patients who underwent total hip and knee replacement surgery, does implementation of an Early Mobilization Protocol, initiated 6 hours after surgery, decrease pain scores, increase distance ambulated and decrease LOS?

Significance

In the past, standard practice for patients receiving total hip or knee replacement surgery was to begin ambulation on the day following surgery, referred to as post-operative day one. Over the past several years, research findings have indicated that early mobilization of post-operative hip and knee replacement patients experience improved clinical outcomes. Early mobilization has been identified as a best practice by the NAON. Research established that early mobilization of post-operative hip and knee replacement patients, on the day of surgery has a positive influence on patients' overall healing process (Yager, & Stichler, 2015).

The significance of this study is that knowledge gained will contribute to the growing literature linking early mobilization of hip and knee replacement patients to improved clinical outcomes. Evidence indicates that early mobilization of hip and knee replacement patients on the day of surgery decreased pain scores experienced by patients and decreased hospital LOS (Yager, & Stichler, 2015). Furthermore, as the result of an Early Mobilization Protocol, hip and knee

replacement patients experienced less pain after ambulation and decreased LOS from 4.3 days to 2.8 days (Yager, & Stichler, 2015).

In 2015, John T. Mather Memorial Hospital implemented early mobilization clinical practice guidelines into standard practice. As a result, care provided to the hip and knee replacement patients aligns with current evidence-based best practice. Early mobilization for hip and knee replacement patients requires the engagement of the patients and providers, such as: orthopedic surgeons, medical doctors, physical therapy and nursing department. Integration of best practice guidelines for hip and knee replacement patients at John T. Mather Memorial Hospital provided the opportunity to conduct a retrospective review of electronic medical records examining the impact of the early mobilization change on three key outcomes variables: pain scores, distance ambulated and LOS.

Literature Review

To incorporate an Early Mobilization Protocol into the organization, it was essential to understand the scientific evidence supporting this best practice. Therefore, a scholarly literature search was conducted using electronic databases such as Ovid, CINAHL, and Medline. Keywords for this literature search included mobilization, hip and knee replacement, pain scores, distance ambulated and LOS. MeSH terms were used, such as: “movement” or “ambulation” for mobilization and “joint replacement” or “arthroplasty” for hip and knee replacement. Boolean operators, such as: AND and OR, were used and yielded more specific articles. Published research and clinical practice guidelines noted that implementation of an Early Mobilization Protocol led to hip and knee replacement patients experiencing decreased pain scores, improved ability to ambulate to set goals and had a decreased LOS (Yager, & Stichler, 2015). Thus,

articles in this literature review supported the Early Mobilization Protocol as evidence-based, best practice as a new standard of care for hip and knee replacement patients.

Early mobilization within 6 hours of surgery for post-operative hip and knee replacement patients, was first identified in 2010 as a best practice standard for decreasing pain scores, increasing distance ambulated and decreasing LOS. In 2010, the University of California San Diego Medical Center's interdisciplinary team was an initial adopter of early mobilization as an effective pain management strategy, which optimized post-operative activity and quality of patient care (Morris, et al., 2010). Although early mobilization has been identified by the National Association of Orthopedic Nurses (NAON) as clinical practice guideline, some organizations have not adopted early mobilization into the post-operative routine (Morris, Benetti, Marro, Rosenthal, 2010).

The main focus of research by Morris and associates (2010) was to evaluate the need for implementing a clinical practice guideline for early mobilization of hip and knee replacement patients. Years before, the Institute of Medicine (2001) defined clinical practice guidelines as: systematically developed statements aimed at guiding decision-making by practitioners and patients' about appropriate health care for specific clinical circumstances. Morris and associates (2010) created order sets in the electronic health record, based on collaboration with an interdisciplinary team. The new order sets streamlined post-operative orders for hip and knee replacement patients. Early mobilization clinical practice guidelines for post-operative hip and knee replacement surgery patients requires that nurses or physical therapists mobilize patients at the bedside within 6 hours after surgery. Recent improvements in pain management, such as: continuous infusion nerve blocks during surgery and standardized medication orders for post-

operative pain medications, have made early mobilization possible from a pain management standpoint (Morris, et al., 2010).

Research indicates that clinical practice guidelines for early mobilization were useful in standardizing post-operative patient care. Morris and associates (2010) found that three months post-implementation of the early mobilization clinical practice guidelines for hip and knee replacement patients, pain scores were consistently 4 or below, on a 0-10 point scale, among 80% of patients who were mobilized 6 hours after surgery. At the same time, LOS decreased from 4.3 days to 2.8 days. The clinical practice guidelines led to the development of an order set in the electronic health record, which included the following: 1) Time selected for mobilization; 2) Weight bearing status; and 3) Information regarding pertinent medications; such as: anticoagulants, pain managements and antiemetic medications (Morris, et al., 2010).

Husted and associates (2011) identified that frequent post-operative ambulation with hip and knee replacement patients promoted rapid recovery of muscle function, while reducing pain scores and LOS. The researchers noted that attention to pain management is necessary in order to safely shorten LOS (Husted, et al., 2011). Husted and associates (2011) discussed a type of pain management protocol implemented known as the Fast-Track Protocol. The Fast-Track Protocol was implemented for patients who underwent a total hip or knee replacement surgery, and included the following: 1) Pain management with spinal anesthesia during surgery; 2) Post-operative multimodal pain medications which included opioids; 3) Venous thromboembolism prevention medication; 4) Early mobilization upon arrival to the orthopedic unit from the recovery room; and 5) Physical therapy sessions twice a day until discharge (Husted, et al., 2011). The methodology used in their study was a concurrent review of the medical records of the hip and knee replacement patients who participated in the Fast-Track Protocol. Patients who

underwent hip or knee replacement surgery on a Monday, Tuesday or Wednesday received standardized pain medications during and after surgery. Assessment of the patient's overall function indicated a decrease in pain scores and LOS (Husted, et al., 2011).

The Fast-Track Protocol, which standardized care for early mobilization for hip and knee replacement patients, was clearly defined in the research study. Researchers discussed improved outcomes, specifically: patients ambulated further, pain scores were less and LOS decreased from 4 days to 2.4 days for knee replacement patients, and 2.2 days for hip replacement patients, (Husted, et al., 2011).

