

EFFECTS OF PREOPERATIVE EDUCATION ON PAIN MANAGEMENT, ANXIETY, AND
PREPAREDNESS IN SPINE SURGERY

By

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Submitted to the School of Nursing and The Graduate Faculty of the University of Kansas in
partial fulfillment of the requirements for the degree of Doctor of Nursing Practice.

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26 March 2019

Date Project Accepted

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Effects of preoperative education on pain management, anxiety, and preparedness in spine surgery

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Abstract

Back pain affects nearly 85% of the population, leading many to seek surgical treatment for their pain (Ramey, Isaac & Alzner, 2017). These patients turn to their providers for education regarding surgical preparation and recovery. A review of the literature supports the use of preoperative patient education in orthopedic spine surgery to reduce perioperative anxiety; however, the impact of preoperative education on pain management, preparedness for surgery, and recovery remains unclear. It is hypothesized that preoperative education will better prepare patients to care for themselves and allow for more realistic expectations of pain control and the recovery process, thereby increasing perceived preparedness and pain management. Malcolm Knowles' 1973 model of andragogy details key elements of adult learning, which have been used successfully with multiple patient populations. In a quality improvement project based on the Model for Improvement's Plan-Do-Study-Act framework, Knowles (1973) theory was used to develop a preoperative educational booklet for patients undergoing 1-4 level thoracic or lumbosacral laminectomies with or without lumbar fusions at a regional academic medical center. The booklet's impact on patient pain management, anxiety, and preparedness were measured via postoperative telephone interview, and scored on a traditional Likert scale of 1-5, with 1 being not helpful, and 5 being extremely helpful. Of the 20 patients enrolled, 12 were included in a final data analysis using descriptive statistics. The mean effectiveness scores of the booklet for preparation, reduction of anxiety, and pain management were 4.39, 4.33, and 3.83, respectively.

Keywords: Andragogy, preoperative education, spine surgery, pain, pain management, anxiety, preparedness, orthopedics, orthopaedics

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Back pain affects nearly everyone at least once in a lifetime (American Academy of Orthopaedic Surgeons [AAOS], 2013a). The prevalence of low back pain is so great that it is the second most frequent presenting symptom in primary care, affecting an estimated 85% of the world population (Ramey, Isaac, & Alzner, 2017). Though many with low back pain recover spontaneously, some people require surgical treatment to reduce pain and regain a satisfactory quality of life (AAOS, 2013a). Before and after surgery, these patients often have anxiety regarding the surgical process, postoperative recovery, and discharge from the hospital. If not addressed, this anxiety can impact postoperative outcomes (Gaudin et al., 2017). Providers are tasked with alleviating this anxiety and guiding patients through their recovery.

This project was conducted to determine the impact of standardized preoperative education on anxiety, pain, and preparation for recovery in patients undergoing elective spinal surgery at a large Midwest academic medical center. After a brief illustration of the phenomenon of concern and statement of the research question, the research term definitions, project plan and organization, and theoretical background are outlined. Malcolm Knowles (1973) model of andragogy and the Model for Improvement (Langley et al., 2009) provided theoretical underpinnings for the project. The results of a literature review are detailed. Finally, project methodology, data collection and analysis, and project results are discussed.

Phenomenon of Concern and Research Question

Anticipatory patient education leads to better outcomes, which impact not only the patient, but also provider and institution (Centers for Medicare and Medicaid Services [CMS], 2017; Kesanen et al., 2017; Koekenbier et al., 2016; Sjolting, Nordahl, Olofsson, & Asplund, 2003). It is no longer patient volume, but patient outcome, that is rewarded. Initiatives such as the CMS's comprehensive joint care model reward providers for good outcomes such as early

discharge, reduction in surgical site infections and reduction in readmissions (CMS, 2017). Reduced pain and anxiety, and increased patient preparedness have been linked with improved outcomes such as increased quality of life and health management (Koekenbier et al., 2016; Reiter, 2014). Across multiple settings, patient education led to improved health-related quality of life (HRQOL) after total joint replacement (TJR) (Koekenbier et al., 2016). For total knee replacement patients, preoperative education was associated with decreases in postoperative pain and anxiety, and improved functional outcomes (Sjoling et al., 2003). Patient education reduced anxiety for patients undergoing bowel and cardiac surgeries (Rufinengo, Versino, & Renga, 2009; Tou, Tou, Mah, Karatassas, & Hewett, 2013). Kesanen, et al. (2017) demonstrated a decrease in anxiety for patients with spinal stenosis when they were educated about their condition and surgical treatment. Research on education's effect on postoperative outcomes such as pain, infection rates, and mobility continues to emerge (Agarwal et al., 2014). Though there is ample evidence that education improves HRQOL and postoperative outcomes with multiple surgical procedures, there is a need to further examine the connection between preoperative education and postoperative pain, anxiety and preparedness in spine surgery.

The aim of this project was to answer the following research question: "In patients undergoing elective spine surgery, does standardized preoperative patient education yield a reduction in patient anxiety, as well as improved pain management and preparedness for surgery and recovery?" A quality improvement initiative was undertaken to measure this impact.

Definition of Terms

Standardized preoperative patient education offers clear instruction on the major aspects of the perioperative, postoperative, and post-hospital recovery periods. Unlike traditional informed consent and discussion with the surgeon, preoperative education details what patients

should do prior to surgery, as well as what they should expect throughout their hospital stay and after discharge from the hospital (National Association of Orthopaedic Nurses [NAON], 2018). The preoperative education comes in a variety of forms, though booklet and in-person class are most common (Wainright, Immins, & Middleton, 2016). By initiating education prior to surgery, there are multiple opportunities to reinforce the anticipatory education and prepare the patient to better care for themselves.

Though there are many spinal procedures, thoracic and lumbosacral laminectomies with or without spinal fusion involving 1-4 vertebrae are among the most common (AAOS, 2013b; D. Burton, personal communication, April 19, 2018; Lindgreen, Rolving, Nielsen, & Lomborg, 2016). For this project, the terms *spine surgery* referred to these general procedures. This allowed for a manageable Plan-Do-Study-Act (PDSA) intervention.

Postoperative pain has many causes, from tissue inflammation and traumatic damage resulting from incision and instrumentation during surgery to degenerative changes at other vertebra (Sheffer, Kelly, Rhodes, & Sawyer, 2017; Wainright et al., 2016). Postoperative pain is defined as the subjective sensation of back pain that is localized around the surgical site, which starts after the patient awakens in the postoperative recovery area (Sheffer et al., 2017). Postoperative pain is often most intense in the first few days after surgery, diminishing as the body recovers from surgery (Sheffer et al., 2017). In this project, *pain management* was defined as the level to which pain is reduced, with the goal being a reduction of pain to a level that allows the patient to work with necessary therapies and complete activities of daily living.

