A comprehensive and multidisciplinary approach to pre- and post-operative education and treatment for patients with TKA and THA in a rural acute care setting: an Administrative Case Report

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ABSTRACT

Background:

It is imperative to find cost effective ways to decrease healthcare cost related to total knee and hip arthroplasty (TKA, THA) without compromising quality of care. An exact procedure to lower hospital cost that utilizes pre- and post-operative methods to address effective use of time and resources while also lowering length of stay (LOS) and health complications is scarce. The purpose of this administration case report is to provide a detailed description of an approach for pre- and post-operative education and treatment as well as describe the relative retrospective outcomes of the approach in an acute care hospital for patient’s electing TKA or THA.

Case Description:

A 32 bed hospital in rural Wisconsin adopted a hospital-wide procedure in 2008 to increase effectiveness of patient care before and after TKA and THA. The procedure referred to as 'Joint Camp' includes a pre-operative multidisciplinary approach to patient education weeks prior to surgery. All joint replacement surgeries are performed Monday of each week. Patients receive physical therapy post-operative day one with an evaluation and subsequent group therapy treatments. Retrospective data was collected to describe outcomes before and after the implementation of this process.

Outcomes:

Retrospective outcomes between 2007 (before the process implementation) and 2008-2010 (after process implementation) were compared. Outcomes revealed „Joint Camp‟ average LOS decreased, greater percentage of patient‟s were discharge to home, increased surgical volume, decreased complication rates, increased walking distance at discharge and elimination of continuous passive range of motion machines, compression stockings, and solo treatment sessions.

Discussion:

The implementation of a multidisciplinary pre- and post-operative procedure involving group education and treatment improved overall outcomes for the hospital and patients.
**BACKGROUND:**

Among one of the most effective options for improving quality of life in individuals with hip or knee osteoarthritis (OA) is an elective a total joint replacement. The average age of individuals electing for total knee arthroplasty (TKA) is 70 years of age with over 90 percent of those individuals having osteoarthritis. It is expected the average number of individuals seeking total knee or hip arthroplasty will rise due to the large number of aging individuals in the baby boomer population. Thus, it is imperative to find effective ways to decreased healthcare cost related to joint arthroplasty without compromising quality of care.

Efforts to lower the cost of inpatient care have been made by decreasing length of hospital stay while also making attempts to minimize health complications. Those who develop health complications associated with inpatient care require an increased length of stay (LOS). Some complications are infection, deep vein thrombosis (DVT) or pulmonary embolism (PE). Together, DVT and PE are referred to as a venous thromboembolism (VTE). Any of these complications significantly increases hospital LOS and leads to a twofold increase in cost. Percentage of patients whom develop a VTE within the hospital was found to be 0.9% by a large retrospective study by White et. al. Once patients have been diagnosed with a VTE during or shortly after their hospital stay, they are at an increased risk for re-hospitalization and thus increases the cost associated with their healthcare.

One approach to reducing additional hospital costs and LOS is utilization of pre-operative efforts. Studies by Gammon, Sjoling, Spalding, and Yoon have suggested pre-operative education decreases patient anxiety related to surgery, hospitalization, and their elective procedure while also improving their ability to cope and thus promote physical healing. All of these efforts can decrease LOS by educating patients on what to expect from their orthopedic surgery and how to best avoid some of the most common health complications. Just as patients who have a health complication have increased LOS, patient’s who exhibit poor pain management may also have an increased LOS. Pre-operative education has also been found to increase patient satisfaction rates with methods for pain management.

Reduction of healthcare costs is also achieved by discharging patients to home rather than a subacute rehabilitation facility. Utilization of pre-operative exercise programs have been discussed in literature as they relate to patient discharge locations from the hospital. Rooks et. al found that individuals participating in a six-week land based and water based exercise program
before THA or TKA had improved odds of a home discharge as compared to individuals who did not partake in the exercise program. Several studies have demonstrated conflicting results for long and short term functional recovery with the implementation of a pre-operative exercise regimen for patients electing for TKA or THA.\textsuperscript{9-11} Despite conflicting results for pre-operative exercise for both TKA and THA, hospitals are still implementing pre-operative exercise programs.\textsuperscript{11} Instead of spending money towards implementing programs with inconclusive results, hospitals should be considering implementing programs which are supported by literature to decrease cost and improve patient function and satisfaction.

