

The Role of Technology in Pain Management Strategies

How a multi-disciplinary approach to pain management in orthopedics can help reduce the risk of narcotic addiction in high-risk populations

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Abstract

Major orthopedic surgeries like total joint arthroplasty, rotator cuff or ligament repair and spinal fusions are noted to be among the most painful surgical experiences for patients.¹ Therefore, pain control in these procedures can play a critical role in patient satisfaction with their surgical experience.² Apart from the emotional distress caused from poorly controlled surgical pain, the patient's perception of pain can also incite physiologic responses that may increase postoperative morbidity.³ Thus, orthopedic surgeons face the challenge of controlling their patients' pain while being careful to avoid overprescribing narcotics which are commonly used to alleviate post-surgical pain, but have also led to abuse and addiction with significant personal and societal ramifications.⁴

There are many, well-documented perioperative strategies that can help manage patients' pain while limiting the use of narcotic addiction in orthopedics.⁵ Nevertheless, additional tools may be found by uniting the health care community, physicians and care teams, with orthopedic industry partners.

With the increased use of smartphones among older adults and the rapidly evolving adoption of mixed medical management (the combination of in-person and virtually administered health care), the current medical sociological environment is primed for the introduction of technology as an additional resource in the pain management armamentarium. (Refer to white paper: Technology Adoption for Health Care Management Among Older Adults). Using a smartphone app to monitor pain levels and narcotic use and allow health care physicians to efficiently manage by exception represent the next frontier in providing a more connected patient experience.

Problem Statement

Orthopedic surgery is commonly associated with substantial perioperative pain. The patient's perception of pain, although highly subjective, is a salient measure of their well-being; is correlated with satisfaction; and perhaps most importantly, can profoundly influence the patient's healing process and functional outcomes.

Orthopedic surgeons must balance multiple risk factors throughout the perioperative period to ensure pain is well controlled while minimizing the patient's exposure to the potentially addictive narcotics which provide pain relief.

Background

The Evolution of Adoption

Preoperatively, orthopedic patients may have experienced a trauma or chronic pathology for which their perception of pain is both persistent and significant. Until surgery can be performed, many patients use pharmacological management, with one study finding that 30% of same-day admissions were using narcotics in this period.⁶ This is clinically significant for several reasons: First, narcotic tolerance can be established in as few as two weeks.⁷ Second, patients using opioids preoperatively have been shown to have result in longer hospital length of stays, poorer functional recovery, and more complications after major elective orthopedic procedures and arthroplasty when compared to those not on narcotics.⁸ Third, both postoperative pain and the risk of narcotic dependency are increased.⁹

Postoperatively, orthopedic patients may also experience high perceptions of pain due to the substantial alterations in musculoskeletal tissue.¹⁰ A German study aggregating a dataset of more than 50,000 patients across 179 surgical procedures, reported that 22 orthopedic and trauma procedures were among the top 40 most-painful surgeries as collected through this patient sample.¹¹ The same study showed knee joint replacement scored in the top 30th percentile for most painful, whereas hip joint replacement was reported around the 50th percentile. The study findings suggest that the experience of pain is not unilaterally related to the amount of tissue affected during the surgery. It suggests that a patient's pain perception is additionally associated with the pain management regime, underscoring the criticality of effective analgesic.

Uncontrolled pain can lead patients to experience both physical and emotional distress. It has been shown to inhibit sleep, and produce anxiety while additionally

stimulating adrenal responses resulting in the release of the “fight or flight” hormone, catecholamine, all of which produces deleterious effects on functional outcomes.¹² As the German authors succinctly describe “Severe pain is associated with decreased patient satisfaction, delayed postoperative ambulation, the development of chronic postoperative pain, an increased incidence of pulmonary and cardiac complications, and increased morbidity and mortality. Therefore, it is of great importance that surgical procedures that result in severe pain and optimal analgesic strategies for these procedures can be identified.”¹³

“In the late 1990’s, the United States saw a marked increase in the use of narcotics for pain management.^{14,15} To minimize the use of narcotics, effective pain management must be viewed from multiple lenses and a variety of strategies should be reported for consideration. Thus, the most effective pain management programs employ a multimodal approach.