Tayrose, and associates (2013), identified the effect of rapid mobilization of hip and knee replacement patients, beginning in the recovery room reduced post-operative pain scores and LOS. The aim of the study was to determine if rapid mobilization of patients (within 2 hours after surgery) in the recovery room correlated with decreased pain scores and LOS (Tayrose, et al. (2013). The "rapid rehabilitation" pilot program consisted of two groups of post-operative hip and knee replacement patients. Group one (experimental group) received rapid mobilization and group two (control group) received the standard rehabilitation process of mobilization on post-operative day one. The researchers did not measure changes in distance ambulated. The methodology used a retrospective review of medical records of patients who had hip or knee replacement surgery. Pain scores and LOS were extracted as data for comparative analysis.

Patients who participated in the rapid rehabilitation program [experimental group] received surgery early in the morning and ambulated on the same day in the afternoon. Whereas, patients who participated in the standard rehabilitation protocol [control] were mobilized on post-operative day one (Tayrose, et al., 2013). Results demonstrated that hip and knee

replacement patients who participated in the rapid rehabilitation program experienced less pain and LOS decreased from 4.4 days to 3.9 days (Tayrose, et al., 2013). Thus, mobilizing patients approximately 2 hours after surgery in the recovery room decreased overall LOS for the hip and knee replacement patients (Tayrose, et al. (2013).

McCann-Spry, Pelton, Grandy and Newell (2016), discussed outcomes associated with implementation of an interdisciplinary approach to early mobilization for hip and knee replacement patients several hours after surgery at their organization. Researchers recommended that the Center for Joint Replacement (CJR) requirements from the Joint Commission (2016), which reduced hospital LOS, must be implemented to achieve optimal care for hip and knee replacement patients. Therefore, researchers implemented the Rapid Mobilization Protocol on post-operative day zero in order to help patients experience less pain and decrease in LOS. The Rapid Mobilization Protocol was implemented as an interdisciplinary initiative, with the physical therapy department, to ensure that hip and knee replacement patients were mobilized twice after surgery on post-operative day zero McCann-Spry, et al., (2016). Each patient was informed prior to having hip or knee replacement surgery, that participation in the Rapid Mobilization Protocol would begin immediately following surgery (McCann-Spry, et al., 2016).

Results from a retrospective review of electronic medical records, conducted by the researchers, identified that patients were able to ambulate with less pain (McCann-Spry, et al., 2016). Researchers also noted a decrease in LOS for hip and knee replacement patients by 0.5 days (McCann-Spry, et al., 2016). The researchers did not indicate the time period between surgery and initial mobilization.

Cox, Cormack, Prendergast, Celestino, Willis, et al. (2016) discussed integration of a quality improvement initiative, namely a new model of care for the hip and knee replacement patients that decreased pain scores and LOS. The new model, based on interdisciplinary collaboration, incorporated an evidence-based comprehensive pain management program with mobility clinical pathways (Cox, et al., 2016). Researchers observed that post-implementation of the hip and knee replacement clinical pathways, there were reductions in pain scores and LOS. In addition, patients reported overall positive satisfaction with the introduction of early mobilization (Cox, et al., 2016).

The new model of care, developed by Cox and associates (2016), included hip and knee replacement clinical pathways focused on same day mobilization. Hip and knee replacement patients were placed into the model of care group if certain criteria were met, namely: 1) Surgery as one of the first two cases of the day; 2) Hemodynamically stable; 3) Neurovascular system intact; 4) Pain score acceptable to the patient; 5) Alert and oriented; and 6) Able to consent to early mobilization within 8 hours after surgery. Results from patients who participated in the model of care group demonstrated that 76% of patients reported low pain scores, 3 out of 10. The average LOS was 2.9 days (Cox, et al., 2016).

With the development of clinical practice guidelines, interchangeably known as clinical pathways, variables of pain level and LOS decreased among patients in the model of care group. This study used mixed method design, paper-based surveys and telephone interviews of hip and knee replacement patients (Cox, et al., 2016).

Sibia and associates (2016) identified an association between early mobilization and enhanced recovery after hip and knee replacement surgery, as evidenced by a decrease in

readmission rates. With hip replacement surgeries expected to increase by 174%, and knee replacement surgeries expected to increase by 673%, by the year 2030, enhanced recovery after surgery must be achieved in the post-operative period (Sibia, et al., 2016). The Enhanced Recovery After Surgery Program was designed to promote earlier discharge home (on post-operative day one). The program included multimodal pain management, aggressive intraoperative fluid management, and day of surgery ambulation (Sibia, et al., 2016). Researchers focused on elderly Medicare hip and knee replacement patients and measured the effect of an Enhanced Recovery After Surgery Program on several quality outcomes.

Sibia, et al., (2016) performed a retrospective review of medical records for hip and knee replacement patients. A total of 174 hip and knee replacement patients were discharged on post-operative day one, and 285 hip and knee replacement patients were discharged on post-operative day two (Sibia, et al., 2016). Ninety-seven percent of patients in both groups were ambulated several hours on the day after surgery (Sibia, et al., 2016).

Researchers concluded that hip and knee replacement patients who were discharged on post-operative day one were less likely to be readmitted to the hospital (Sibia, et al., 2016). Effects on early mobilization correlated to positive patient outcomes. Early mobilization decreased LOS and readmission rates post-operatively on the day of surgery. In addition, patients had less reported pain due to the multimodal pain medications ordered under the Enhanced Recovery After Surgery Program (Sibia, et al., 2016). With the increased utilization of clinical practice guidelines, such as the Enhanced Recovery After Surgery Program, efforts to improve clinical outcomes have been achieved.

Ayalon, et al., (2011), created a clinical pathway specifically for post-operative care of the total knee replacement patient. The clinical pathway was designed to decrease pain scores, improve overall functional milestones and decrease LOS (Ayalon, et al., 2011). The clinical pathway, or clinical practice guidelines, enables health care professionals to follow a comprehensive plan aimed at reducing pain scores, achieving improved motor function and decreasing LOS among patients receiving hip and knee replacement surgery (Ayalon, et al., 2011).