Anxiety is a broad term. Trait or baseline anxiety varies from person to person (Chuang et al., 2016; Eley, Searles, Donovan, & Walters, 2013). State anxiety varies from person to

person, but also varies situationally (Chuang et al., 2016; Eley et al., 2013). For this project, *anxiety* referred to state anxiety regarding the postoperative recovery.

In this project, *preparedness* was defined as the patient's subjective feeling of being ready for their surgical procedure, hospital recovery, and to care for themselves at the time of discharge from the hospital. Mobility, understanding of postoperative restrictions, anxiety, family support, and home environment play a role in preparedness.

Organization and Project

Orthopedic surgeons at The University of Kansas Hospital (TUKH) perform a high volume of spine surgeries. Most spine surgeries are elective, and patients encounter the hospital system multiple times prior to surgery. Though patients were educated by various clinicians, there was no comprehensive preoperative education program. Several years ago, TUKH implemented a structured preoperative education program for TJR patients. Patients who received the education reported a reduction in anxiety and an increase in preparedness for discharge (Butterfield et al., 2017). Patients, providers, and the organization stand to benefit from implementation of a formalized pre-spine surgery patient education program.

After completion of a literature review, a standardized patient education handbook was developed with interprofessional input. Content and design were evidence-based and designed to guide patients through the process from pre-operation to hospital discharge and initiation of post-hospital care. This handbook was presented to the patient in clinic during their final preoperative visit and reviewed during future encounters. Patient perception on the booklet's effectiveness in reducing anxiety, improving postoperative pain management, and preparedness for surgery and recovery were measured after the patient discharged from the hospital.

Conceptual Framework

Malcolm Knowles' (1973) adult learning model was used to frame the educational intervention. The model differentiates andragogy, or the teaching of adults, from pedagogy, or the teaching of children (Knowles, 1973). Adults learn differently than children, thus educators must approach education in different ways. Self-motivated adult learners see themselves as separate from the educator, seek problem-focused education that builds upon their experiences, and want to know why they should learn something prior to learning it (Knowles, 1973). As many patients undergoing the procedures of focus in this project are adults, the assumptions of andragogy, illustrated below, helped create a value-added educational offering.

As individuals age, they begin to see themselves independently. They rely less upon the educator to dictate learning and begin to direct themselves (Knowles, 1973). The adult learner seeks information independently from many sources, and individual learning styles become more important (Chesbro, & Davis, 2002). Adult learners want more involvement in their learning, and if they don't get the information they need from an educator, they will seek information from another source. There is benefit to clinician-educators taking adult learning principles into account when offering preoperative education.

Adult education must build upon the learner's experiences. Over years, humans gain experience and knowledge, and this is often the launch point for future education (Knowles, 1973). Prior educational status and knowledge regarding a topic become important, and the clinician must be sure not to teach above or below the level of the learner (Chesbro, & Davis, 2002). Just as experience influences adult education, so too do current developmental tasks and social roles (Knowles, 1973). The adult learner is more receptive to education that advances their vocation, hobbies, and livelihood (Knowles, 1973). Adult learners seek knowledge that builds upon their past experiences and enriches their current and future experiences.

Building upon the first three assumptions, the fourth andragogy assumption deals with just-in-time education. As individuals age, they begin to value education that is relevant to their current challenges as opposed to education that arms them against as-yet-unseen challenges (Knowles, 1973). They seek what they need to know to accomplish the task at hand, rather than what they may need to accomplish in the far-off future. Clinicians can play to this concept by insuring that education is appropriate to the challenges the learner faces at the time of the educational encounter.

Implied by the other assumptions, Knowles posits that the adult learner draws from internal, rather than external, motivations to learn, and that the learner must know why they must learn new information prior to being receptive to the education (Chesbro, & Davis, 2002). It is not enough for a family member or peer to tell someone that they need to learn or change their habits, the adult learner must find the motivation to change within themselves (Chesbro, & Davis, 2002). Similarly, if the learner does not perceive a need to learn, and the education is not made relevant to them, they are less likely to appreciate the educational offering (Chesbro, & Davis, 2002). Adult-oriented education will be most successful if the educator designs the offering with the above-listed assumptions in mind.

Knowles' (1973) theory of andragogy has been used to guide patient education in several diverse settings and populations. Chesbro and Davis (2002) used andragogy theory to design education for patients with osteoporosis. The theory has been used to guide education for chronic conditions such as diabetes, a disease which requires lifelong lifestyle modifications (Coates, 1998). Educators used Knowles' theory when building their in-patient cardiac education program (Egan, 1999). The effectiveness of Knowles' theory has been noted in oncology education as well (Padberg, & Padberg, 1990). Knowles' (1973) andragogy has been used to improve patient

education in a wide variety of situations, from acute post-procedure education to lifelong chronic condition management.

While Knowles' (1973) model guided the development of this project's preoperative education intervention, the Model for Improvement (Langley et al., 2009) and PDSA cycle of quality improvement drove project implementation. The model allows for rapid improvement initiatives by guiding the development of a team to solve a problem and providing a framework for testing and measuring the solution (Langley et al., 2009). The PDSA cycle guides the implementation and evaluation of the decided intervention, through a process of intervention planning, implementation of the intervention on a small scale, measurement of intervention impact on the desired outcome, and then wide-spread intervention implementation if the small-scale test was successful (Langley et al., 2009). With Knowles' (1973) model guiding project educational design and the Model for Improvement (Langely et al., 2009) guiding project implementation and evaluation, the research literature provided a basis for the project's educational content.

Literature Review

The academic literature was reviewed for studies relevant to patient education. The CINAHL and PubMed online databases were used, and pertinent articles cited in studies were reviewed. Major search terms included "patient education," "preoperative education," "orthopedic surgery," "spine surgery," "spinal fusion," "anxiety" and "pain." Articles were excluded if they were unavailable in full text or in English. The search was limited to studies published within the past 10 years, though exceptions were made in the case of significant articles. One presentation from a professional conference was included in the review.

Out of nearly 90 articles that were identified during the search, 33 met full criteria and were included in the review. Though there was ample evidence for the impact of preoperative patient education on outcomes in a variety of patient populations, studies specific to the spine population continue to emerge. The following review summary is organized by general study focus.