Many authors\textsuperscript{5-7,9-11} have discussed generalized pre-operative efforts to TKA and THA. However, lacking in literature is an exact procedure to lower hospital cost that utilizes pre- and post-operative methods to address effective use of time and resources while also lowering LOS and health complications. The purpose of this administration case report is to provide a detailed description of a multidisciplinary approach for pre- and post-operative education and treatment as well as describe the relative retrospective outcomes of the approach in an acute care hospital for patient’s electing for TKA or THA. The following retrospective outcomes will presented in this case: 1) average LOS, 2) location of discharge, 3) joint replacement volume, 4) complication rates, 5) walking distance at discharge and 6) gender, age, and insurance distributions from 2007-2010.

**CASE DESCRIPTION:**

**Setting and Patient Population**

Based upon availability, the patient population for this case was chosen within an acute care hospital setting in rural Wisconsin. The thirty-two bed hospital has an objective of becoming the leading joint replacement center in the area. The hospital reserves eight patient beds on the medical/surgical floor specifically for patients post orthopedic procedures including total knee and hip replacements. Orthopedic surgeon staff includes three physicians who perform high volumes of elective orthopedic surgeries. Physical therapy staff includes one fulltime physical therapist (PT) and one fulltime physical therapist assistant (PTA) for the entire hospital.

To meet the needs of this patient population, the organization adopted a hospital-wide procedure to increase effectiveness of acute patient care before and after elective TKA or THA. An additional underlying goal was to reduce hospital length of stay and medical complications.
associated with the acute phase of patients recovering from TKA and THA. This required collaborative efforts from orthopedic surgeons, nurses, physical and occupational therapists, and additional staff. Efficiency began with orthopedic surgeons agreeing to perform all TKA and THA on the same day of each week. Therefore, every Monday, (with the exception of holidays), the joint replacement surgeries are performed to keep the patients on similar acute care phases for recovery. This influx of patients required additional staffing within the hospital to accommodate for the changes in surgical scheduling an increased nursing, pharmacy, housekeeping, lab, and kitchen staff. The approach to physical therapy was altered to also include volunteer staff to assist the PT and PTA.

The hospital’s effort to make an organizational-wide change to accommodate the pre- and post-operative needs of patients electing for TKA or THA was implemented in 2008. The process referred to as 'Joint Camp' will be described next and includes pre-operative education and post-operative education with treatment through individual and group therapy sessions.

**Pre-operative Education Process**

The pre-operative educational process for the ‘Joint Camp’ program begins once the patient and their orthopedic surgeon schedule a date for their surgery. Typically, the date for surgery is selected three to four weeks in advance. A three ringed binder is presented to the patient containing pre- and post-operative expectations to surgery. Particular attention is drawn to the section of the binder providing written descriptions and pictures of the exercises for the patient to perform pre-operatively. These exercises are the same as the post-operative exercises the patient will be performing acutely.

In some cases, patients obtain a pre-operative physical therapy evaluation at the location they plan to seek outpatient therapy services. If the patient’s are planning to receive outpatient services from the outpatient therapy clinic affiliated with the hospital, they are evaluated on items such as their past medical history, level of function, range of motion (ROM) and strength of the joint of interest, gait pattern, and transfer ability. The therapist also inquires about any adaptive equipment the patient may own, their family support, and living environment. Components of the evaluation also includes a review of the goals and expectations of having a joint replacement, a review of the hip precautions if applicable, and a review of the preoperative exercises including but not limited to ankle pumps, quad set, heel slide, short arc quad, long arc
quad, and straight leg raise. Education on utilizing an assistive device is also warranted if the patient requires it. Not all of the patients receive this therapy preoperative evaluation due to their varying discharge plans, schedules, or preferences.

