KNOWLEDGE, ATTITUDES, AND PERCEPTIONS OF ADVANCED PRACTICE PROVIDERS REGARDING USE OF BUFFERED VERSUS NON-BUFFERED LIDOCAINE HYDROCHLORIDE 1% FOR INTERVENTIONAL PROCEDURAL PAIN MANAGEMENT IN ADULTS

A Scholarly Project
Submitted to the Faculty of the Graduate School of Arts and Sciences of Georgetown University in partial fulfillment of the requirements for the Degree of Doctor of Nursing Practice

By

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ABSTRACT

The purpose of this study was to examine: a) knowledge, attitudes, and perceptions of advanced practice providers (APPs) - nurse practitioners (NPs), and physician assistants (PAs) - regarding the use of buffered versus non-buffered lidocaine hydrochloride 1% for interventional procedural pain management in adults; and b) relationships among socio-demographic variables and knowledge, attitudes, and perceptions of APPs regarding use of buffered versus non-buffered lidocaine hydrochloride 1% within the clinical setting.

Procedural pain management by APPs requires adequate knowledge regarding appropriate choice of local anesthetic agent, including buffered versus non-buffered lidocaine hydrochloride 1%. Although non-buffered lidocaine hydrochloride 1% pH is more acidic than human tissue pH, it is often used by APPs.

This descriptive study used a survey design. Inclusion criteria were: 1) ≥ 18 years of age; 2) APP: NP and PA; c) administer local anesthetics for interventional procedural pain management in adults; 3) employed by a pain center organization with sites in Arizona and Florida; 4) DEA licensed and board certified; 5) computer access to use the electronic platform of SurveyMonkey™; and 6) active pain center organization encrypted email address. The investigator-created 48-item survey had 4 sections: socio-demographics; knowledge; attitudes; and perceptions. The survey contained Likert-type
scales and 2 open-ended questions. After Georgetown University Institutional Review Board approval, study staff administered the survey via SurveyMonkey™. Descriptive statistics and SPSS (version 25, 2016) were utilized for data analysis.

The survey was sent to all 53 eligible APPs. Twenty-nine participants returned completed surveys giving a 54.7% response rate. Mean knowledge score for interventional pain management in adults was 2.8 (SD=1.0) (2 = “moderate knowledge”; 3 = “good knowledge”). Although most participants (68.9%) agreed that buffered lidocaine hydrochloride 1% was effective, only 44.8% reported it more effective than the non-buffered formulation. Most participants (72.4%) reported needing more education regarding appropriate use of buffered lidocaine hydrochloride 1%, which is an important finding.
DEDICATION

This scholarly project is dedicated to Abby and Jacob Rowlett. Without my children, I do not know if my career in healthcare would have been this meaningful or the completion of this doctoral degree as motivating. It is to you both that I attribute my success. To Robby, I am thankful for all the love and support. Robby, with you all things in my wonderful life have been made possible. Thank you for all my greatest accomplishments and happiness. Most of all, I thank God for my strength, mental fortitude, and the ability to complete this monumental task with my family by my side.

To my DNP 6 pack, I am forever blessed to take this journey with you. Your insight, experience, passion, care, and continual encouragement in support of my success have forever altered my perspective and I sincerely thank you. It has been an honor beyond measure to have made this journey alongside you.
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Chapter I

Statement of the Problem

Adult patients frequently present to interventional procedural pain management clinics in the United States (U.S.) with the chief complaint of pain related to chronic conditions, including degenerative disc disease, non-degenerative joint disease, spondylitis, as well as, rheumatoid and osteoarthritis (Prince, Soares, & Iannuccilli, 2013). Interventional procedural pain management treatments include radio-frequency ablation therapy, implantation of neuro-stimulators, and epidural and musculoskeletal joint injections (Chou et al., 2009). Acute pain is reported frequently in the U. S. with estimates of up to 80% of all people during their life span and leading to significant disability in 1 to 2% of adults (Prince, Soares, & Iannuccilli, 2013). Local anesthetic infiltration is the standard of care preventing acute pain related to procedural injection, and most frequently (84%) non-buffered (without sodium bicarbonate 8.4%) lidocaine hydrochloride 1% is selected (Bond et al., 2016). Pain management continues to be a major focus of primary care, and thus, it is imperative that APPs including nurse practitioners (NPs) and physician assistants (PAs) provide appropriate procedure-related pain management under their scope of practice (Goldberg & McGee, 2011). This requires that APPs have comprehensive evidenced-based knowledge regarding pain management for procedural pain.

Description of the Problem

Pain is defined as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage”, according to Benzon, Rathmell, Wu, Turk, Argoff, and Hurley (2014, p.114). Cooney and Broglio (2017) stated that pain is a subjective experience that can only be described by the patient experiencing it. Local acute pain related to medical procedures, including interventional pain management treatments, is often undertreated (Smith &
Wilson, 2013), which, according to Merskey and Bodguk (1994), may be psychologically distressing for patients, family members, and the health care providers involved. Smith and Wilson (2013) found that short- and long-term negative patient outcomes are correlated with inadequate local pain management including increased anxiety, inadequate pain control, and increased long-term treatment delays due to the patient’s fear of uncontrolled acute procedural pain. Importantly, these researchers suggest that early pain experiences play a role in shaping an individual’s future pain response and overall threshold for pain tolerance (Smith & Wilson, 2013).

Interventional procedural pain management requires pre-infiltration of the procedural area(s) with a local anesthetic (Best, Best, Best, & Hamilton, 2015). Local anesthetics may be administered to a substantial transdermal region or select anatomical regions, including the forearm, face, or hand (Mustoe, Buck & Lalonde, 2010). This acute pain management requires the appropriate choice of both local anesthetic agent and route of administration. Goldberg and McGee (2011) caution that inappropriate decision-making regarding agent and/or route leads to ineffective local pain management, increased patient and provider anxiety, and decreased patient satisfaction with care. Appropriate local anesthetics for pre-infiltration ideally will have both a fast onset of action and sufficient duration of action. It is critical that the healthcare provider selects the appropriate local anesthetic to best mitigate acute pain.

Lidocaine hydrochloride 1% is an appropriate local anesthetic agent for interventional procedural pain management. This agent has the additional benefit of providing “freezing ahead of the needle”, which refers to the patient’s perception of the numbing sensation that is related to the blocking of nociception as the needle tip enters the skin (Best et al., 2015). However, this
standard practice of infiltrating the skin in the procedural site with lidocaine hydrochloride 1% often leads to a burning sensation at the injection site.

In contrast, lidocaine hydrochloride 1% that has been buffered with sodium bicarbonate 8.4% prevents local pain as the needle tip enters the skin (Afolabi, 2013). Lidocaine hydrochloride 1% has a pH that is approximately 1000 times more acidic than subcutaneous tissue, which causes the burning sensation upon injection. The addition of sodium bicarbonate 8.4%, which has a pH of 6.09-6.16, to the lidocaine hydrochloride 1% solution increases its pH to the pH of human tissue, 7.38-7.62, and lessens the burning sensation. Buffering of lidocaine hydrochloride 1% solution is achieved easily, inexpensively, and yields the desired outcome of decreasing burning at the needle injection site (Frank & Lalonde, 2012). The literature also presents data suggesting that the elevated pH of buffered lidocaine hydrochloride 1% local anesthetic has increased the probability of being more effective for acute pain management and has a faster onset anesthesia than non-buffered lidocaine hydrochloride 1% (Kattan, Karabucak, Hersh, Korostoff, & Hunter, 2017).

Interestingly, it has been reported that APPs only use local buffered anesthetic approximately 6% of the time (Bond et al., 2016). Advanced practice providers’ reasons for not using buffered lidocaine hydrochloride 1% have been reported: it is too time consuming (45%); not indicated (35%); buffering would make the procedure more difficult to perform overall (21%); not available (13%); logistically difficult (13%); against peer pressure (4%); not allowed in clinical setting (4%); and practically difficult to achieve adequate patient pain control (Bond et al., 2016).
Significance of the Problem

Local Anesthetic Use

Pain is a common post-procedural outcome. Recent data suggest that 80% of patients experience acute post-procedural pain, with 11% to 20% experiencing severe adult procedural pain (Joint Commission on Accreditation of Healthcare, 2015). According to Prince, Soares, and Iannuccilli (2013), acute pain during the injection of local anesthetic is often cited in the literature as being the most painful part of interventional procedural pain management. The American Pain Society (IASP) and the American College of Physicians (ACP) have published evidence-based guidelines for the appropriate treatment of acute local pain. Numerous anesthetic agents and procedures are available to providers for standard local pain management. Despite easy access to these guidelines, and available analgesics and anesthetics, pain ratings have remained stable over the past decade (Strazar, Leynes, & Lalonde, 2013).

Almost 35 million patients were discharged from US hospitals in 2004, of which 46% had interventional procedures that would require local anesthetic. Zempsky and Cravero (2004) stated that evidence supports the efficacy of intradermal or subcutaneous injectable anesthetics for rapid local analgesia. Anesthetic agents and appropriate administration techniques for minimizing anesthetic injection pain are described in anecdotal and systematic reviews (Strazar, Leynes, & Lalonde, 2013).

Pathophysiology of Pain Related to Local Anesthetic Infiltration

Benzon et al. (2014) stated that cutaneous nociceptors provide a significant warning system regarding pain and injury to the body. Strazar, Leynes, and Lalonde (2013) explained that nociceptors are comprised of numerous specific types of receptors including motion-sensitive follicle receptors called Pacinian corpuscles, Ruffini endings that are pressure-sensitive...
receptors, and mechanoreceptor and free-ended nociceptors that are located at the dermal epidermal borders. The nociceptor activates two types of nerve fibers: fast, myelinated fibers; and slow unmyelinated fibers. The myelinated fibers typically carry afferent impulses for sharp pain sensations, whereas the unmyelinated fibers carry afferent impulses that are perceived as dull (Strazar, Leynes, & Lalonde, 2013).