Postoperative Pain and Outcome Variability

Surgery is associated with some degree of postoperative pain. In a study interviewing over 50,000 patients undergoing nearly 200 surgical procedures, spine surgeries were found to be the second, third, and sixth most painful procedures on the first postoperative day (Gerbershagen et al., 2013). Though many spine patients have chronic pain from degenerative processes prior to surgery, most surgical pain results from local tissue trauma during surgery and the subsequent inflammatory process (Sheffer et al., 2017). Despite the pain induced by surgery, patients often proceed with the expectation that the procedure will relieve their pain. An understanding of the likelihood of pain after surgery may benefit patients and lead to less frustration and pain-related anxiety after surgery.

Spine surgery costs patients, providers, and payers in ways beyond pain. Infection, bleeding, and in the case of spinal fusion, fusion failure, are among the potential complications of spine surgery (AAOS, 2010). Although the rate of surgery has decreased, surgical complexity and cost (measured financially and in patient morbidity), have increased over the years (Deyo et al., 2010). Prior knowledge of postoperative pain and risks, and how to minimize them, could benefit patients and the healthcare system alike.

Preoperative Education in Non-Orthopedic Populations

Researchers have studied preoperative education in several populations (Bytzer, & Lindberg, 2007; Eley et al., 2013; Ruffinengo et al., 2009; Tou et al., 2013). The results of the studies were as varied as the populations observed.

Pregnancy is a time in which women are expected to learn much to care for themselves and their soon-to-be infant; however, there is not always much thought placed on preoperatively educating those who elect to proceed with Cesarean section (CS) (Eley et al., 2013). In a randomized control test (RCT) of 110 patients undergoing elective CS, patients were offered detailed preoperative education on epidural anesthesia or standard of care (Eley, et al., 2013). The researchers found no change between groups regarding state anxiety or satisfaction with anesthesia (Eley, et al., 2013).

In one study, researchers found similar results in patients undergoing colonoscopy (Bytzer, & Lindberg, 2007). An educational video was offered to the experimental arm of the study, and state anxiety and anesthetic use were recorded (Bytzer, & Lindberg, 2007). There was no change in anxiety or anesthetic use between the groups, and the authors noted that colonoscopy remained unpleasant to both groups (Bytzer, & Lindberg, 2007).

Though Bytzer and Lindberg (2007) found that education was not helpful in mitigating anxiety or pain in colonoscopy patients, another study found positive impacts on patients undergoing more extensive bowel surgeries (Tou et al., 2013). In Tou et al.'s (2013) RCT, 31 patients received either standard consent or were presented with a cartoon educational video. Those who viewed the video reported less anxiety immediately afterwards as well as at the time of discharge from the hospital (Tou et al., 2013).

Ruffinengo et al. (2009) studied preoperative education in patients undergoing cardiac procedures. In their RCT of 93 patients (Ruffinengo et al., 2009), video orientation to the

procedure was associated with a significant reduction in state anxiety and improved procedure satisfaction. Though the results of these studies varied, they gave no indication that preoperative education was detrimental to patient outcomes.

Preoperative Education in the Total Joint Replacement Population

Preoperative education has been well-studied in the TJR population (Husted, 2012; McDonald, Page, Beringer, Wasiak, & Sprowson, 2014; Sjolting et al., 2003). The effects of education on patient outcomes and experience have been scrutinized, in some studies as a specific intervention while in others as part of a comprehensive fast-track protocol. The results of the studies, described below, have proven as varied as the educational materials themselves.

Interventions aimed at improving surgical outcomes are not a new phenomenon, and often have a component designed to improve the patient experience. Well before the current payment-for-performance structures were set in place, surgeons strived for optimal outcomes (Husted, 2012). With an enhanced recovery after surgery (ERAS) fast-track protocol, complete with preoperative patient education, multi-modal perioperative analgesia, and clearly defined postoperative milestones, Dr. Kehlet pioneered short-stay, quality-outcome surgery (Kehlet, 1997). A cornerstone of Kehlet's model was patient education designed to set realistic patient expectations and reduce barriers to motivation and mobility such as anxiety and pain (Husted, 2012; Kehlet, 1997). Over the years, Kehlet's (1997) method was applied to many surgical procedures, often with positive results. Husted (2012) applied the ERAS protocol to patients undergoing primary TJR and found preoperative education to be an integral part of the successful protocol. Likely, the education helped manage postoperative expectations and minimize anxiety, allowing patients to progress more rapidly (Husted, 2012). Though this study showed promising results, it lacked generalizability due to a small sample and single-hospital setting (Husted,

2012). The authors of these studies showed the impact of preoperative education, as part of a greater ERAS protocol, on postoperative anxiety and pain.

Evidence also exists for the impact of preoperative education alone. In one study, there was a link between preoperative education and reduced pain and anxiety as well as improved functional outcomes after total knee replacement (Sjoling et al., 2003). Improved functionality may increase patient's preparedness for discharge from the hospital. At TUKH, an optional preoperative class was designed for those undergoing primary and revision TJR, as part of an ERAS protocol (Butterfield et al., 2017). Compared to those who did not attend the class, attendees experienced reduced levels of anxiety and pain, and felt more prepared for hospital discharge, though these differences were not statistically significant (Butterfield et al., 2017). Though both studies examined the effect of single institution interventions, another study examined effects of education across multiple settings. In a study of 762 TJR patients across five European countries, Koekenbier, et al (2016) found that preoperative education led to improved postoperative HRQOL using the EuroQol 5 Dimensional tool, which evaluates anxiety and pain, as well as other traits. The researchers (Koekenbier et al., 2016) found that most patients felt they received less education than needed. Those patients who perceived their education to be adequate exhibited improved HRQOLs after surgery (Koekenbier et al., 2016). Illustrated in the described studies was a link between preoperative education, patient anxiety, pain, preparedness for discharge, and HRQOL in the TJR population.

Though benefits of patient education on postoperative outcomes were found in the previously described articles, different conclusions were found in other studies. In their RCT, Wilson, Watt-Watson, Hodnett and Tranmer (2016) found that preoperative education had no effect on pain control after total knee replacement. In a meta-analysis of 18 RCTs and quasi-

randomized studies of preoperative education in nearly 1,500 TJR patients, no correlation was found between education and outcomes such as less pain or improved function (McDonald et al., 2014). Aggregate scores of pain, anxiety, adverse events, and physiological function showed no significant difference based on receiving preoperative education (McDonald et al., 2014).

