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Opportunities to Improve Pain Management Outcomes in Total Knee Replacements

Patient-Centered Care Across the Continuum

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Despite the importance of pain management to each patient's overall experience with a total knee replacement, opportunities to improve pain care exist. The authors target an unnecessarily fragmented pain management trajectory as one cause of variability in pain outcomes. They propose that a technology-enhanced patient-centered pain management continuum running from the preoperative through the recovery phase offers effective and efficient pain management.

According to a recent investigation, total knee replacement (TKR) surgeries in adults have more than doubled from 1999 to 2008, with a threefold increase in patients between the ages of 45 and 64 years (Losina, Thornhill, Rome, Wright, & Katz, 2012). The Centers for Disease Control and Prevention reported that 719,000 TKR procedures were performed in 2010, making TKR second to C-sections that require an inpatient stay (National Center for Health Statistics, 2014). While the increase in TKR can represent a substantial improvement in quality of life (Djukanovic, Brudin, Hagberg, Tillander, & Cöster, 2011), the surgical experience can be less than satisfactory, too frequently resulting in a very painful and troublesome hospital and posthospitalization experience. Severe post-TKR pain has the potential to delay rehabilitation and length of stay, or worse, to pose a risk for the development of venous thromboembolism or chronic pain states (Carr & Goudas, 1999; Pearse, Caldwell, Lockwood, & Hollard, 2007).

Unfortunately, poor postoperative pain management has been an enduring problem faced by many surgical inpatients, not only those who undergo TKR. To address the global problem, in 1992 the Agency for Health Care Policy & Research (now the Agency for Healthcare Research and Quality) distributed pain management guidelines to manage acute pain from operative procedures (U.S. Department of Health and Human Services, 1992). These voluntary guidelines established regular pain assessment as the mechanism to capture the subjectivity of the pain experience, and the basis for pain-reducing intervention. In 2001, voluntarily applied Agency for Health Care Policy & Research guidelines were superseded by the implementation of Joint Commission standards calling for the patient's right to regular pain assessment and ongoing pain management care (The Joint Commission, 2012). The adoption of Joint Commission standards definitively altered the paradigm of provider-driven pain management to a more patient-centered approach. Doctors and nurses are now required now to consistently document their assessments, interventions, and reassessments in the patient record. With hospitals as major stakeholders for effective processes and positive outcomes, standards also require agencies to address pain management deficits with quality improvement strategies (The Joint Commission, 2012). Hospital-level accountability enforcing the subjectivity of pain management was solidified when the Hospital Consumer Assessment of Healthcare Providers and Systems, required by the Affordable Care Act of 2010 and the Centers for Medicare & Medicaid Services, included questions asking patients to rate their pain management experience.

Still, pain management outcomes continue to fluctuate despite broad system changes and multiple calls for action. The Institute of Medicine (1999), in its report *To Err Is Human*, regarded patient-centeredness as one of six foundations of improving healthcare quality. As such, improvements and innovations are needed to reconstruct systems to achieve patient-centered pain management (PCPM). Patient-centeredness, or care based on patients' wants and needs (Morgan & Yoder, 2012), is not a new concept especially for nurses who

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embraced the philosophy as a pinnacle of practice long before the 1999 Institute of Medicine report. Antecedents of patient-centeredness are realized in organizational visions, commitments, while attributes of the concept include holism, individualized care, respect, and patient empowerment. Outcomes of patient-centered care result in improved quality, satisfaction, and improved health (Morgan & Yoder, 2012).

Applying patient-centeredness to pain management means that care decisions are based on collaboration between providers and the patient. Initial information on which to base the pain management plan is generated during a comprehensive pain assessment conversation aimed to understand the patient experience and goals. Providers may use age and condition appropriate pain assessment instruments that identify pain severity and interference factors. Patient information is then interpreted and shared with the patient by the provider within the context of the clinical condition. Appropriate treatments are mutually identified. Once pain-relieving methods are initiated, reassessment dialogue continues and side effects are carefully monitored.

While the principles of PCPM are readily stated, in reality the provision of pain management is highly intricate and not easily addressed in a patient-centered fashion in complex organizations or across settings, especially when the patient is not included in overall planning. Well-documented barriers plague the provision of PCPM. As an example, assessment instruments have long been criticized for their lack of precision and one-dimensional approach to pain assessment (Buckenmaier et al., 2013; Chapman, Donaldson, Davis, & Bradshaw, 2011). Scales are also inconsistently applied across practitioners (Buckenmaier et al., 2013). In addition to the measurement limitations, current pain management practices historically are applied within the context of long-standing patient and provider biases and knowledge deficits (Brown, 2004; Chou et al., 2009; Murnion, Gnjidic, & Hilmer, 2010).