Typically, a threshold number of nociceptors is needed to be triggered in a limited dermal region to produce a painful response (Koltzenburg & Handwerker, 1994). The analgesic effects of local anesthetics, including lidocaine hydrochloride 1%, are achieved through blocking nerve endings and preventing the transmission of painful stimuli. This is achieved at the molecular level by blocking the voltage-gated sodium driven channels (Koltzenburg & Handwerker, 1994). Before the local anesthetic molecules can provide anesthesia, they need to diffuse through hydrophobic cell membranes, and then relay to corresponding neurons. However, there are data supporting the etiology of lidocaine hydrochloride 1% administration-related pain as related to the low pH (acidity) of this solution (Cepeda, Tzortzopoulou, Thackrey, Hudcova, Arora, Gandhi, & Schumann, 2012).

The etiology of pain from a local anesthetic injection into the skin is related to the initiation of Pacinian corpuscles, mechanoreceptors, and the Ruffini ending (Egekvist, Bjerring, & Arendt-Nielsen, 1999). The Ruffini ending afferent impulses run through the myelinated fibers producing an acute, sharp, pain-related response (Egekvist, Bjerring, & Arendt-Nielsen, 1999). After the needle puncture, the infiltration of solution induces pain, primarily through the activation of polymodal free-end nociceptors, which tend to be more forceful and produce prolonged pain (Egekvist, Bjerring, & Arendt-Nielsen, 1999). Associated pain is formed from
receptors responding to the chemical irritant process and the rapid tissue distention from the injected solution subcutaneously (Egekvist, Bjerring, & Arendt-Nielson, 1999).

The relationship between the pH of anesthetic solutions and a patient’s perception of pain with injection is important for APPs to understand. The acute pain that patients experience during needle insertion and local anesthetic administration can be perceived as sufficiently traumatizing to influence their future decisions regarding pain management (Melzack, 1965). Not only has anxiety been reported as a negative outcome of inadequate pain management, but also post-traumatic stress disorder has been reported post-procedures or during stressful medical encounters (Wintgens, Boileau, & Robaey, 1997). In addition, Wintgens, et al., (1997) have determined that inadequate pain management with needle involvement during interventional procedure has been found to negatively affect procedural patient outcomes.

It is imperative that APPs who practice in the adult interventional procedural pain-management setting have an adequate knowledge base regarding the appropriate choice of local anesthetic agent based on the clinical evidence (Quaba, Huntley, Bahia, & McKenwn, 2005). Although the literature presented the advantages of using buffered lidocaine hydrochloride 1% versus non-buffered lidocaine hydrochloride 1% for a local anesthetic for interventional procedural pain management, no study was found which examined the knowledge, attitudes, and perceptions of the APPs regarding their choice of agent. Thus, it is important to examine the knowledge base, attitudes, and perceptions of APPs regarding appropriate acute pain management in this setting.

**Research Question**

The purpose of this DNP scholarly project is to examine the knowledge, attitudes, and perceptions of APPs regarding their use of buffered lidocaine hydrochloride 1% versus non-
buffered lidocaine hydrochloride 1% in the adult interventional procedural pain management setting. The PICOT framework was used to develop the five key components of the research question. The PICOT acronym stands for: population, intervention/issue, comparison, outcome, and time. The population is comprised of APPs who routinely use local anesthetics in the adult interventional procedural pain management setting. There is no intervention for this study. The comparison groups are the NPs and PAs who work in the interventional procedural pain-management setting. The outcomes are the knowledge, attitudes, and perceptions of APP participants regarding the use of buffered 1% lidocaine hydrochloride 1% versus non-buffered lidocaine hydrochloride 1% in the interventional procedural pain-management setting.

Specific aims of this DNP scholarly project were to:

1. Examine and compare the knowledge base of NPs and PAs regarding the evidence base for use of buffered lidocaine hydrochloride 1% versus non-buffered lidocaine hydrochloride 1% in the interventional procedural pain-management setting.

2. Examine and compare attitudes of NPs and PAs regarding the use of buffered lidocaine hydrochloride 1% versus non-buffered lidocaine hydrochloride 1% in the interventional procedural pain-management setting.

3. Examine and compare perceptions of NPs and PAs regarding the efficacy of buffered lidocaine hydrochloride 1% versus non-buffered lidocaine hydrochloride 1% in the interventional procedural pain-management setting.

4. Examine relationships among socio-demographic variables (gender, age, race, ethnicity, and professional educational preparation), years of NPs and PAs experience with pain management, practice setting, and category of APP, knowledge, attitudes and perceptions.
The operational definitions for the variables of DNP scholarly project interest and related definitions are now presented.

**Definitions of Terms**

**Acute pain:** acute pain is an unpleasant sensory or emotional experience associated with actual or potential tissue damage or described in terms of such damage (IASP, 2018).

**Analgesia:** the selective suppression of pain or insensitivity to pain without loss of consciousness or other sensations (Benzon, et al., 2014).

**Anesthetic:** a substance that induces insensitivity to regional pain (IASP, 2018).

**Attitudes:** the APP’s confidence or feelings towards evidence based practice regarding buffered versus non-buffered lidocaine hydrochloride 1% for interventional procedural acute pain management in adults as measured by survey questions in the Attitudes Section.

**Buffered lidocaine:** buffered lidocaine hydrochloride 1% is an anesthetic that is mixed with 8.4% sodium bicarbonate for interventional procedural acute pain management in adults (IASP, 2018).

**Cutaneous Nociceptors:** a peripheral nerve organ or mechanism for the reception and transmission of painful or injurious stimuli (IASP, 2018).

**Knowledge:** the APP’s understanding towards evidence-based practice regarding buffered versus non-buffered lidocaine hydrochloride 1% for interventional procedural acute pain management in adults as measured by survey questions in the Knowledge Section.

**Lidocaine:** (Trade name, Xylocaine): a crystalline compound (synthetic compound) used as a local anesthetic to numb tissue in a specific region. Also used in ventricular arrhythmia management (Benzon, et al., pp. 380-381, 2014).
**Perception:** the APP’s perception towards evidence based practice regarding buffered versus non-buffered lidocaine hydrochloride 1% for interventional procedural acute pain management in adults as measured by survey questions in the Perceptions Section.

**Sodium bicarbonate:** a common salt or baking soda. Sodium is the most important cation in the extracellular fluid, and bicarbonate is the most used buffer in the body. Also called sodium acid carbonate (Benzon, et al., pp. 380-381, 2014).

**Theoretical Framework**

The Diffusion of Innovations Model, developed in the early 1950s by Everett Rogers, is the conceptual framework for this DNP scholarly project (see Figure 1). It is used to guide the examination of the knowledge, attitudes, and perceptions of APPs regarding the use of buffered lidocaine hydrochloride 1% versus non-buffered lidocaine hydrochloride 1% in the adult interventional procedural pain-management setting.

![Rogers' Diffusion of Innovations Theory](image)

Figure 1. Rogers’ Diffusion of Innovations Theory (2015)
In Rogers’ theory, the consequences are defined as the changes that occur in an individual or a social area as the direct result of the adoption or the rejection of proposed innovation (Rogers, 2003). To reduce this uncertainty, individuals should be informed of the advantages and disadvantages to become more aware of all the consequences involved. This can be further understood as the functional or dysfunctional, direct versus indirect, and the anticipated versus unanticipated consequences in more groups’ classifications (Rogers, 2003).

The diffusion of innovations model was designed to aid in the process of adopting innovation. Innovators comprise 2.5% of the innovation curve in Everett’s theory. They are considered the innovative thinkers, who are quick to recognize process improvement opportunities. In this theory, it is important that the innovators be highly influential in organizations and be an integral part of helping others to adapt (Melnyk & Fineout-Overholt, 2015). Over the past 30 years, many researchers from diverse disciplines have used this framework in the areas of technology diffusion, innovation medicine, and adoption framework (Melnyk & Fineou-Overholt, 2015).

This change theory model involves five steps: knowledge; persuasion; decision; implementation; and confirmation. These stages typically follow one another in a time-ordered manner. For Rogers, innovation is the idea, practice, or project that is perceived as new by either an individual or other unit of adoption (Moon, 2016). The application of an evidence-based practice (EBP) theory allows stakeholders to be: 1) informed regarding the identifiable knowledge base and gaps of the APP; and 2) able to synthesize the best available evidence with clinical expertise and patients’ preferences, attributes necessary for providing improved patient outcomes (Melnyk & Fineout-Overholt, 2015).
The Knowledge Stage

The first stage is the identification of the gap in the literature regarding knowledge, attitudes, and perceptions of APPs regarding the use of buffered vs. non-buffered lidocaine hydrochloride 1% for interventional procedural pain management in adults. This gap in the literature led to the development of the PICOT question identifying the population of APPs (NPs and PAs) who routinely use local anesthetics. A recognition of the knowledge gap regarding the perceptions APPs have regarding local anesthetics in their practice setting provides an opportunity for increased APP education and a review of practice. (Moon, 2016).

The knowledge stage of Rogers’ Diffusion of Innovations Theory starts with APPs learning about the existence of the innovation and seeking information on the subject. Critical questions are explored and answered. During this stage, the provider attempts to establish what the innovation is and how and why it works (Moon, 2016). Although this DNP Scholarly Project primarily focuses on the knowledge component of the Rogers’ Diffusion of Innovations Theory, the additional components of the model are articulated for their completeness.