Despite these findings, the authors did find that patients with severe anxiety may have benefitted from preoperative education, and posited that this may have been due to resetting of expectations (McDonald et al., 2014). In a separate systematic review, preoperative education based on physiology and surgical procedure failed to positively impact postoperative pain, and often increased patient anxiety (Louw, Diener, Butler & Puentedura, 2013). Out of 13 RCTs, only the study that evaluated education based on pain physiology and management resulted in improved outcomes (Louw et al., 2013). Patients may not want to know the details of a complicated procedure, but rather are interested in what to expect and how they will be cared for afterwards. Although a lack of impact on physiological outcomes was found in several studies (Louw et al., 2013; McDonald et al., 2014; Wilson et al., 2016), there was support in the literature about the role of preoperative education in reducing pain and anxiety and improving preparedness for TJR patients (Butterfield et al., 2017; Koekenbier et al., 2016; Sjoling et al., 2003).

Preoperative Expectations and Postoperative Impact in Spine Surgery

In a cohort study of 262 randomly selected individuals, Landers et al. (2014) surveyed perceptions of spine surgery success and recovery. The majority of those surveyed had neutral or uncertain views of spinal surgery success, and many anticipated severe side effects and extensive recovery (Landers et al., 2014). In their literature review, Landers et al. (2014) found that negative preoperative emotions such as anxiety were often associated with increased postoperative pain.

Echoing the findings of Landers et al. (2014), several researchers found correlation between patients' preoperative expectations and postoperative outcomes in spine surgery (Ellis et al., 2015; Gaudin, Krafcik, Mansour, & Alnemari, 2017; Mancuso, Reid, Duculan, & Girardi, 2017; Reiter, 2014). In a study by Mancuso et al. (2017), 422 patients undergoing lumbar surgery were provided a preoperative questionnaire regarding pain expectations, and their pain relief was assessed two years after surgery. While 61% of patients reported a lot or total pain relief, those who expected more pain relief prior to surgery, as well as those suffering from depression or needing repeat surgery, experienced less pain relief (Mancuso et al., 2017).

Two systematic reviews had similar findings (Ellis et al., 2015; Gaudin et al., 2017). The effects of expectations and psychological factors on patient's postoperative experiences were highlighted in both reviews (Ellis et al., 2015; Gaudin et al., 2017). Ellis, et al. (2015) found that high expectations yielded improved symptom relief, increased activity, and quicker recovery, but when expectations were too high, they found that it negatively impacted perception of back and leg pain after surgery. Gaudin et al. (2017) noted that positive psychosocial factors not only affected immediate recovery, but anxiety and neuroticism were likely to lead to poorer outcomes. Gaudin et al. (2017) suggested that cognitive-behavioral therapy (CBT) may improve results in these patients. CBT-based education may help to set realistic expectations for pain and recovery while also relieving anxiety (Gaudin et al., 2017).

One ambulatory surgery center used the concept of expectation setting as part of their successful spine program. The center found that patients had better outcomes when realistic expectations for pain management and course of recovery were set (Reiter, 2014). Expectation-setting between provider and patient helped patients prepare and feel less anxiety and more trust

(Reiter, 2014). When educational interventions yield more appropriate expectations, patients experience improved postoperative outcomes.

Readability of Web-Based Spine Patient Education Material

Educational offerings mean little if learners are unable to digest the material. Over the years, the impacts of readability and health literacy have become more evident. Poor readability and low health literacy often lead to poor outcomes (Agarwal et al., 2014). To improve comprehension, it is recommended that any patient education material be written at or below a 6th grade reading level (Agarwal et al., 2014).

In three studies, researchers examined the readability of various online spine education materials. In a review of 50 patient resources on open and minimally invasive spine procedures, researchers found that, on average, the resources were written at a 10th grade level, and no resource was written at the recommended level (Agarwal et al., 2014). In another study, researchers found that 310 patient education articles on anterior cervical disketomy and fusion and lumbar fusion, two common spine procedures, were written at an average grade levels of 10.7 and 11.3, respectively, with only six offerings written at the 6th grade level or below (Long et al., 2017). In a review of 125 patient education materials from national organizations such as the North American Spine Society, American Association of Neurosurgeons, and AAOS, over 90% of articles were written above recommended levels, and over the years, only one professional organization had shown significant improvement (Eltorai et al., 2016). These high reading levels may limit access to education for some patients.

Effects of Patient Education in the Spine Population

Evidence of the impact of preoperative education on patient anxiety, pain, and preparedness is emerging. By offering an educational program 10 days prior to surgery,

researchers at a German hospital saw a 4.7-day reduction in hospital length of stay (LOS) and increased patient satisfaction (Fleege, Arabmotlagh, Almajali, & Rauschmann, 2014). The German researchers associated the reduction in LOS with increased patient preparation and motivation to mobilize after surgery (Fleege et al., 2014). Chuang et al. (2016) found the use of interactive technology to augment standard booklet education yielded significant decreases in anxiety and uncertainty and improved patient satisfaction. Rhodes et al., (2015) conducted an RCT in which 65 adolescents undergoing spinal fusion for scoliosis received either preoperative education focused on hospital course and recovery or standard care. Paradoxically, increased anxiety levels throughout the hospitalization, but improved patient satisfaction resulted post-education (Rhodes et al., 2015). The researcher associated the increased anxiety with a lack of education on how to cope with postoperative pain and the need for adolescents to have concrete solutions for dealing with problems (Rhodes et al., 2015). Kesanen et al. (2017) measured the impact of preoperative teaching on patient anxiety and knowledge of the surgical procedure and physiology. The group of patients that was randomized to receive the telephonic education program had significantly increased knowledge and decreased anxiety (Kesanen et al., 2017). Researchers showed reduction in state anxiety and pain in patients undergoing lumbar surgery after receiving preoperative education the day before surgery in a recently conducted RCT (Lee et al., 2018). In one systematic review of 13 articles, researchers found evidence to support the use of preoperative education in spine surgery to reduce anxiety, though there was no evidence to suggest an impact on other outcomes (Wainright et al., 2016).

