

Improving Care and Reducing Length of Stay in Patients Undergoing Total Knee Replacement

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A team approach to orthopedic surgery process improvement helped reduce length of stay without increasing 30-day readmission rates.

Many improvements in health care today involve care coordination across the entire health care system. Active management of an orthopedic surgery service from a system perspective allows for improvements that can favorably impact readmissions and length of stay (LOS) for patients.¹ The following is an example of a system-wide process improvement in total knee replacement (TKR) surgery that dramatically decreased 30-day readmissions and shortened the LOS during a 12-month period.

BACKGROUND

The VA is the largest integrated health care system in the U.S. VA hospitals use the VA Surgical Quality Improvement Program (VASQIP) to monitor surgical services. Initially known as the National Surgery Quality Improvement Program (NSQIP), the program began in 1994 to help provide reliable, valid information on patient presurgical factors, processes of care during surgery, and 30-day

morbidity and mortality rates in VA hospitals.² Since its inception, NSQIP has spread to the private sector and is now widely used throughout the U.S.

Using on-site data acquisition by specially trained and dedicated registered nurses, information on each surgical case is input into a quality program. Quarterly reports are distributed to each hospital, and a comparison of mortality, LOS, 30-day readmissions to the hospital, and other data are analyzed and presented by quarter and rolling 12-month time frames. Use of VASQIP data allows improvement of the structures and processes of care throughout the VA, providing safer surgery for veterans.

At the Phoenix VA Health Care System (PVAHCS) in Arizona, the third quarter 2014 report showed the rolling 12-month average LOS for orthopedic TKR patients was 3.5 days and corresponding 30-day readmissions were 7.9%. Using a systems improvement approach, the authors set a goal of reducing these metrics by 10%.

The orthopedic service engaged members of the hospitalist, anesthesia, physical therapy (PT), nursing, social work, primary care, and pharmacy services, as well as hospital administration. Twelve months

later, the LOS for TKR patients declined 20% to 2.8 days. Corresponding 30-day readmissions declined for the patients with knee replacement to 3.4%—a 57% reduction in 1 year. Mortality for these 177 cases was zero.

To accomplish these improvements, the authors divided the surgical procedure into preoperative, perioperative, and postoperative time frames and looked at process improvement during each of these periods. The following is a summary of the various processes that the authors feel contributed to the reduced LOS and 30-day readmission rate. Although some of these interventions were in place before the study period, all the processes were standardized for TKRs through surgeon consensus, and each of the surgeons adopted all the processes during the study period.

PREOPERATIVE PROCESSES

In the VA primary care-based model orthopedic surgery is accessed through a consult process in the electronic health record. The orthopedic surgery service reviews each new consult and makes recommendations for optimization at the time the consult was received. This process was

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used to work closely with primary care providers to preoperatively prepare patients. The orthopedic surgery service advocates smoking cessation, substance abuse treatment, weight loss with an ideal body mass index of ≤ 35 , and diabetes mellitus (DM) management with a ≤ 7 hemoglobin A_{1c} value.³⁻⁷

This management did not result in fewer patients receiving TKR. In fact, the volume of TKR patients increased by 8% over the study period. Although part of this increase could have been due to increased scheduling efficiency, the orthopedic surgery service worked closely with primary care, nutrition, and medicine services to optimize these patients so they could be placed on the schedule for surgery.

Preoperative Education

Physical therapy and the orthopedic preprocedure clinic provided preoperative education to patients, covering preoperative chlorhexidine body washes, home safety, use of a walker, anticipated LOS, use of ambulatory sequential compressive devices, use of a knee cooling device, as well as PT protocols during hospitalization.⁸ This helped increase postoperative patient adherence and helped patients anticipate an appropriate LOS. Health care providers worked with patients to understand their home environment and plan for caregivers to assist them in the immediate postoperative period.

INTRAOPERATIVE PROCESSES

Reducing Blood Loss

The orthopedic surgery service reviewed literature related to the efficacy and safety of tranexamic acid. Based on the literature, the orthopedic surgery service arrived at a consensus agreement to implement

a topical tranexamic acid dose of 3 g/100 cc saline for each TKR. Presentation of the pertinent literature to the pharmacy service allowed placement of this medication on the formulary for intraoperative use in the TKR cases.

Specific processes were implemented that involved the orthopedic service ordering tranexamic acid in advance for each patient, pharmacy mixing the solution and having it ready in a timely manner, and the operating room sending a messenger to the pharmacy to pick up a sterile container of the tranexamic acid/saline solution. Postoperative blood loss and transfusions decreased. Less anemia contributed to better performance and less fatigue in PT, which helped move patients down a pathway for quicker discharge.^{9,10}

DVT Mechanical Prophylaxis

The orthopedic surgery service was concerned about adherence with stationary sequential compressive devices for mechanical thromboembolic prophylaxis. Patients had to remove them for PT, ambulation in the halls, and visiting the restroom, and then nurses had to replace them. A literature review examined a mobile compressive device that could be maintained during ambulation, and a demonstration for the orthopedic surgery service was arranged. The orthopedic service decided to change to the newer device, and the mobile compression device was presented to the PVAHCS Therapeutics Committee. Subsequently the new device was implemented after the appropriate in-service of the various clinic, PT, ward, surgery, preoperative, and postoperative personnel.¹¹ The device was initiated in the holding area prior to surgery, continued throughout the hospitalization, and taken home by the patient for 2 weeks of use follow-

ing surgery. Patients were instructed to return the device to clinic at their 2-week follow-up appointment.