The Persuasion Stage

The persuasion stage occurs when the participant has a positive or a negative attitude towards the presented innovation. However, the formation of a favorable or unfavorable opinion toward an innovation does not always lead directly to a rejection or approval (Rogers, 2003). The participant’s attitude is shaped after being informed about the innovation; consequently, the persuasion stage follows the knowledge stage in the overall decision-making process.

The Decision Stage

At the decision-making stage in the innovation-decision process, the individual making the decision to adopt or reject the proposed innovation. Adoption refers to the full use of an
innovation as the best course of action in practice. If an innovation has a partial trial, it is usually adopted more quickly, due to the notion that most individuals first want to try the innovation on their own. The vicarious trial can speed up the innovation-decision process (Rogers, 2003).

**The Implementation Stage**

The implementation stage is where the innovation is put into practice (Rogers, 2003). With innovation and its newness which some grade of ambiguity is involved in diffusion. Ambiguity about the final outcomes of the innovation still can be a problematic during this stage.

**The Conformation Stage**

According to Rogers (2003), the aim can be revised if the participants expose conflicting messages regarding the innovation and current practice perceptions (p. 189). Consequently, attitudes become crucial at the conformational stage and the innovation decision outcomes. Discontinuance is possible in two ways (Moon, 2016). Rogers states that diffusion is a specific variation of communication and includes units of adoption, and various communication channels (Moon, 2016). The adoption is a hypothetical decision of full use of an innovation as in its best course of action available to its use (Rogers, 2003, p. 177). Thus, it is a very social process that involves interpersonal communication relationships and participant feedback to increase the success of adoption (Rogers, 2003, p. 19). This provides the research with a framework, parameters, and a strong commitment to be timely in its delivery.

The next element of the diffusion of innovations process is through the communication process. This involves the creation of a channel through which the participants can create an exchange and review of information to gain more increased understanding of the innovation. The adoption is a methodical decision regarding the full use of an innovation based on participants’ feedback (Rogers, 2003, p. 177). Thus, it is a very social process that involves interpersonal
communication relationships in making this stage functional in the adoption of change (Rogers, 2003, p. 19).

**Conclusion**

The background and significance of this DNP scholarly project topic have been presented clearly. Rogers’ Diffusion of Innovations Theory 2015 was used felicitate the recognition of a knowledge gap regarding APPs use of buffered verses non-buffered lidocaine hydrochloride 1% interventional procedural acute pain management in adults.

The next chapter of the DNP scholarly project presents a systematic literature review concerning the knowledge, attitudes, and perceptions of APPs regarding the use of buffered verses non-buffered lidocaine hydrochloride 1% for interventional procedural pain-management in adults.
Chapter II

Search Criteria

A literature review was conducted to elucidate information on the knowledge, attitudes, and perceptions of APPs regarding the use of buffered vs. non-buffered lidocaine hydrochloride 1% for interventional procedural pain management in adults. Electronic databases searched included the Cumulative Index Nursing Allied Health Literature (CINAHL), EMBASE, Ovid, and PubMed. Primary searches also included Google Scholar. Inclusion criteria included: a) English language, b) publication years 1965-2017; and c) scholarly research studies investigating the knowledge level of, perceptions of, and attitudes of APPs regarding use of buffered versus non-buffered lidocaine hydrochloride 1% local anesthesia for interventional procedural pain management in adults. Exclusion criteria included: a) pediatric acute pain; b) expert opinion articles; and c) case studies.

Search terms included: acute pain, lidocaine hydrochloride 1%, sodium bicarbonate, buffered lidocaine versus lidocaine hydrochloride 1%. There were no studies found which explored relationships among knowledge, perceptions, and attitudes of APP’s regarding the use of buffered verses non buffered lidocaine hydrochloride 1% for interventional procedural pain management in adults, and sociodemographic variables, and APP categories.

Search terms were combined as follows: acute pain AND lidocaine hydrochloride 1%; knowledge, perceptions AND providers AND buffered lidocaine; acute pain AND attitudes of advance practice providers; buffered lidocaine 1% AND nurse practitioners; buffered lidocaine hydrochloride 1% AND physician’s assistants; perceptions, attitudes, AND pain AND lidocaine hydrochloride 1%; acute pain AND nurse practitioners; acute pain AND physician’s assistants;
sodium bicarbonate. Occasionally, NP and nurse practitioner were used interchangeably as well as PA for physician’s assistant.

PubMed yielded 10 randomized controlled trials and six systematic reviews and meta-analyses. The CINAHL search produced six systematic reviews and seven meta-analysis articles, as well as, three retrospective studies using pain questionnaires. Two descriptive cross-sectional studies and one descriptive systematic review were obtained via Google Scholar. Duplicate studies were omitted.

The initial search conducted used elements from the PICOT question: knowledge, attitudes, perceptions, local analgesia; and NP. The search terms were combined with the Boolean operators “AND” and “OR.” Including the search terms “knowledge,” “attitudes,” “perceptions,” “analgesia,” and “buffered lidocaine,” with other terms resulted in zero only using NP. The initial literature search was limited to articles published during 2012-2017; however, due to limited findings, the search years were expanded to 2007-2017. A few relevant studies were located with this expansion. The initial search criteria were also expanded to include benchmark studies regarding the study of pain and the use of analgesia, including the research on pain theory by Melzack in 1965.

The electronic search yielded 35 eligible studies for review: 1) ten randomized controlled trials as primary sources of evidence; 2) seven systematic reviews; 3) seven meta-analysis; 4) three retrospective studies; 5) two descriptive cross-sectional studies.

The search of PubMed with full text resulted in a retrieval of 543 articles on acute pain and lidocaine of which two were retained. The search of CINAHL Plus with full text resulted in the 331 publications, of which six were retained and one used. The search of Google Scholar resulted in two additional articles. Duplicate papers were excluded, which eliminated 47 full-text
articles. A final sample of 37 full-text articles were retained for this scholarly project and literature review.

**Critique and Synthesis of Previous Evidence**

The impact of knowledge, attitudes, and perceptions of NPs and the use of buffered lidocaine hydrochloride 1% was appraised and critiqued using the Strength of Recommendation Taxonomy (SORT) appraisal tool (Ebell et al, 2004). This appraisal tool evaluates the quality, quantity, and consistency of evidence. The SORT evaluation tool places an emphasis on patient-oriented outcomes and rates the articles as follows: 1 = good quality and patient-oriented evidence; 2 = an article with more limited quality, patient-oriented findings; and 3 = articles with other evidence found, such as disease-based, usual practice, opinion bias, or consensus guidelines.

The second phase of the SORT appraisal tool uses an A, B, or C assignation to determine the strength of evidence, to aid in the translation of research into clinical practice. A through C is labeled as a Strength of Recommendation Grade as follows: A = good quality, consistency, patient-oriented evidence; B = more inconsistent or limited quality findings and patient-oriented outcomes; and C = evidence found with disease-oriented findings, usual practice, expert opinion, consensus, or treatment, prevention, or screening (Ebell et al., 2004).

**Pathophysiology of Pain**

Pain is the body's way of alerting a person to potential or actual damage (Egekvist, Bjerring, & Arendt-Nielson, 1999). According to Barrett (2003), pain is the way the peripheral nervous system warns the central nervous system of injury or potential injury to the body. The message is transmitted through nerve cells that are termed nociceptors by neurotransmitters. The body also releases prostaglandins that may enhance the pain message. Lynch (2001) describes
pain as being nociceptive, neuropathic, or mixed because nociceptive pain is somatic pain that arises from an injury or visceral pain that arises from inflammation, obstruction, or ischemia.

Neuropathic pain results from damage to the peripheral or central nervous system that alters sensation. Barrett (2003) states that nociceptive pain is typically called acute pain, which usually resolves when the condition that caused the pain is removed. Acute pain usually lasts from one to three months and negatively impacts a patient's daily life and activities, such as increased stress and an inability to sleep (Yates et al., 1998) and (Lynch, 2001). However, if pain remains after the acute insult, it may be considered chronic pain, and consequently, negatively impacts a patient’s life for the long term (Lynch, 2001).

**Treatment of Pain**

According to the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), pain is a personal and subjective symptom that is influenced by gender, age, race, and psychosocial factors (NIAMS, 2015). A June 2015 Gallup Survey indicated that 42% of adults say they experience an acute pain episode daily, and approximately 28-30% of the US population suffers from acute pain. Of the population who reports pain, over reporting of the amount of pain they experience is estimated to be approximately 10% (Daykin, 2017). That leaves 90% of those who report pain experiencing some pain intensity that needs to be addressed.

There are many reasons why pain is undertreated by healthcare providers. The most common barrier to effective pain management is the healthcare provider's incorrect assessment of pain and/or the ineffectiveness of the pain relief measures. A study by Daykin (2017) found that there is a lack of knowledge regarding pain management and assessment by providers. Healthcare providers may not treat appropriately localized acute pain because they often receive limited pain and symptom management information within their educational curricula.
Providers have a central role in assessing a patient's pain and providing appropriate pain-treatment options. Thus, they can apply evidence-based practice to pain management, and potentially stop pain being undertreated (Lynch, 2001). According to Dalton (1989), providers are more worried about addictive behavior when a patient requests pain medication, than they are with adequately treating severe acute pain. Dalton (1989) also found that providers spend little time assessing the effect of pain on the patient's daily life and consequently, they do not understand the importance of acute pain management.