Several researchers have studied the effects of CBT-based preoperative education on anxiety, pain, and patient preparation (LaMontagne, Hepworth, Salisbury, & Cohen, 2003; Lindgreen et al., 2016; Rolving et al., 2016). Education can break the cycle of pain and

dysfunction often associated with back pain by reducing anxiety and increasing motivation (Sullivan & Hudson, 2017). Rolving et al. (2016) assessed the impact of a CBT-based education intervention focused on pain control and coping. Results of the CBT-based intervention were significant reduction in pain-related disability at three and six months postoperatively and increased quality of life (Rolving et al., 2016). In an RCT of 90 patients undergoing lumbar spinal fusion, CBT-based preoperative education was linked with improved pain coping, though not necessarily reduction in pain levels (Lindgreen et al., 2016). Lindgreen et al. (2016) found that validation of postoperative pain by the staff was associated with improved coping mechanisms. LaMontagne et al. (2003) studied the effects of various CBT offerings on postoperative pain two and four days after adolescent scoliosis surgery. The researchers randomized the patients to receive CBT that included pain coping strategies and found reduced pain four days after surgery in comparison to those who did not receive coping-based CBT (LaMontagne et al., 2003). There were no between-group differences in pain two days after surgery, potentially indicating that the pain was overriding education in the adolescent's minds (LaMontagne et al., 2003). These researchers suggest a link between preoperative pain management education and reduction of pain postoperatively (LaMontagne et al., 2003; Lindgreen et al., 2016; Rolving et al., 2016).

Ickmans et al (2016) used modern imaging technology to quantify the effect of education on pain. Neurologic monitoring and functional MRI were used to assess the physiological impact of preoperative pain neuroscience education (Ickmans et al., 2016). Data collection continued through 2018, but publication of results is pending (Ickmans et al., 2016).

Though most researchers focused on preoperative education, one group examined the benefit of postoperative education. McGregor, Henley, Morris, and Dore (2012) evaluated the

impact of a patient education booklet given to patients at the time of discharge. In an RCT, McGregor et al. (2012) found that 78% of patients were satisfied with the booklet, with 31% wanting more information, particularly on pain control, wound care, and exercise after surgery. Although McGregor et al. (2012) distributed the patient education booklet during the postoperative period rather than the preoperative period, the patients seemed to seek the same knowledge on pain relief and care of the surgical site at home.

Though still emerging, the evidence backed the importance of education in the spine surgery population (Fleege et al., 2014; Kesanen et al., 2017; McGregor et al., 2012; Rolving et al., 2016). A focus on pain management, pain physiology, and postoperative care may reduce anxiety and pain, and improve preparedness for self-care at the time of discharge.

Summary of Current Literature

The importance of patient education was clearly illustrated in the literature. Though the evidence is mixed on the impact of preoperative education on patient outcomes in many surgical populations, it indicates a likely reduction in anxiety, pain, and an increase in preparation for discharge. Postoperative outcomes, pain, and patient satisfaction are impacted by patient expectations and psychological factors. High levels of anxiety are associated with poor surgical outcomes, and education reduces anxiety in TJR and spine surgery.

As adult learners, patients may turn to the internet to answer their questions and allay their fears when faced with an absence of formal preoperative education. Most publicly available online educational materials far exceed the recommended reading level. As a result, patients may misinterpret the information or avoid education all together, potentially resulting in less-than-optimal expectations and outcomes. Patients, providers, and institutions are negatively impacted by poor outcomes such as postoperative infection and wound complications, which may have

been prevented with adequate patient education. Any written preoperative education material should be written at or below the appropriate 6th grade reading level.

Suggested in the literature was a link between preoperative patient education and a reduction in anxiety and pain. There has been a demonstrated correlation between education and preparedness for surgery and recovery. These connections are likely due in part to the setting of realistic expectations, and providing problem-focused, just-in-time information. Though there is some evidence to suggest relationships between education and patient perceived anxiety, pain, and preparedness, the overall evidence is mixed. This project centered on education designed to guide patients through the experience from the preoperative time to the time of discharge from the hospital. The project coordinator added to the existing literature by assessing the link between preoperative spinal education and patient anxiety, pain, and preparation. Quality of care for spine patients treated at TUKH may increase by using the spine patient education manual.

Methods

Assumptions

Based on the literature review and Knowles' (1973) model of andragogy, several methodological assumptions were made. Education may alleviate some procedure-related anxiety (Kesanen et al., 2017; Wainright et al., 2016), and if the education incorporates pain management techniques, pain may be lessened after the procedure (LaMontagne et al., 2003; Louw et al., 2013; Lindgreen et al., 2016; Rolving et al., 2016). The reduction in anxiety and pain could lead to patient empowerment and better self-care (Gaudin et al., 2017), increased motivation to mobilize and prepare for their surgery as well as home care (Fleege et al., 2014; Reiter, 2014).

The literature backs several of Knowles' assumptions about education. As independent learners, adults will utilize outside resources if they are not presented with education (Knowles, 1973). Given the high reading level of many online patient resources, health care providers must offer accessible, readable education (Agarwal et al., 2014; Eltorai et al., 2016; Long et al., 2017). Individuals have different styles of learning (Knowles, 1973), and interventions that incorporate multiple modalities, such as written, verbal, and visual elements are well received (Chuang et al., 2016). Adults seek education that benefits them in the moment and helps them achieve their goals (Knowles, 1973), thus preoperative education is best delivered near the time of surgery and reviewed during the hospital stay as well.

Project Design

An interprofessional team, led by the project coordinator, designed a spinal educational booklet to present to patients prior to their surgeries. Team members included the project coordinator, orthopedic spine surgeon, physical and occupational therapists, case managers and social workers, and orthopedic unit nursing staff and primary clinic nurse. Multiple researchers have shown the benefit of interprofessional collaboration for patient care outcomes (Puckeridge, Terblanche, & Massey, 2017; Tedesco, Whiteman, Heuston, Swanson-Biearman, & Stephens, 2017). Close collaboration between physicians, nurses, and various other health professions have led to improved patient outcomes in situations as varied as hip fractures and sepsis (Puckeridge et al., 2017; Tedesco et al., 2017). By drawing key information from a multitude of professional backgrounds, the spine booklet provided patients with thorough education before and after their procedures.

To best prepare patients, the spine booklet covered the continuum of care from the immediate preoperative period through discharge from the hospital and the beginning of home

care. Like several similar books, this spine booklet contained information regarding home safety, preoperative testing, hospital milestones and goals, and planning for discharge from the hospital (McCann-Spry, 2017; NAON, 2018; The University of Kansas Health System [TUKHS], 2017). The spine booklet provided a general overview of what to expect once surgery was scheduled. Pre-anesthesia testing was described, and patients were presented with a list of information to bring to this appointment. Patients were given a checklist where they could keep track of their clearances from cardiology, internal medicine, and any other specialists they may see. Day of surgery instructions, such as what to bring to the hospital, were provided, as was a map of the campus with included parking information. An overview of the surgical procedure and time in recovery was included. Described in the booklet was the anticipated course of the hospital stay, touching on postoperative diet advancement and movement precautions, as well as expected mobility progression and an estimated length of stay. Pain physiology and management methods were detailed to reduce patient anxiety and postoperative pain (LaMontagne et al., 2003; Louw et al., 2013; Lindgreen et al., 2016; Rolving et al., 2016). Information was given on how to prepare one's home for recovery, and processes for contacting insurance to determine in-network skilled facilities were discussed. General discharge information, such as activity restrictions, sleeping positions, and alarm symptoms were outlined, and a phone number to reach the clinic was provided. Community resources for durable medical equipment, as well as online resources for further education were included. In total, the booklet was 20 pages long.