Researchers noted that although a clinical pathway had been established, modifications to the clinical pathway were necessary. The original pathway focused on management of the knee replacement patient, throughout the care-continuum from surgery until discharge (Ayalon, et al., 2011). Modifications to the clinical pathway for knee replacement patients included: 1) Faster mobilization of patients on the day of surgery; 2) Multimodal pain approach; and 3) Improved discharge planning phase (Ayalon, et al., 2011). With modifications to the clinical pathway, researchers conducted a case-control study, with one group experiencing the older version of the clinical pathway, and the other group experiencing the updated clinical pathway. A retrospective review of medical records was used to collect outcome data.

With implementation of the enhanced clinical pathway, patients' reported lower pain scores on post-operative day one, from an average of 3.5 to 2.8 (Ayalon, et al., 2011). Patients who used the updated clinical pathway were able to transfer and tolerate physical therapy on the day of surgery (Ayalon, et al., 2011). In comparison, the group who had the updated clinical pathway had a lower LOS from 4.03 days to 3.77 days (Ayalon, et al., 2011).

den Hertog, Gliesche, Timm, Muhlbauer and Zebrowski, (2012), compared a Pathway-Controlled Early Recovery Program, to standard postoperative rehabilitation care, for the knee replacement patient. Known as the Fast-Track Rehabilitation Program, the main focus of this clinical pathway was early post-operative mobilization to help reduce LOS for knee replacement patients. The Fast-Track Rehabilitation Program was characterized by standardized mobilization milestones, which included getting up on the day of surgery and climbing stairs by post-operative day two (den Hertog, et al., 2012). This program was compared to a standard rehabilitation protocol, consisting of intravenous fluids for the first 24 hours after surgery, with the first mobilization on post-operative day two (den Hertog, et al., 2012).

This study used a prospective, randomized, case control design. Findings included reduced use of pain medication consumption secondary to patients' reported low pain scores. Patients who participated in the Fast-Track Rehabilitation Program returned to everyday motor function sooner, when mobilized on the day of surgery. LOS was reduced by almost 50% (den Hertog, et al., 2012). Researchers noted that colleagues replicated a similar study within the same organization. Their study focused on hip replacement patients not on knee replacement patients. Results of their Fast-Track Rehabilitation Program, among hip replacement patients were equal to that of knee replacement patients (Larsen, Hansen, Soballe, & Kehlet, 2010; den Hertog, et al., 2012).

Outcomes associated with the Fast-Track Rehabilitation Program for knee replacement patients were as follows: 1) Significant decreases in pain scores; and 2) Return of motor function in a shorter time frame, resulting in a decreased LOS (de Hertog, et al., 2012). Chen, Stewart, Heyl and Klatt (2012) discussed implementation of the rapid recovery protocol of hip and knee replacement patients within their organization. Their research focused on the effects of physical

therapy interventions beginning on the day of surgery (Chen, et al., 2012). The researchers performed a prospective cohort study among post-operative total hip and knee replacement patients who participated in the rapid recovery protocol (Chen, et al., 2012). The rehabilitation process began on the nursing unit after patients were transferred from the post-anesthesia care unit. Postoperative day zero was defined as the same day of surgery. Mobilization on post-operative day zero was defined as any time after the patient was transferred from the post-anesthesia care unit and before midnight (Chen, et al., 2012). This study compared patients who received the rapid recovery protocol of mobilization on post-operative day zero, to the standard rapid recovery protocol of mobilization on post-operative day one.

Results from the study indicated that hip and knee replacement patients, who participated in the revised rapid recovery program, had significantly less pain and shorter LOS (Chen, et al., 2012). However, pain scores were decreased only when patients ambulated on the same day of surgery (Chen, et al., 2012). Another result was that distance ambulated during the first session with physical therapy was statistically greater in comparison to patients who received physical therapy on post-operative day one (37 feet), than on post-operative day zero (18 feet). Furthermore, patients who participated in the revised protocol experienced shortened LOS, regardless of the mobilization therapy utilized such as: dangling, moving from the bed to a chair, or ambulating with physical therapy (Chen, et al., 2012).

Stewart (2012) discussed how a multimodal pain medication approach promoted faster rehabilitation, improved post-operative pain control and decreased LOS. Positive outcomes were achieved through clinical practice guidelines, known as the Rapid Arthroplasty Mobilization Protocol (RAMP). The aim of RAMP is to promote acceleration of rehabilitation and encourage a rapid return to optimum function (Stewart, 2012). RAMP was designed in Australia and

involved a multimodal pain management intervention, which used less opioids after surgery and early mobilization within 5-6 hours after surgery (Stewart, 2012).

In recent years, revisions have been made to RAMP to enhance the patient experience and healing process. Initially, hip and knee replacement patients began early mobilization 5-6 hours after surgery. With the revised protocol, knee replacement patients were mobilized within 2 hours after surgery and hip replacement patients were mobilized within 4 hours after surgery (Stewart, 2012). With improved pain medication protocols, which include decreased use of opioids, patients are able to participate in early mobilization activities without being drowsy (Stewart, 2012). As a result of implementing RAMP, improved post-operative pain management, early mobilization and decreased LOS were achieved (Stewart, 2012). Clinical practice guidelines, such as RAMP, have standardized post-operative care for hip and knee replacement and contributed to improved positive patient outcomes.

In summary, this research study was developed to fill knowledge gaps related to early mobilization of total hip and knee replacement patients. Knowledge gaps in the literature include a the lack of studies researching distance ambulated as a key improvement of an Early Mobilization Protocol. Therefore, the goal of the literature review was to identify if an early mobilization clinical practice guideline made a difference in distance ambulated on the immediate post-operative phase of recovery. In addition, this study investigated the impact on variables of pain and LOS.

Theoretical Foundations, Identifying and Defining Variables

In order to improve quality outcomes among the hip and knee replacement patient population, the clinical practice of early mobilization must become standard clinical practice.

