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# The Perioperative Surgical Home model facilitates change implementation in anesthetic technique within a clinical pathway for total knee arthroplasty

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## ABSTRACT

**Background:** The challenge of knowledge translation in medical settings is well known, and implementing change in clinical practice can take years. For the increasing number total knee arthroplasty (TKA) patients annually, there is ample evidence to endorse neuraxial anesthesia over general anesthesia. The rate of adoption of this practice, however, is slow at the current time. We hypothesized that a Perioperative Surgical Home (PSH) model facilitates rapid change implementation in anesthesia.

**Methods:** The PSH clinical pathways workgroup at a tertiary care Veterans Affairs hospital embarked on a 5-month process of changing the preferred anesthetic technique for patients undergoing TKA. This process involved multiple sequential steps: literature review; development of a work document; training of staff; and prospective collection of data. To assess the impact of this change, we examined data 6 months before (PRE, n=90) and after (POST) change implementation (n=128), and our primary outcome was the overall proportion of spinal anesthesia usage for each 6 month period. Secondary outcomes included minor and major complications associated with anesthetic technique.

**Results:** Over a period of one year, there was an increase in the proportion of patients who received spinal anesthesia (13% vs. 63%,  $p < 0.001$ ). For the following year, 53-92% of TKA patients per month received spinal anesthesia. There were no differences in major complications.

**Conclusion:** Rapid and sustained change implementation in clinical anesthesia practice based on emerging evidence is feasible.

**Implications:** Perioperative Surgical Home model may facilitate rapid change implementation in surgical care.

**Level of evidence:** Cohort study, Level 2

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## 1. Introduction

Despite the wealth of research evidence generated to guide clinical care, the time lag before implementation of evidence into practice is often long and may last up to two decades.<sup>1</sup> While there is universal agreement on the need for evidence-based practice, there is still substantial uncertainty as to how physicians and their institutions or organizations go about implementing both evidence-based practices and changes to existing practices.<sup>2</sup> For physicians, change barriers may include: *lack of awareness*

(unaware that the evidence exists); *lack of familiarity* (know evidence exists but unfamiliar with the details); *lack of agreement* (do not agree with recommendations); *lack of self-efficacy* (do not think they can do it); *lack of outcome expectancy* (do not think recommendations will work); *inertia* (do not want to change); or *external factors* (want to change but blocked by systems issues).<sup>3</sup>

The delay in translation of evidence to practice is especially of concern in the field of perioperative orthopedic care given that projections forecast a dramatic increase in the annual number of total knee arthroplasty (TKA) procedures due to an aging population's growing prevalence of osteoarthritis.<sup>4</sup> Recent estimates suggest that the lifetime risk of primary TKA for adults twenty-five years or older is 7.0% for males and 9.5% for females with potentially over half of adults in the U.S. diagnosed with knee osteoarthritis undergoing TKA. While generally TKA is considered to be a

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safe procedure, reports indicate a 30-day mortality rate of 0.18% and a complication rate of 5.6%.<sup>5</sup> In the context of high rates of utilization of this procedure, however, complications represent a major clinical and economic burden to the health care system. Today, available evidence supports the use of neuraxial anesthesia as the preferred intraoperative anesthetic technique for TKA patients, with several large epidemiologic studies demonstrating lower mortality and morbidity, particularly lower postoperative rates of deep-vein thrombosis, a shorter operative time, and decreased blood loss when compared with general anesthesia.<sup>6–10</sup> Yet, in a recent cohort study that included nearly 200,000 TKA patients from over 400 acute care hospitals, general anesthesia was used over 70% of the time.<sup>11</sup>

While the clinical pathway concept in joint replacement surgery has existed for over 20 years,<sup>12</sup> implementing changes in clinical practice remains challenging for the reasons outlined above. The recently-introduced Perioperative Surgical Home<sup>13</sup> is a patient-centered, physician anesthesiologist-led, multidisciplinary team-based practice model that coordinates surgical patient care throughout the continuum from the decision to pursue surgery through convalescence. This model encourages the use of clinical pathways in order to better incorporate evidence-based practice, improve communication, and reduce system-related variability in practice.<sup>13</sup> We submit that implementing changes in clinical practice should benefit from being nested within a PSH model.<sup>13,14</sup> As such, we designed this study to test the hypothesis that the PSH model facilitates rapid anesthesia clinical pathway adoption with sustained changes in physician behavior.