The urgency to reduce hospital length of stay, especially in the TKR patient population, further strains already-flawed practices. Surgical stays are now "shortened and fragmented" (Splaine Wiggins, 2008, p. 630). In particular, recent evidence suggests that orthopaedic patients leave the hospital with a higher level of pain (Chan, Blyth, Nairn, & Fransen, 2013; Samuels & Eckardt, 2013). Findings suggest that pain management deficits once captured in the hospital setting are not improving but instead moving to outpatient settings.

Longer term care delivery models aimed at embracing care across the complex surgical continuum are emerging (Shippee-Rice, Fetzer, & Long, 2011; Wiggins, 2006). The value of focusing on the longer or broader trajectory rather than focusing mainly on the inpatient hospital experience could provide a more seamless pain management experience and reduce analgesic gaps. Conceptually, a surgical trajectory for the TKR patient can be divided into multiple phases: preadmission, preoperative, operative, postoperative, and recovery (Shippee-Rice et al., 2011). A closer look at the administration of the current surgical trajectory offers an ability to assess the barriers of PCPM and expose opportunities for improvement.

Preadmission and Preoperative Phases

Patients, some living with osteoarthritis, chronic pain, and progressive activity limitations, enter the TKR surgical trajectory convinced that their quality of life will be improved with the procedure (NIH Consensus Panel, 2004; Weinstein et al., 2013). The introductory meeting is a typical time for the interdisciplinary team to learn more about and collaborate with the patient regarding the weeks to come. It is important to note that the patient profiles of those presenting for TKR are currently changing. Although advancing age and obesity are contributors to osteoarthritis, a recent study suggests that the population of patients presenting for TKR may be a younger, more physically active group (Losina et al., 2012).

Patients with osteoarthritis typically have been managing pain with long-acting Cox 2 inhibitors or even long-acting opioids. The variability in chronic pain management exposes differences in underlying attitudes and knowledge levels regarding pain management and pain medication among patients. Many fear opioids, some because of the risk of addiction and others because they fear an altered level of consciousness, nausea, or constipation (Duignan & Dunn, 2008; Gunnarsdottir, Donovan, & Ward, 2003). Older studies show that some patients wait for the pain to become unbearable before resorting to medication, whereas others believe that good patients should avoid talking about their pain (Gunnarsdottir et al., 2003; Salmon & Manyande, 1996). The focus now is more on patients at risk for opioid dependence (Chou et al., 2009). Indeed, patients present for their surgical experience with a wide range of predetermined philosophies, beliefs, and experiences with pain management and/or particular drugs. Individualizing care is dependent on the careful listening and engagement on the part of providers to clarify issues and discuss concerns.

In contrast, institutional preadmission and preoperative assessment systems at present are tightly prescribed to efficiently ensure compliance with regulatory requirements and the completion of necessary insurance and institutional paperwork. Multiple individual assessments are performed by nurses or doctors at this time. Some information is duplicated whereas other important data are omitted. The preassessment nurse initiates many hospital processes with a telephone call to the patient. The surgeon and possibly the primary care practitioner perform the histories and physicals, which are updated at least 24 hours before surgery. At the time of the surgery, an admissions coordinator collects more information and obtains the required patient signatures. Another nurse, sometimes armed with information obtained from previous assessments, repeats questions for verification or asks new ones. At the time of surgery, the anesthesiologist performs yet another assessment, this time geared specifically to gather information required during the procedure. Information about previous medications or pain-relieving strategies could be obtained at any assessment point or captured with the medication reconciliation process.

Despite this duplicative and highly inefficient process, there is no one patient/provider relationship or assessment document from which to build a comprehensive PCPM plan. Practitioners operate from the assessments that contain information specific to their service. Therefore, care-related information is fragmented and focused mainly on the hospital phase many times without consideration of the broader patient trajectory. Operationalizing the assessment process in this manner prevents patients from sharing their unique stories that undergird a trusting and genuine patient relationship (Morgan & Yoder, 2012). Patients' capabilities, pain management goals, and previously effective pain-relieving strategies are potentially lost and fail to be incorporated into the PCPM plan.