This requires that all members of the healthcare team share a common vision and goal. Imogene King's Theory of Goal Attainment has been used widely by nurses, administrators and other health care providers (Fewster-Thuente, & Velor-Friedrich, 2008). This theory can be applied to foster interdisciplinary collaboration with the goal of improved patient care (Fewster-Thuente, & Velsor-Friedrich, 2008). Theory of Goal Attainment focuses on setting goals by creating an interpersonal system of interaction, communication and transactions. The involvement of human beings, families and communities serve as a framework within which care providers make transactions with health as the goal (Khowaja, 2006). By utilizing King's Theory of Goal Attainment, the inter-professional team recognizes the importance of the Early Mobilization Protocol. The objective was to have the hip and knee replacement patient mobilized 6 hours following surgery. Implementation of goals associated with clinical practice guideline of early mobilization, included: decreased pain, increased distance ambulated and decreased LOS. For this study, the independent variable was the implementation of the Early Mobilization Protocol; the three dependent variables were: pain scores, distance ambulated and LOS. For a full review of the variables, see Appendix A for the Identifying and Defining Variable Table.

Methods - Overview

Research Design

This non-experimental, correlational research study used a pre/post intervention design to identify the effect of early mobilization on pain, distance ambulated and LOS among patients having either total hip or knee replacement surgery. A retrospective review of electronic medical records was conducted to obtain data on the aforementioned dependent variables. The retrospective approach was appropriate for the purpose of this research for the following reasons:

1) Produced accurate data on the dependent variables of pain, distance ambulated and LOS, both prior to and after implementation of an Early Mobilization Protocol; 2) Collected data in a reasonable time frame; and 3) Provided the researcher with insight regarding overall quality of documentation adherence to protocol requirements. Pre-intervention data was collected from January 1, 2014 through December 31, 2014. This time frame was prior to implementation of the Early Mobilization Protocol at John T. Mather Memorial Hospital. Post-intervention data was collected from January 1, 2015 through December 31, 2015.

Study Population/Sample

The target population were men and women who underwent either a total hip or total knee replacement surgery at John T. Mather Memorial Hospital between 2014-2015. The sample consisted of 64 hip and knee replacement patients from January 1, 2014 to December 31, 2014 (32 charts were hip replacement patients and 32 charts were knee replacement patients). The results were compared to 64 hip and knee replacement patients from January 1, 2015 to December 31, 2015 (32 charts were hip replacement patients and 32 charts were knee replacement patients). Pre-intervention data was collected in 2014, whereas post-intervention data was collected in 2015. The inclusion criteria included: 1) Men and women; 2) Ages 18 and older; 3) Elective total hip or total knee replacement patients; 4) Patients who undergone bilateral hip and knee replacement surgeries; 5) Performed at John T. Mather Memorial Hospital; and 6) patients for whom the surgeons ordered the clinical practice guideline order sets for early mobilization in the electronic health record in 2015.

Exclusion criteria included patients with the following: 1) Admitted to the hospital for a hip fracture; 2) Underwent a hemiarthroplasty, unicondylar (partial) knee replacement patients;

3) Had a hip or knee revision surgery; 4) Not eligible to participate in early mobilization in 2015; and 5) Admitted to the orthopedic unit late on the night shift. Electronic medical records that had incomplete documentation and unstable patients who were transferred to a higher level of care from the recovery room were excluded from the study.

Sample Size

Based on Cohen's power analysis, for a medium effect size to be significant in this pilot study, with a Cohen's d of 0.50, a power of 80%, with an alpha of 0.05 calculates to 64 patient charts reviewed for each group for a total of 124 patient charts. Of the 64 patient charts were reviewed for 2014 and 2015; in 2014, 32 charts were hip replacement and 32 were knee replacement (for a total of 64 charts) and in 2015, 32 charts were hip replacement and 32 charts were knee replacement (for a total of 64). This was the breakdown of the total 124 charts reviewed for this pilot study. Hip and knee replacement patients electronic medical record review were completed separately due to the differences in surgery.

Recruitment of Subjects

The Institutional Review Board (IRB) at John T. Mather Memorial Hospital granted full board permission for the present research study. Methods included a retrospective review of the electronic medical records of those patients who had a total hip or total knee replacement surgery, and included patients who met the specified inclusion and exclusion criteria. The pre-intervention group had a hip or knee replacement in 2014, this group ambulated on post-operative day one (post-operative day one began 7am the following day). The post-intervention group had a total hip or total knee replacement surgery in 2015 and participated in the early mobilization clinical practice guidelines of mobilizing 6 hours after surgery. Subjects for this

review were not recruited, as a retrospective review of electronic medical records was conducted. Identity of subjects was anonymous. Therefore, consent was not required as per the IRB.

Setting

John T. Mather Memorial Hospital is a 248 bed community, teaching hospital located 50 miles east of New York City in Port Jefferson, Long Island, New York. Established in 1929, John T. Mather Memorial Hospital has a long history of providing high quality care to community residents. John T. Mather Memorial Hospital has been recognized for its patient safety record with a Leapfrog Group's Top "A" Hospital Safety Score for nine consecutive rating periods- the only hospital in New York State to achieve that distinction. In 2013, John T. Mather Memorial Hospital received Magnet designation for excellence in nursing services. In 2015, over 14,500 surgical procedures were performed; this included 211 total hip and knee replacement surgeries. The post-operative nursing unit, used as the site for this study, was 3 South, which is a 30 bed telemetry unit specializing in orthopedics. Approximately 20-25 hip and knee replacement surgeries are performed monthly at John T. Mather Memorial Hospital, which made the potential pool sample ample for this study. The length of time needed to obtain data for the required sample size was approximately 2 months.

Intervention

The intervention for this study was implementation of the clinical practice guidelines for the Early Mobilization Protocol for hip and knee replacement patients 6 hours post-operatively after surgery. The intervention began in January 2015. Hip and knee replacement patients were mobilized either by dangling at the bedside or ambulating, as long as they were medically stable and physically present on 3 South after surgery.

