

Title

The introduction of a multimodal clinical pathway for outpatient total knee arthroplasty in the COVID-19 era.

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Introduction

The Sars2CoV pandemic had an enormous impact on healthcare systems over the past 9 months. With emergency rooms and intensive care units at or near capacity, many hospitals had to cancel or postpone many elective surgeries. A recent report showed that 106 hospitals were postponing elective procedures amid the resurgence of Covid-19 cases, resulting in significant financial ramifications and limiting patients' access to care.¹ With concern for nursing and bed shortages, and a desire to preserve personal protective equipment and other hospital resources, it seems justifiable to cancel elective cases. However, these delays in care are not without consequences. While the long-term effects of these delays in care may not be known for some time, the emotional and economic toll is readily apparent. Total joint arthroplasties are one surgical service line that has been particularly affected. A recent study in the *Annals of Medicine and Surgery* estimated a cancellation rate of 82% in the early months of the pandemic.² In patients with debilitating arthritic conditions, delaying or cancelling these cases can adversely affect their quality of life and contribute to worsening disability. Our practice at Maine Medical Center, a tertiary academic medical center based in Portland, Maine, has been no exception to these cancellations and, as a result, a small task force was created to introduce a safe and effective protocol for outpatient total knee arthroplasty. This quality improvement initiative has been a multidisciplinary project involving surgeons, anesthesiologists, nursing, and physical and occupational therapy staff with the united goal to achieve, on an outpatient level, the successful outcomes our joint program has enjoyed over the years. Our program combines modern regional techniques and short acting neuraxial anesthesia so that patients are able to recover in a significantly shorter time period and avoid hospital admission, saving hospital staff, supplies, and beds for critically ill patients in demand during this pandemic.

Material and Methods

Before the pandemic, our total knee arthroplasty surgical service had transitioned to a next day discharge with large success. Given the constraints caused by the pandemic, it resulted in the development of an anesthetic protocol that would allow for expedited discharge following surgery.

Patient selection for the new outpatient knee arthroplasty was extended to all existing patients who were eligible for the next day knee program. Patients who were willing to participate, had a low ASA class (<3), and had home support were considered eligible. Non eligible patients were left to the surgeons' discretion, but included factors such as age >75, high ASA classification (>2), bleeding disorders, severe cardiac or pulmonary disorders, uncontrolled diabetes, chronic opioid consumption, and functional neurologic impairment.

After discussion with the surgeons, pharmacists, and anesthesiologists, a new anesthetic protocol was developed to best suit a same day discharge. Pain management consisted

of a multimodal approach that limits the use of opioids, minimizes pain, and facilitates early mobilization.

Patients in both protocols received pre and postoperative oral pain medicine (details shown in Table 1).

Table 1: Pre and Post Surgical Medications

Night Prior	Morning of	Discharge
Celecoxib 200 mg	Celecoxib 200 mg	Celecoxib 200 mg BID x 3d, then daily until complete (disp #14)
Pregabalin 50 mg	Acetaminophen 1000 mg	Pregabalin 50 mg BID x 3d, then nightly until complete (disp #14)
Acetaminophen 1000 mg		Acetaminophen 1000 mg TID
		Oxycodone 5mg 1-2 tab q 4h PRN (disp #42)

Anesthesia for both protocols focused on regional techniques with limited opioid exposure (Table 2). The new outpatient protocol was developed to facilitate rapid mobilization prior to discharge with long acting pain relief.

Table 2: Anesthesia Protocols

Previous anesthesia protocol	New anesthesia protocol
0.5 or 0.75% bupivacaine spinal	Spinal 60mg 2% mepivacaine
Postoperative adductor canal 20cc 0.5% ropivacaine	Preop adductor canal with 10cc 0.5% bupivacaine, 10cc 13.3% liposomal bupivacaine
	Preop iPACK block 20cc 0.2% ropivacaine
Posterior injection by surgeon (bupivacaine 120mg, epinephrine 300mcg, morphine 8mg)	Posterior injection by surgeon (bupivacaine 50mg, epinephrine 100mcg)
Propofol sedation	Propofol sedation

The surgical protocol remained the same with a focus on minimizing blood loss and preventing surgical site infections. This included the use of a tourniquet, tranexamic acid administration, preoperative warming, and prophylactic antibiotics.

Results:

A total of 49 patients underwent the new same day knee protocol between December 2020 and January 2021. A cohort of 48 patients from the same time period one-year prior was used as comparison.

Data was collected by the surgical team and included patient age, ASA score, anesthesia time, procedure time, length of stay, post-operative IV hydromorphone use, postoperative oral opioids, pain score in hospital, and pain scores at two weeks follow up (shown in Table 3). Average age was 63 for both groups and average ASA scores were comparable (2.3 for next day knee patients and 2.2 for same day knee patients).

Table 3: Demographics and Outcomes

	Next day knee	Same day Knee
Number of patients	48	49
Average LOS (hrs)	42	12
Number of patients needing IV hydromorphone post op	15	11
Number of patients needing oral opioids post op	41	32
Average pain score in hospital	3.9	3.8
Average pain score at 2 weeks	3.3	3
Number of patients filling narcotics following surgery	25	20
Total number of narcotics refills following surgery	49	27

Discussion

The current COVID-19 pandemic is inflicting enormous damage on the healthcare industry. The American Hospital Association estimates that U.S. hospitals and health systems will lose \$120.5 billion between July and December 2020 due to reductions in patient volumes.³ As one of the most commonly performed surgical procedures in the United States, total joint arthroplasties have similarly decreased substantially during the pandemic, with a negative impact on patients' quality of life. At Maine Medical Center, the flagship hospital of Maine Health, we have successfully introduced a new pathway for outpatient total knee arthroplasties with a high level of success. Results were found to be similar between both cohorts indicating a continuation of the prior success of our program and a proof of concept. Early results may show a decrease in overall narcotic use among the outpatient group receiving liposomal bupivacaine, however, further studies would be needed to confirm this.

Quick acting spinal anesthesia with 2% mepivacaine allows for a dense surgical block, but it is quick enough to resolve so that post-anesthesia care unit stays are significantly shorter than with longer acting intrathecal local anesthetics. Our muscle-sparing

regional blocks, including the preoperative iPACK and adductor canal block, in addition to local infiltration by the surgeon intraoperatively, have allowed patients to have adequate pain control throughout the perioperative period. The addition of liposomal bupivacaine to the adductor canal block also appears to be giving significantly prolonged anterior knee analgesia with no apparent sequelae. While we all wish for a timely end to the pandemic and its negative impact on elective surgical procedures, our quality improvement initiative has successfully allowed us to continue these cases when appropriate patient selection is employed.

References:

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