Commonly noted barriers to adequate acute local pain management for adults include knowledge deficits about pain management (83%), attitudes about pain treatment 77% of the time, and skills regarding pain management 35% of the time in provider management of acute pain management (Dayton, 2017). A study done by Brunier, Carson, and Harrison (1995) looked specifically at nurses’ knowledge and attitudes about local and acute pain and found that both greatly affected the nurse's management of pain. Their findings indicated there was a serious gap in registered nurses' knowledge and attitudes about pain.

Three themes are repeatedly explored in the literature in examining why pain is not adequately controlled (Visser, 2006). First, knowledge of pain and its management is often cited. A second factor cited is the attitudes of the healthcare provider. Third is the perception of addiction or other side effects from the pain therapies. These perceptions may be on the part of the healthcare professional, the patient experiencing the pain, or the families of the patient (Visser, 2006).

Guidelines on Pain

Many state and professional organizations have developed clinical-practice guidelines to direct healthcare providers and the adequate management of acute and chronic pain. The 2005
acute pain clinical-practice guidelines from the International Association for the Study of Pain are the foundation for more current guidelines (IASP, 2018). Sample current pain guidelines include guidelines available from the National Guideline Clearinghouse, and the Pain Guidelines released in 2005 by the Healthcare Association of New Jersey, (Gordon, Dahl, Miaskowski, McCarberg, Todd, & Paice, et al., 2005). Guidelines by the Healthcare Association of New Jersey regarding pain management include definitions of acute and chronic pain, and clear directions for acute to chronic pain diagnosis by providing assessment and the treatment options with pharmacological and non-pharmacological interventions, including physical and occupational therapy, in addition to regional pain treatments.

The American’s Society of Peri-Anesthesia Nurses (ASPAN) released a series of pain and comfort clinical guidelines in August 2003 to aid in the standardization of EBP for pain management in adults. These guidelines provide direction for the assessment, interventions, and expected outcomes for procedural pre-and post-phases of treatment; the use of pharmacological and non-pharmacological interventions is also endorsed. The Veterans’ Health Administration released Clinical practice guidelines for the management of post-interventional pain, initially in May 2002. These guidelines are organized into two phases and main algorithms. Algorithms present is for treatment for pre-and post-interventional procedural pain management. The pain management plan is structured within the framework of comprehensive and multi-modal care structures, which include discharge planning for post-procedural pain management. A patient-focused objective is included for each step of the pain-management plan. Great emphasis is placed upon the reassessment and re-modifications of the treatment plan; post reassessment is also found within this algorithm. Clear descriptions of systemic treatments, as well as, local analgesic interventions to reduce overall pain symptoms are found within these clinical practice
guidelines. The American Society of Pain Management Nursing (ASPMN) has published two position statements on pain management issues, with a focus on very difficult pain management challenges and practice guidelines in nursing (American Society of Pain Management, 2018). Practice recommendations are based on evidence and research, and clinical expertise. The ethical side of the ASPMN is also focused on ethical pain management for patient’s management with patients with addictive disease and hyper-sensitivities to acute and chronic pain-management outcomes (ASPMN, 2018).

The use of interdisciplinary teams to monitor current pain practice, identify areas for improvement, and oversee patient quality improvement plans is consistently recommended across pain practice guidelines to direct care, and management of acute pain in adults.

Guidelines for use of local adult anesthetic and interventional procedural-based dermatological procedures come from the American Academy of Dermatological Association (AADA) guidelines for clinical use and safety for local anesthetics, infiltrated, nerve blocks, and infiltrated acute pain-treatment modalities (Kouba, et al., 2016). The guidelines established for dermatological local anesthetic office-based use and reflect the best available data at this time for local analgesia management (Kouba, et al., 2016). American Academy of Dermatological Association has reported that adverse events from local in infiltration anesthetics are rare in adults (Kouba, et al., 2016). It has been noted in evidence-based comparative studies explored by the AADA clinical practice guidelines that use of local infiltrated anesthetics, like lidocaine hydrochloride 1 %, are a safer type of acute analgesia than systemic analgesia (Kouba, et al., 2016). The International Association for the Study of Pain (IASP) has created principles of office procedural medicine and recommends use of effective anesthetic as a vital element in any office-based potentially pain-inducing procedure (IASP, 2018). The IASP states that the ideal
anesthetic achieves 100% analgesia for a short duration, works on impacted or non-impacted skin without systemic side effects, and invokes neither pain nor toxicity. It is noted that no single agent meets all these ideal criteria. An APP then selects a local anesthetic while using other properties other than patient pathology due to most initial anesthetics not achieving 100% analgesia. Infiltrated anesthetics are frequently selected because of their proven safety record, their cost, their ease of storage, their availability, and their rapid onset of action (IASP, 2018).

Noted allergies to local infiltrative anesthetics are rare, but when a reaction does occur, it is often secondary to preservatives or other additives in multiuse vials. Additives in local anesthetics can be useful in interventional procedural management in adults in that some can prolong the pain relief of the anesthetic (IASP, 2018). Allergies and reactions remain a point for providers to consider when determining the safety of buffered lidocaine hydrochloride 1%. The ASP states that not only are allergies to local infiltrative anesthetics rare, but also, they have been reported to occur at less than 0.03%, and not increase with the addition of sodium bicarbonate. The IASP notes that since the development of lidocaine 1% in 1943, infiltrative local anesthetics for acute care in adults has had many clinical uses in procedural medicine. Even with the recent advances in topical anesthetics, infiltrated analgesia remains standard for interventional procedural pain management in adults (IASP, 2018).

The Joint Commission on Accreditation of Healthcare Organizations (JACHO) has recognized that pain is a serious problem. Pain inhibits a patient’s daily functioning and is undertreated for diverse reasons. The JCAHO (NCS Pearson, 2015) established new standards for the assessment and management of pain. The most recent JCAHO standards, published in 2013-2015, state that a pain assessment should include a psychosocial assessment, a detailed patient history, a physical examination, and a diagnostic evaluation. How pain affects the patient's
functioning in daily life also needs to be addressed. A pain scale for pain rating by adult patients should be used each time pain is present. JCAHO suggests that all patients need to be screened for pain. Providers need to be educated on pain assessment and management, and the quality of pain management must be quantified (NCS Pearson, 2015).

**Barriers to Pain Management**

**Knowledge.** Despite the tremendous growth in knowledge about the management of pain over the last 20 to 30 years, concomitant improvement in provider practice and knowledge has not occurred (Goldberg, 2011). Researchers have repeatedly demonstrated that nurses and physicians alike have an inadequate ability to manage local pain and the efforts to improve this gap have not been universally met (Melnyk & Fineout-Overholt, 2015). In addition to the available literature on practice barriers, several authors have recently described financial, educational, and ethical problems associated with pain management that may impede adequate care of patients in acute pain (Melnyk & Fineout-Overholt, 2015). Reported barriers to optimal acute pain management include inadequate assessment of pain and pain relief, as reported by 53% of advanced practice providers (Daylin, 2017). However, less than one third of the APPs reported that a barrier to pain management was the reluctance of providers to administer local analgesia due to knowledge and skills (Daylin, 2017).

**Attitudes.** Together with knowledge and perceptions, attitudes are often listed among the barriers to adequate APP use of local anesthetic in interventional procedural pain management in adults. Acute pain services in interventional procedural pain management in adults have recently become an important part of anesthesia services. Surveys conducted in the mid-90s in the U. S. revealed that 14% of providers were running acute pain services to support acute pain needs (Manzoni, 2013). Acute pain management does not only involve anesthetists and pain specialists,
but also APPs and specialty nurses within their acute pain services. An increasing number of healthcare providers in multiple specialties have become interested in pain and its treatment modalities. Acute pain continues to be undertreated in an estimated 1 in 5 adults with the median time of exposure being 7 years. This situation is not likely to improve until healthcare providers gradually change their attitudes and beliefs regarding acute pain management (Goldberg & McGee, 2011).

**Perceptions.** Despite tremendous progress in knowledge and pain management, there has been a consistent lack of emphasis on adequate pain control. Additionally, there remains little accountability for pain management in the adult acute pain management setting. Researchers repeatedly report that providers have inadequate abilities and procedures to improve pain management, and thus continue to fall short of the goal (Wallace et al., 1995). The knowledge and sensitivity of the provider’s initial contact with the patient experiencing acute pain is critical to the patient’s initial comfort and pain management.

Researchers have documented that providers do not have adequate standardized knowledge of localized acute pain management. Providers’ perceptions of their own adequacy and skill in local pain management may provide insight into the lack of progress presently in this area (Ung, Salamonson, Hu & Gallego, 2015). Many providers report less than adequate knowledge of their state's definition of pain, which has serious consequences to patient self-escalating behaviors when not properly treated initially (Ung, Salamonson, Hu & Gallego, 2015). The literature presents a paucity of evidence that the knowledge of local anesthetic pain management is not improving. There is a primary focus in the literature on systemic analgesia versus local anesthetic.
Buffered Lidocaine Hydrochloride 1% versus Non-Buffered Lidocaine Hydrochloride 1%

Lidocaine hydrochloride 1% is an amide local anesthetic that has anti-hyperalgesia and anti-inflammatory properties. The actions of lidocaine hydrochloride 1% are more intense and its effects more prolonged than that of cocaine, and its action is shorter than that of bupivacaine or prilocaine (Lidocaine hydrochloride, 2018). Lidocaine interacts with the voltage-gated sodium channels in the nerve cell membrane and blocks the transient increase in permeability of excitable membranes to the sodium channels (Lidocaine hydrochloride, 2018). This prevents degeneration and conduction of nerve impulses and produces a diverse loss of sensation. Lidocaine hydrochloride 1% also exhibits class IB antiarrhythmic effects (Lidocaine hydrochloride, 2018). The agent decreases the flow of sodium ions into myocardial tissue, especially Purkinje fibers or, during the phase 0 of the action potential, by decreasing the polarization, automaticity, and excitability of the muscles (Lidocaine hydrochloride, 2018).