Instrument and Measurements

Two different tools were used to collect study data; the first tool was used to collect pre-intervention data and the second tool to collect post-intervention data. Implementation of the new Early Mobilization Protocol was an inter-professional effort with surgeons, nursing staff and physical therapy staff following the early mobilization clinical practice guidelines. Demographic information retrieved included the patients' age and gender. Clinical characteristics of demographics included patients' with a diagnosis of hip or knee replacement documented in the electronic health record by the surgeon as "osteoarthritis of the hip [or knee]" and based on the ICD 10 codes.

The Early Mobilization Protocol was monitored throughout the patient's hospitalization by retrospective review of electronic medical records. When the patient arrived on 3 South, the charge nurse collaborated with the patient's clinical nurse to determine eligibility for mobilization. For instance, the patient needed to be medically stable to mobilize 6 hours after surgery (vital signs are stable, no lethargy noted). According to the clinical practice guidelines, if it was before 4pm and the patient was stable, the patient ambulated with physical therapy; however if it was after 4pm, the nursing staff mobilized the patient by sitting at the bedside or assisted the patient to a chair at the bedside.

Pain scores were monitored by reviewing documentation in the electronic health record. As per John T. Mather Memorial Hospital policy, pain scores must be documented every 8 hours at 6am, 2pm and 10pm, and also when the patient reports pain. Distance walked, every time a patient was ambulated, was entered into the activity log in the electronic health record by the physical therapy or nursing staff. On 3 South, decals were placed every 10 feet in the hall ways

and patient rooms. These markings enabled staff, as well as the hip and knee replacement patients, to count the distance ambulated accurately. LOS was measured based on the date and time of the hip or knee replacement patient's arrival to 3 South after surgery. LOS included the number of post-operative nights the patient was in the hospital, and the date and time the patient was discharged from the 3 South. Discharges from 3 South occur between 9am until 8pm daily.

The pre-mobilization checklist for hip and knee replacement patients in 2014 included:

1) Patient's medical record number; 2) Site and type of replacement surgery; 3) Type of anesthesia (including femoral or adductor canal block for knee replacement patients); 4) Date and time of arrival to the orthopedic unit from the post-anesthesia care unit and discharge from the orthopedic unit; 5) Post-operative day number and time the patient first mobilized; 6) Total distance ambulated on subsequent post-operative days; and 7) Average pain scores during the post-operative phase, (See Appendix B). Information collected on the early mobilization checklist included: 1) Medical record number; 2) Site and type of replacement surgery; 3) Type of anesthesia (including femoral or adductor canal block for knee replacement patients); 4) Date and time the patient arrived to the orthopedic unit from the post-anesthesia care unit and the time discharged from the orthopedic unit; 5) Who mobilized the patient, the date and time of the first mobilization; 6) What the outcome of the first mobilization was; 7) Total distance ambulated in feet during the post-operative phase; and 8) Average pain scores during the post-operative phase, (See Appendix C).

The data collection tool was appropriate, as it documented the variables measured via the retrospective review of electronic medical records. The early mobilization checklist data collection tool for hip and knee replacement patients in 2015 monitored the Early Mobilization Protocol, the variables and the documentation stating the protocol was implemented. The

reliability of the early mobilization checklist was that it consistently measured the dependent variables associated with early mobilization. The validity of the early mobilization checklist can be described as content validity due to the content of the tool was appropriate for gathering data. This early mobilization check list was a valid tool because it addressed the key variables associated with early mobilization, as well as, identified proper assessment of the documentation of the patients' pain scores, mobilization status, and LOS on 3 South. The data collected has generalizability or external validity, which would be beneficial in the future for the hip or knee replacement population.

Data Collection Procedure and Timeline

The data collection tools used to measure the study variables aided in reviewing information both before implementation of the clinical practice guidelines for early mobilization in 2014, and after the guidelines were implemented in 2015. The pre-mobilization and early mobilization checklists were created and completed by the primary researcher.

Data was extracted by reviewing the electronic health record utilized by John T. Mather Memorial Hospital. Performance of the nursing and physical therapy staff, related to documentation, was standardized by the Director of Nursing Informatics to help streamline the documentation process for the hip and knee replacement patients. Respective staff received instruction from the researcher and the Director of Physical Therapy. Raw data was stored in a secured, password protected computer file. Coded data was stored in a secure, shared computer file entitled "orthopedic share drive." This shared drive has a Microsoft Excel spreadsheet that can be updated and accessed by this researcher and statistician. A Gantt chart has been developed, (See Appendix D).

Data Analysis Plan

Accurate valid data was obtained via effective data capture and entry, coding of the patient's medical record numbers, and manual computer entry onto the Microsoft Excel spreadsheet. Data was coded by assigning each hip and knee replacement patient's chart with a unique five digit code to de-identify the patient. The data code and information gathered was entered on to a Microsoft Excel spreadsheet for analysis. Assurance of accurate data entry was double-checked by the hospital's statistician. Data was analyzed by using descriptive statistics for all variables. Pre-intervention data from calendar year 2014 and post-intervention calendar year 2015 was analyzed using a t-test to determine the average pain scores, total distance ambulated and LOS for hip and knee replacement patients. To measure a standard power analysis with a t-test, a 2 group ANOVA was used to compare pre and post quality improvement implementation and the effect on pain scores, distance ambulated and LOS. In 2014, there were 164 patients who underwent a hip or knee replacement surgery; in 2015, 211 patients underwent a hip or knee replacement surgery. Based on Cohen's power analysis for a medium effect size, 64 charts from 2014 and 64 charts from 2015 were analyzed. All data analysis was performed using the SPSS 23 software to store and analyze data. This data analysis method of descriptive statistics was appropriate as it ensured that thorough and proper inquiry of variables has been quantified.

Ethical Considerations

Protection of patient information was achieved by de-identification of data using coding methods when analysis was performed. The collected data was placed in a secured shared drive that is password protected. IRB approval was obtained from John T. Mather Memorial Hospital

and GWU review boards as an exempt study (See Appendices E and F for exempt letters from both organizations).