All of the patients are informed however, to attend the pre-operative educational course which begins the patient’s journey through the ‘Joint Camp’ program. One of the hospital’s experienced registered nurses (RN) was appointed to be the Joint Care Coordinator for the ‘Joint Camp’ program. The Joint Care Coordinator contacts the patient after they have scheduled a surgery date and schedules them for a pre-operative educational class. The class is offered every Tuesday of each week and depending on the patient’s schedule, the pre-operative class is attended one to four weeks prior to the scheduled surgery date. The group class is an educational effort for patients and their family members on how to prepare for surgery, what to expect in the hospital, and how to best prepare for the discharge location of their preference. The group lecture is lead by the Joint Care Coordinator via PowerPoint slide show and highlights the main components of the information obtained from the three ringed binder.

Although the class is run by the Joint Care Coordinator, a multidisciplinary approach is taken to further educate the patient’s on what to expect from other caregivers in the acute care setting such the anesthesiologist, pharmacologist, and physical therapist. After a 60 minute lecture, the PT or PTA makes an appearance to the group to discuss the inpatient therapy schedule and typical discharge day. They also discuss the mobility implications after having a femoral nerve block during a TKA. Patient safety is emphasized for the patient’s to utilize their nursing call lights when they want to get up to use the bathroom until cleared by the PT to be independent in their room. Safety and utilization of the equipment in the patients’ room is also emphasized. This is especially true for the wheeled recliner chairs present within each patient’s room.

The wheeled recliner chairs were special ordered for the ‘Joint Camp’ patient rooms to promote lower extremity edema control with foot rest elevation and adjustable head rest decline. They were also chosen for ease of transport. The therapy staff reviews how to use the breaks and also how to manually recline the chair. Importance of icing and reclining with the legs above the level of the heart is emphasized to the group of patients.

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1 Winco Model #6531 Oscala, FL.
Post-operative Education and Treatment Process

After the surgeries are performed on Monday each week, patients are relocated to their private room on the medical/surgery floor of the hospital. The nursing staff utilizes an intermittent compression system for acute control of lower leg edema in the surgical limb immediately after the patient enters their room. Patients who are post TKA are fitted with a foot compression garment with the unit adjusted to 80 millimeters of mercury (mmHg) of pressure. A calf compression garment set at 40 mmHg is utilized for patients who received a THA. Nursing staff will leave the garment on the entire day of surgery and morning after until the patient sees the physical therapy staff for evaluation. Nurses will typically wean patients off of the intermittent compression by post op day 2-3 once the patient is able to increase tolerance in ambulation. Physical therapy staff isn’t typically involved with the application, establishment of parameters, or discharge of the intermittent compression for patients in this acute care facility. However, close communication between nurses and therapy staff is utilized to discuss each patient’s progress in mobility during their course of inpatient treatment.

Post operative day 1, Tuesday morning, is the first time the patients receive a visit from the physical therapist. The initial evaluation is performed in the morning and includes not only education on walking with a wheeled walker, but also individual training with transfers and exercise. Any given week may contain 2-8 patients who require a PT evaluation for a joint replacement. Patients are seen twice each day they remain in the hospital. After patients receive their initial PT evaluation, the remainder of their sessions revolves around group therapy times.

Group PT sessions begin on Tuesday afternoon for all of the patients who underwent a TKA or THA. Group sessions are then continued once every morning and afternoon until discharge with typical discharge by the end of post op day 3 (Thursday).

Baskets for each patient are assembled prior to initial evaluation. Contents of the baskets include a laminated exercise sheet and hospital floor map, taped towel roll, pillow case and washcloth, egg timer, and handcrafted bead counter. See Appendix I. The everyday tools within the basket are for the patient to utilize for their therapeutic exercises while in the hospital. Initial introduction to the exercises and the basket contents are done by the PTA after the therapy evaluation. It is then transported from the patient’s room to the group therapy room with the patients for each group session.

ii Compression Therapy Concepts, Vaso Press DVT Model VP500
One to two volunteer staff typically assist during each group session with recliner chair and exercise basket transport as the PT and PTA work to guard each patient during ambulation to the therapy room. Volunteer staff is prohibited in touching the patients in any way including assisting in positional changes during exercises. They are there to act as additional coaches for the patients and to offer their own personal experiences with joint replacements. Various other volunteers help after group therapy hours to assemble/disassemble the exercise baskets.

