ASSESSMENT OF PERIOPERATIVE PAIN MANAGEMENT PRACTICES AMONG ARIZONA NURSE ANESTHETISTS FOR OPEN ABDOMINAL SURGERY

by

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SIGNED: Magdalena Wahls
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DEDICATION

I dedicate this DNP project to my parents, Anna and Stanislaw Podsiadlo, whose focus on the importance of education in my upbringing has taught me that nothing happens without hard work and passion.
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ABSTRACT

With intraoperative interventions, nurse anesthetists can help improve pain control, quality of care and patient outcomes in patients undergoing open abdominal surgery. This project aimed to identify current practices, use of evidence, and barriers to implementing perioperative pain management guidelines for future practice improvement. The purpose of this project was to assess the types of evidence and barriers that guide Arizona nurse anesthetist’s decision to use evidence-based practice (EBP) for intraoperative pain management of patients undergoing open abdominal surgery. A quantitative survey consisting of Likert scale questions (n=53) assessed a convenience sample of nurse anesthesia providers (n=17) at a Level 1 hospital in Phoenix, Arizona. The results from this project concluded that guidelines from the American Society of Anesthesiologists (ASA) and American Association of Nurse Anesthetists (AANA) (n=16), were used more frequently for managing perioperative pain compared to published practice guidelines (n=9) or facility guidelines (n=9). Journal articles (n=16), Google (n=13), doctors (n=16) were reported as the most frequently used sources for evidence to guide pain management practices. The most commonly reported barriers included inadequate facility for implementation of the multimodal therapies (n=13) and lack of staff support (n=13). The framework used in this project was the Promoting Action on Research Implementation in Health Services (PARiHS) framework, which supports the translation of evidence-based research into practice. Results from this survey can be used to facilitate the process of evidence dissemination by removing barriers, resulting in the best clinical practices to improve perioperative pain management for those undergoing open abdominal surgery.
INTRODUCTION

Post-surgical pain is a significant contributor to patient discomfort that leads to prolonged recovery and hospital stay (Laufenberg-Feldmann, Kappis, Mauff, Schmidtmann, & Ferner, 2016). Additionally, postsurgical pain represents a major, largely unrecognized clinical problem that increases morbidity and mortality while also contributing to the development of chronic pain (Laufenberg-Feldmann et al., 2016). The World Health Organization (WHO) and the International Association for the Study of Pain (IASP) acknowledge that pain management is a human right (Garimella & Cellini, 2013). Unfortunately, current postoperative pain management remains subpar; over 45 million Americans experience acute postsurgical pain each year and 80% of this population reports their pain as severe (Arnstein, 2010).

This Doctor of Nursing Practice (DNP) project investigated the types of evidence and barriers that guide a nurse anesthetist’s decision to use evidence-based practice (EBP) for intraoperative pain management of patients undergoing open abdominal surgery. Using the Promoting Action on Research Implementation in Health Services (PARiHS) framework, this DNP project assessed the factors that influence the use of EBP for pain management among nurse anesthetists who work for District Medical Group (DMG) in Phoenix, Arizona. This project focused on the use of evidence for pain management for open abdominal surgery during the perioperative period. This type of surgery was chosen due to its correlation with severe pain in the postoperative period (Belkind-Gerson & Kuo, 2014). While pharmacological modalities treat somatic pain, non-pharmacological pain management is effective in treating the cognitive and behavioral characteristics that result from pain (Demur, 2012). Although non-pharmacological pain management, such as acupuncture and music therapy, is important in the
postoperative period, this project excluded these types of modalities and focused only on pharmacological management.

**Background Knowledge**

Over 98 million surgical procedures are performed in both the hospital and ambulatory care setting each year (Oderda, 2012). Even though many surgeries are occurring each and every day, the management of acute postsurgical pain continues to be a major health challenge for patients, providers, and healthcare settings. Patients continue to face inadequate pain relief, which negatively impacts their quality of life (Chou et al., 2016). According to D’Arcy (2011), 59% of patients are concerned about inadequate pain management. Studies have shown poorly managed acute pain after surgery progresses to chronic pain in 10 to 50% of patients (Meissner et al., 2015).

Despite the remarkable progress in medicine in the areas of prevention, diagnosis, and therapy, the incidence of pain is increasing (Arnstein, 2010). The cause of chronic pain is complex and multifactorial, and so, anesthesia providers struggle with the prevention, assessment, and treatment of pain during the surgical period (Goldbery & McGee, 2011; Wells, Pasero, McCaffery, 2008). Opioid analgesics are frequently used to manage postsurgical pain, but their use must be balanced against the potential risk of negative side effects such as somnolence, respiratory depression, and delayed gastric motility (Oderda, 2012). However, the known side effects of opioids, the increased incidence of abuse and continued reports of uncontrolled postoperative pain indicate the need for new pain management strategies (Arnstein, 2010).
Postoperative abdominal pain varies in presentation and severity depending on the type of surgery being performed, the incision location, surgical techniques used, and underlying coexisting disease (Belkind-Gerson & Kuo, 2014). In open abdominal surgery, pain arises from the abdominal wall incision and from the interruption of normal muscle and tissue that occurs during the surgical period (Belkind-Gerson & Kuo, 2014). Open abdominal surgery causes somatic pain, visceral pain and inflammation, presenting many challenges in terms of pain management targets (Belkind-Gerson & Kuo, 2014).

Multimodal analgesia targets different pain receptors, decreases opioid requirements for pain relief, prevents hyperalgesia and the development of chronic pain (De Pinto & Cahana, 2012). Hyperalgesia is a state of increased sensitivity of pain; a stimulus that normally does not cause pain is perceived as significantly more painful (Janig, 2015). Sensitization of pain receptors by various substances (e.g., histamine, bradykinin, prostaglandins) that are released when tissue is damaged leads to hyperalgesia (Janig, 2015). Opioid induced hyperalgesia is a paradoxical response in which patients who receive opioids become more sensitive to pain resulting in loss of opioid efficacy (Lee, Silverman, Hansen, Patel, & Manchikanti (2011). Targeting different receptors helps address the many causes of pain—somatic pain, visceral pain and inflammation (Belkind-Gerson & Kuo, 2014). By decreasing pain transmission, multimodal analgesia decreases intraoperative and postoperative pain levels and opioid use (Chou et al., 2016).

**CRNA Scope of Practice**

Certified Registered Nurse Anesthetists (CRNAs) are advanced practice registered nurses (APRNs) that deliver anesthesia services in both independent and collaborative environments
After completing a graduate education and passing the National Certification Examination, nurse anesthetists enter the work setting equipped to provide high quality and evidence-based care to a variety of patient populations. The role of the CRNA includes performing a preoperative assessment, developing and initiating an individualized anesthetic plan, selecting and ordering medications, selecting and inserting invasive and noninvasive monitoring devices and monitoring patient status during and after anesthesia delivery (AANA, 2017). CRNAs provide a wide variety of services, ranging from acute to chronic, to patients via techniques such as general anesthesia, regional, local and sedation (AANA, 2017). A CRNA’s anesthetic and analgesic plan carries a patient through surgery with goals to optimize patient status, improve postoperative pain management, and decrease complications (AANA, 2017).

**Significance of Project**

There are many benefits of providing patients with adequate analgesia. Patients with adequate analgesia have improved outcomes, decreased recovery room stays, more rapid recovery and shorter hospital admissions (Polomano, Dunwoody, Krenzischek, & Rathmell, 2008). Additionally, patients experience better sleep, improved satisfaction, less need for rehabilitative services, and decreased costs of care (Polomano et al., 2008). On the organizational side, hospitals that are better at pain control have increased nurse retention and satisfaction along with improved institutional health (Polomano et al., 2008).

Acute pain after surgery can lead to delays in ambulation, discharge and return to normal daily activity (Oderda, 2012). Persistent acute pain has been related to the development of hyperalgesia and chronic pain states that are debilitating and difficult to manage (Oderda, 2012;
Arnstein, 2010). Pain may lead to prolonged immobility after surgery and increases a patient’s risk for thrombosis, pneumonia, and weakness (Saasouh, Jones, Stang, Hovsepyan, Chang, & Turan, 2016). Opioid use for pain management can further complicate recovery, leading to sedation, nausea, vomiting, urinary retention, constipation and postoperative ileus, which further prolongs hospital stay, increases healthcare costs, and lowers patient satisfaction (Saasouh et al., 2016). According to McCartney (2011), 10-15% of 40 million surgical patients will develop chronic pain after one year. Chronic pain is associated with clinical, psychological and social consequences including reductions in productivity, quality of life and stamina (Dowell, Haegerich, & Chou, 2016).

Readmissions for pain relief is the most frequent cause for hospital admission within the first week after surgery, with the average amount of charges generated by the health system from patient returns due to pain being $1,869 (Coley, Williams, DaPos, Chen, & Smith, 2002). These average costs do not take into account the additional resources, both indirect and direct costs, required for pain relief during hospitalization (Coley et al., 2002). Patients admitted to the hospital for postoperative pain and classified as inpatient incur mean charges of $13,902 (Coley et al., 2002). Other postsurgical patients come to the Emergency Department for pain management and are discharged home; these visits also increase healthcare costs, averaging about $1,278 per visit (Coley et al., 2002). Given the high cost of uncontrolled pain postoperatively, especially if the patient requires hospitalization, it seems prudent to improve pain control in order to avoid the financial burden associated with these possibly unnecessary and avoidable returns and readmissions.
Patient Satisfaction Scores

As part of its “triple aim” framework, the Institute for Healthcare Improvement (IHI) includes both care quality and patient satisfaction in their quality indicators (2017). Patient satisfaction scores are associated with fiscal reimbursement from Medicare and other insurance companies (Letourneau, 2016). Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey results can affect Medicare reimbursements by 2% (Letourneau, 2016). Uncontrolled pain after surgery, as well as the undesirable side effects of opioids, such as nausea, vomiting, urinary retention, and ileus all result in reduced patient satisfaction (Garimella & Cellini, 2013; Saasouh et al., 2016). With a growing amount of revenue at stake, and in order to increase reimbursement amounts, improving patient experience ratings is beneficial for healthcare systems (Letourneau, 2016).

Evidence-Based Practice

The integration of EBP in the healthcare setting has led to better patient outcomes, greater quality of care, and reduced healthcare costs (Melnyk, Fineout-Overholt, Gallagher-Ford, & Kaplan, 2012). The 2012 Practice Guidelines for the Acute Pain Management in the Perioperative Setting and 2016 Clinical Practice Guideline (CPG) on the management of postoperative pain offers anesthesia providers strong, evidence-based recommendations for pain management during the perioperative period (Ashburn et al., 2012; Chou et al., 2016). The Institute of Medicine’s (IOM’s) goal is that by the year 2020, 90% of healthcare assessments and decisions will be supported by evidence (Melnyk et al., 2012). According to Melnyk and colleagues, IOM’s overarching goal will be difficult to attain without sustained efforts to improve EBP adoption in the healthcare environment (2012). Improving EBP knowledge and
skills, creating EBP mentoring programs, and fostering an organizational culture of EBP use can help enhance EBP adoption (Melnyk et al., 2012).