The Operative Phase

Because PCPM requires that the patient be conscious enough to make decisions, it may be suspended during the actual procedure when members of the health care team, on behalf of the patient, implement plans previously discussed. Many times medications for pain management are administered or initiated by anesthesia personnel as a mechanism to preempt postoperative pain. Because many different protocols for pain management are employed, it is important that information is communicated to the nurses postoperatively. This information is typically collected in the patient record and communicated to nurses through a verbal report or written pain management protocols contained in order sets. Despite its potential importance as a starting point for the pain management in the postoperative phase, the patient may not be informed about the duration of action of medications administered during the operative phase.

The Postoperative Phase

Postoperative pain management can often be less than optimum, a fact well documented and attributed to patient, provider, or system barriers (Brown, 2004; Chou et al., 2009; Duignan & Dunn, 2008; Fox, Solomon, Raina, & Jadad, 2004; Titler et al., 2003). Patient barriers in the immediate postoperative phase may include the lack of motivation and/or necessary cognition along with other patient barriers regarding medication already discussed. The multiple and highly technological pain-reducing technologies employed for patients with TKR may be confusing for patients to use or understand. Some interventions may actually reduce pain completely, only to wear off later. From the patient's perspective, orthopaedic surgical pain is more likely to worsen over the course of the hospitalization (Samuels & Eckardt, 2013).

From the provider perspective, the European Society of Regional Anesthesia and Pain Therapy (Fischer et al., 2008) recommends nonsteroidal anti-inflammatory drugs and Cox 2 inhibitors and strong opioids with patient-controlled analgesia for severe pain and as-needed weak opioids for mild pain contingent on the application of blocks during the operative procedures. This multimodal pain management therapy incorporates the use of both (i) long- and short-term agents to maintain pain at low levels or prevent pain exacerbations and (ii) different medication classes to interrupt pain signaling at different points in the nociceptive pathway. Guidelines for individual patients are typically based on population outcomes and fail to consider patient-specific consequences of the potential multiple opioid, nonsteroidal anti-inflammatory drug, or Cox 2 side effects.

Within the last few years, the infusion of peripheral nerve blockade has been added to the selection of available pain management modalities for TKR and has become standard care in many facilities. Peripheral nerve blockade provides localized pain relief with the delivery of a local anesthetic and carries the benefit of analgesia without causing systemic side effects of opioid preparations like nausea and sedation (Turjanica, 2007). It can be administered directly into the tissue of the operative site or regionally near a nerve to block pain transmission via a bolus or continuous infusion. We are now just learning about the effects of blockade; however, failure to plan for the drug half-life and elimination increases the risk for analgesic gaps.

The clinical reality is that pain management for the TKR population in the postoperative period depends on nurse-driven implementation of templated order sets provided by the anesthesiologist and/or surgeon. Standard dosing of medications prevails with little titration for PCPM. Many order sets provide for pro re nata (PRN) dosing of analgesia. Administered in combination with patient-controlled analgesia or other long-acting infusions or medications, PRN dosing is most useful when employed as a rescue medication for breakthrough pain, and not as a singular method of pain relief. The inherent variability of PRN dosing has been associated with unfavorable patient pain severity levels and inconsistent pain levels (Samuels & Bliss, 2012). The effectiveness of PRN dosing alone is dependent on nurses' ability to critically base interventions on assessments and reassessments along with a developed pain management routine that anticipates drug duration of action and patient activity.

Postoperative provider barriers are many and include the inadequacy of pain measurement instruments, a lack of time and knowledge deficits (Chou et al., 2009). Research clearly demonstrates that nurses often miss pain cues from patients, employ less than adequate assessment strategies, and are frequently interrupted in the course of their work (Bucknall, Manias, & Botti, 2007; Manias, Botti, & Bucknall, 2002). While critical in the provision of postoperative pain management, nurses generally fail to reassess patients after administering pain medication (Samuels & Fetzer, 2009).