The booklet was written at a 6th grade reading level per guidelines from the American Medical Association (Agarwal et al., 2014). The project coordinator partnered with TUKH's hospital standards coordinator to maintain readability standards. The readability.io software, used by TUKH, averages the scores of four different validated readability standards (J.

Lombardi, personal communication on November 28, 2017). Graphics and pictures were used when appropriate to illustrate different key pieces of information, since a multi-media approach improves comprehension even when literacy is a problem (Agarwal et al., 2014). A page from the booklet is replicated in Appendix A.

Elective orthopedic spine patients encountered the various members of the care team at TUKH many times prior to surgery. Each of these encounters presents an opportunity for education. Once surgery was decided upon, there was often a waiting period of 1-3 months (M. Bokemper, personal communication, November 20, 2017). The patient was scheduled for a preoperative assessment clinic visit, cardiology evaluation, as well as a final preoperative visit with the surgeon about two weeks prior to surgery (M. Bokemper, personal communication, November 20, 2017).

The primary clinic nurse presented the spine education booklet to the patient at their final preoperative clinic visit and encouraged the patient to review the booklet frequently prior to the procedure. To further reinforce information related to postoperative recovery, staff on the orthopedic postoperative unit reviewed pertinent aspects of the booklet with the patient during their hospital stay. By allowing the patient to review the booklet before surgery and throughout the hospital stay, the andragogy tenet of self-driven, individualized, purposeful education was followed (Knowles, 1973).

Patients received a standardized telephonic survey within one week of hospital discharge to assess the effect of the intervention on anxiety, pain, and preparedness for surgery, recovery, and home care. The project coordinator attempted this phone call a maximum of three times on three separate business days. In the event a patient did not answer the phone, a standardized

voicemail with call-back number was left. The text of the telephonic patient interview can be found in Appendix B.

Project Sample and Selection Process

Convenience sampling was used for this project. Patients undergoing 1-4 level thoracic or lumbosacral laminectomies with or without spinal fusion by one orthopedic surgeon at TUKH during the eight-week project period were provided the educational intervention. These patients were identified by the primary clinic nurse prior to the patient's final preoperative visit. The project coordinator verified that patients met inclusion criteria before the educational booklets were provided. Medical record numbers (MRNs) and date of surgery were provided to the project coordinator for data collection purposes. Exclusion criteria included: (a) patients under the age of 18 years; (b) patients unable to read and speak the English language; (c) patients admitted after surgery to units other than the postoperative orthopedic unit at TUKH; and (d) patients who did not receive the educational booklet during preoperative clinic visits.

Prior to implementation, the Human Subjects Committee (HSC) reviewed the project proposal and determined it to meet quality improvement criteria. As a quality improvement project that did not involve a novel treatment, no informed consent was necessary for reception of the educational material. Reception of the educational materials did not place patients in harm, nor did the educational material represent a situation that would have required consent in contexts other than academic research. Patients received an explanatory letter with opt-out consent for the telephonic interview. The primary clinic nurse provided patients the explanatory letter and consent when presenting the educational booklet and notified the project coordinator if any patient opted out of the project. This letter with consent can be found in Appendix C.

Enrolled patient tracking can be found in Table 1. Throughout the project period, 20 patients were enrolled in the project. Eight patients were identified and received the educational intervention but were not included in data analysis for various reasons. Two patients could not recall receiving a booklet. Both patients were contacted for their post-discharge interview; however, the interview was cancelled after they stated they could not recall receiving the booklet. Several others were not contacted for the following reasons:

- One patient was admitted to a non-orthopedic unit due to comorbidities.
- Three patients cancelled surgery after their final preoperative appointment.
- One patient was transferred to a telemetry unit after sustaining a postoperative myocardial infarction.
- One patient's surgery was rescheduled due to a separate emergent case and was rescheduled for a date outside of the project period.

The remaining 12 patients were contacted postoperatively, and interviews were completed.

Table 1

Enrolled Patient Tracking

Count	Enrolled	Unable to follow	Unable to complete interview	In final analysis
<i>N</i>	20	6	2	12

Data Collection

The project coordinator collected survey data via the secure Research Electronic Data Capture (REDCap) server. The project coordinator obtained patient phone numbers via the electronic medical record (EMR). The project coordinator entered patient responses from the interview into REDCap for further analysis. To maintain patient confidentiality, patients were assigned numbers for the interview. For the purposes of this project, only numerical rating

responses to the interview questions were recorded. Charge nurses on the orthopedic unit notified the project coordinator when patients discharged, so that phone calls took place in the given timeframe.

To protect confidential patient information, encrypted messages with MRNs and dates of surgery were emailed to the project coordinator's University of Kansas Medical Center (KUMC) email. The project coordinator deleted the emails after the completion of data collection. Only the project coordinator and primary investigator had access to the REDCap project site. The project information will be removed from the REDCap site within one year of project completion to allow for potential project expansion.

Data Analysis

The data was analyzed using descriptive statistics to determine the impact of preoperative education on outcome measures. De-identified individual patient interview responses were used to generate mean reported effectiveness scores for each of the questions about pain management, anxiety, and preparedness.

Results

Each patient's interview responses for preparedness for surgery and recovery, anxiety reduction, and pain management are listed in Table 2. Scores were based on a 1-5 Likert scale, with one being not helpful at all, three being moderately helpful, and five being extremely helpful. No supplementary qualitative data was collected during this project.

Mean scores for preparedness for surgery, reducing anxiety, and pain management can be found in Table 3. Related to preparedness for surgery and recovery, the mean effectiveness score was 4.39 out of 5, indicating that patients on average found the booklet to be more than moderately helpful in preparing them for surgery and recovery. Scores ranged from 3.5 to 5 out

of 5. For reducing anxiety, patients found the booklet to be more than moderately helpful in reducing anxiety related to surgery and recovery. Patients gave the booklet a mean score of 4.33 out of 5, with a range from 3 to 5 out of 5. Regarding pain management, patients on average found the booklet to be more than moderately helpful with pain management, giving it a rating of 3.83 out of 5, with a range of 2 to 5 out of 5.