**Multimodal Analgesia**

Evidence supports the use of multimodal analgesia for pain management, which combines various analgesics with different mechanisms, and sites of actions. Multimodal analgesia results in additive and synergistic effects on modulating pain (Buvanendran, 2012). The various multimodal techniques described below are supported by research evidence and are available to nurse anesthetists managing intraoperative pain during abdominal surgery.

By inhibiting the neural conduction from the surgical incision to the spinal cord, regional anesthesia and analgesia reduce spinal cord sensitization (Buvanendran, 2012). Neuraxial anesthesia is extremely effective in decreasing postoperative pain by attenuating the stress response and inhibiting pain transmission from the areas of surgical intervention (Olson, Pellegrini, & Movinsky, 2014). Local anesthetics, opioids, and other pharmacologically active drugs can be given neuraxially to cause spinal analgesia and/or anesthesia for patients undergoing open abdominal surgery (Olson, Pellegrini, & Movinsky, 2014).

Sodium channel blockers (lidocaine), nonsteroidal anti-inflammatory drugs (NSAIDs) (acetaminophen, ketorolac, celecoxib), noncompetitive N-methyl-D-aspartate (NMDA) receptor antagonists (ketamine, magnesium), and alpha-2 adrenergic agonists (precedes) offer multimodal analgesia. By inhibiting nerve-ending excitation and by blocking conduction of peripheral nerves, lidocaine produces analgesia (Scholz, 2002). NSAIDs have anti-inflammatory, analgesic and opioid-sparing effects (Buvanendran, 2012). By blocking the NMDA receptors, ketamine and magnesium block signals of pain perception from going to the thalamus and cortex and
prevent the development of hyperalgesia (Buvanendran, 2012). Activation of alpha-2 adrenergic receptors in the brainstem and peripherally inhibits substance P and norepinephrine release that stimulates the transmission of painful stimulations and activates the pain pathways (Mohamed, Fares, & Mohamed, 2012). The exact mechanisms of action of gabapentin and pregabalin are undecided (Chen & Mao, 2015). However, they are thought to block voltage-gated calcium channels in order to decrease pain after surgery (Chen & Mao, 2015).

Local Problem

With the negative consequences associated with postoperative pain, along with evidence portraying the benefits of multimodal approaches for pain management, nurse anesthetists are increasingly individualizing their pain management approach to best fit their patients’ needs. As a student nurse anesthetist, this author has performed clinical rotations in operating rooms (ORs) across Arizona. While in the clinical location, a wide variety of provider preferences with regards to optimal pain management have been observed. The majority of the clinical sites do not have specific hospital guidelines and protocols for perioperative pain management, which may be due to the complexity involved in patient and provider variability.

Improving pain management after surgery and decreasing opioid use is especially important in Arizona. Evidence supports the use of multimodal analgesia for pain management. The intraoperative use of multimodal analgesia decreases postoperative pain and lowers opioid requirements after surgery (Melnikov, Bjoergo, & Kongsgaard, 2012). According to King and colleagues (2017), poorly controlled pain after surgery is associated with a higher risk of post-surgery initiated opioid use. Postoperative overdose is a rare but possibly fatal complication with increasing incidence (Cauley et al., 2017). Opioid prescriptions increase the risk of fatal opioid
overdose (Garg, Fulton-Kehoe, & Franklin, 2017). Last year alone, Arizona had 790 deaths from opioid overdose from both prescription and illicit drugs; this equates to about two deaths per day due to opioid overdose and a 74% increase in the last four years (Office of the Governor Dough Ducey, 2017). Governor Doug Ducey, in June of 2017, issued an executive order to increase the reporting of opioid-related data within 24 hours (Office of the Governor Dough Ducey, 2017).

**Purpose**

The purpose of this Doctor of Nursing Practice (DNP) project was to gain insight into the types of evidence nurse anesthetists in Arizona are using to determine their analgesic plan for patients undergoing open abdominal surgery. Specifically, this project sought to identify what type of evidence nurse anesthetists in Phoenix, Arizona use to manage perioperative pain and to identify barriers to using EBP for patient’s pain management while undergoing abdominal surgery.

The quality of care provided to patients can be enhanced with the transfer of evidence-based knowledge into daily practice; the uptake of evidence-based knowledge in the healthcare environment does not happen spontaneously but instead involves an active implementation process. Information gathered from this assessment can help this author consider how the findings may impact future pain management practices across Arizona. The results may assist with determining the need for an educational tool, a clinical decision tool or protocols to improve guideline application in the clinical setting.

As a leader in the healthcare setting, an APRN can drive forward changes to improve the current management of perioperative pain to better match best evidence recommendations. APRNs may be the first providers that meet with the patient, placing them in an opportune
situation for initiating quality-improvement measures (Boucher, McMillen, & Gould, 2015). Educating colleagues, supporting the adoption of EBP and participating in and leading quality measures at the hospital strategically place APRNs in key roles that shape healthcare quality and outcomes (Boucher, McMillen, & Gould, 2015).

**Key Stakeholders**

Multiple stakeholders play a role in controlling perioperative pain, as uncontrolled postsurgical pain has negative effects system-wide. Hospital administrators, the Chief Anesthesia Director, and the Chief Surgical Director, and CRNAs are all hospital stakeholders with an interest in improving pain control and patient satisfaction after surgery. By directly managing pain during the preoperative, intraoperative and postoperative periods, nurse anesthetists in Arizona will be the key stakeholders of this DNP project by yielding insight into their current practices. Nurses that work with patients who have inadequate pain control are also impacted (Slatyer, Williams, & Michael, 2015). Nurses might feel anxious and helpless when working with patients with poor pain control, which can result in distress and work exhaustion (Slatyer et al., 2015). With the negative consequences of acute postsurgical pain and the possibility of acute pain progressing to chronic pain, patients are also stakeholders in this DNP project. Decreasing chronic pain and opioid use, now more than ever, is a nationwide goal; the Centers for Disease Control and Prevention, U.S. Food and Drug Administration and federal government are all stakeholders in the success associated with multimodal analgesia, improved acute pain control, and decreased opioid use (U.S. Department of Health and Human Services [USDHHS], 2016).
DNP Project Questions

This DNP project asked four questions with three aims to identify the type of evidence nurse anesthetists in Phoenix, Arizona use to manage perioperative pain for patients undergoing abdominal surgery along with barriers to the use of evidence:

1) Among nurse anesthetists at District Medical Group (DMG) in Phoenix, Arizona, what specific guidelines are being used to manage perioperative pain during open abdominal surgery?

2) What types of evidence are being used to manage perioperative pain during open abdominal surgery?

3) What barriers prevent the use of evidence for perioperative pain management in patients undergoing open abdominal surgery?

4) Is there a relationship between the use of evidence for perioperative pain management in patients undergoing open abdominal surgery and years of clinical experience as a nurse anesthetist and level of education?

Project Aims

1) Assess if specific guidelines are being used to manage perioperative pain during open abdominal surgery.

2) Identify the different types of evidence that are being used to manage perioperative pain during open abdominal surgery.

3) Identify barriers that prevent the use of evidence for the perioperative management of pain in patients undergoing open abdominal surgery.
CONCEPTUAL FRAMEWORK AND SYNTHESIS OF EVIDENCE

Conceptual Framework

Although research on the pharmacological management of pain after abdominal surgery is comprehensive, the translation of research evidence into clinical practice is difficult and often left to the discretion of the clinician, resulting in substantial variation in prescribing practices (Botti et al., 2014). There is limited data about the different types of evidence (research, clinical experience, patient experience and local data or information) that are utilized in the clinical setting. This DNP project will use the Promoting Action on Research Implementation in Health Services (PARiHS) framework to perform an initial diagnostic analysis of the evidence element to understand evidence resources and barriers to intraoperative pain management for abdominal surgery among CRNAs at one facility. This framework (Figure 1) supports the translation of evidence-based research into practice and includes the nature of the evidence, the context in which the change is to be implemented and the facilitation process (Kitson, Harvey, & McCormack, 1998).

Key Concepts

The Promoting Action on Research Implementation in Health Services (PARiHS) framework supports the translation of evidence-based research into practice. According to the framework, the nature of the evidence, the context in which the change is to be implemented and the facilitation process all influence the successful implementation of research into a clinical setting (Kitson, Harvey, & McCormack, 1998). The PARiHS framework states that evidence comes from four sources: research, clinical experience, patient experience and local data or information (Kitson et al., 1998). The context section of the PARiHS framework evaluates
innovation relevance, organization fit of the innovation, resources and implementation strategies (Kitson et al., 1998). Facilitation assesses the support needed to implement the change on the individual level and involves helping individuals adjust their attitudes, practices, and ways of thinking and working (Kitson et al., 1998). For successful implementation, the PARiHS framework needs strong ratings in all three factors (evidence, context, and facilitation) (Kitson et al., 1998).

In nursing, best evidence is research that is methodologically appropriate, rigorous, and clinically relevant (Polit & Beck, 2012). Best evidence addresses clinical needs, efficacy, safety, cost-effectiveness, reliability, and patients’ experiences (Polit & Beck, 2012). Evidence is a key element in the PARiHS framework and includes research, clinical experience, patient experience and local data or information. The PARiHS framework element of evidence addresses all of the components of best evidence in nursing.

Clinical experience, patient experience, and local data or information all influence evidence. Clinical expertise is essential for integrating evidence in the clinical setting. Practitioners draw from both their own and colleague experiences; this knowledge is often tacit and intuitive (Rycroft-Malone, Seers, Titchen, Harvey, Kitson, & McCormack, 2004). Knowledge from patients about their previous experiences, their own bodies, and their social history should inform evidence. Rycroft-Malone and colleagues (2004) state that involving patient experiences into evidence is a complex process. Local data and information also informs evidence and includes information about audit/performance data, organizational culture, social or professional networks, and national/local policy (Rycroft-Malone et al., 2004).
The multidimensional PARiHS framework represents the complexity involved in the process of evidence translation into clinical practice (Rycroft-Malone et al., 2002). For the successful translation of knowledge into practice, transparency about the nature of the evidence, the quality of the context and the type of facilitation needed is required (Rycroft-Malone et al., 2002). According to Kitson, Rycroft-Malone, Harvey, McCormack, Seers, and Titchen (2008), the PARiHS framework is best used to implement evidence into practice in a two-stage process. The facilitation of evidence into the clinical area is directed by the information gathered from the preliminary stage, which performs a diagnostic analysis of the evidence and context (Kitson et al., 2008). The data gathered from this diagnostic analysis can then be used to determine the most appropriate facilitation method for implementing evidence into the clinical area (Kitson et al., 2008). By using the PARiHS framework in a two-stage process, interventions for knowledge translation can be integrated locally. This DNP project will use the first stage of the PARiHS framework to assess what types of evidence are used in the clinical area and current context. A PARiHS-based diagnostic analysis not only informs the facilitation process, but also engages stakeholders in self-reflection about the implementation and the nature of the change (Stetler, Damschroder, Helfrich, & Hagedorn, 2011).
Synthesis of Evidence