Results

Study findings were statistically significant with implementation of the Early Mobilization Protocol. Specifically, 64 hip replacement charts and 64 knee replacement charts were reviewed; of the 128, 68 were left side surgeries and 60 were right side surgeries. The level of significance was accepted as $p \leq 0.05$, for a 95% confidence interval. For the pre-intervention group in 2014, all 64 patients ambulated on post-operative day one, whereas the Early Mobilization Protocol group in 2015, all 64 patients were mobilized or ambulated 6 hours after surgery on the orthopedic unit. Fifty patients ambulated with physical therapy upon arrival to the unit, 14 patients dangled at the bedside with the registered nurse, (See Appendix G).

In regard to average pain scores, the pre-intervention group in 2014 had an average pain score of 4.8. Patients who participated in the Early Mobilization Protocol group in 2015 had an average pain score of 2.4; this was a 50% reduction. The average total distance ambulated for the pre-intervention group 282 feet; when compared to the Early Mobilization Protocol group, the average total distance ambulated was 653 feet; this was a 132% increase. For the pre-intervention group in 2014, the average LOS was 3.4 days. With the implementation of the Early Mobilization Protocol, in 2015 the average LOS decreased to 2.4 days; this was a significant reduction of 1 day, (See Appendix H). Standard deviations have been calculated using Levene's test for equality of variances for the identified variables, (See Appendix I). The results of the variables for decreased pain scores, increased distance ambulated and decreased LOS prove that

the research hypothesis was accurate in predicting the positive impact of an Early Mobilization Protocol on pain, distance ambulated and LOS.

Comparative analysis was conducted between hip and knee replacement patients and the variables of pain, distance ambulated and LOS for pre-intervention in comparison to post-intervention of the Early Mobilization Protocol. The pre-intervention hip replacement patient pain score average was 4.5, the knee replacement patient was 5. The Early Mobilization Protocol group hip replacement patient pain score average was 2.4, the knee replacement patient was 2.5. The pre-intervention hip replacement patient average distance ambulated was 273 feet and knee replacement was 287 feet. The Early Mobilization Protocol group hip replacement patient average distance ambulated was 670 feet and knee replacement patients was 641 feet. Finally, the pre-intervention hip replacement LOS was 3.1 days and knee replacement patient was 3.6 days; the Early Mobilization Protocol group hip replacement patient LOS was 2.6 days and knee replacement patients LOS was 2.1 days, (See Appendix J).

Discussion

Implementation of an Early Mobilization Protocol for hip and knee replacement patients resulted in positive outcomes. Previous studies had focused on decreased pain scores and LOS after hip or knee replacement surgery via implementation of various early mobilization procedures and protocols. This research was significant because it identified that early mobilization also made a significant contribution on total distance ambulated. This was unique because previous research had not focused on total distance ambulated after hip or knee replacement surgery. It is important to note that early mobilization hours after surgery was facilitated by the presence of long acting pain medications still in effect in the immediate post-

operative period. These medications are ordered using the structured standards of pain management through clinical practice guidelines. As a result, patients participated in early mobilization with less pain. In addition, less pain during early mobilization allows hip and knee replacement patients to achieve goals toward more frequent and longer overall distance ambulated.

Limitations

There were several limitations within this study. First, the patients' age may have limited patients' ability to participate in an Early Mobilization Protocol. Intervening variables that influenced this research study included the patient's experience of replacement surgery. For example, if the patient had a negative past experience with prior replacement surgery, this could impact recovery during current replacement surgery. In regards to the patient experience, pain scores may be elevated as a result of the type of intraoperative and post-operative pain medications prescribed in the order set. Another limitation was differences in the orthopedic surgeons, their years of experience, and level of expertise performing hip or knee replacement surgeries. Limitations during the operative phase include the following: 1) Amount of blood loss; 2) If the patient received a transexemic acid injection; 3) Type of anesthesia the patient received; 4) If the patient received a femoral or adductor canal block for the knee replacement patient. An additional limitation was that 50 medical records could not be used in the review process due to lack of or limited documentation. A final study limitation was measurement of the minimum and maximum number of feet ambulated. Specifically, outliers in distance ambulated may have skewed the results for the average total of distance ambulated.

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Implications and Recommendations

Implications and recommendations for nursing practice correlate to the research question and hypothesis having positive outcomes. Early mobilization 6 hours after surgery requires having physical therapy and/or nursing staff readily available to assist patients ambulate in the hallway or to dangle at the bedside. For example, if the work day for physical therapy staff shift ends at 4pm and post-operative patients arrive to the orthopedic unit after 4pm, the physical therapist may not be available due to the restricted shift hours. Therefore, rotating the physical therapist's shift hours to accommodate the patient's arrival to the orthopedic unit would increase the number of patients who ambulate after surgery. Otherwise, patients just dangle or move from the bed to the chair with the nursing staff. In addition, the nursing department should schedule an additional nursing assistant for the afternoon shift to help nurses with mobilizing hip and knee patients. Another implication is that hip and knee replacement patients who are the first case of the day at 7:30am, arrive on the orthopedic unit before 4pm, thus accommodating the physical therapist's schedule. Also, hip and knee replacement patients who are the first case, or early case of the day, have more time on post-operative day zero to participate in the Early Mobilization Protocol. Therefore, total hip and knee surgeries should be scheduled for surgery as early in the morning as possible.

Finally, pain management that facilitates early mobilization is the use of femoral or adductor canal blocks during the operative phase of surgery. Increased utilization of such blocks makes the analgesic effect last for 24 hours post-operatively, making early mobilization less painful for the knee replacement patient (Kim, Lin, Goytizolo, Kahn, et al., 2014).

Recommendations from this study include 1) Study can be easily replicated in similar hospital settings; 2) Different healthcare organizations may achieve the same or similar results with implementation an Early Mobilization Protocol; 3) Prospective hip and knee replacement patients should be educated about the Early Mobilization Protocol during the pre-operative phase. Educating patients on the integration of early mobilization after surgery sets the standard and expectations of achievable goals. 4) In conjunction with the teaching process, scripting should be used by clinical staff. Having the inter-professional team deliver the same message to patients regarding participation in the Early Mobilization Protocol will provide encouragement and promote active patient participation in post-operative care.