Once patients are all gathered in the group therapy room, they are positioned in the reclined position within their wheeled recliner chairs with a Plexiglas slide board beneath their lower extremities.iii This helps promote ease of movement during their exercises. Necessary tools from their baskets are retrieved as needed for each exercise. Patients and family members learn the exercises through the instruction of the PT and PTA as well as through the instructional laminated exercise sheet. See Appendix II and III. The PT and PTA assist in manual and verbal cues as well as provide assistance during positional changes. Exercise order was determined based upon ease of positional changes.

Each patient is designated two 10 x15 inch ice packs which are stored in a common freezer.iv Ice packs are utilized at the end of each group therapy session as well as around the clock as needed by the patient. Nursing staff, PT staff, and family members of the patients are permitted in retrieving the ice packs for the patient. PT recommendations for ice during hospital stay are 20 minutes of ice each hour. At discharge, patients are given their ice packs to take home.

Individual patient treatment time is given to each patient at the start and end of each group therapy session for gait training. Additional individual training is received by each patient for stair ambulation which typically occurs on their day of discharge. Patient’s have the opportunity to also receive transfer training into their vehicle of transport on their day of discharge by the PTA.

Family members are encouraged to join the group sessions to act as the patient’s coach and supporter. The family members also receive education from the physical therapy staff including methods of assistance and reinforcement for the patient’s exercise program. Additional

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iii Custom-made by hospital maintenance staff.
v
iv Pelton Shepherd Industries, Polar Ice, Stockton, CA.
recommendations on gait and transfer patterns, icing/elevating schedules, and accommodations or patient needs are addressed by the PT and PTA.

Coulter et. al\textsuperscript{12} suggests group rehabilitation classes for patients with TKA or THA is a cost effective approach without sacrificing quality of patient outcomes when compared to on-on-one treatment. The rationale for implementing a group atmosphere for treatment is not only to increase hospital efficiency and cost effectiveness, but also to promote patient and family members socialization and communication about their personal experiences. Teamwork, camaraderie, and moral support are also some of the outcomes the hospital wants to promote between patients with this group approach.

\textbf{Data Collection}

Retrospective data was collected between the calendar years of 2007 and 2010. Records of all patients receiving total knee and hip replacements were compiled to include data of each patient’s joint replacement procedure, age, gender, discharge location, hospital length of stay, and insurance type. Calculations that were derived from the data collected included total volume of patients receiving TKA and THA including breakdown of gender, average length of stay (LOS), percent of patient location of discharge (d/c), and percentage of patient’s who carried Medicare/Medicaid insurance. Additional data calculations included yearly VTE rates, as well as percent infection rates from all patients receiving knee or hip replacements in the years 2007-2010.

\textbf{OUTCOMES DATA:}

Retrospective outcomes of the data collected from 2007 (before the implementation of the „Joint Camp” process) and 2008-2010 (after the initiation of „Joint Camp”) demonstrate certain trends. The average age decade of people receiving a TKA was 60 and THA was 70. See figure 1 for bell curve age distributions. See figures 2 and 3 for gender distributions and volume distributions across the years. Complications of VTE although not available from the year 2007, declined from 2008-2010. See Table 1. From 2007 to 2009 there was a .1% decrease in infection rate. However, there was a .8% increase in infection in 2010. The data reflecting health complications was a comprehension of the patient’s rate of infection and VTE during their hospital stay and within 30 days after d/c if hospital re-admission was required.
Average LOS has decreased since the initiation of “Joint Camp” in 2008. See Figure 4. An increased percentage of patients were discharged to home rather than a subacute facility after their hospital stay. See Figures 5 and 6. Functional changes included ambulation distance at time of discharge. Typical patient walking distance at discharge greatly increased from 200 feet before „Joint Camp” in 2007 to 800-1000 feet in 2010.

Payment source of patients receiving TKA and THA are displayed in Figure 7. Medicare was the most common insurance. Other payment sources included commercial insurances or self-pay.