Numerous studies have evaluated the effectiveness of multimodal analgesia in decreasing pain after surgery; the synthesis below will describe the most updated literature concerning multimodal analgesia in abdominal surgery and its effects on modulating pain during the surgical period. Key search terms used for this literature search were abdominal surgery, multimodal, postoperative, pain and analgesia. CINHAL, Embase, and Pubmed were all used to search for relevant articles. The literature search aimed to find randomized control trials published within the last five years, in English and with human subjects. Sixty-seven randomized control trials (RCTs) were selected based on their study design, surgical procedure, and analgesic approach. The articles were evaluated for validity and reliability, and ten articles were selected to evaluate the efficacy of multimodal analgesic approaches during abdominal surgery due to their specificity for abdominal surgery (Table 1).
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<th>Key Variables Hypothesis Research Question</th>
<th>Design</th>
<th>Sample (N)</th>
<th>Data Collection (Instruments/tools)</th>
<th>Findings</th>
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<tr>
<td>El Chaar, Stoltzfus, Claros, &amp; Wasylik, 2016</td>
<td>Investigate the economic impact of IV acetaminophen in bariatric surgery, its effect on pain, satisfaction and hospital length of stay (LOS). <strong>Hypothesis</strong>: IV acetaminophen with IV/PO narcotics would produce significant cost savings, lower pain scores, decrease hospital length of stay (LOS), and improve overall pt satisfaction.</td>
<td>Double-blind, prospective, randomized controlled trial</td>
<td>Sample N=100 Pt undergoing bariatric surgery Age &gt; 18 BMI&gt; 35 with 1+ comorbidities ASA I-III</td>
<td><strong>Data Collection</strong> Pain was measured every 2 hr for 24 hr, postoperative days 7 and 10, using the numeric scale 0-10; satisfaction was measured with the 5-point Likert scale during postoperative visit days 7 and 10. <strong>Data Analysis</strong> AVONA, Cochran-Mantel-Haenszel test, Mann-Whitney rank-sum tests. Adequate power of 0.92 (alpha 0.05) needed with 24 patients.</td>
<td>• Mean direct hospital costs: Group 1 = $3089.18 Group 2 = $29991.62 (P&gt;0.05). • Pain scores did not differ significantly (P=0.61), no significant difference in LOS (P=0.95). • Significantly more pt in group 2 incurred surgery-related indirect costs (10% vs 2%) (P&lt;0.05) with more ED visits in first 30 days for uncontrolled pain, yielding higher total indirect costs</td>
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<tr>
<td>Gasanova et al., 2015</td>
<td>Compare bilateral TAP blocks with surgical site infiltration on postoperative pain. <strong>Hypothesis</strong>: Ultrasound-guided bilateral TAP blocks deliver greater pain reductions versus surgical site infiltration at 6 hr after open TAH</td>
<td>Prospective, randomized trail</td>
<td>Sample N=74 Female undergoing TAH Age 18-80 ASA I-III</td>
<td><strong>Data Collection</strong> Pain scores at rest and with coughing using the visual analog scale (VAS), opioid requirements, nausea/vomiting (n/v), rescue antiemetics measured in the post anesthesia care unit (PACU), and at hours 2, 6, 12, 24, 48. <strong>Data Analysis</strong> Post hoc comparisons, t tests with Bonferroni correction; Power of 0.90 (alpha 0.05) with &gt;23 patients/group</td>
<td><strong>Main outcomes Measured</strong> - <strong>Primary Outcomes</strong>: direct hospital costs, LOS, postoperative pain, patient satisfaction - <strong>Secondary Outcomes</strong>: indirect costs, rescue narcotic dosage, 30-day outcomes</td>
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<td>• Significantly lower pain scores at rest and with coughing in group 2 at all postoperative time points (P&lt;0.0001) except at rest in the PACU. • Significantly lower opioid requirements in group 2 at 24 and 48 hours. • No differences in n/v, need for rescue antiemetics.</td>
</tr>
<tr>
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| Gasanova, Grant, Way, Rosero, & Joshi, 2013 | Evaluate the analgesic efficacy of TAP block with or without an acetaminophen and NSAID combination.  
*Hypothesis*: Bilateral TAP block combined with acetaminophen and NSAID would be superior to either analgesic technique alone. | Randomized, controlled, observer-blinded trial | Sample  
N=74  
Female undergoing TAH  
Age 18-80  
ASA 1-3 | Data Collection  
Pain and nausea scores measure at 6 time points over 24 hr period.  
**Data Analysis**  
Chi-square, Fisher’s exact test, Cochran-Mantel-Haenszel test, post hoc analyses  
- Considered 25% reduction in 24h morphine consumption clinically significant, power of 0.90 (alpha 0.05), needing sample size of 22 patients per group  
**Main outcomes Measured**  
-Primary Outcomes: morphine consumption in first 24 hr after surgery  
-Secondary Outcomes: resting and dynamic pain scores, nausea scores, occurrence of vomiting, need for rescue antiemetics | No statistically significant differentiations in pain at rest, opioid consumption, n/v occurrence, rescue antiemetic needs between groups.  
Pain with coughing in Group 1 was significantly less variable (P=0.012).  
Not double blinded because group 3 did not receive a placebo TAP block. |
| Gilron et al., 2015 | Evaluate triple versus double nonopioid perioperative analgesic regimens  
*Hypothesis*: Triple combination of nonopioids would decreased postoperative evoked pain more than a double combination. | Single-center, Randomized, parallel design, double-blind controlled trial | Sample  
N=87  
Female >18 yrs. undergoing TAH  
ASA 1 & 2  
BMI< 40 kg/m2 | Data Collection  
Medications administered 1 hour preoperatively for 48 hours.  
**Data Analysis**  
Bonferroni method, linear mixed models, ANOVA with Wilcoxon test, Pearson correlation coefficients  
**Main outcomes Measured**  
-Primary outcomes: cough-evoked pain  
-Secondary outcomes: pain at rest, sitting, with peak expiration; opioid use, side effects; peak expiratory flow rate, timed up and go test, modified brief pain inventory | Trial did not show considerable benefits of adding 3rd nonopioid analgesic (P<0.05).  
Trial inadequately powered due to small sample recruitment size, and was prematurely terminated. Large dropout rate due to protocol violations. |
<table>
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</tr>
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<tbody>
<tr>
<td>Kadam, Wijk, Moran, &amp; Millers, 2013</td>
<td>Evaluate analgesic efficacy of thoracic epidural or TAP block for pain control after abdominal surgery</td>
<td>Randomized controlled trial</td>
<td>Sample N=42 Age 18-80 ASA 1-III 0.2% ropivacaine 8 ml/hr. bilaterally for 3 days (N=22)</td>
<td><strong>Data Collection</strong> Numerical rating scores for pain (0 to 10) immediately in PACU, 1 hour after PACU arrival, on days 1, 2, 3 on ward. Patient satisfaction assessed with Likert scale at day 3 and at one month. <strong>Data Analysis</strong> Linear mixed-effect model, two sample t test, Fisher's exact test. For 0.80 power, needed 82 patients. <strong>Main outcomes Measured</strong> -Primary outcomes: Numerical rating pain scores (at rest &amp; dynamic) x 72 hours; total fentanyl intake -Secondary outcomes: Complications, satisfaction scores</td>
<td>Participants and assessors were not blinded. Study terminated early due to fewer open cases being performed and lack of participants, study underpowered No differences found in pain scores (P&gt;0.1), total fentanyl requirement (P&gt;0.99) and satisfaction scores (P&gt;0.47)</td>
</tr>
<tr>
<td>Kroll, Meadows, Rock, &amp; Pavliv, 2011</td>
<td>Evaluate safety and efficacy of IV ibuprofen for postoperative analgesia</td>
<td>Multicenter randomized placebo-controlled trial</td>
<td>Sample N=319 Female Age 18-70 Undergoing elective TAH with required postoperative hospitalization <strong>Intervention group (IG):</strong> N=166 800 mg IV ibuprofen every 6 hours <strong>Control group (CG):</strong> N=153 Placebo every 6 hours -All had PRN morphine 1-2 mg every 5 minutes <strong>Setting</strong> 10 different hospitals across the USA</td>
<td><strong>Data Collection</strong> Pain measured by visual analog scale (VAS) from 0-10, assessed every 3 hours in the first 24 hours, then every 6 hours for the next 24 hours. <strong>Data Analysis</strong> ANCOVA and Dunnet’s test used for statistical analysis <strong>Main outcomes Measured</strong> -Primary outcomes: Decrease morphine intake 24 hours after surgery -Secondary outcomes: reduced pain intensity, prolonged interval for 1st breakthrough pain narcotic, incidence of opioid side effects, ambulation time and PO intake, LOS</td>
<td>First 24 hours in CG: -Median morphine requirement decreased 19% (P&lt;0.001) -Significant pain decrease at rest (P&lt;0.001) and with movement (P&lt;0.001) -Ambulation time was significantly faster (P=0.018) No difference in adverse events in both groups. Power&gt;90 %, alpha 0.05 P&lt;0.05 significant</td>
</tr>
<tr>
<td>Author / Article</td>
<td>Key Variables Hypothesis Research Question</td>
<td>Design</td>
<td>Sample (N)</td>
<td>Data Collection (Instruments/tools)</td>
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| Melnikov, Bjørgo, & Kongsgaard, 2012 | Evaluate the effectiveness of bilateral TAP block and paravertebral block (PVB) in reducing opioid consumption in patients undergoing major gynecologic surgery.  
Hypothesis: PVB is at least as useful as TAP in postop pain relief. | Prospective, randomized, controlled, observer-blinded study | **Sample**  
N=58  
Females  
Undergoing major gynecologic surgery (vertical midline laparotomy)  
*Intervention groups:*  
1) PCA only (N=20)  
2) Bilateral TAP block (N=19)  
3) Bilateral paravertebral block (PVB) at T10 level (N=19)  
**Setting**  
Norwegian Radium Hospital  
March-Nov 2010 | **Data Collection**  
Pain assessed using numeric rating scale (NRS). Cumulative ketobemidon use, postop pain scores (resting & with coughing), postop n/v at hours 2, 4, 6, 24, 48. Patient satisfaction assessed at 48 hours using a categorical scoring system (1=satisfied, 2= cannot answer, 3=dissatisfied) | Both blocks have significant reduction in opioid intake and pain compared with control patients.  
Total fentanyl intake was significantly reduced in PVB group.  
No differences in postoperative n/v and antiemetic need.  
Limited size, hard to assess safety of bilateral PVB.  
Success rate of each form of block no assessed.  
Some difficulty with incorrect data collection.  
Difficult to blind patient to intervention. |
| Mohamed, Fares, & Mohamed, 2012 | Evaluate the analgesic efficacy of spinally given dexmedetomidine or dexmedetomidine combined with fentanyl in pts having major abdominal cancer surgery. | Randomized, double blind trial | **Sample**  
N=90  
ASA I-II | **Data Collection**  
HR and BP were recorded for 120 min after intrathecal administration; Visual analog scale (VAS) assessed pain immediately after surgery and at 2, 4, 6, 8, 16 & 24 hr postop; Sedation was assessed via modified Observer's Assessment of Alertness/Sedation Scale.  
**Data Analysis**  
Kruskal-Wallis, Mann-Whitney, and chi-squared tests. Used P<0.05 as statistically significant | Groups 2 and 3 showed statistically reduced:  
-Mean intraoperative heart rate and blood pressure (P<0.05)  
-pain scores immediately after surgery and 12 hr postoperatively  
-Breaththrough pain time (P<0.01).  
-Tramadol requirements (P<0.01).  
No significant differences in postop hemodynamics/sedation.  
No adverse outcomes. Addition of 25 mcg fentanyl has effect. Study limited by sample size. |
<table>
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<tr>
<th>Author / Article</th>
<th>Key Variables Hypothesis</th>
<th>Research Question</th>
<th>Design</th>
<th>Sample (N)</th>
<th>Data Collection (Instruments/tools)</th>
<th>Findings</th>
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<tr>
<td>Yang, Peng, Li, &amp; Li, 2015</td>
<td>Examine effect of cyclooxygenase-2 (COX-2) on postop analgesia after major abdominal surgery x 1 week</td>
<td>Prospective, randomized controlled, double-blind study</td>
<td><strong>Sample</strong> N=90 Age 18-75 ASA I-II Pt undergoing major elective abdominal surgery</td>
<td><strong>Data Collection</strong> Pain intensity (resting &amp; during leg raising exercise) measured four times per day using numeric rating scale (NRS) or faces rating scale (FRS).</td>
<td><strong>Findings</strong> 77 patients completed study, 13 withdrew (14.4%) due to need for rescue medication. Pain intensity ratings decreased significantly within 3 days in all group (P&lt;0.05). No significant differences in pain levels among groups. Most pts still reported pain as moderate after 72 hr. After day 4, group 3 had significantly lower pain intensity scores during leg raising exercises (P&lt;0.05). No significant differences among groups in adverse effects.</td>
<td></td>
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<tr>
<td>Yon, Choi, Kang, Park, &amp; Yang, 2014</td>
<td>Evaluate effect of IV Lidocaine in improving postop pain in pts undergoing subtotal gastrectomy</td>
<td>Double-blind, randomized, placebo-controlled trial</td>
<td><strong>Sample</strong> N=36 Age 18-80 Weight between 45-100 kg Intervention group: (1) IV Lidocaine preoperatively and throughout surgery (N=17) (2) IV NS solution placebo (N=19) All patients received IV fentanyl PCA postoperatively</td>
<td><strong>Data Collection</strong> Visual analogue scale (VAS) pain scores measured at hours 2, 4, 8, 12, 24, and 48 hr after surgery</td>
<td><strong>Main outcomes Measured</strong> -Primary outcomes: Decrease pain intensity up to day 7 after surgery -Secondary outcomes: Fentanyl consumption; administration frequency of PCA; Postoperative adverse effects; patient satisfaction at discharge</td>
<td>Lidocaine group had: Significantly reduced VAS pain levels &amp; PCA dosing until 24 hr after surgery (P&lt;0.001); fentanyl consumption was significantly lower until 12 hr postop (P=0.007); total amount of fentanyl used &amp; administration frequency of PCA were significantly reduced (P=0.003). No significant differences in nausea/vomiting (n/v), length of hospital stay (LOS), return to normal diet, pt satisfaction. No reported side effects from Lidocaine.</td>
</tr>
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</table>
Strengths