Table 2

Patient Perceptions of Preparation for Surgery, Anxiety Reduction, and Pain Management

Patient	Preparation for Surgery	Anxiety Reduction	Pain Management
1	4	5	3
2	5	5	5
3	4	4	2
4	5	5	5
5	5	5	5
6	4	4	3
7	5	5	4
8	4	3	3
9	3.5	4	3
10	5	4	5
11	4	4	4
12	4	4	4

Table 3

Mean Scores for Preparation for Surgery, Anxiety Reduction, and Pain Management

Measure	Preparation for Surgery	Anxiety Reduction	Pain Management
<i>M</i>	4.39	4.33	3.83

Discussion

The findings of this project reflect and supported the assumptions of the project as well as current literature. On average, patients stated that the preoperative spine education booklet was more than moderately effective in reducing anxiety and improving pain management and preparation for recovery. This was in line with data from several studies on the effect of

preoperative education in spine surgery (Fleege et al., 2014; Kesanen et al., 2017; McGregor et al., 2012; Rolving et al., 2016). Giving patients the spine booklet during their final preoperative clinic visit and reviewing pertinent information during their hospital stays fit with Knowles' andragogical model focus on just-in-time, pertinent education (Knowles, 1973), as patients could focus on the information they needed to know at that time, such as preoperative preparation, hospital goals, or home care. Written at a 6th grade level, the spine booklet was more likely to be educating patients at their level of understanding, another key to Knowles' andragogy concepts (Chesbro & Davis, 2002; Knowles, 1973). Interprofessional input into the spine booklet allowed for a clear picture of surgical preparation and recovery (Puckeridge et al., 2017; Tedesco et al., 2017). By designing the booklet with interprofessional input, the project coordinator provided patients with comprehensive information that helped increase preparation and decrease anxiety for surgery, recovery, and homecare. The value of this comprehensive information, written at an appropriate reading level and provided in a timely manner can be detected in the high scores patients reported during the survey.

The spine booklet's impact on pain management scored lower than its impact on anxiety and preparation, though it still was noted by most patients as being more than moderately helpful. The reduced impact on pain management echoed findings of several researchers who showed preoperative education to have a reduced effect on postoperative pain management (Louw et al., 2013; Wainright et al., 2016; Wilson et al., 2016). Though patients did not rate the booklet as high regarding pain management, most patients still found it more than moderately helpful in providing them with tools to manage postoperative pain. The impact on pain management was likely attributable in part to modification of expectations as well as CBT focus

(Ellis et al., 2015; Gaudin et al., 2017; LaMontagne et al., 2003; Lindgreen et al., 2016; Mancuso et al., 2017; Reiter, 2014; Rolving et al., 2016).

This project had several limitations. The small project sample size and subjective nature of the survey reduce generalizability. Spine booklet administration was dependent upon clinic staff; therefore, some patients may not have received the booklet. The project coordinator educated inpatient staff on the expectation that patients would also be educated about their plan of care and home care while in the hospital, however the degree to which this was done was not measured. The patient survey as written did not differentiate between state and trait anxiety. There was no pre-test for anxiety prior to administration of the spine booklet, rather the project relied on the patient's subjective assessment of anxiety reduction. Similarly, there was no group with which to compare postoperative pain management. Without a comparison group, it is difficult to identify how much of the changes in pain, anxiety, and preparation for home care was attributable to the educational offering, and not influenced by other external factors. While such control is not needed for a quality improvement project, future research studies may be able to shed more light on the impact of the booklet alone on pain, anxiety, and preparation.

Despite the above-listed limitations, the project had several strengths. Administration of the spine booklet led to easy integration into current clinic workflow and provided clinic staff with one more tool for educating the spine surgery population. The spine booklet was designed to benefit the patient, and in this way a subjective survey captured the true importance of education. The patients stated that the education improved their anxiety, pain, and preparedness, highlighting the impact of the intervention. The compact timeline of project implementation allowed for rapid analysis and determination of results; a trait crucial in today's world of rapid-cycle change. The interprofessional input for the spine booklet insured that patients received a

comprehensive product designed to help them prepare in as many ways as possible. The sixth-grade readability of the spine booklet made the booklet easier to read than some educational booklets identified in previous studies (Agarwal et al., 2014; Eltorai et al., 2016; Long et al., 2017), allowing many patients to benefit from education that would possibly be inaccessible to them if written at a higher grade-level.

Future PDSA cycles and research can take a variety of different paths. A continuation of this project could refine survey results since the booklet has remained in use after the completion of the project. A further examination of the impact of state anxiety on trait anxiety relating to their upcoming spine surgery may help improve preoperative screening and patient optimization. Further research may result in quantitative connections between preoperative education and readmission rates, especially regarding postoperative wound complications and infections in spine patients. Further exploration into varied media for preoperative education may yield other, more beneficial ways to educate patients. Implementation of the spine booklet with other spine populations, such as cervical fusions and fusions of greater than four levels can be explored, and any differences in results analyzed for further adaptation. Results of this project will be reviewed with the project team to determine clinical significance and continued worth of the intervention. A discussion will be held to decide on how and when to expand the educational offering to other types of spine procedures.

Conclusion

Back pain affects countless people throughout the world, and surgical intervention may be one treatment option. Anticipatory patient education can benefit patients in multiple settings, especially when designed with adult learners in mind. Many have used the tenets of Knowles'

(1973) andragogy model to offer problem-oriented, just-in-time education and improve patient outcomes.

The focus of this quality improvement project was the relationship between preoperative education and postoperative anxiety, preparation, and pain management in the spine surgery population. There is evidence that preoperative education helps reduce pain and anxiety, and improve preparedness in various surgical populations, along with some emerging evidence to support similar effects in spinal surgery. This evidence comes from a variety of multinational studies, ranging from anecdotal evidence from single centers to large cohort studies and from RCTs to comprehensive systematic reviews (Butterfield et al., 2017; Fleege et al., 2014; Kesanen et al., 2017; Koekenbier et al., 2016; LaMontagne et al., 2003; Lindgreen et al., 2016; Reiter, 2014; Rolving et al., 2016; Sjolting et al., 2003). Lessons learned from studies regarding educational content with Knowles' (1973) andragogical tenets were incorporated into this project. The impact of education on patient perceptions of anxiety, pain management, and preparedness was evaluated in this project.