**DISCUSSION:**

The purpose of this administrative case report was to describe a specific protocol for pre- and post-operative education and treatment for patients electing for TKA or THA at an acute care hospital. This hospital’s approach was referred to as „Joint Camp” and over a 4 year period there has been a reduction in LOS, and VTE rates after surgery. Discharged walking distance suggests most patients were able to walk four times farther than before the process of “Joint Camp.” Data also suggests more people were able to be discharged home vs. subacute facility after the implementation of „Joint Camp”. The outcome data on infection rates also show an increase in percentage rate of infection in 2010 possibly due to an outlier.

Yoon et. al\(^7\) found that offering pre-operative education to patients receiving knee or hip arthroplasty can significantly reduce hospital LOS by one day. Data from this case also supports this. Williams\(^13\) and Parvizi\(^14\) would argue that discharge within 2-3 days post-joint replacement increases risk of health complications related to hip dislocation and VTE. However, VTE outcomes from this case show low rates and reflect the VTE occurrences during patients” hospital stay and 30 days post discharge.

Analyzing the post-operative care of this case, Coulter et. al\(^12\) supports group rehabilitation classes for patients with TKA or THA and shows that it is a cost effective approach without sacrificing quality of patient outcomes when compared to on-on-one treatment.

Difficulties arose when implementing this process in 2008 due to the requirement of a hospital-wide agreement on the approach. The procedure eliminated such uses of continuous passive range of motion machines, compression stockings, and solo treatment sessions while
integrating pre-operative education, intermittent compression machines, and group therapy sessions.

CPM’s have been a tool utilized within inpatient care as a way to promote early ROM. Research is conflicting but states that there is no long-term benefit with CPM use but it may offer short-term improvements with range of motion (ROM).\textsuperscript{15} Lenssen et. al\textsuperscript{16} suggests that CPM use improves pain perception within the first four days post surgery however, Bruun-Olsen\textsuperscript{17} argues that there is no additional benefit to the CPM when compared to active exercise in the first few weeks post-operative. The rural hospital in this case chose not to implement the CPM into their plan of care for their patients” due to the cost and inconclusive research.

This hospital also chose not to utilize graded compression stockings for the lower extremity due to the cost and having limited storage. Compression garments are typically chosen to provide intermittent compression of the lower extremity after surgery to decrease edema and reduce risk of VTE.\textsuperscript{18} This hospital instead chose to utilize a machine that provides intermittent compression with washable foot and calf garments. Research is lacking on the effectiveness of this machine vs. compression stockings but the hospital made its decision based upon it being a reusable resource located within each patient’s hospital room. In addition to the intermittent compression machine, active exercise and ambulation are encouraged to the patients to help reduce risk of VTE. The VTE rates at this hospital since 2008 have decreased and are lower than VTE rates reported at 0.9% by White et. al.\textsuperscript{4}

Data from subjects for this case report from 2007-2010 are comparable to other populations receiving TKA and THA. However, further research is still necessary for the implementation of such a process in more hospitals of varying sizes and demographics. Research is also necessary perform cost analysis of this form of pre- and post-operative education and treatment.

CONCLUSION:

The implementation of a comprehensive pre- and post-operative procedure involving group education and treatment improved outcomes such as LOS, VTE rates, and preferred DC location after total knee or hip arthroplasty at a rural acute care hospital.
REFERENCES:


Table 1. Complication rates for all patients receiving TKA and THA before (2007) and after (2008-2010) the implementation of „Joint Camp’s” pre- and post-operative education and treatment procedure.