The evidence strongly supports the use of NSAIDs, lidocaine, dexmedetomidine and neuraxial anesthesia (paravertebral and TAP blocks) to improve pain control and decrease opioid consumption after abdominal surgery (Kroll, Meadows, Rock, & Pavliv, 2011; Yon, Choi, Kang, Park, & Yang, 2014; Mohamed, Fares, & Mohamed, 2012; Melnikov, Bjoergo, & Kongsgaard, 2012). Additionally, El Chaar, Stoltzfus, Claros and Wasylik (2016) found that intraoperative dosing of acetaminophen for bariatric surgery significantly decreased indirect costs associated with surgery and thirty-day postoperative pain levels. No adverse effects from the drugs were reported in any of the studies reviewed.

Some authors aimed to determine the analgesic benefit of one intervention versus another. Kadam, Wijk, Moran, and Millers (2013) did not find differences in pain levels after thoracic epidurals or TAP blocks. However, Mohamed, Fares, and Mohamed found that adding dexmedetomidine to neuraxial anesthesia resulted in significantly reduced pain responses and scores (2012). The authors also found that adding fentanyl, an opioid, to the neuraxial medication mixture, had no added benefits for pain relief (Mohammed et al., 2012). Melnikov, Bjoergo, and Kongsgaard (2012) found that both the paravertebral and TAP blocks were effective in reducing pain intensity and opioid consumption. In open abdominal surgery, Gasanova et al. (2013) found that surgical site infiltration has superior pain relief to the TAP blocks.

Weaknesses

Discrepancies among the study results weaken the overall strength of the evidence. El Chaar, Stoltzfus, Claros and Wasylik (2016) and Yang, Peng, Li and Li (2015) failed to show
pain reductions after acetaminophen and parecoxib administration during the immediate postoperative period. Yang, Peng, Li, and Li administered cyclooxygenase (COX-2) selective NSAIDs to patients undergoing open abdominal surgery (2015). In their trial, they failed to see any decreases in postoperative pain after the administration of parecoxib for 3 days; patients continued to complain of moderate levels of pain (Yang et al., 2015). Only after celecoxib was added to the regimen on day 4 did pain levels begin significantly decreasing (Yang et al., 2015). Even though Yon, Choi, Kang, Park and Yang found that intraoperative lidocaine infusions decreased pain scores and opioid needs, it did not result in improved patient satisfaction (2014).

The literature review also revealed studies that evaluated the benefits of adding more than one multimodal analgesic to the anesthetic plan (Gilron et al., 2015; Gasanova, Grant, Way, Rosero & Joshi, 2013). Gilron et al. (2015) did not find pain reductions when three versus two non-opioid analgesics were used. Gasanova and colleagues (2013) failed to show differences in pain at rest or opioid consumption when TAP blocks were performed in addition to acetaminophen and NSAIDs.

**Gaps**

Current updated literature within the last five years regarding the benefits of individual multimodal analgesic additions is lacking. Additionally, no published studies had non-opioid pharmacologic strategies as the sole analgesic plan. Gilron et al. (2015) and Gasanova et al. (2013) both failed to show the benefits of more non-opioid analgesics leading to improved pain control. No other studies were found to specifically compare the number of multimodal interventions to improved pain control, hence leaving the question of too many or not enough, unanswered. Another gap found in the literature is the lack of detail about barriers to study
implementation and cost analysis. One study did evaluate the cost-benefit of adding acetaminophen to the multimodal strategy and, even though it was for laparoscopic abdominal surgery, it was included in this synthesis of evidence (El Chaar et al., 2016). Understanding the barriers to implementation, costs, and how they were addressed could have strengthened future study replication.

**Limitations**

Numerous studies were underpowered and had limited sample sizes. Patients often were withdrawn from the studies due to needing increased rescue pain medications, changes in surgical practices, and due to the use of other analgesic strategies that violated trial protocols (Yang et al., 2015; Gilron et al., 2015; Melnikov et al., 2012). Participants were not always blinded due to the intervention being performed made blinding not feasible.

The literature review revealed that multimodal analgesic approaches are being frequently used during abdominal surgery. A decrease in postoperative pain scores and opioid consumption can be achieved by the addition of non-opioid drugs given orally, intravenously, regionally, and neuraxially. The literature review of these high-quality RCTs supports that multimodal non-opioid techniques are safe and effective options to improve pain control after open abdominal surgery. However, more research is still needed to evaluate best practice recommendations for consistently improved pain control, improved patient satisfaction, and cost-effectiveness.

**METHODOLOGY**

The methodology for this project is a descriptive design guided by the PARIHS framework. The purpose is to identify the type of evidence nurse anesthetists in Phoenix,
Arizona implement to manage perioperative pain and to identify barriers to using EBP for patient’s pain management while undergoing open abdominal surgery.

**Ethical Considerations**

Prior to initiating this DNP project in the clinical setting, approval from the IRB at the University of Arizona was obtained which determined this did not meet human subject review. The ethical principle of “Respect for Persons” was implemented by providing all CRNAs with an introduction letter explaining that this survey includes volunteer participation and a brief explanation of the study with no known risk associated with completing the survey (Appendix A and B). Participants were reassured that no personal identifiers are linked to survey results and anonymity will be maintained (Qualtrics, 2017). The principle of doing good, “Beneficence” informed participants that information obtained in this study might lead to future research and the development of an action plan that further improves pain management practices and the incorporation of evidence into practice.

**Design**

This DNP project implemented a non-experimental descriptive design with an anonymous online survey that was distributed to nurse anesthetists at a Level I trauma center in central Phoenix for one month. A quantitative survey with 53 questions assessed the types of evidence nurse anesthetists use to manage perioperative pain for abdominal surgery and barriers to the use of evidence.

**Setting and Sample**

This DNP project took place at a 515 bed, Level I trauma center whose anesthesia providers include anesthesiologists and CRNAs employed by District Medical Group (DMG).
The project was focused toward CRNAs actively working at this facility for DMG, which includes approximately 41 nurse anesthetists. Surveys were sent to the email addresses of nurse anesthetists, obtained from the DMG anesthesia department, and included a description of the study with the opportunity to voluntarily participate in the survey. The survey opened on November 1, 2017, and closed on November 30, 2017.

Data Collection

Prior to collecting data for this DNP project, approval from the Institutional Review Board (IRB) at the University of Arizona was obtained and did not meet requirements for human research review. DMG approval for access to email addresses and survey distribution was also obtained from the Director of Anesthesiology (Appendix G). Data was collected via an online survey sent via email to nurse anesthetists using the Qualtrics online survey software. Qualtrics is an online platform that facilitates online data collection and analysis (Qualtrics, 2017). An email was sent to nurse anesthetists when the survey opened, along with a follow-up email in two weeks as a reminder (Appendix E). Attachments to the email included (1) an introduction letter (Appendix A), (2) a disclaimer form (Appendix B), and (3) the Qualtrics survey link. The welcome letter included instructions not to share the link with others, thus avoiding the collection of less reliable data. Participants could fill out the survey at home or at work. No hard copies of the data were collected for this assessment survey; all data collected was stored in a single secure electronic format through the Qualtrics secure data center (Qualtrics, 2017).

Figure 2 presents a visual map of the steps involved in participant recruitment, data collection, and analysis.
**FIGURE 2.** Steps for collecting and analyzing data. Certified Registered Nurse Anesthetist (CRNA); Doctor of Nursing Practice (DNP).

**Survey Tool**

The survey tool included demographic questions (n=3) and questions regarding use of evidence based practice (EBP) guidelines and barriers (n=50), for a total of 53 questions (Appendix C and D). Demographic questions included years of anesthesia experience, educational degree and whether they are practicing in Arizona. Questions regarding EBP guidelines had five separate sections: 1) In your daily practice of anesthesia, please mark the guidelines that you currently use to guide pain management for open abdominal surgery and the extent to which it guides your practice, 2) In your daily practice of anesthesia, please mark the practices that you currently use to guide pain management for open abdominal surgery, 3) The following drugs should be considered as part of a multimodal pain management regimen for patients undergoing open abdominal surgery, 4) How frequently do you use the following
sources for patient care and making clinical decisions for pain management in patients undergoing open abdominal surgery?, and 5) For each item, mark the response that best represents your barriers to using evidence for managing pain for patients undergoing open abdominal surgery.