Rehabilitation Phase

Because of the economic pressure to shorten the length of hospital stays, patients will be discharged while still at risk for pain. Even though older, more chronically ill patients may be discharged to a skilled facility (Barsoum et al., 2010), many TKR patients are discharged home where pain is reported to be a major stressor along with constipation from the use of opioids and the fear of addiction (Barksdale & Backer, 2005; Chan et al., 2013). Some patients may be experiencing pain exacerbation as a result of the diminishing effects of long-acting analgesic blocks. Many patients report moderate to severe pain occurring during the first 2 weeks at home requiring patients to seek extra help from primary care or orthopaedic surgical practitioners (Apfelbaum, Chen, Mehta, & Gan, 2003; Chan et al., 2013).

Once home, patients must provide their own self-care. Lost is the close attention and expertise afforded by hospital providers. Patients with questions now need to access provider offices, sometime listening to long and protracted recorded messages. Their concerns are passed on yet to another person who relays information accordingly.

Summary and Discussion

Patient issues, provider practices, and system barriers combine to obstruct optimal PCPM in TKR surgery. Optimal PCPM is often lost as the patient moves through the fragmented phases of the surgical trajectory and is cared for by many different clinicians. Each stage, while well intentioned, is based on service provided at the time without the recognition of the entire surgical trajectory. Reconstructing the surgical experience as a trajectory, with each phase smoothly transitioning to the next, with a patient as a legitimate and contributing partner, has the potential to vastly improve pain management outcomes.

While the cognitive and motivational limitations patients bring to the surgical suite must be recognized and managed as best possible, systems in collaboration with providers bear a high responsibility for pain management issues clearly within their control. Full realization of PCPM means that systems need to support a combination of patient accountability, provider responsibility, and patient guidance. Especially in an era of cheap and ubiquitous electronic communication, there are opportunities to support each patient sufficiently to “stay ahead” of his or her TKR pain while also making substantial rehabilitation gains.

Applications (apps) on handheld electronic devices such as smartphone or tablets evolving in concert with the development of telemedicine have the potential to facilitate PCPM across all phases of the care continuum. Telemedicine or telehealth incorporates the acquisition, processing, dissemination, storage, and retrieval of information to promote health (Bashshur & Shannon, 2009). Bashshur and Shannon, in a national policy paper, contend that telemedicine can “promote patient centered care at a lower cost” (p. 601). Systems already in use with the rheumatoid arthritis (Smarr et al., 2011) and diabetes populations (Jackson, Bolen, & Gary, 2006) show that active engagement can improve patient outcomes. Patients also report greater satisfaction with convenience for telemedicine (Agha, Schapira, Laud, McNutt, & Roter, 2009), which can be an important consideration for the younger, more active TKR patients. Although the engineering has not yet reached its full potential in terms of safety and medical vetting, the combination of telemedicine growth also with the development of pain management handheld apps could add credibility to the programs currently developed without professional involvement (Buijink, Visser, & Marshall, 2013; Rosser & Eccleston, 2011; Schmitt, 2013).

A hospital-owned and managed handheld device with a pain-management app could be loaned to patients for some months starting from 2 weeks before their TKR. The app would collect information and communicate with care providers in the three stages surrounding the operation. During the preoperational weeks, the patient would acclimate to the app by recording baseline periodic preoperational pain levels. The app could also be used to create baseline medication and knee flexibility records.

During the operational phase, the app would accept information from the anesthesiologist about the range of times that the anesthesia might wear off. As that time approached, the app would inquire about the patient’s pain levels and notify the nurse’s station at the first sign of any changes in the pain levels. That sequence could be repeated with each pain medication administration. The app could also be used to anticipate the patient’s need for pain medications in anticipation of, and subsequent to, scheduled physical therapy.

Improved handheld technologies, in combination with telemedicine interventions, may prove beneficial when fostering PCPM. Preoperatively and after discharge may be where patient-focused apps could be of greatest benefit, especially if the information regarding the surgical experience is entered into the electronic record and accessible to all involved in the care. Postdischarge, the app would provide a record of the patient’s medications, physical activities, and pain levels that could be uploaded automatically (or on demand) to the electronic record. The app could also be programmed to send cautionary notes to any interested party if prespecified and unanticipated levels of pain or inactivity were noted.

More research and development are needed to fully realize the potential of handheld devices and telemedicine in creating a PCPM focus. Collaborative, interdisciplinary work among nurses, patients, and informatics specialists is needed to help build credible, vetted systems that patients and providers will find useful and relevant. New strategies can capitalize on the technological capabilities of the emerging TKR population demographics and perhaps provide the mechanisms needed to drive new systemwide PCPM processes. It is time to move beyond calls for action and make a difference for patients in pain.

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