<table>
<thead>
<tr>
<th>Year</th>
<th>Infection</th>
<th>Venous Thromboembolism (VTE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 (n=162)</td>
<td>0.4%</td>
<td>x</td>
</tr>
<tr>
<td>2008 (n=189)</td>
<td>0.4%</td>
<td>1.2%</td>
</tr>
<tr>
<td>2009 (n=194)</td>
<td>0.3%</td>
<td>1.3%</td>
</tr>
<tr>
<td>2010 (n=191)</td>
<td>1.1%</td>
<td>0.3%</td>
</tr>
</tbody>
</table>
Figure 1:
Age distribution by decade for patients receiving THA and TKA for the combined years 2007-2010.
Figure 2:
Volume and gender distribution across the years for patients receiving TKA before (2007) and after (2008-2010) the implementation of 'Joint Camp.'
Figure 3:
Volume and gender distribution across the years for patients receiving THA before (2007) and after (2008-2010) the implementation of ‘Joint Camp.’
Figure 4:
Average hospital LOS for patients receiving TKA and THA before (2007) and after (2008-2010) the implementation of 'Joint Camp.'
Figure 5:
Location of discharge for patients receiving TKA before (2007) and after (2008-2010) the implementation of ‘Joint Camp.’
Figure 6: Location of discharge for patients receiving THA before (2007) and after (2008-2010) the implementation of 'Joint Camp.'
Figure 7:
Payment sources for all knee and hip joint replacements before (2007) and after (2008-2010) the implementation of ‘Joint Camp.’ *Other: commercial insurance, self pay, etc.
### Appendix I.
Detailed description of each patients’ basket contents and uses.

<table>
<thead>
<tr>
<th>Basket Contents</th>
<th>Patient Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laminated exercise sheet</td>
<td>Visual and written instruction for exercises.</td>
</tr>
<tr>
<td>Laminated hospital floor map</td>
<td>Directional use and distance calculations for once independent with ambulation.</td>
</tr>
<tr>
<td>Taped towel roll</td>
<td>Support during quad sets and short arc quads.</td>
</tr>
<tr>
<td>Pillow case</td>
<td>Skin-ice barrier during icing.</td>
</tr>
<tr>
<td>Washcloth</td>
<td>Assist during seated heel slides/knee flexion to reduce friction between patients’ non-skid socks and floor.</td>
</tr>
<tr>
<td>Egg timer</td>
<td>Individualized timing during icing after group therapy sessions.</td>
</tr>
<tr>
<td>Bead counter</td>
<td>Handcrafted keepsake and assist in counting repetitions of exercises.</td>
</tr>
</tbody>
</table>
Appendix II.
Exercise order for patients receiving TKA. Exercises denoted with * are performed in a reclined position with Plexiglas under bilateral lower extremity for decreasing friction.

<table>
<thead>
<tr>
<th>Treatment Order</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ankle pumps*</td>
<td>None.</td>
</tr>
<tr>
<td>Quad sets*</td>
<td>Towel roll under ankle.</td>
</tr>
<tr>
<td>Short arc quads*</td>
<td>Towel roll under knee.</td>
</tr>
<tr>
<td>Straight leg raises</td>
<td>Remain in reclined position and flex opposite leg for back support.</td>
</tr>
<tr>
<td>Long arc quads</td>
<td>Sitting at edge of chair.</td>
</tr>
<tr>
<td>Heel slides</td>
<td>Sitting at edge of chair with washcloth under foot.</td>
</tr>
<tr>
<td>Ice with knee extension stretch</td>
<td>Sitting in chair with leg supported in extension and pillowcase used as skin-ice barrier.</td>
</tr>
</tbody>
</table>
Appendix III.
Exercise order for patients receiving THA. Exercises denoted with * are performed in a reclined position with Plexiglas under lower extremity for decreasing friction.

<table>
<thead>
<tr>
<th>Treatment Order</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ankle pumps*</td>
<td>None.</td>
</tr>
<tr>
<td>Quad sets*</td>
<td>Towel roll under ankle.</td>
</tr>
<tr>
<td>Gluteal sets*</td>
<td>None.</td>
</tr>
<tr>
<td>Hip abduction *</td>
<td>Hip precautions.</td>
</tr>
<tr>
<td>Heel slides*</td>
<td>Hip precautions.</td>
</tr>
<tr>
<td>Standing marches</td>
<td>Wheeled walker for upper extremity support.</td>
</tr>
<tr>
<td>Standing hip extension</td>
<td>Wheeled walker for upper extremity support.</td>
</tr>
<tr>
<td>Standing hip abduction</td>
<td>Wheeled walker for upper extremity support.</td>
</tr>
<tr>
<td>Ice with elevation</td>
<td>Sitting in reclined chair with pillowcase used as skin-ice barrier.</td>
</tr>
</tbody>
</table>