Responses to questions regarding EBP guidelines were formatted as a Likert frequency scale, ranging from never to always, with the majority as closed-ended questions (n=43). Additional open-ended questions (n=7) were added to the survey to understand any other resources or barriers missed in the closed-ended questions. Upon completion of the survey, responses from the Likert scale were scored; this type of scale is a summated rating scale and allows for fine discriminations to be made among people with diverse perspectives (Polit & Beck, 2012). Using this varied survey format allowed greater assessment of CRNAs perioperative pain management practices with a focus on open abdominal procedures.

Validity of Survey

The survey implemented in this project was adapted and modified from three validated surveys to create an appropriate tool. Permission for use of the surveys was obtained from the survey authors (Appendix F). The ASA Task Force Survey was used to develop the Demographics and Characteristics Form (Appendix C) (Ashburn et al., 2012). Questions assessing resources CRNAs use for evidence was adapted from the Evidence-Based Practice Questionnaire (EBPQ) and the Perceptions of Nurses of Evidence-Based Practice (PNEBPQ). The validity of the EBPQ tool has an internal consistency of 0.87, construct validity (r=0.3-0.4, P<0.001), content and face validity (Upton & Upton, 2006) and the PNEBPQ has an established content validity and internal consistency (Crobach alpha coefficient 0.681-0.954) (Majid et al.,
Internal consistency is often measured using Cronbach’s alpha formula; a Cronbach’s alpha coefficient greater than or equal to 0.7 has acceptable to excellent internal consistency (Polit & Beck, 2012). In order to assess barriers to the use of evidence in clinical practice, the BARRIERS Scale, which assesses perceptions of barriers to the use of research findings in practice, was used (Funk et al., 1991). The BARRIERS Scale has both internal reliability and content validity (Cronbach’s alpha coefficient 0.65-0.80) (Funk et al., 1991).

**Data Analysis**

The data and analysis module of Qualtrics allows the researcher to manage, add information, and analyze individual participant responses (Qualtrics, 2017). Descriptive statistics were used to score and analyze close-ended and demographic questions through the Qualtrics online data analysis tools. Data was downloaded into Excel formatting for further analysis and organized according to each DNP question. Data analysis specific to each DNP question included the summative scores of the Likert scale (never to always). Results were analyzed with descriptive statistics and summarized according to percentages, means and standard deviation.

**RESULTS**

**Demographics**

A convenience sample of 41 Arizona nurse anesthetists employed by DMG were emailed the survey resulting in a response rate of 41.4% (n=17). Descriptive statistics were used to analyze demographic data; they include mean (M), standard deviations (SD) and percentages. The years of CRNA experience ranged from 1-14 years (M=5.4 years, SD+/-3.4) (Figure 3). Educationally, 94.1% of CRNAs reported having a Master’s degree (n=16) and 5.9% of CRNAs reported having a Doctorate degree (n=1) (Figure 4).
Figures 3 and 4 illustrate the years of experience and educational degrees of the respondents, respectively.

Results Specific to Project Questions

This DNP project asked four questions to identify the type of evidence nurse anesthetists in one Phoenix, Arizona hospital use to manage perioperative pain for patients undergoing abdominal surgery along with barriers to the use of evidence.

DNP Project Question 1

What specific guidelines are being used to manage perioperative pain during open abdominal surgery? Guidelines from the ASA and AANA were reported as most commonly used resources by 94% of CRNAs (n=16) (Table 2). Published practice guidelines and facility
guidelines were less likely to be used as resources for pain management by 44% of CRNAs (n=7).

TABLE 2. *In your daily practice of anesthesia, how often do you use the following guidelines for pain management in patients undergoing open abdominal surgery?*

<table>
<thead>
<tr>
<th>Question</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Very Often</th>
<th>Always</th>
<th>Total (N)</th>
<th>Mean</th>
<th>SD</th>
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<tbody>
<tr>
<td>Guidelines from the American Society of Anesthesiologists (ASA) guide my practice</td>
<td>0.00%</td>
<td>0 5.88%</td>
<td>1 41.18%</td>
<td>7 17.65%</td>
<td>3 35.29%</td>
<td>6 17</td>
<td>3.82</td>
<td>0.98</td>
</tr>
<tr>
<td>Guidelines from American Association of Nurse Anesthetists (AANA) guide my practice</td>
<td>0.00%</td>
<td>0 5.88%</td>
<td>1 41.18%</td>
<td>7 17.65%</td>
<td>3 35.29%</td>
<td>6 17</td>
<td>3.82</td>
<td>0.98</td>
</tr>
<tr>
<td>Practice Guidelines for Acute Pain Management in the Perioperative Setting (2011) guide my practice</td>
<td>25.00%</td>
<td>4 18.75%</td>
<td>3 43.75%</td>
<td>7 12.50%</td>
<td>2 0.00%</td>
<td>0 16</td>
<td>2.44</td>
<td>1.00</td>
</tr>
<tr>
<td>Guidelines on the Management of Postoperative Pain (2016) guide my practice</td>
<td>25.00%</td>
<td>4 18.75%</td>
<td>3 31.25%</td>
<td>5 18.75%</td>
<td>3 6.25%</td>
<td>1 16</td>
<td>2.63</td>
<td>1.22</td>
</tr>
<tr>
<td>Guidelines from my practice facility guide my practice</td>
<td>18.75%</td>
<td>3 25.00%</td>
<td>4 0.00%</td>
<td>0 25.00%</td>
<td>4 31.25%</td>
<td>5 16</td>
<td>3.25</td>
<td>1.56</td>
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DNP Project Question 2

What types of evidence are being used to manage perioperative pain during open abdominal surgery? Specifically, the survey assessed which sources of information (print, electronic or human information sources) CRNAs use to guide their decision-making process for intraoperative pain management.

**Print information sources.** Journal articles were reported as the most commonly used print information sources by 100% of CRNAs (n=16), followed by 69% who used textbooks (n=11), with 100% of CRNAs responding that newspapers are the least common (n=16) source to guide pain management (Table 3).
TABLE 3. How frequently do you use the following print information sources for making clinical decisions for pain management in patients undergoing open abdominal surgery?

<table>
<thead>
<tr>
<th>Question</th>
<th>Never (%)</th>
<th>Rarely (%)</th>
<th>Sometimes (%)</th>
<th>Very Often (%)</th>
<th>Always (%)</th>
<th>Total (N=16)</th>
<th>Mean</th>
<th>SD</th>
</tr>
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<tbody>
<tr>
<td>Textbooks</td>
<td>6.25%</td>
<td>25.00%</td>
<td>43.75%</td>
<td>25.00%</td>
<td>0.00%</td>
<td>16</td>
<td>2.88</td>
<td>0.86</td>
</tr>
<tr>
<td>Journal Articles</td>
<td>0.00%</td>
<td>0.00%</td>
<td>75.00%</td>
<td>12</td>
<td>18.75%</td>
<td>16</td>
<td>3.31</td>
<td>0.58</td>
</tr>
<tr>
<td>Newspapers</td>
<td>93.75%</td>
<td>6.25%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>16</td>
<td>1.06</td>
<td>0.24</td>
</tr>
<tr>
<td>Pamphlets/Handouts</td>
<td>25.00%</td>
<td>37.50%</td>
<td>6</td>
<td>37.50%</td>
<td>0.00%</td>
<td>0</td>
<td>2.06</td>
<td>0.66</td>
</tr>
<tr>
<td>Reference books (e.g., medical dictionaries, encyclopedias)</td>
<td>31.25%</td>
<td>25.00%</td>
<td>31.25%</td>
<td>12.50%</td>
<td>0.00%</td>
<td>16</td>
<td>2.25</td>
<td>1.03</td>
</tr>
<tr>
<td>Other print information sources</td>
<td>75.00%</td>
<td>25.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0</td>
<td>1.25</td>
<td>0.43</td>
</tr>
</tbody>
</table>

**Electronic information sources.** Google was the most commonly used electronic source of information by 81% of CRNAs (n=13), followed by digital medical and nursing libraries, which were used by 75% of CRNAs (n=12) (Table 4). The least likely electronic sources used were blogs on EBP as reported by 75% of CRNAs (n=12) and nursing e-books as reported by 69% of CRNAs (n=11).

TABLE 4. How frequently do you use the following electronic information sources for making clinical decisions for pain management in patients undergoing open abdominal surgery?

<table>
<thead>
<tr>
<th>Question</th>
<th>Never (%)</th>
<th>Rarely (%)</th>
<th>Sometimes (%)</th>
<th>Very Often (%)</th>
<th>Always (%)</th>
<th>Total (N=16)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nursing e-books</td>
<td>37.50%</td>
<td>31.25%</td>
<td>18.75%</td>
<td>12.50%</td>
<td>0.00%</td>
<td>16</td>
<td>2.06</td>
<td>1.03</td>
</tr>
<tr>
<td>Digital medical and nursing libraries</td>
<td>0.00%</td>
<td>0.00%</td>
<td>56.25%</td>
<td>18.75%</td>
<td>0.00%</td>
<td>16</td>
<td>2.94</td>
<td>0.66</td>
</tr>
<tr>
<td>Medical databases (e.g., CINAHL)</td>
<td>6.25%</td>
<td>31.25%</td>
<td>37.50%</td>
<td>25.00%</td>
<td>0.00%</td>
<td>16</td>
<td>2.81</td>
<td>0.88</td>
</tr>
<tr>
<td>Google</td>
<td>12.50%</td>
<td>6.25%</td>
<td>50.00%</td>
<td>25.00%</td>
<td>6.25%</td>
<td>16</td>
<td>3.06</td>
<td>1.03</td>
</tr>
<tr>
<td>Online tutorials</td>
<td>6.25%</td>
<td>37.50%</td>
<td>43.75%</td>
<td>12.50%</td>
<td>0.00%</td>
<td>16</td>
<td>2.63</td>
<td>0.78</td>
</tr>
<tr>
<td>Blogs on evidence based practice (EBP)</td>
<td>50.00%</td>
<td>25.00%</td>
<td>4</td>
<td>6.25%</td>
<td>0.00%</td>
<td>16</td>
<td>1.81</td>
<td>0.95</td>
</tr>
<tr>
<td>UpToDate</td>
<td>25.00%</td>
<td>18.75%</td>
<td>37.50%</td>
<td>18.75%</td>
<td>3.00%</td>
<td>16</td>
<td>2.50</td>
<td>1.06</td>
</tr>
<tr>
<td>Other e-information sources</td>
<td>60.00%</td>
<td>20.00%</td>
<td>2</td>
<td>20.00%</td>
<td>0.00%</td>
<td>10</td>
<td>1.60</td>
<td>0.08</td>
</tr>
</tbody>
</table>

**Human information sources.** Colleagues are often useful and accessible sources of information that provide context-specific, clinically relevant information and time efficient information. One hundred percent of respondent’s report doctors (n=16) and 94% of respondent’s report operating room colleagues (n=15) as the most frequently used sources of
information (Table 5). Anesthesia supervisors, anesthesia management staff, and professional colleagues were also frequently used as sources of information to guide practice by 88% of CRNAs (n=14). Social networking media were least likely to be used as information by 88% of CRNAs (n=14).