Lidocaine hydrochloride 1% versus lidocaine hydrochloride 2% has shown no additional benefit with the increase in percent of lidocaine hydrochloride 1%. Lidocaine hydrochloride 2% has reported an analgesic benefit, but the antiarrhythmic effects of lidocaine hydrochloride 2% is a very important monitor to avoid reaching a cardiac muscle automaticity threshold earlier with 2%, with no added anesthetic benefit (Conahan, 2007). The analgesic effects are thought to be mediated by the suppression of impulses generated from injured nerve fibers and the proximal dorsal root ganglion (Daykin, 2017). This occurs by the inhibition of several pain receptor channels. The anti-inflammatory effects are attributed to the blockade of neural transmission at the site of tissue injury, equating to the attenuation of neurogenic inflammation and the intrinsic anti-inflammatory pathway (Daykin, 2017).
Several studies have evaluated the pain of local anesthetic injection of lidocaine hydrochloride 1% injection versus buffered lidocaine hydrochloride 1%. Nuttall et al. (1993) studied 280 patients who were randomized to receive 1 of 4 different treatment arms: benzyl alcohol in normal saline; normal saline; lidocaine hydrochloride 1%; and buffered lidocaine hydrochloride 1%. Results showed that the injection was more painful without any intervention of lidocaine hydrochloride 1% at all per patient response (Nuttall et al., 1993). Several reasons can be identified for the reduction in pain with the buffered lidocaine hydrochloride 1%. Initially, the adjustment of local anesthetic pH towards the physiological range of 7.0-7.4 reduces the direct tissue irritation caused by the infiltration of a more acidic compound. Secondly, the increased relative concentration of the non-ionized form allows for a more rapid diffusion throughout the tissues with potential almost immediate sensory nerve blockade (Christoph, Buchanan, Begalla & Schwartz, 1988).

Studies have found that APPs are inadequately prepared to care for patients with acute local pain needs in multiple settings (Daylin, 2017). The Department of Veteran Affairs reported in 2008 that the prevalence of acute non-malignant pain was lower than that of a surgical service, but was still substantial (Indivior, 2015). In one hospital survey, 43% of acute pain patients experienced local pain, and 12% reported unbearable amounts of pain. Local pain management has anesthetic, anti-hyperalgesia, and anti-inflammatory properties with reduction in pain scores and is found to be systemic opioid sparing (Daykin, 2017).

**Conclusion**

Although the literature addressed the rationale of healthcare providers’ choice of local anesthetic, no studies were found addressing whether the participants used evidence-based
practice. This chapter reviewed the body of literature related to knowledge, attitudes, and perceptions of NPs and PAs regarding the use of buffered local analgesia in adults.

Throughout this literature, all investigators concluded that the use of local pain management in adults and procedural medicine continues to be a clinical challenge. Although many factors contribute to this problem, three key factors were the knowledge, attitudes, and perceptions of APPs regarding the use of buffered lidocaine hydrochloride 1% versus non-buffered lidocaine hydrochloride 1% for interventional procedural pain management in adults.

Although these gaps appear across the provider spectrum in general, none of the studies explored whether APPs shared these common misconceptions and deficits. Therefore, this study will contribute to the body of knowledge by exploring APPs knowledge, perceptions, and attitudes regarding the use of buffered lidocaine hydrochloride 1% for interventional procedural pain management in adults.
Chapter III

Methodology

This DNP scholarly project was a descriptive, cross-sectional study using a survey design. Georgetown University approval was obtained prior to data collection in July 2018 (University, 2018). Inclusion criteria for the sample were: 1) ≥ 18 years of age; 2) APP: NP and PA; c) administer local anesthetics for interventional procedural pain management in adults; 3) employed by a pain center organization with clinical sites in Arizona and Florida; 4) DEA licensed and board certified; 5) computer access to use the electronic platform of SurveyMonkey™; and 6) active and pain center organization encrypted email address. Submission of a completed survey denoted participants’ informed consent.

Aims

Specific aims of this DNP scholarly project were to:

1. Examine and compare the knowledge base of NPs and PAs regarding the evidence base for use of buffered lidocaine hydrochloride 1% versus non-buffered lidocaine hydrochloride 1% in the interventional procedural pain-management setting.

2. Examine and compare attitudes of NPs and PAs regarding the use of buffered lidocaine hydrochloride 1% versus non-buffered lidocaine hydrochloride 1% in the interventional procedural pain-management setting.

3. Examine and compare perceptions of NPs and PAs regarding the efficacy of buffered lidocaine hydrochloride 1% versus non-buffered lidocaine hydrochloride 1% in the interventional procedural pain-management setting.

4. Examine relationships among socio-demographic variables: (gender, age, race, ethnicity, and professional educational preparation), years of NPs and PAs experience
level with pain management, practice setting, and category of APP), knowledge, attitudes and perceptions.

Sample

The purposive sample was recruited through a closed email serving 21 sites in a pain center organization with clinical sites in Arizona and Florida. The number of active employees was calculated at the time the survey was disbursed and the total APP surveyed was 53.

Survey Instrument

The instrument was an investigator-created 48-item survey, consisting of 4 distinct sections: 1) Socio-demographic Section assessed variables including age, gender, ethnicity, race, and years in clinical practice, the highest educational levels, and advance practice specialty; 2) Knowledge Section assessed NPs and PAs knowledge regarding the use of buffered versus non-buffered lidocaine hydrochloride 1% in interventional pain management in adults; 3) Perceptions Section assessed participant perceptions regarding the use of buffered versus non-buffered lidocaine hydrochloride 1% in interventional pain management in adults; 4) Attitudes Section assessed participants’ attitudes regarding use of buffered versus non-buffered lidocaine hydrochloride 1% in interventional pain management in an adult-care setting. The items were guided by the current APS, World Health Organization, and IASP Guidelines. Construct validity was established by graduate-level advanced practice NPs, PAs, interventional pain physicians, doctoral prepared mentors, and senior pain experts.

The survey tool items were identified from the literature review and the DNP scholar’s clinical practice, which included administering local anesthesia to patients before minor medical procedures. The response items were related directly to the project’s purpose and specific aims.
Survey 2 response items were identified from the literature and the DNP scholar’s five years of clinical experience working with this population.

A panel of experts, who validated the survey tool’s content validity and administrative utility. Included the DNP Scholarly Project team lead, project statistician, pain content expert, nurse anesthesia expert. The tool was able to discriminate between levels of advanced practice and levels of experience.

That demographic data was used to examine correlations among APP knowledge, perceptions, and attitudes regarding the use of buffered versus non-buffered lidocaine in interventional procedural pain management in adults, 2) age, gender, and years in practice as an advance practice provider, and 3) levels of education. Additional investigated efforts regarding the years of practice and specialty were performed to determine a specific target population of APP that will benefit from additional educational resources in interventional pain management and local anesthetics/treatment information. Correlations between APP educational level, knowledge, attitudes, and perceptions were investigated to determine the effects of advanced practice provider education and the influence of lidocaine hydrochloride 1% outcomes in the interventional procedural pain management setting with adults.

Knowledge Section. Knowledge questions captured the APPs knowledge level regarding buffered versus non-buffered lidocaine hydrochloride 1% use in interventional pain management in adults. Participants rated themselves on a Likert-Type scale with possible scores rated as: 1= “None”; 2= “Some”, 3= “Moderate”, 4 = “Good”, 5= “Excellent”. The total score was the sum of all questions with the low score being 1 and the highest score being 6.

Attitudes Section. Attitude questions captured APPs’ confidence and diagnostic acumen, treatment requirement, provider satisfaction in local anesthetics, and practice selection. These
questions required APPs to rate themselves on a Likert-Type scale with possible scores ranging from: 1= “very strongly agree”; 2= “agree”, 3= ‘neither agree nor disagree’, 4= ‘disagree’, 5= “very strongly disagree”. The total sections scores were the sum of all questions in that section. One multiple-choice question regarding the use of buffered versus non-buffered lidocaine was included in the section.

**Perceptions Section.** Perceptions of APPs regarding use of buffered versus non-buffered lidocaine hydrochloride 1% use in interventional procedural pain management in adults regarding: 1) whether there was a preference of one anesthetic over another; 2) APPs confidence level on local anesthetic pain management in the interventional procedural pain management setting in adults; 3) The strategies versus acute and chronic pain management in the interventional pain setting; 4) The attitudes on comparable pain stimuli and intensity treatment; 5) The advanced practice providers understanding of buffered versus non-buffered lidocaine hydrochloride 1% as an interventional pain managements role and symptom management. Participants rated themselves on a Likert-Type scale with possible scores including: 1= “very strongly agree”; 2= “agree”, 3= “disagree”, 4= “strongly disagree”, and 5= “very strongly disagree”. The total score was the sum of all the scores of all the questions with the low score being 1 and highest score being 6.

Two open-ended questions were presented at the end of the Survey that assessed whether the participants felt that they would benefit from additional education regarding: 1) buffered versus non-buffered lidocaine hydrochloride 1% in the use of interventional pain management in adults; and 2) what educational modality would be most useful for them to receive additional information about buffered versus non-buffered lidocaine hydrochloride 1% use. Participants were asked to explain their answers in an open-ended format.
**Procedures.** The Institutional Review Board application was completed and submitted by the DNP scholar for approval to the Georgetown University IRB, Section A, Biomedical in Pediatric Oncology Committee in July 2018. The IRB not only ensures ethical standards; it also ensures responsible science in all research studies involving human subjects. The rigor and quality of this research must be of a standard high enough to anonymity and limit potential harm to subjects within the study. Beneficence and justice must serve as the basis for all research studies. Accordingly, the ethical principles of respect for persons and the protection of vulnerable populations must be the baseline of quality research. The DNP project received University IRB expedited approval because it was determined that there was minimal risk to human subjects. Minimal risk was defined by University IRB as, (University, 2018). The study received Georgetown IRB approval before the data collection began.