Conclusion

Implementing an Early Mobilization Protocol among total hip and knee replacement patients, within 6 hours after having surgery, yields positive results. Specifically, utilizing early mobilization, based on the clinical practice guidelines set forth by the NAON, results in hip and knee replacement patients experiencing less overall pain, and LOS in the hospital. In addition, hip and knee replacement patients are able to ambulate further as a result of beginning the mobilization process several hours after surgery.

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Appendix A: Identifying and Defining Variable Table.

Main Variable	Theoretical Definition	Operational Definition
Independent Variable: Early Mobilization Protocol	Mobilization of a hip and knee replacement patient post-operatively within 6 hours of surgery	The total number of hip and knee replacement patients who are eligible to participate in the Early Mobilization Protocol which includes dangling at the bedside, sitting in a chair or ambulation.
Dependent Variables: decreased pain scores decreased LOS, Increase in distance ambulated	A patient who is mobilized within 6 hours of surgery will have decreased pain scores, decreased LOS and increased distance ambulated	LOS will be measured from date/time the patient was admitted to post-surgical unit until the date/time the patient was discharged to be measured in days. Reported pain scores documented per policy and distance ambulated will be monitored by reviewing the documentation. Also, if the nurse or physical therapist performed early mobilization for the patient first.
Moderator Variables: Patients who are mobilized on the day of surgery who did not have a decrease pain, LOS or increase in distance ambulated.	Patients may not experience a decrease in pain, LOS or an increase in distance ambulated.	The total number of patients who participated in the Early Mobilization Protocol who did not have positive outcomes such as a decrease in pain, LOS and increase in distance ambulated over a 2 day postoperative period.
Demographic Variable: Men and women ages 18 and older, patients who need a total hip or knee replacement electively.	Patients who were electively scheduled for either total hip or knee replacement surgery.	The age, race and gender of total hip and knee replacement patients at John T. Mather Memorial Hospital for 2014 and 2015.

Appendix D: Gantt Table.

Project		When to Start				How long				Dependent on	
A. Development of Early Mobilization Protocol for post-operative hip and knee replacement patients.		November 1, 2014				One week					
B. Development of standardized specific computer charting for hip and knee replacement patients.						Three weeks					
C. Instructions for nursing and PT staff regarding protocol and documentation.						Four weeks				A and B	
D. Implementation of protocol sheet and computer charting.		January 1, 2015								A, B, C	
Project	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	
A	NM										
B		NI	NI	NI							
C					NM. DPT	NM, DPT	NM, DPT	NM, DPT			
D									Staff	Staff	

Nurse Manager (NM) and Director of Physical Therapy (DPT)

Director of Nursing Informatics (NI)

Implementation of protocol sheet and charting (staff)

Appendix E: John T. Mather Memorial Hospital IRB Exempt Letter.



INSTITUTIONAL REVIEW BOARD
75 North Country Road, Port Jefferson, NY 11777

August 15, 2016

Emily Emma, MSN, RN-BC, ONC
60 South Pond Lane
Smithtown, NY 11787

Re: IRB #16-025
Title of Study: Joint Replacement Early Ambulation Program

Type of Review: Full Board
Risk Level: Minimal

Dear Ms. Emma:

This is to confirm that your updates to the application for the aforementioned protocol was reviewed on August 09, 2016 and determined to be exempt from review by the IRB.

You are granted permission to conduct your study as described in your application effective immediately. You are not required to obtain signed written consent from the subjects participating in this study. You are not required to obtain continuing review or to provide a closeout report to the IRB.

Please note that any changes to the study as approved must be promptly reported and approved. Some changes may be approved by expedited review; others require full board review. Contact Ben von Harz, IRB Administrator at 314.703.8716 or via email at matherirb@gmail.com, if you have any questions or require further information. This IRB is organized and operates according to Good Clinical Practices and applicable laws and regulations.

Sincerely,

Henry James Best, IV, DO
IRB Chairman

Sent via email to eemma04@gmail.com

Appendix F: GWU IRB Exempt Letter.

Date: October 26, 2016
To: Kate Malliarakis, PhD
Emily Emma, MSN
From: The George Washington University Committee on Human Research,
Institutional Review Board (IRB), FWA00005945
Subject: Request for Concurrence, "*Joint Replacement Early Ambulation Program*"
Sponsor: None
Status: Exempt

The request for an exemption concurrence for the above-referenced study has been completed. The GW IRB agrees with the determination made by Mather Hospital that this study is exempt from IRB review under DHHS regulatory category 4.

The exemption concurrence applies only to the project described in your submission to the IRB. Any changes that may alter in any way the risks to participants, type of information to be accessed, addition of new populations, or change in PI may not be instituted without further review by the OHR prior to implementation of the changes.

Questions or concerns regarding the exemption concurrence made should be directed to the OHR staff at ohrirb@gwu.edu.

CXR

Appendix G. RN or PT Ambulated Hip or Knee Patient on Day of Surgery Frequency Table.

Who ambulated patient

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	PT	50	39.1	78.1	78.1
	RN	14	10.9	21.9	100.0
	Total	64	50.0	100.0	
Missing	System	64	50.0		
Total		128	100.0		

Appendix H. Group Statistics T-Test.