TABLE 5. How frequently do you use the following human information sources for making clinical decisions for pain management in patients undergoing open abdominal surgery?

<table>
<thead>
<tr>
<th>Question</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Very Often</th>
<th>Always</th>
<th>Total (N)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating room colleagues</td>
<td>0.00%</td>
<td>0</td>
<td>6.25%</td>
<td>37.50%</td>
<td>56.25%</td>
<td>9</td>
<td>0.00%</td>
<td>0</td>
</tr>
<tr>
<td>Anesthesia supervisor</td>
<td>0.00%</td>
<td>0</td>
<td>12.50%</td>
<td>31.25%</td>
<td>56.25%</td>
<td>9</td>
<td>0.00%</td>
<td>0</td>
</tr>
<tr>
<td>Anesthesia management staff</td>
<td>0.00%</td>
<td>0</td>
<td>12.50%</td>
<td>37.50%</td>
<td>50.00%</td>
<td>8</td>
<td>0.00%</td>
<td>0</td>
</tr>
<tr>
<td>Nursing research committee/evidence-based nursing group</td>
<td>37.50%</td>
<td>6</td>
<td>31.25%</td>
<td>12.50%</td>
<td>18.75%</td>
<td>3</td>
<td>0.00%</td>
<td>0</td>
</tr>
<tr>
<td>Doctors (e.g., Anesthesiologists, Surgeons)</td>
<td>0.00%</td>
<td>0</td>
<td>0.00%</td>
<td>18.75%</td>
<td>68.75%</td>
<td>11</td>
<td>12.50%</td>
<td>2</td>
</tr>
<tr>
<td>Professional friends working in other hospitals and clinics</td>
<td>0.00%</td>
<td>0</td>
<td>12.50%</td>
<td>43.75%</td>
<td>37.50%</td>
<td>6</td>
<td>6.25%</td>
<td>1</td>
</tr>
<tr>
<td>Social networking media (e.g., Facebook)</td>
<td>56.25%</td>
<td>9</td>
<td>31.25%</td>
<td>6.25%</td>
<td>6.25%</td>
<td>1</td>
<td>0.00%</td>
<td>0</td>
</tr>
<tr>
<td>Other human information sources (please specify)</td>
<td>70.00%</td>
<td>7</td>
<td>30.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0</td>
<td>0.00%</td>
<td>0</td>
</tr>
</tbody>
</table>

DNP Project Question 3

What barriers prevent the use of evidence for the perioperative pain management in patients undergoing open abdominal surgery? The most commonly reported barriers by CRNAs were facility specific; 81% of CRNAs (n=13) thought the facility was inadequate for implementation and 81% of CRNAs (n=13) felt that other staff was not supportive of the implementation (Table 6). Seventy-five percent of CRNAs (n=12) report that the amount of research information is overwhelming and felt that the implications for practice are not made clear. Lack of knowledgeable colleagues with whom to discuss research was least likely to be a barrier, as reported by 81% of CRNAs (n=13). CRNAs were given the option to fill in additional
barriers to research utilization; additional barriers that were identified included surgeons, hospital supplies and costs of medication/equipment.

TABLE 6. For each item, mark the response that best represents your barriers to using evidence for managing pain for patients undergoing open abdominal surgery.

<table>
<thead>
<tr>
<th>Question</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Very Often</th>
<th>Always</th>
<th>Total (N)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research reports/articles are not readily available</td>
<td>6.25%</td>
<td>31.25%</td>
<td>43.75%</td>
<td>18.75%</td>
<td>0.00%</td>
<td>16</td>
<td>2.75</td>
<td>0.83</td>
</tr>
<tr>
<td>Implications for practice are not made clear</td>
<td>12.50%</td>
<td>6.25%</td>
<td>68.75%</td>
<td>6.25%</td>
<td>0.00%</td>
<td>16</td>
<td>2.69</td>
<td>0.77</td>
</tr>
<tr>
<td>The facilities are inadequate for implementation</td>
<td>12.50%</td>
<td>6.25%</td>
<td>37.50%</td>
<td>37.50%</td>
<td>6.25%</td>
<td>16</td>
<td>3.19</td>
<td>1.07</td>
</tr>
<tr>
<td>The nurse anesthetist feels the benefits of changing practice will be minimal</td>
<td>12.50%</td>
<td>62.50%</td>
<td>10</td>
<td>18.75%</td>
<td>3</td>
<td>0.00%</td>
<td>0</td>
<td>2.19</td>
</tr>
<tr>
<td>The relevant literature is not compiled in one place</td>
<td>12.50%</td>
<td>18.75%</td>
<td>31.25%</td>
<td>25.00%</td>
<td>12.50%</td>
<td>16</td>
<td>3.06</td>
<td>1.20</td>
</tr>
<tr>
<td>The nurse anesthetist does not feel she/he has enough authority to change patient care procedures</td>
<td>12.50%</td>
<td>25.00%</td>
<td>18.75%</td>
<td>37.50%</td>
<td>6</td>
<td>16</td>
<td>3.00</td>
<td>1.17</td>
</tr>
<tr>
<td>The nurse anesthetist is isolated from knowledgeable colleagues with whom to discuss the research</td>
<td>31.25%</td>
<td>50.00%</td>
<td>18.75%</td>
<td>0.00%</td>
<td>0</td>
<td>16</td>
<td>1.88</td>
<td>0.70</td>
</tr>
<tr>
<td>Physicians will not cooperate with implementation</td>
<td>0.00%</td>
<td>43.75%</td>
<td>37.50%</td>
<td>12.50%</td>
<td>6.25%</td>
<td>16</td>
<td>2.81</td>
<td>0.88</td>
</tr>
<tr>
<td>There is not a documented need to change practice</td>
<td>12.50%</td>
<td>37.50%</td>
<td>50.00%</td>
<td>0.00%</td>
<td>0</td>
<td>16</td>
<td>2.38</td>
<td>0.70</td>
</tr>
<tr>
<td>The literature reports conflicting results</td>
<td>0.00%</td>
<td>37.50%</td>
<td>50.00%</td>
<td>12.50%</td>
<td>2</td>
<td>16</td>
<td>2.75</td>
<td>0.66</td>
</tr>
<tr>
<td>Other staff are not supportive of implementation</td>
<td>0.00%</td>
<td>18.75%</td>
<td>62.50%</td>
<td>12.50%</td>
<td>2</td>
<td>16</td>
<td>3.06</td>
<td>0.75</td>
</tr>
<tr>
<td>The amount of research information is overwhelming</td>
<td>6.25%</td>
<td>18.75%</td>
<td>50.00%</td>
<td>12.50%</td>
<td>2</td>
<td>16</td>
<td>3.06</td>
<td>1.03</td>
</tr>
</tbody>
</table>

DNP Project Question 4

This question sought to answer if there is a relationship between the use of evidence for perioperative pain management in patients undergoing open abdominal surgery and years of clinical experience as a nurse anesthetist and level of education? Data for this DNP question were obtained from the Demographics and Characteristics Form questions 2 and 3 (Appendix C) and section 2 and 3 of the survey (Appendix D).

The survey assessed the types of analgesia CRNAs are using to guide pain management in patients undergoing open abdominal surgery (Table 7). One hundred percent of CRNAs
(n=16) reported using multimodal pain management therapy during open abdominal surgery when possible and using therapeutic options such as epidural or intrathecal opioids, systemic opioid patient-controlled analgesia, and regional techniques. Ninety-four percent of CRNAs (n=15) reported considering regional blockade for multimodal pain management.

**TABLE 7. In your daily practice of anesthesia, please mark the practices that you currently use to guide pain management for open abdominal surgery?**

<table>
<thead>
<tr>
<th>Question</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Very Often</th>
<th>Always</th>
<th>Total (N)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whenever possible, I use multimodal pain management therapy during open abdominal surgery</td>
<td>0.00%</td>
<td>0.00%</td>
<td>18.75%</td>
<td>43.75%</td>
<td>37.50%</td>
<td>16</td>
<td>4.19</td>
<td>0.73</td>
</tr>
<tr>
<td>Regional blockade with local anesthetics should be considered as part of a multimodal approach</td>
<td>0.00%</td>
<td>6.25%</td>
<td>31.25%</td>
<td>43.75%</td>
<td>18.75%</td>
<td>16</td>
<td>3.75</td>
<td>0.83</td>
</tr>
<tr>
<td>Anesthesia providers should use therapeutic options (epidural, intrathecal opioids, systemic opioid patient-controlled analgesia, regional techniques) after considering the risk/benefits for the patient</td>
<td>0.00%</td>
<td>0.00%</td>
<td>11.76%</td>
<td>52.94%</td>
<td>35.29%</td>
<td>17</td>
<td>4.24</td>
<td>0.64</td>
</tr>
</tbody>
</table>

CRNAs were asked which drugs they use as part of their multimodal pain management regimen for patients undergoing open abdominal surgery (Table 8). One hundred percent of CRNAs (n=17) chose nonselective NSAIDs as the most commonly used drug. The least likely multimodal drug used by 75% of CRNAs (n=12) was calcium channel blockers (e.g. gabapentin, pregabalin). In the last part of this section, CRNAs were able to write in other drugs they frequently use as part of their multimodal analgesic plan. Six CRNAs responded to the free text option, citing ketamine and preceded as other multimodal analgesics commonly used for multimodal pain management.
TABLE 8. The following drugs should be considered as part of a multimodal pain management regimen for patients undergoing open abdominal surgery.

<table>
<thead>
<tr>
<th>Question</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Very Often</th>
<th>Always</th>
<th>Total (N)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>COX-2 selective NSAIDs (e.g., celebrex)</td>
<td>41.18%</td>
<td>7</td>
<td>17.65%</td>
<td>3</td>
<td>29.41%</td>
<td>5</td>
<td>11.76%</td>
<td>2</td>
</tr>
<tr>
<td>Nonselective NSAIDs (e.g., ketorolac, ibuprofen)</td>
<td>0.00%</td>
<td>0</td>
<td>0.00%</td>
<td>0</td>
<td>52.94%</td>
<td>9</td>
<td>47.06%</td>
<td>8</td>
</tr>
<tr>
<td>Acetaminophen</td>
<td>23.53%</td>
<td>4</td>
<td>29.41%</td>
<td>5</td>
<td>35.29%</td>
<td>6</td>
<td>11.76%</td>
<td>2</td>
</tr>
<tr>
<td>Calcium channel blockers (e.g., gabapentin, pregabalin)</td>
<td>41.18%</td>
<td>7</td>
<td>29.41%</td>
<td>5</td>
<td>29.41%</td>
<td>5</td>
<td>0.00%</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>50.00%</td>
<td>3</td>
<td>16.67%</td>
<td>1</td>
<td>16.67%</td>
<td>1</td>
<td>16.67%</td>
<td>1</td>
</tr>
</tbody>
</table>

The different types of multimodal therapies implemented by nurse anesthetists (Tables 7 and 8) were compared to years of clinical experience and level of education. Fourteen CRNAs provided responses for years of experience, so only they will be included in this discussion. Years of experience as a CRNA were grouped for comparison to other groups as follows, 1-2 years of experience (n=3), 2.5-5 years of experience (n=4), 6 years of experience (n=3), 7-14 years of experience (n=4).