The DNP Scholar discussed the scholarly project with the President and Chief Executive Officer (CEO) of pain center with 21 facilities in Arizona and Florida. Permission for the survey distribution was obtained by the DNP scholar from the pain center CEO and was reviewed by the pain center Board of Directors. The DNP scholar established a partnership with the pain center to allow the distribution of the survey to only their APPs.

Following Georgetown IRB approval, the DNP scholar contacted the CEO at the pain center in Arizona, who was initially noted as the point of contact for the study email listserv. Once this listserv of 53 APPs in two states was formulated and assessed, the CEO at the pain center was provided the SurveyMonkey™ link with informed consent script embedded in the beginning of the survey. The survey was distributed using SurveyMonkey™ to all eligible APP pain center employees through the pain center employee registered emails. Eligible participants clicked on the survey link contained within the introductory letter to participate in this study,
indicating that they were eligible for the study and met all inclusion criteria as advanced practice providers practicing within the states of Arizona and Florida.

The introductory letter included study rationale, eligibility criteria and inclusion criteria, study procedures, estimated time in which to complete the survey (approximately 20 minutes), any potential risk and benefits, an explanation that participants may withdraw from the study at any given time, how personal confidentiality and data confidentiality will be maintained, the DNP’s contact information, and to whom to ask questions about the study in general. Potential participants were informed that completion of the survey denoted their informed consent.

Confidentiality was maintained via several mechanisms. These included secure socket layers (SSL) encrypted and disabled IP address tracking through SurveyMonkey™. These safety mechanisms were embedded through the SurveyMonkey™ electronic platform. Additionally, no response identifiers occurred in the data analysis. All data were in an aggregated form. The privacy policy of SurveyMonkey™ was attached to the consent form for participants to review.

Data Analysis

The data analysis plan was created in collaboration with the study statistician. The data analysis focused on answering the project’s questions and aims. Descriptive statistic techniques such as frequency, distribution, measurements of central tendency, and measurements of variability were used to characterize the sample. The three domains of knowledge, attitudes, and perceptions of the survey were analyzed for coefficient of reliability. Descriptive statistics were calculated for the sociodemographic and clinical practice data of the sample, including frequencies distributions for categorical variables, and means, standard deviation, skewness, and kurtosis for continuous variables. Independent samples t-test, one-way ANOVA, and chi square test of independence were utilized to determine statistical differences between use of buffered
lidocaine hydrochloride 1%, knowledge, attitudes, and perceptions by participants’ demographic characteristics. Data analysis was conducted using IBM SPSS statistical analysis software (version 25, 2016). Content data analysis was performed to analyze open-ended questions and their responses.

**Data Management**

This DNP scholarly project used an anonymous survey and the confidentiality of the participants was maintained using a unique participant identification number. Data were directly downloaded and stored on the DNP scholar’s password-protected computer provided by the anonymous pain centers encrypted computer. Only the DNP scholarly project team lead, DNP faculty mentor, and the studies statistician had access to the data.

All data were maintained confidentially in an electronic format with SSL encryption, disabled IP tracking, and aggregated data analysis. No printed responses or personal identifiers were produced during the study conduct. The DNP scholars’ SurveyMonkey™ advantage member account terminates in June 2019 and, consequently, the data will no longer be stored within the SurveyMonkey™ server beyond this date. Data are stored on a password protected and encrypted computer and will be kept for nine months following the study completion, as was described in the IRB application for approval.

**Human Subjects Protection**

The study was approved by the University Institutional Review Board (IRB) before data collection began. The DNP scholar completed Collaborative Institutional Training Initiative (CITI) classes in both biomedical and social/behavioral responsible conduct of research, including informed consent, which presented study rationale, risk versus benefits, data confidentiality protection, and inclusion and exclusion criteria.
The cover letter that participants read prior to the survey explained the study rationale and procedures. Federal regulations inform the guidelines for participants in a research study and the following rights were evident in the protocol for IRB application: the participants were informed of the purpose of the research; the participants had the right to ask questions with the principal investigator’s contact information available to them; the participants were informed that they had the right to withdrawal from the survey at any time without consequence; the participants were not subject to any form of coercion of forced to participate. Anonymous participation for the survey was ensured by an anonymous setting on the SurveyMonkey™ data collected, with no identifiable information collected. Completion and submission of the survey denoted informed consent.

**Data Collection Procedure**

The data was collected through SurveyMonkey™; and was only accessible to the DNP student, thesis advisor, and scholarly project statistician. The same questionnaire was used for all providers and sites.

**Budget Analysis**

Budget obligations for the DNP scholarly project included the cost to obtain SurveyMonkey™ advantage membership account, and the cost for statistician services. SurveyMonkey™ advantage membership is $384 annually (SurveyMonkey™, 2018). The advantage membership provides unlimited questions and responses, and provides data exports and reports, statistical significance and test analysis, questions and answer piping, questions and page randomization, and email support. The DNP scholar received statistical support from a Georgetown University faculty statistician, who provided the services at a student rate of $25/hour. The total for hours statistician cost was at ten hours equaling $250.00. This project
utilized descriptive statistics, which were calculated with Microsoft Excel and IBM SPSS statistical software (version 25, 2016). The total cost of the DNP scholarly project was $634.00. No other costs, such as project tools, printed materials, setting, or utilities were needed for the DNP project. The DNP scholar provided primary funding for the DNP project, which included, SurveyMonkey™ advantage membership, and statistician expenses.
Chapter IV

Results

Characteristics Section

Data were analyzed using descriptive statistical techniques, such as frequency distribution, measurements of central tendency, and measures of variability to characterize the sample. The descriptive cross-sectional survey was intended to have 48 items, however errors in item working on two questions (29 and 34) required they not be included in the analysis. Survey design provided an assessment of current APPs in their use of buffered versus non-buffered lidocaine hydrochloride 1% for interventional pain management with adults. Three domains - knowledge, attitudes, and perceptions - of the survey were analyzed for internal reliability using Cronbach’s alpha. Independent samples t tests, one-way ANOVA, and chi-squared tests of independence were utilized to determine any statistical differences by providers’ demographic characteristics and their knowledge, attitudes, and perceptions.

The survey was sent to all 53 eligible APPs. Twenty-nine participants returned completed surveys giving a (54.7%) response rate. All surveys returned were usable. The sample (N= 29) had slightly more female (58.6%) than male (41.4%) participants. The mean age of participants was 42 years (SD = 12.0), ranging from 24 to 68 years old. Mean years of experience as an APP was 11.9 (SD = 9.6), ranging from 0 to 32. The sample was predominantly Caucasian (69.0%), with equal (6.9%) representation from Black or African American, Asian or Asian American, and American Indian or Alaskan Native. Most survey participants were from Arizona (75.9%) with (24.1%) from Florida. The participant provider category was primarily NP (65.5%). PAs made up (34.5%) of the sample. The primary education reported was MS/MSN (82.8%).
Specialty practice was reported primarily as pain management and family practice (72.4%) (Table 1).

Most participants worked with patients reporting acute and chronic pain (86.2%) in primarily private settings (79.3%) (Table 2). About two-fifths (41.4%) of participants had practice locations in major metropolitan areas and two-fifths (41.4%) practiced in inner cities. Responses to the survey question of type of training, which allowed participants select more than one option, varied widely with responses of continuing education (75.9%), clinical mentor (82.8%), and on the job training (89.7%). Almost all participants (89.7%) reported that they received annual training in interventional procedural pain management. The type of local anesthetic most often used by the participants was lidocaine hydrochloride 1% (89.7%) followed by buffered lidocaine hydrochloride 1% with sodium bicarbonate 8.4% (55.2%).

**Knowledge Section**

Knowledge was measured using six questions rated on a six-point Likert-Type scale, ranging from 0 = “No knowledge” to 5 = “Excellent knowledge” (Table 3). These six questions had a Cronbach’s alpha of .892, indicating good internal reliability. Most participants rated their knowledge as “good” or “excellent” on all the knowledge questions. More than three-fifths (62.1%) rated their general knowledge of acute pain management as “good” to “excellent”. Nearly three-quarters (72.4%) rated their general knowledge of interventional procedural pain management and their knowledge of the pathophysiology of interventional procedural pain as “good” to “excellent.”
Table 1.