## 2. Material and methods

This study was conducted at a university-affiliated tertiary care VA hospital with an active total joint replacement program<sup>15</sup> and a PSH program.<sup>16</sup> The PSH program in our institution has been described previously<sup>16,17</sup> and features a regional anesthesiology and acute pain medicine (RAAPM) team with a dedicated physician anesthesiologist and nurse practitioner assigned per day with no operating room clinical duties. In addition, a PSH consult program with a dedicated anesthesiologist provides routine postoperative follow-up and acute care consultation on all inpatients. Perioperative outcomes are tracked using a customized PSH database.<sup>16,17</sup> The local Veterans Affairs (VA) research committee and our Institutional Review Board approved this retrospective cohort study with waiver of informed consent.

In December 2013, we implemented a change in our clinical pathway for TKA and uni-compartmental knee replacement patients (“TKA clinical pathway”) related to preferred intraoperative anesthetic technique in favor of spinal anesthesia. For the six month period before and after this change, we retrospectively examined prospectively-collected administrative, preoperative, and postoperative data from VistA, the VA centralized electronic medical record; intraoperative data from our anesthesia information management system (Picis 8.0, Wakefield, MA.); and our customized PSH database on Microsoft Access (Redmond, WA). All individual electronic charts were manually audited by the authors to validate query results from databases. We included a sequential series of patients who underwent unilateral knee replacement during the study period and were admitted to the hospital postoperatively. Cases were excluded if they involved additional significant surgical procedures besides unilateral knee replacement (e.g., bilateral knee replacement).

### 2.1. Preexisting clinical pathway

The TKA clinical pathway prior to December 2013 consisted of a set of routine protocols involving orthopedic surgery, anesthesiology,

nursing, and physical therapy and has been described previously.<sup>18–20</sup> The anesthesiologists’ role in this clinical pathway primarily involved perioperative pain management, including standardization of continuous peripheral nerve block site and perineural local anesthetic regimen, and the clinical pathway did not include specific recommendations on choice of intraoperative anesthetic technique. Preoperatively, all patients underwent insertion of a perineural catheter, using standardized ultrasound-guided techniques<sup>20</sup>; then the intraoperative anesthetic plan was left to the discretion of anesthesiologist.

### 2.2. Change management process

The process of changing intraoperative anesthetic management in our TKA clinical pathway involved several steps and was initiated by the Anesthesiology and Perioperative Care Service. First, we presented at our Service staff meeting an article<sup>6</sup> by Memtsoudis and colleagues that discussed the potential benefits of promoting spinal anesthesia for TKA patients. Second, a committee of anesthesiologists reviewed additional publications, graded the findings,<sup>5–9</sup> and then discussed the ramifications of a potential change in anesthetic technique with orthopedic surgery, nursing, and anesthesiology staff during a series of meetings over several months in the fall of 2013 to achieve “buy in” from other stakeholders. Third, the departmental physician champion presented the committee’s interpretation of the evidence and a revised TKA clinical pathway recommending spinal anesthesia as the preferred intraoperative anesthetic technique for knee replacement patients at our mid-December 2013 staff meeting for immediate rollout. This change was endorsed both by the department head and hospital administrator in charge of surgical and invasive procedures. The goal was not to achieve 100% usage of spinal anesthesia since factors may preclude its use such as patient refusal, procedural difficulty, or medical contraindication (e.g., anticoagulation, severe aortic stenosis, severe involuntary movement disorders).<sup>21</sup> Fourth, the PSH team was charged with using the PSH database to provide ongoing evaluation of the clinical pathway change implementation plan, provide timely feedback, generate standard work and training when applicable, and monitor for any adverse outcomes. All stakeholders provided ongoing feedback to the departmental physician champion regarding problems or potential concerns during the post-implementation phase.

### 2.3. Outcomes

Our primary outcome was the overall proportion of spinal anesthesia usage for each 6 month period, both before and after change implementation in December 2013. There were no changes in any other aspect of the TKA clinical pathway or surgical technique during this period. As a secondary outcome, we assessed sustainability of this clinical pathway change by measuring the proportion of spinal anesthesia usage per month for an additional year (July 2014 through July 2015). We also measured a number of secondary outcomes related to minor and major complications as well as length of hospital day (days). Minor complications included sore throat; neuropathy; postoperative nausea and vomiting in the postanesthesia care unit (PACU) or wards; postoperative headache; patient’s assessment of pain control; use of intravenous patient-controlled analgesia (PCA); and pruritus. Major complications included delirium; cerebrovascular accident; any unintended recall; myocardial infarction; arrhythmia; cardiac arrest; transfer to higher level of care; unanticipated return to the operating room; sustained use of supplemental oxygen; acute renal failure; need for packed red blood cell transfusion; infection; or corneal abrasion.

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