The types of multimodal therapies that CRNAs use to guide pain management for open abdominal surgery were compared to years of experience (Figure 5). CRNAs with 1-2 years of experience were more likely to consider using, when possible, multimodal pain management therapy (M=4.67, SD +/- 0.58) and regional blockade (M=4.33, SD +/- 0.58) during open abdominal surgery. CRNAs with 7-14 years of experience were most likely to consider using therapeutic options such as epidural or intrathecal opioids, systemic opioid patient-controlled analgesia, and regional techniques after considering the risk and benefits for the patient (M=4.5, SD +/- 1.15). The mean results of the three questions showed that CRNAs sometimes, very often, or always support the use of multimodal therapies in their daily practices. CRNAs with 2.5-5 years of experience reported the least frequent use of the multimodal therapies (M=3.75, SD +/-
0.87), while CRNAs with 1-2 years of experience reported the most frequent use of the multimodal therapies (M=4.4, SD +/- 0.53).

**FIGURE 5.** Comparison of years of experience to practices that CRNAs currently use to guide pain management for open abdominal surgery.

Drugs that CRNAs considered should be part of a multimodal pain management regimen for patients undergoing open abdominal surgery were compared to years of experience as a CRNA (Figure 6). CRNAs with 1-2 years of experience were most likely to consider COX-2 selective NSAIDs, however their overall use was still infrequent (M=2.67, SD +/- 0.58). CRNAs with 6 years of experience were least likely to consider using COX-2 selective NSAIDs (M=1.33, SD +/- 0.58). CRNAs with 2.5 years of experience were most likely to use nonselective NSAIDs (M=3.5, SD +/- 0.58), while CRNAs with 6 years of experience were less likely to use this drug (M=2.67, SD +/- 0.58). CRNAs with 1-2 years and 6 years of experience were most likely to consider using acetaminophen; however the overall use of acetaminophen was still low (M=2.67; SD +/- 0.58). Acetaminophen was least likely to be used by CRNAs with
2.5-5 years of experience (M=2.25, SD +/- 0.96). The use of calcium channel blockers was low among all the groups; CRNAs with 1-2 years of experience were most likely to consider their use (M=2.33, SD +/- 0.58) and CRNAs with 6 years of experience were least likely to consider their use (M=1.33, SD +/- 0.58).

*FIGURE 6.* Comparison of years of experience to drugs that CRNAs consider should be part of a multimodal pain management regimen for patients undergoing open abdominal surgery.

CRNAs with a Doctorate Degree were more likely to consider all of the multimodal practices to guide pain management than CRNAs with a Master’s Degree (M=4.67, SD +/- 0.58) (Figure 7).
Drugs that CRNAs considered should be part of a multimodal pain management regimen for patients undergoing open abdominal surgery were compared to the level of education (Figure 8). CRNAs with a Master’s degree were more likely to consider using COX-2 selective NSAIDs ($M=2.29$, $SD \pm 1.11$) and calcium channel blockers ($M=1.9$, $SD \pm 0.85$) compared to CRNAs with a Doctorate degree. CRNAs with a Doctorate degree were more likely to use nonselective NSAIDs ($M=4$) and acetaminophen ($M=3$) than CRNAs with a Master’s degree.
DISCUSSION

Patients place trust in nurse anesthetists to manage their intraoperative pain. With the wealth of resources available for information, this DNP project was designed to discover the different sources of evidence nurse anesthetists used to guide intraoperative pain management during open abdominal surgery and to understand barriers present in the workplace that impede the use of evidence for intraoperative pain management.

Results of the survey revealed that the most commonly used guidelines clinically for intraoperative pain management were from the ASA and AANA. Practice guidelines from the ASA Task Force on Acute Pain Management (2011) and guidelines on the management of postoperative pain (Choi et al., 2016) were least likely to be used by CRNAs.
CRNAs use different types of sources of evidence to guide their clinical practice for intraoperative pain management. All of the CRNAs surveyed reported using journal articles in their clinical practice. The most commonly used electronic source of evidence was Google followed by digital medical and nursing libraries. Blogs on EBP were least likely to be used by CRNAs. Consulting with doctors (i.e. anesthesiologists, surgeons) was the most commonly reported source of human information, followed by operating room colleagues.

Many barriers exist to using evidence-based recommendations for intraoperative pain management during open abdominal surgery. The most commonly cited barrier by CRNAs was that other staff was not supportive of the implementation, the facilities were inadequate for implementation and that the implication for practice was not clear in the evidence. CRNAs also felt that relevant literature was not compiled in one place and that the literature showed conflicting results. CRNAs were least likely to report a lack of knowledgeable colleagues with whom to discuss the evidence as a barrier.

Due to the lack of multiple responses from CRNAs with a Doctorate degree, the DNP project was unable to make any conclusions about how level of education influences use of multimodal analgesics.

**Strengths and Limitations**

Increased survey participation by CRNAs could have added rich information about the types of evidence used by CRNAs along with barriers to practice and is considered a limitation to this study. One survey was started but not finished. Ketamine and dexmedetomidine were not included in the survey but could have added rich information to the survey results. Additionally, the survey was distributed to CRNAs who work at one facility that has a medically supervised
care team model. Distribution of the survey to different facilities could have added information about how team models and facilities influence the use of EBP and barriers. Only one CRNA in the sample had a Doctorate Degree, which limits the strength of the analysis by level of education. Survey responses were self-reported and did not allow for a way to verify stated practices.

Strengths of the DNP project include that participation projections (30% participation) were met; 41% of CRNAs participated in the survey. Data was gathered through the multiple survey questions and the average time of completion was under five minutes, less than originally projected. The aims of this DNP project were to discover what types of evidence are being used in the clinical setting, assess if multimodal analgesia is being used in daily practice, and identify barriers that prevent the use of evidence for the perioperative management of pain in patients undergoing open abdominal surgery. The aims of this DNP project were met through data collection and analysis.

**Dissemination Plan**

The DNP project findings will be shared with nurse anesthetists via the use of PowerPoint and/or poster board presentations that will be disseminated at the 2018 AZANA Sun & Fun Conference poster presentation session in March 2018 and at Mayo Clinic Anesthesia Grand Grounds in April 2018. End users that will be targeted in the dissemination plan are nurse anesthetists, as their practices directly influence this DNP project. The dissemination partners for this project are the AZANA members, nurse anesthetists, and student nurse anesthetists who attend the conference.
An executive summary will be presented to the CRNAs where this project took place including barriers that may be blocking adequate implementation of using evidence-based guidelines for perioperative pain management. Feedback received will be used to improve the dissemination plan and plan the next steps for improving EBP adoption. Engaging in a dialogue with CRNAs about this DNP project is important in learning more about how it can be applied clinically and how to mitigate barriers.

**Conclusion**

Promoting the uptake and use of evidence-based practice to guide intraoperative pain management can lead to improved patient outcomes and quality of care (Melnyk et al., 2012). Results of the survey show that CRNAs use evidence to guide their clinical decisions for intraoperative pain management and frequently consider the use of multimodal therapies for intraoperative pain management.

The field of translation research into clinical practice is a healthcare challenge and CPGs synthesize research findings and provide clinicians with strong, evidence-based recommendations (Graham et al., 2011). In this survey, CRNAs reported using CPGs infrequently for the management of intraoperative pain. Additionally, 75% of CRNAs reported that the implications of research in practice were not clear, 69% reported that relevant literature was not compiled into one place, and 63% of CRNAs reported that the literature showed conflicting results. Full translation of research into clinical practice through CPG continues to be a challenge in the clinical setting.

Further assessment is needed to include a larger sample size from several hospitals in Arizona to gain better understanding of implementation of intraoperative pain guidelines.
Arizona has only one doctorally prepared CRNA program with an emphasis in implementing evidence-based research, which can be a positive factor, as DNP CRNAs will lead the change by adopting CPGs to guide their practice.

This DNP project used the initial diagnostic stage of the PARiHS framework to assess evidence and context at one hospital in Phoenix, Arizona. The PARiHS framework is best used to implement evidence into practice in a two-stage process (Kitson et al., 2008). The facilitation of evidence into the clinical area is directed by the information gathered from the preliminary stage, which performs a diagnostic analysis of the evidence and context (Kitson et al., 2008). The data gathered from this diagnostic analysis can then be used to determine the most appropriate facilitation method for implementing evidence into a specific clinical area (Kitson et al., 2008). Future developments stemming from this DNP project include moving forward with the second stage of the PARiHS framework, where the data gathered in this DNP project can be used to determine the most appropriate facilitation method for improving the use of evidence for multimodal analgesia for intraoperative pain management in patients undergoing open abdominal surgery.

This DNP project adds to the body of literature concerning intraoperative pain management by nurse anesthetists, implementation of EBP, sources of information and barriers to implementing evidence-based pain management. This project demonstrates that there are still areas that need practice improvement. Quality improvement measures to increase knowledge translation into clinical practice, remove barriers, and areas of future implications may include:

- Leading interactive sessions to disseminate information about CPGs for intraoperative pain management
• Assess a need for changing practice by trending pain scores and outcomes in patients after surgery

• Creating open lines of communications among team members to build support in implementing best practices for intraoperative pain management
APPENDIX A:

WELCOME LETTER
November 1, 2017

Dear Nurse Anesthetists,

Postoperative pain represents a major, largely unrecognized clinical problem that increases morbidity and mortality while also contributing to the development of chronic pain and lowering quality of life (Laufenberg-Feldmann et al., 2016). Over 45 million Americans experience acute postsurgical pain each year and 80% of this population reports their pain as severe (Arnstein, 2010). The quality of care provided to patients can be enhanced with the transfer of evidence-based knowledge on pain management into daily practice. Evidence-based practice is the incorporation of best research evidence, clinical expertise and patient values and preferences into the healthcare decision making process.

As a nurse anesthesia student at the University of Arizona, my doctoral project seeks to gain insight on the types of evidence nurse anesthetist’s use for intraoperative pain management in patients undergoing open abdominal surgery, along with barriers to using evidence.

As a practicing nurse anesthetist in Arizona, I am inviting you to participate in this survey that will take about 20 minutes to complete. Participation is strictly voluntary with no known risks; you may decide to decline or stop participation at any point. Data collected will remain confidential and anonymous. Please do not share your survey link with others. Information gathered from this assessment can be used improve knowledge translation about evidence-based pain management strategies and to remove barriers during the perioperative period.

Thank you for taking the time to support my DNP project on the use of evidence for pain management, as the management of acute postsurgical pain continues to be a major health challenge for patients, providers, and healthcare settings.

Sincerely,

Magdalena Wahls, BSN, RN, SRNA-DNP Student
MagdalenaWahls@email.arizona.edu
623-203-5376
APPENDIX B:

INSTITUTIONAL REVIEW BOARD DISCLAIMER FORM
Assessment of Perioperative Pain Management Practices Among

Arizona Nurse Anesthetists

Magdalena Wahls

The purpose of this Doctor of Nursing Practice (DNP) project is to assess barriers and the type of evidence being used by nurse anesthetists to determine their analgesic plan for patients undergoing open abdominal surgery.