*Characteristics of Project Participants (N = 29)*

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</tr>
<tr>
<td>N/A</td>
<td>1</td>
<td>3.4</td>
</tr>
<tr>
<td><strong>Advanced Practice Specialty</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family practice</td>
<td>7</td>
<td>24.1</td>
</tr>
<tr>
<td>Acute care</td>
<td>3</td>
<td>10.3</td>
</tr>
<tr>
<td>Women’s health</td>
<td>1</td>
<td>3.4</td>
</tr>
<tr>
<td>Adult geriatric</td>
<td>1</td>
<td>3.4</td>
</tr>
<tr>
<td>Pain management</td>
<td>14</td>
<td>48.3</td>
</tr>
<tr>
<td>Surgery</td>
<td>2</td>
<td>6.9</td>
</tr>
<tr>
<td>Hospital</td>
<td>1</td>
<td>3.4</td>
</tr>
<tr>
<td><strong>Credentialing Association</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AANP(^6)</td>
<td>11</td>
<td>37.9</td>
</tr>
<tr>
<td>AACN(^7)</td>
<td>8</td>
<td>27.6</td>
</tr>
<tr>
<td>AAPA(^8)</td>
<td>8</td>
<td>27.6</td>
</tr>
<tr>
<td>None</td>
<td>2</td>
<td>6.9</td>
</tr>
</tbody>
</table>

1. AA=Associates Degree in Applied Science; 2. BSN=Bachelors of Science in Nursing; 3. MS=Masters; 4. MSN=Masters in Nursing; 5. PhD=Doctoral of Philosophy; 6. AANP=American Association of Nurse Practitioners; 7. AACN=American Association of Critical Care Nurses; 8. AAPA=American Academy of Physicians Assistants
On knowledge about the rational for the use of buffered lidocaine hydrochloride 1%, only 1 in 3 or 31% of participants reported that they have “very good” or “excellent” knowledge while 31% reported that they have only “some” knowledge. On the participants’ use of buffered lidocaine hydrochloride 1%, only (27.5%) have “very good” or “excellent” knowledge on its uses in interventional pain management in adults. The mean of the six knowledge items was 2.8 ($SD = 1.0$) indicating overall knowledge between “moderate” and “good.”

Two questions about experience with interventional procedural pain management were also asked (Table 3). Approximately one third of the participants indicated only “some” or “moderate” experience in interventional procedural pain management with adults and with injecting anesthetics, while an additional one third indicated “very good” or “excellent” experience.

**Attitudes Section**

A series of questions about provider attitudes was rated on a five-point Likert-Type scale from 1 = “strongly disagree” to 5 = “strongly agree.” Greater than (90%) of participants agreed that the onset time of local anesthesia injections effect is an important consideration for acute local pain control. Confidence level in respondents’ ability to manage patient’s interventional procedural acute pain was above (75%) in the agreed to strongly agreed range as seen in Table 5. Most participants (75.9%) agreed that patients with acute local pain should receive different pain management strategies than those with chronic systemic pain. Comparable stimuli in different patients will produce the same intensity of pain participants was disagreed with by (72.4%) of respondents. Greater than (70%) of providers disagree with the statement that comparable stimuli in different patients produces the same level of pain intensity. Greater than (85%) of participants disagreed with the statement that acute pain patients should be encouraged to tolerate as much
pain as possible before requesting pain coverage. The final question focused on providers’
selection of local anesthetic based on providers’ perception of patient’s pain needs. Over a third
(37.9%) disagreed, just under a third (27.6%) neither agreed nor disagreed and about a third
(34.5%) agreed. An independent t test was used to compare years of experience between those
who did and did not use buffered lidocaine. No different in use of buffered lidocaine by years’
experience was found; those who had used buffered lidocaine had a mean of 13.7 years’
experience compared to 9.7 years among non-users, but the difference was not statistically
significant, t (27) = 1.12, p = .271.

No statistically significance difference was found in the use of buffered lidocaine
hydrochloride 1% by type of practice. 52.6% of Nurse practitioners and (60 %) of Physician
assistants use it, x²(1) = .144, p = .705. No statistically significant difference was found in the
use of buffered lidocaine hydrochloride 1% by specialty; (50%) of those in pain management and
(60%) of other specialties use it, x²(1) = .293, p = .588.

**Perception Section**

Nine questions were asked about respondents’ perceptions (Table 4). These five items did
not have good internal reliability, with a Cronbach’s alpha = .08. Therefore, no overall
perception score was created. The questions were rated on a five-point Likert-Type scale, with
1= Strongly Disagree to 5=Strongly Agree. Local anesthetic treatment was largely agreed as
affective for interventional procedural pain management in adults by (89.7%) with no
participants in disagreement. The remaining (10.3%) remained undecided or neutral. Most
participants (93.1%) thought that local pain control was a priority for their patients in pain
management. Most participants (93.1%) agreed that the patient was the most accurate judge of
the intensity of their pain.
Most participants (81.9%) disagreed that patients with acute and chronic local pain should receive similar treatment. A greater number of participants (68.9%) perceived that the use of buffered lidocaine hydrochloride 1% is an effective treatment option in acute interventional pain management in adults.

Participants answers shifted to be more disagreement with the question of whether non-buffered lidocaine hydrochloride 1% is more effective for the management of interventional procedural acute pain in adults; disagree (44.8%), neither agree nor disagree (37.9%), and (17.2%).

More than half (51.7%) strongly disagreed that patients were over reacting when they reacted.

An additional t-test compared average rating on knowledge/experience and perceptions by use of buffered lidocaine hydrochloride 1% who used buffered lidocaine agreed more strongly with the statement that “interventional procedural pain management in adults is a necessary component of best practice” than those who did not, $t(27) = 2.23, p = .034$. Those who used buffered lidocaine hydrochloride 1% agreed more strongly with the statement “I believe that inadequate local acute pain management has negative patient outcomes” than those who did not, $t(27) = 2.61, p = .015$. A one-way ANOVA was used to compare attitudes by frequency of local anesthetics use by providers.

Those who use local anesthetics on a more frequent bases (daily or weekly) agree more strongly with the statement, “the use of buffered hydrochloride 1% is effective in providing local interventional procedural pain management in adults” than those who use it on a monthly or less frequent basis, $F(3, 25 ) = 3.56, p = .028$. Gender did not appear to play a significant role in experience in local anesthetic injection results or level of agreement with the statements about reported pain intensity greater than the provider’s perceived intensity of the stimulus.
Table 2.

*Characteristics of Practice Site*

<table>
<thead>
<tr>
<th>Type of Pain</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute only</td>
<td>2</td>
<td>6.9</td>
</tr>
<tr>
<td>Acute and chronic</td>
<td>25</td>
<td>86.2</td>
</tr>
<tr>
<td>Chronic only</td>
<td>1</td>
<td>3.4</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>3.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Practice Affiliation</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital-based practice</td>
<td>5</td>
<td>17.2</td>
</tr>
<tr>
<td>Private medical office</td>
<td>15</td>
<td>51.7</td>
</tr>
<tr>
<td>Private free-standing clinic</td>
<td>8</td>
<td>27.6</td>
</tr>
<tr>
<td>VA outpatient pain management</td>
<td>1</td>
<td>3.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major metropolitan area</td>
<td>12</td>
<td>41.4</td>
</tr>
<tr>
<td>Inner city</td>
<td>12</td>
<td>41.4</td>
</tr>
<tr>
<td>Rural</td>
<td>4</td>
<td>13.8</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>3.4</td>
</tr>
</tbody>
</table>

Receive annual training regarding interventional procedural pain management in adults

<table>
<thead>
<tr>
<th>Type of training</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal academic education</td>
<td>14</td>
<td>48.3</td>
</tr>
<tr>
<td>Post-doctoral training</td>
<td>1</td>
<td>3.4</td>
</tr>
<tr>
<td>Continuing education</td>
<td>22</td>
<td>75.9</td>
</tr>
<tr>
<td>Clinical mentor</td>
<td>24</td>
<td>82.8</td>
</tr>
<tr>
<td>On the job training</td>
<td>26</td>
<td>89.7</td>
</tr>
<tr>
<td>No formal training</td>
<td>5</td>
<td>17.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of Anesthetic Used</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lidocaine Hydrochloride 1%</td>
<td>26</td>
<td>89.7</td>
</tr>
<tr>
<td>Lidocaine Hydrochloride 1% with sodium bicarbonate 8.4%</td>
<td>16</td>
<td>55.2</td>
</tr>
<tr>
<td>Lidocaine Hydrochloride 1% with epinephrine</td>
<td>2</td>
<td>6.9</td>
</tr>
<tr>
<td>Lidocaine Hydrochloride 2%</td>
<td>7</td>
<td>24.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of Anesthetic Preferred</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lidocaine Hydrochloride 1%</td>
<td>16</td>
<td>55.2</td>
</tr>
<tr>
<td>Lidocaine Hydrochloride 1% with sodium bicarbonate 8.4%</td>
<td>9</td>
<td>31.0</td>
</tr>
<tr>
<td>Lidocaine Hydrochloride 1% with epinephrine</td>
<td>3</td>
<td>10.3</td>
</tr>
<tr>
<td>Lidocaine Hydrochloride 2%</td>
<td>1</td>
<td>3.4</td>
</tr>
</tbody>
</table>
Table 3.