Current pain management strategies

Current pain management strategies are numerous and well documented in the scientific literature. Labrum and Ilyas outline a robust multimodal approach to pre-, intra-, and postoperative alternatives to managing pain (Table 1).¹⁶

Table 1

Preoperative
<ul style="list-style-type: none"> • Patient addiction-risk screening • Maintenance of opioid naiveté • Use of multi-modal analgesia
Intraoperative
<ul style="list-style-type: none"> • Use of multimodal analgesia • Customized surgical and anesthetic techniques
Postoperative
<ul style="list-style-type: none"> • Patient education • Vigilant monitoring • Institution of a standardized analgesic taper protocol • Prescription of the lowest possible dose and quantity • Involvement of pain management specialists

As an example of the criticality of patient education in understanding how to mitigate the risks of narcotic abuse, two different studies found that less than 8% of patients received appropriate education on postoperative narcotic disposal. Moreover, in one study 91% of patients inappropriately stored the narcotics.¹⁷ While the

responsibility lies with the patient to take appropriate action, the first step in the process occurs through appropriate patient education.

Appropriate risk management of opioid use begins with thorough screening, education and vigilant monitoring of aberrant behaviors—meaning that much of the time burden for addressing this challenge lies with the physician and care team. Technology resources and processes that automate or standardize patient awareness, education and responsible self-management are beneficial tools to improving health care efficiency.

Solution
Incorporating technology to aid in pain management tracking

According to a recent study involving 140 patients undergoing arthroscopic rotator cuff repair, preoperative education can help to reduce postoperative narcotics consumption and increase the speed of discontinuing narcotics postoperatively.¹⁸ Thus, patient education is of the utmost importance. Physicians need a convenient and consistent path for delivering this education and tracking compliance to their prescribed educational protocol. Vigilant monitoring can be a challenge with limited patient touchpoints available in current patient care continuums. Ideal solutions expand the frequencies of these patient touchpoints and communication opportunities both pre- and postoperatively.¹⁸ Advances in technology that allow for increased communication, like telemedicine, can also greatly decrease the time it takes to receive medical care by eliminating or reducing travel and waiting times.¹⁹ Perhaps just as important as providing care when it is needed, remote patient care (in a study of 55 radical prostatectomy patients) maintained equivalent satisfaction while having a significant reduction of both direct and indirect patient costs.²⁰

Complementing the efforts of physicians in this challenging area of pain management, are now ubiquitous consumer smartphones that have the ability to leverage healthcare applications. Given the population’s growing daily reliance on smartphone technology, companies such as Zimmer Biomet can offer physicians a digital solution for providing their qualified* patients with consistent and reliable information, monitoring and transparency through mymobility® with Apple Watch.

Ideal technology solutions should integrate seamlessly into patient management workflows. mymobility with Apple Watch allows surgeons to manage patients by exception by prompting patients to report pain and

**Patients must have a compatible smartphone to utilize mymobility.*

narcotic use through the app, triggering alerts for the care team when patient reported pain or narcotic use cross preset thresholds. This solution also provides a channel for patient narcotic education to be delivered to the patient at points of need and, if desired, repetitiously.

Perioperative patient education is a valuable tool in the pain management armamentarium to inform patients about the risk of narcotic dependency. Setting expectations on the surgical intervention and immediate days following the procedure can aid in both a patient's understanding and mental preparation for the course of events. Patients can be robustly educated on prescription narcotic misuse and their potential risk factors (e.g. smoking), including the risk of friends or family members abusing the prescription. While it is understood that the orthopedic surgeon reviews the risks with each patient, the role of technology in a modern treatment pathway is to remind and reinforce the importance to patients of critical pain management information.

Finally, data that subsidizes a physician's understanding of their patients' pain should be considered in any proposed solution. Patient reported data on pain perception, narcotic and non-narcotic consumption perioperatively, timing of pain prevalence, and challenges associated with certain activities can add value beyond traditional Patient Reported Outcome Measures (PROMs).

Conclusion

Orthopedic surgeons face challenges managing the perioperative needs of his or her patient. Pain is not only an important sequela, but also a risk factor for achieving a successful outcome which must be weighed and controlled against the risk of addictive narcotics used to treat pain. Many pre-, intra- and postoperative strategies exist, and surgeons are faced with customizing a multimodal approach on an individual basis. To augment the efforts of the surgeon, innovative orthopedic manufacturers must continue to offer new technological resources to aid surgeons in monitoring pain and narcotics use. The opportunity to receive real-time pain-related data that allows physicians to efficiently manage by exception and further customize pre- and post-procedure care may help surgeons manage patient satisfaction, safety and outcomes. Smartphone based applications, such as mymobility with Apple Watch, provide the means necessary for physicians, and care teams, to capture more pain-relative data between office visits. Research is ongoing to evaluate the impact of this digital platform and associated technology on patient outcomes.

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