Voluntary participation in this survey involves completing an online survey and should take about 20 minutes to complete. The survey includes quantitative questions. Using the Likert scale, respondents are asked to choose the level in which they agree or disagree with a statement. The four response options are: strongly agree, agree, disagree, and strongly disagree. There will not be any follow-up after survey submission. Participation is strictly voluntary with no known risks; you may decide to decline or stop participation at any point. Your decision to decline or stop participation will be respected; there will be no penalty and your decision will not affect any future relationship with the University of Arizona. You may also skip any questions you do not want to answer. All survey results will be anonymous, with no personal identifiers being linked to survey results. Again, the decision to participate in the survey is entirely voluntary and implies informed consent. By participating in this survey, you agree to have your survey responses used for research purposes in this DNP project. At this time, the author has no plans to publish the data from this study.

Participation in this survey does not revoke the legal rights you have as a participant. Approval from the University of Arizona’s Institutional Review Board, which is responsible for approving, monitoring, and reviewing research involving human subjects, has been obtained. If you have any questions regarding your rights as a participant in this study or to discuss study-related concerns, please contact the Human Subjects Protection Program at the University of Arizona at (520) 626-7575, VPR-IRB@email.arizona.edu, or online at http://rgw.arizona.edu/compliance/human-subjects-protection-program

For any questions, concerns or complaints about this study, please also feel free to contact Magdalena Wahls at MagdalenaWahls@email.arizona.edu or (623) 203-5376.
APPENDIX C:

DEMOGRAPHIC AND CHARACTERISTICS FORM
Demographic and Characteristics Form

1. Are you currently practicing as a Certified Registered Nurse Anesthetist in Arizona?
   a. Yes (continue with survey)
   b. No (exit survey)

2. Years of experience as a Certified Registered Nurse Anesthetist

3. Highest level of education
   a. Doctorate degree
   b. Master’s degree
   c. Diploma
APPENDIX D:

EVIDENCE-BASED PRACTICE QUESTIONNAIRE
### Evidence Based Practice Questionnaire for the Use of Evidence and Barriers Survey

**Section 1.** In your daily practice of anesthesia, please mark the guidelines that **you currently use to guide pain management for open abdominal surgery** and the extent to which it guides your practice:

<table>
<thead>
<tr>
<th>Guideline</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Very Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Guidelines from the American Society of Anesthesiologists (ASA) guide my practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Guidelines from American Association of Nurse Anesthetists (AANA) guide my practice</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>5. Guidelines from my practice facility guide my practice</td>
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</tbody>
</table>

**Section 2.** In your daily practice of anesthesia, please mark the practices that **you currently use to guide pain management for open abdominal surgery**:

<table>
<thead>
<tr>
<th>Practice</th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Whenever possible, I use multimodal pain management therapy during open abdominal surgery</td>
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<tr>
<td>2. Regional blockade with local anesthetics should be considered as part of a multimodal approach for pain management during open abdominal surgery</td>
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<tr>
<td>3. Anesthesia providers who manage perioperative pain during open abdominal surgery should use therapeutic options such as epidural or intrathecal opioids, systemic opioid patient-controlled analgesia and regional techniques after considering the risk and benefits for the patient</td>
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</tbody>
</table>

**Section 3.** The following drugs should be considered as part of a multimodal pain management regimen for patients undergoing open abdominal surgery:

<table>
<thead>
<tr>
<th>Drug</th>
<th></th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. COX-2 selective NSAIDs (e.g., celebrex)</td>
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<tr>
<td>2. Nonselective NSAIDs (e.g., ketorolac, ibuprofen)</td>
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<tr>
<td>3. Acetaminophen</td>
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<tr>
<td>4. Calcium channel blockers (e.g., gabapentin, pregabalin)</td>
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<tr>
<td>5. Other (please specify):</td>
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</tr>
</tbody>
</table>

**Section 4.** How frequently do you use the following sources for patient care and making clinical decisions for pain management in patients undergoing open abdominal surgery?

**Print information sources**

<table>
<thead>
<tr>
<th>Source</th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Textbooks</td>
<td></td>
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</tr>
<tr>
<td>2. Journal Articles</td>
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<td></td>
</tr>
<tr>
<td>3. Newspapers</td>
<td></td>
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<tr>
<td>4. Pamphlets/handouts (produced by health care companies, hospitals)</td>
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</tr>
<tr>
<td>5. Reference books (e.g., medical dictionaries, encyclopedias)</td>
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<tr>
<td>6. Other print information sources (please specify):</td>
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<td></td>
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</tr>
</tbody>
</table>
### Electronic information sources

1. Nursing e-books
2. Digital medical and nursing libraries
3. Medical databases (e.g., CINAHL)
4. Google (websites providing information about a specific medicine, treatment or symptom)
5. Online tutorials provided by professional associations, medical libraries and overseas hospitals
6. Blogs on EBP
7. UpToDate and MD Consult
8. Other e-information sources (please specify):

### Human information sources

1. Operating room colleagues
2. Anesthesia supervisor
3. Anesthesia management staff
4. Nursing research committee/evidence-based nursing group
5. Doctors
6. Professional friends working in other hospitals and clinics
7. Social networking media (e.g., facebook)
8. Other human information sources (please specify):

---

**Section 5.** For each item, mark the response that best represents your **barriers to using evidence for managing pain for patients undergoing open abdominal surgery**.

1. Research reports/articles are not readily available
2. Implications for practice are not made clear
3. The facilities are inadequate for implementation
4. The nurse feels the benefits of changing practice will be minimal
5. The relevant literature is not compiled in one place
6. The nurse does not feel she/he has enough authority to change patient care procedures
7. The nurse is isolated from knowledgeable colleagues with whom to discuss the research
8. Physicians will not cooperate with implementation
9. There is not a documented need to change practice
10. The literature reports conflicting results
11. Other staff are not supportive of implementation
12. The amount of research information is overwhelming

**Are there other things you think are barriers to research utilization?** If so, please list and rate each on the scale:

13.
14.
15.
APPENDIX E:

FOLLOW-UP EMAIL
November 14, 2017

Dear Nurse Anesthetists,

Postsurgical pain represents a major, largely unrecognized clinical problem that increases morbidity and mortality while also contributing to the development of chronic pain and lowering quality of life (Laufenberg-Feldmann et al., 2016). Over 45 million Americans experience acute postsurgical pain each year and 80% of this population reports their pain as severe (Arnstein, 2010). The quality of care provided to patients can be enhanced with the transfer of evidence-based knowledge on pain management into daily practice. Evidence-based practice is the incorporation of best research evidence, clinical expertise and patient values and preferences into the healthcare decision making process.

As a nurse anesthesia student at the University of Arizona, my doctoral project seeks to gain insight on the types of evidence nurse anesthetist’s use for intraoperative pain management in patients undergoing open abdominal surgery, along with barriers to using evidence.

As a practicing nurse anesthetist at District Medical Group, I am sending you a follow-up email to invite you to participate in this survey that will take about 20 minutes to complete. Again, participation is strictly voluntary with no known risks; you may decide to decline or stop participation at any point. Data collected will remain confidential and anonymous. Please do not share your survey link with others. Information gathered from this assessment can be used to improve knowledge translation about evidence-based pain management strategies and to remove barriers encountered during the perioperative period.

Thank you for taking the time to support my DNP project on the use of evidence for pain management, as the management of acute postsurgical pain continues to be a major health challenge for patients, providers, and healthcare settings.

Sincerely,

Magdalena Wahls, BSN, RN, SRNA-DNP Student
MagdalenaWahls@email.arizona.edu
623-203-5376
APPENDIX F:

PERMISSION TO USE SURVEYS
AGREEMENT TO USE THE BARRIERS SCALE

I agree to the conditions included in the document “Permission to use the BARRIERS Scale”

Name: Magdalena Wahls

Title: DNP with specialty in nurse anesthesia, senior student

Academic/business affiliation: University of Arizona

E-mail address: MagdalenaWahls@email.arizona.edu

Postal Address: 1524 East Candlestick Drive, Tempe, AZ 85283

Phone Number: 623.203.5376

Study Title: Assessment of perioperative pain management practices among Arizona nurse anesthetists for open abdominal surgery

Brief Description of Study:

The purpose of this Doctor of Nursing Practice (DNP) project is to gain insight on the types of evidence nurse anesthetists in Arizona are using to determine their analgesic plan for patients undergoing open abdominal surgery. Specifically, this project seeks to identify what type of evidence nurse anesthetists in Phoenix, Arizona use to manage perioperative pain and to identify barriers to using EBP for patients undergoing abdominal surgery.

Signature: [Signature]

Date: 09/02/2017

E-mail to: sfunk@unc.edu

Please keep a copy of this form in your files. You automatically have permission to use the scale and do not need a response from the authors.
This Agreement between Mrs. Magdalena Wahls ("You") and Wolters Kluwer Health, Inc. ("Wolters Kluwer Health, Inc.") consists of your license details and the terms and conditions provided by Wolters Kluwer Health, Inc. and Copyright Clearance Center.

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License date Sep 02, 2017
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Licensed Content Publication Anesthesiology
Licensed Content Title Practice Guidelines for Acute Pain Management in the Perioperative Setting: An Updated Report by the American Society of Anesthesiologists Task Force on Acute Pain Management

Licensed Content Author
Licensed Content Date Feb 1, 2012
Licensed Content Volume 116
Licensed Content Issue 2
Type of Use Dissertation/Thesis
Requestor type Individual
Portion Figures/table/illustration
Number of figures/tables/illustrations used 1
Figures/tables/illustrations used Table 2
Author of this Wolters Kluwer article No
Title of your thesis / dissertation Assessment of perioperative pain management practices among Arizona nurse anesthetists for open abdominal surgery
Expected completion date Mar 2018
Estimated size(pages) 60
Requestor Location Mrs. Magdalena Wahls
1524 E Candlestick Drive

Publisher Tax ID 13-2932696
Billing Type Invoice
Billing Address Mrs. Magdalena Wahls
1524 E Candlestick Drive

Total 0.00 USD

Terms and Conditions
We are happy to grant you permission to use the EBPQ in your work, with the proviso that as authors Professor Dominic Upton and Dr Penney Upton are acknowledged in any communication, including publication, in which the questionnaire is used. The Student version of the EBPQ (SEBPQ) is also available from this section of the website. If you wish to use the SEBPQ we ask that you acknowledge the authors Professor Dominic Upton, Dr Penney Upton and Laura Scurlock-Evans in any communication, including publication.

In accordance with UK and Australian copyright law we would be grateful if you would refer anyone else interested in using either the EBPQ or the SEBPQ to us, rather than distribute copies of the questionnaires to third parties yourself. This will also help us as authors gauge the level of interest in the questionnaires and their application in the clinical/research/educational setting. The EBPQ is available to download in a number of languages. As new translations are being undertaken all the time, if the language you require is not available please contact us in the first instance to check whether the translation you require is already in progress.
APPENDIX G:

PERMISSION TO DISTRIBUTE SURVEY TO DISTRICT MEDICAL GROUP (DMG)

NURSE ANESTHETISTS
October 9, 2017

Dear University of Arizona Institutional Review Board,

I grant permission for Magdalena Wahls to use District Medical Group email addresses in order to distribute her DNP project survey for the University of Arizona.

Thank you,

Dr. William Johnson
District Medical Group
Chair of the Anesthesiology Department
Medical Director – Perioperative Services
REFERENCES