Group Statistics

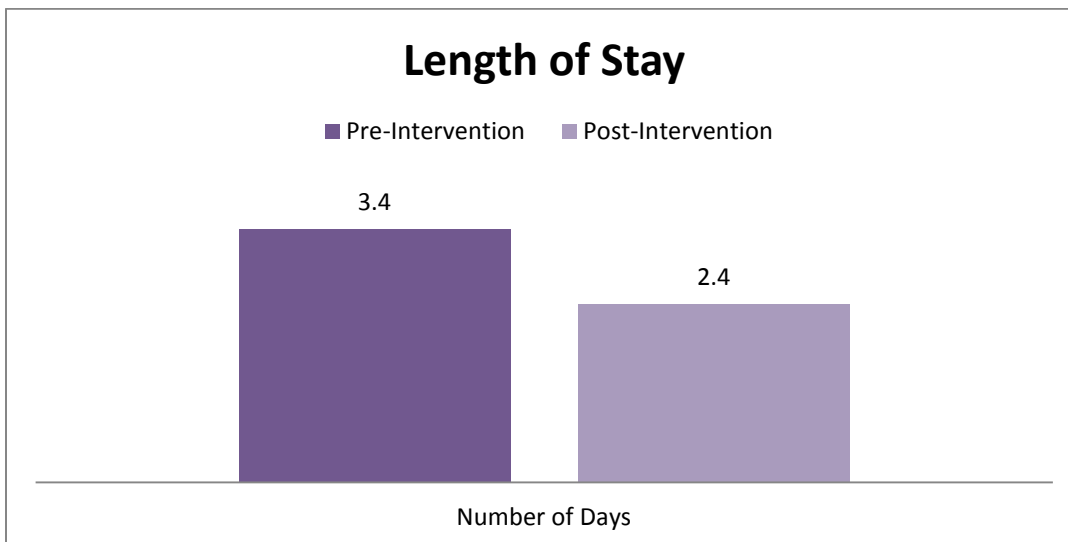
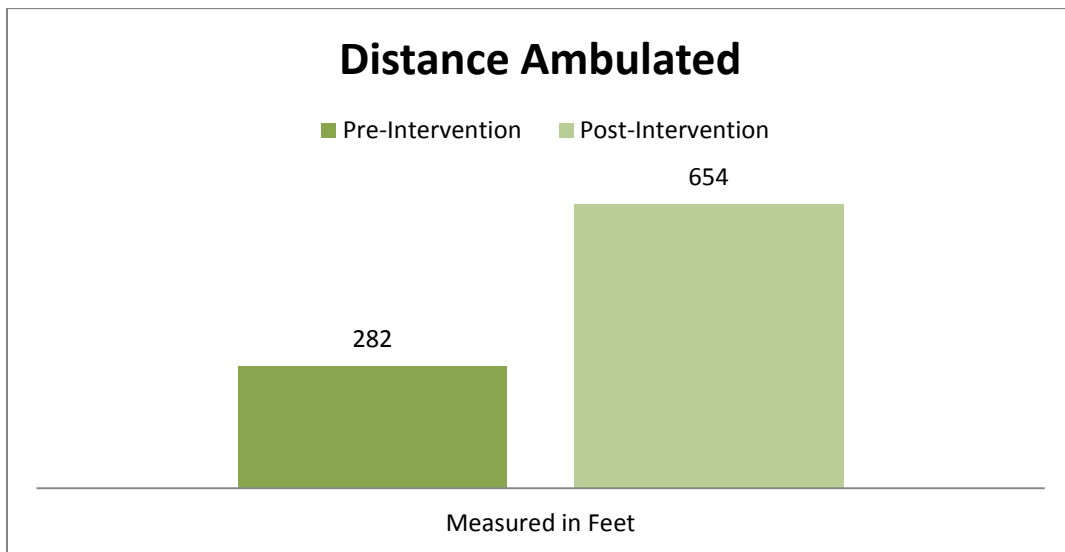
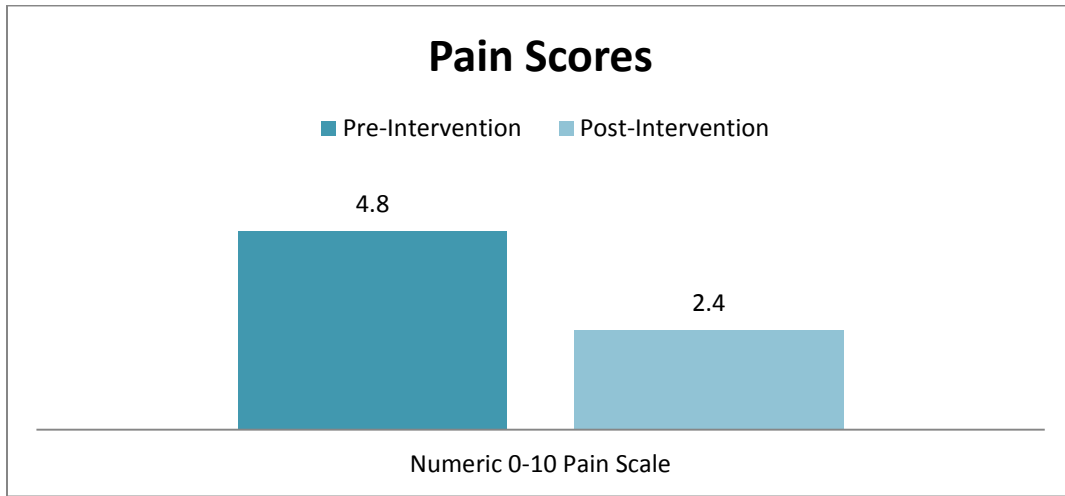
	When did patient ambulate?	N	Mean	Std. Deviation	Std. Error Mean
Total Distance Ambulated Post-Operative	DOS	64	653.641	389.1519	48.6440
	Post-op day 1	64	282.391	152.4607	19.0576
Exact LOS	DOS	64	2.352365	.7371617	.0921452
	Post-op day 1	64	3.356478	1.0218425	.1277303
Average Pain Score Post-Operatively	DOS	64	2.438	1.5824	.1978
	Post-op day 1	64	4.797	1.1976	.1497

Appendix I. Independent Sample Test.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Total Distance Ambulated Post-Operative	Equal variances assumed	35.561	.000	7.106	126	.000	371.2500	52.2439	267.8608	474.6392
	Equal variances not assumed			7.106	81.894	.000	371.2500	52.2439	267.3182	475.1818
Exact LOS	Equal variances assumed	.158	.692	-6.375	126	.000	-1.0041124	.1574985	1.3157973	.6924275
	Equal variances not assumed			-6.375	114.598	.000	-1.0041124	.1574985	1.3160982	.6921266
Average Pain Score Post-Operatively	Equal variances assumed	7.900	.006	9.511	126	.000	-2.3594	.2481	-2.8503	-1.8685
	Equal variances not assumed			9.511	117.343	.000	-2.3594	.2481	-2.8506	-1.8681

Appendix J. Comparative Graphs.



Appendix J. Comparative Graphs (continued).