Illustrated in this project was the connection between preoperative education and the spinal patient's subjective outcomes of preparation, pain, and anxiety. The importance of such education was demonstrated in this project. Incorporating current best evidence on content and design, the preoperative educational material created by an interprofessional team allowed spinal patients to reduce their anxiety, manage postoperative pain, and better prepare for their upcoming surgery.

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Appendix A

Reproduction of Spine Booklet Page

What to Expect After Surgery

Pain management

Pain after surgery is expected.

The goal of pain management is to make you as comfortable as possible by reducing your pain, but allowing you to remain alert enough to move, breathe deeply and help care for yourself. These activities help prevent complications and speed up recovery.

- Many people experience post-surgery pain and discomfort for four to six weeks.
- You are the expert on your pain.
- Tell staff or a nurse if your pain is not controlled.
- It's important to ask for and take pain medicine when you feel pain. Waiting longer may result in your pain being more severe and the medicine taking longer to take effect.
- Inform staff or nurses if your pain medicine fails to work or makes you uncomfortable in any other way.

Nurses will ask you to rate your pain on a scale of 0 to 10, with 0 as no pain at all and 10 as the worst pain imaginable. Though you likely will not be pain-free after surgery, it is important for it to be at a tolerable level to allow you to rest and move comfortably.

Types of pain medications

Many kinds of pain medicine which work together are given, so that side effects from any one kind are minimized. Your provider will customize the medications based on your history, symptoms, and response to the medications

PCA (patient-controlled analgesia): Some patients receive a PCA so they can administer pain medication with a push of a button. The machine is hooked into your IV line and set to deliver medication at certain intervals of time. Small tubing will be placed in your nose to monitor your breathing while on the PCA. For your safety, the PCA button may only be pushed by you. The PCA delivers the ordered medication only if enough time has passed between button pushes.

IV (intravenous) medications: You may receive pain medicine through your IV line when ordered by the doctor. Once the doctor orders this medication, it may be given to you as needed, when you request it.

Oral medications: Patients are often given pain medicine in the form of pills once they can tolerate fluids and are preparing to go home. Some are scheduled, some are given only when asked for.

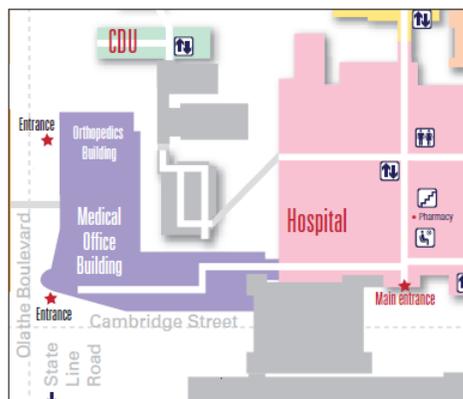
Alternative Pain Management Techniques

Pain is affected by your mental state. Past experiences of pain, and anxiety can make pain feel worse, and pain is less when you are relaxed or distracted. There are many activities that you can do to help control your pain:

- Distraction (Methods such as reading and talking can turn away attention from pain.)
- Guided Imagery (Meditation and breathing exercises)
- Changing position, sitting in a chair, and walking can take pressure off of your incision and keep muscles from getting tight.
- Music Therapy - bring headphones and your favorite relaxing music.
- Relaxation (Decreasing stress, reducing muscle tension or remembering pleasant experiences can help reduce pain.)

Pain Medicine at Discharge

- Fill the prescription here in our pharmacy on the ground level as you leave the hospital.
 - Hours:
 - Monday-Friday 7am-9pm
 - Saturday-Sunday 9am-5pm
 - Holidays 9am-5pm
- Do not lose or share your medications.
- We cannot refill medications same day; please call AT LEAST 7 calendar days in advance so that you do not run out.
- If you pain is uncontrolled when you go home, please call your surgeon's clinic nurse.
-



Appendix B

Post-Discharge Patient Interview Tool

Hello Mrs./Mr. _____, this is Morteza Rabii, a Doctor of Nursing Practice student at the University of Kansas Medical Center. I understand that you were recently discharged from the hospital after your back surgery. I hope all is going well with your recovery. I would appreciate if you would take the time to answer three short questions in regard to the educational booklet you received in Dr. _____'s clinic prior to your surgery.

Using a scale of one to five, with one being not helpful at all, three being moderately helpful, and five being extremely helpful, please answer the following questions:

- How helpful was the educational booklet in preparing you for your surgery, recovery, and home care? 1---2---3---4---5
- How helpful was the educational booklet in reducing anxiety about the surgery, recovery, and home care? 1---2---3---4---5
- How helpful was the educational booklet for providing you tools to help manage pain after surgery? 1---2---3---4---5

Do you have any questions I can help you with?

If patient does not answer telephone: Hello, this is Morteza Rabii, a nurse practitioner student at the University of Kansas Medical Center. I am calling (patient name) in regard to their recent hospitalization. You may return this phone call at (785) 979-3952, otherwise I will make another attempt to call between the hours of 8am and 5pm within two business days.

Appendix C

Patient Consent for Telephonic Interview

Dear _____,

I am Morteza Rabii, and I am a Doctor of Nursing Practice student at the KUMC school of nursing. I am conducting a quality improvement project along with my project committee and Dr. _____. We are contacting you because you are a patient of Dr. _____ and have been provided a preoperative educational booklet. We are recruiting patient participants to help us determine the impact of preoperative education on pain management, anxiety, and preparedness for surgery and recovery after spine surgery. Participation involves completing a telephone survey that will take about five minutes. No identifiable information will be collected about you, and the survey is anonymous. We will use the phone number you have provided to the hospital and clinic to reach you after discharge from the hospital. I will be calling within one week of your discharge from the hospital to complete the survey. I will call between the hours of 9 AM and 5 PM Monday-Friday unless you specify another time.

There are no personal benefits or risks to participating in this quality improvement project.

Participation is voluntary, and you can stop taking the survey at any time.

If you have any questions, please contact the project coordinator, Morteza Rabii at (785) 979-3952 or mrabii@kumc.edu, or the primary investigator, Dr. Carol Buller, at cbuller@kumc.edu.

For questions about the rights of quality improvement project participants, you may contact the KUMC Institutional Review Board (IRB) at (913) 588-1240 or humansubjects@kumc.edu

Sincerely,

Morteza Rabii, BSN, RN, ONC

mrabii@kumc.edu, (785) 979-3952