Infection Control

A dilute betadine lavage was instituted for each surgical case, using the pulsatile lavage followed by a lactated Ringer solution rinse prior to TKR implantation. Additionally, the wound was lavaged prior to closure with this dilute betadine solution.¹²

Pain Control

Immediately before surgery, patients received oral morphine sulfate and celecoxib. A local 2% lidocaine with epinephrine injection was used at the surgical incision and joint after the skin prep and immediately prior to the skin incision. Patients received a mixture of ropivacaine .5%/20 mL, morphine sulfate 10 mg, and toradol 30 mg at the capsular region prior to implantation of the total knee prosthesis. At the end of the procedure, an additional 20 mL of 2% lidocaine was injected into the joint once the capsule was closed. This improved postoperative pain, decreased postoperative opioid dosing, and allowed for earlier ambulation with PT.¹³

POSTOPERATIVE PROCESSES

Deep Vein Thrombosis (DVT) Chemoprophylaxis

Once the chest physician guidelines-approved stand-alone mobile compressive devices was implemented, orthopedic surgery service revisited the chemoprophylaxis for routine low-risk patients. Use of subcutaneously daily injections of 2.5 mg fondaparinux was switched to 81 mg enteric-coated aspirin administered orally twice daily. The authors believe this further reduced the postoperative bleeding and transfusion risks. There was not an increase in DVT or pulmonary embolism complications.^{14,15}

Physical Therapy

Partnering with PT, a 2-day LOS protocol was established. Patients were introduced to this protocol in a preoperative PT teaching class, and it was reinforced during the hospital stay. Patients who had earlier cases in the day were seen by PT the day of surgery when staffing and scheduling permitted. Early ambulation contributed significantly to earlier discharge for patients.¹⁶ Early ambulation also has been shown to decrease thromboembolic complications in orthopedic total joint patients.

Pain and Nausea Management

Parenteral narcotics were avoided, and oral narcotics were implemented with a graduated dosing based on a 10-point pain scale. For most patients, this was adequate and avoided the nausea frequently seen with the injectable narcotics.

Use of a postoperative cooling device that circulated cool water through a pad over the patient's knee was instituted to assist with pain control. The patient received instruction on this device at the preoperative education sessions and was given the device to continue at home postdischarge.

Hospitalist Comanagement

Comanagement of orthopedic patients with hospitalists has become a standard practice nationally. The orthopedic surgery service works closely with the hospitalist team who see each total joint patient on postoperative admission to the ward. The orthopedic team handles all aspects of PT, wound management, pain control, and DVT prophylaxis. The hospitalist focuses on the remainder of comorbid conditions such as DM, chronic obstructive pulmonary disease, and underlying cardiac conditions.

The American Society of Anesthesiologists (ASA) average score was 2.8 for these procedures. Despite comprehensive preoperative screening, older patients with more comorbidities (higher ASA score) are more prone to emerging complications.¹⁷ Integration of the hospitalist team into the care of every orthopedic total joint patient facilitates prompt recognition and mitigation of these complications as they occur, directly reducing overall severity and LOS and allowing safe recovery from the surgical procedure.^{18,19}

CONCLUSION

At the start of this system improvement, the previous 12-month data showed 164 knee replacements with a 4.9-day VA national LOS and 3.5-day PVAHCS LOS. At the end of the 12-month system improvement, the VA national LOS for TKR was 4.8 days, and at PVAHCS it was 2.8 days.

The 30-day readmission rate was 8.4% nationally and 7.9% at PVAHCS. After the system improvements, the national 30-day readmission rate was 7.1%, while the PVAHCS rate dropped to less than half the national rate: 3.4%.

It is important to note, that the improvements in the aforementioned multiple processes could not have been possible without a dedicated effort from the multiple stakeholders involved. Hospitalists, primary care, PT, pharmacy, operating room staff, anesthesia, preprocedure staff, floor nurses, the Commodities and Therapeutics Committee, and administration all partnered with the orthopedic surgery service to produce the improvements in LOS and corresponding reduction in 30-day readmissions.

These data suggest that there does not need to be an inherent tradeoff between LOS and 30-day readmis-

sions. Rather, both measures can be managed independently to produce improvements across the service. A team approach to process improvement can allow for increased efficiency while providing safer care for patients. ●

Author disclosures

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