*Knowledge with Interventional Procedural Pain Management in Adults*

<table>
<thead>
<tr>
<th>Knowledge Category</th>
<th>None (0)</th>
<th>Some (1)</th>
<th>Moderate (2)</th>
<th>Good (3)</th>
<th>Very Good (4)</th>
<th>Excellent (5)</th>
<th>M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General knowledge of acute pain management in adults</td>
<td>1 (3.4)</td>
<td>3 (10.3)</td>
<td>7 (24.1)</td>
<td>12 (41.4)</td>
<td>4 (13.8)</td>
<td>2 (6.9)</td>
<td>2.7 (1.2)</td>
</tr>
<tr>
<td>General knowledge of interventional procedural pain management in adults</td>
<td>1 (3.4)</td>
<td>2 (6.9)</td>
<td>5 (17.2)</td>
<td>14 (48.3)</td>
<td>4 (13.8)</td>
<td>3 (10.3)</td>
<td>2.9 (1.2)</td>
</tr>
<tr>
<td>Pathophysiology of interventional procedural pain in adults</td>
<td>--</td>
<td>2 (6.9)</td>
<td>6 (20.7)</td>
<td>12 (41.4)</td>
<td>7 (24.1)</td>
<td>2 (6.9)</td>
<td>3.0 (1.0)</td>
</tr>
<tr>
<td>Rationale for use of non-buffered lidocaine hydrochloride 1%</td>
<td>--</td>
<td>9 (31.0)</td>
<td>5 (17.2)</td>
<td>6 (20.7)</td>
<td>6 (20.7)</td>
<td>3 (10.3)</td>
<td>2.6 (1.4)</td>
</tr>
<tr>
<td>Use of buffered lidocaine hydrochloride 1%</td>
<td>--</td>
<td>5 (17.2)</td>
<td>9 (31.0)</td>
<td>7 (24.1)</td>
<td>5 (17.2)</td>
<td>3 (10.3)</td>
<td>2.7 (1.3)</td>
</tr>
<tr>
<td>Evidence based practice recommendations supporting choice of buffered or non-buffered lidocaine 1%</td>
<td>--</td>
<td>7 (24.1)</td>
<td>6 (20.7)</td>
<td>6 (20.7)</td>
<td>6 (20.7)</td>
<td>4 (13.8)</td>
<td>2.8 (1.4)</td>
</tr>
<tr>
<td>Experience in managing interventional procedural pain in adults</td>
<td>--</td>
<td>3 (10.3)</td>
<td>6 (20.7)</td>
<td>11 (37.9)</td>
<td>7 (24.1)</td>
<td>2 (6.9)</td>
<td>3.0 (1.1)</td>
</tr>
<tr>
<td>Experience injecting anesthetics locally for interventional procedural pain management in adults</td>
<td>--</td>
<td>10 (34.5)</td>
<td>3 (10.3)</td>
<td>7 (24.1)</td>
<td>6 (20.7)</td>
<td>3 (10.3)</td>
<td>2.6 (1.4)</td>
</tr>
</tbody>
</table>

*Note:* Only the first two questions allowed for a “none” response.
buffered lidocaine hydrochloride’s 1% effectiveness, using a t-test, t(27) = .546, p = .460. No statistically significant difference, using a chi-squared test, was found in the likelihood of using buffered lidocaine hydrochloride 1% by state of APP, x²(1) = 2.097 p = .148, but Arizona reported (50%) use compared to (71.4%) reported use in Florida, a potentially practical difference. Note that (57.1%) of Florida’s participants were PA’s and only (27.3%) of Arizona participants were PA’s.

No statistically significant correlation among knowledge, attitudes, and perceptions and APP experience, education level, gender, age, or type of APP were found. Open-ended questions were asked including: interest in interventional procedural acute pain management education in adults and how that education would be best delivered. Most participants (79.9%) reported that they would benefit from continuing education on interventional procedural acute pain management in adults. They expressed interest in pain management education regarding interventional procedural pain management in adults, being delivered through Webinars (31%), on-line modules (41.1%), and in-person (6.9%) formats and remaining percent not interested (21%).
Table 4.

Perceptions with Interventional Procedural Pain Management in Adults

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local anesthetic treatment is effective for interventional procedural pain management in adults</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>3 (10.3)</td>
<td>12 (41.4)</td>
<td>14 (48.3)</td>
<td>4.4 (0.7)</td>
</tr>
<tr>
<td>I think that local pain control is a priority for my patients</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>2 (6.9)</td>
<td>3 (10.3)</td>
<td>24 (82.8)</td>
<td>4.8 (0.6)</td>
</tr>
<tr>
<td>I think that the patient is the most accurate judge of the intensity of their acute pain</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>2 (6.9)</td>
<td>7 (24.1)</td>
<td>20 (69.0)</td>
<td>4.6 (0.6)</td>
</tr>
<tr>
<td>I think that both acute and chronic pain require similar interventions</td>
<td>13 (44.8)</td>
<td>11 (37.9)</td>
<td>3 (10.3)</td>
<td>1 (3.4)</td>
<td>1 (3.4)</td>
<td>1.8 (1.0)</td>
</tr>
<tr>
<td>Use of buffered lidocaine hydrochloride 1% is effective in providing local interventional procedural pain management in adults</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>9 (31.0)</td>
<td>9 (31.0)</td>
<td>11 (37.9)</td>
<td>4.1 (0.8)</td>
</tr>
<tr>
<td>Non-buffered lidocaine hydrochloride 1% is more effective than buffered lidocaine 1% for the management of interventional procedural acute pain in adults</td>
<td>5 (17.2)</td>
<td>8 (27.6)</td>
<td>11 (37.9)</td>
<td>5 (17.2)</td>
<td>0 (0)</td>
<td>2.6 (1.0)</td>
</tr>
<tr>
<td>The advanced practice provider’s recommendation for type of local anesthetic to be used is respected by other members of the health care team</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>5 (17.2)</td>
<td>8 (27.6)</td>
<td>16 (55.2)</td>
<td>4.4 (0.8)</td>
</tr>
<tr>
<td>Interventional procedural pain management in adults is a necessary component of best practice</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>6 (20.7)</td>
<td>12 (41.4)</td>
<td>11 (37.9)</td>
<td>4.2 (0.8)</td>
</tr>
<tr>
<td>Patients who report pain intensity that I do not perceive as equal to the pain stimulus are over reacting</td>
<td>15 (51.7)</td>
<td>8 (27.6)</td>
<td>5 (17.2)</td>
<td>1 (3.4)</td>
<td>0 (0)</td>
<td>1.7 (0.9)</td>
</tr>
</tbody>
</table>
Table 5.

**Attitudes with Interventional Procedural Pain Management in Adults**

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree (1) n (%)</th>
<th>Disagree (2) n (%)</th>
<th>Neither agree nor disagree (3) n (%)</th>
<th>Agree (4) n (%)</th>
<th>Strongly Agree (5) n (%)</th>
<th>M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset time of local anesthetic injection effect is an important consideration for acute local pain management</td>
<td>0</td>
<td>0</td>
<td>2 (6.9)</td>
<td>8 (27.6)</td>
<td>19 (65.5)</td>
<td>4.6 (0.6)</td>
</tr>
<tr>
<td>I am confident that I can manage my patient’s interventional procedural acute pain</td>
<td>0</td>
<td>2 (6.9)</td>
<td>5 (17.2)</td>
<td>14 (48.3)</td>
<td>8 (27.6)</td>
<td>4.0 (0.9)</td>
</tr>
<tr>
<td>I believe that patients with acute local pain should receive different pain management strategies than patients with chronic systemic pain</td>
<td>0</td>
<td>2 (13.8)</td>
<td>3 (10.3)</td>
<td>12 (41.4)</td>
<td>10 (34.5)</td>
<td>4.0 (1.0)</td>
</tr>
<tr>
<td>Comparable stimuli in different people produce the same intensity of pain</td>
<td>6 (20.7)</td>
<td>15 (51.7)</td>
<td>3 (10.3)</td>
<td>5 (17.2)</td>
<td>0</td>
<td>2.2 (1.0)</td>
</tr>
<tr>
<td>Patients with acute pain should be encouraged to tolerate as much pain as they can before requesting pain relief measures</td>
<td>19 (65.5)</td>
<td>7 (24.1)</td>
<td>2 (6.9)</td>
<td>1 (3.4)</td>
<td>0</td>
<td>1.5 (0.8)</td>
</tr>
<tr>
<td>I select the type of local anesthetic for patient’s interventional procedural acute pain based on my perceptions of the local anesthetic agent’s effectiveness for this procedure</td>
<td>0</td>
<td>11 (37.9)</td>
<td>8 (27.6)</td>
<td>10 (34.5)</td>
<td>0</td>
<td>3.0 (0.9)</td>
</tr>
<tr>
<td>I believe that inadequate local acute pain management has negative patient outcomes</td>
<td>0</td>
<td>0</td>
<td>1 (3.4)</td>
<td>8 (27.6)</td>
<td>20 (69.0)</td>
<td>4.7 (0.6)</td>
</tr>
</tbody>
</table>
Chapter V

Discussion

Chapter V presents a discussion of the research findings, research strengths, study limitations, as well as, the plausible implications for advanced nursing practice outcomes. Before discussing the study’s findings, it is necessary to return to the primary purpose of the DNP scholarly project. Despite the growth in knowledge and strategies in pain management over the thirty years, research through this scholarly project has identified a lack of APP understanding of interventional pain management in adults. Additionally, there has been a consistent lack of knowledge regarding local anesthetic agents and usage, and little APP accountability for interventional pain management in the adult care setting. Therefore, the primary purpose of this scholarly project was to examine the knowledge, attitudes, and perceptions of APPs regarding their use of buffered verses non-buffered lidocaine hydrochloride 1% in interventional procedural pain management in adults. Finally, correlations between APP knowledge level, attitudes, and perceptions and sociodemographic variables including age, gender, years of practice experience and provider education level were examined.

Knowledge section

The Knowledge Section of the survey indicated an APP knowledge deficit was noted in overall understanding of acute, as well as, interventional procedural pain management. A knowledge deficit was noted in survey item rating indicating that participants had “none” to “some” general foundational knowledge of acute interventional procedural pain management in adults. This finding is unusual because the participants were APPs employed in a pain center, who were providing only interventional pain management. Responses to survey general knowledge questions using the Likert-type scales yielded higher scores than the items, which
scored participants’ evidence-based experience. This may have indicated an initial impression of APP understanding of pain pathology and current practice but identified a specific knowledge barrier or deficit among the study participants in local anesthetics use in practice.

Scores for overall knowledge regarding pain management for interventional procedural pain, and for knowledge regarding pain pathophysiology, demonstrated that approximately 50% of participants have a “good” working understanding regarding pain, but that this knowledge did not translate into appropriate pain management.

**Attitudes section**

The Attitudes Section included Likert-type questions to identify APPs’ attitudes toward use of buffered versus non-buffered lidocaine hydrochloride 1% for interventional procedural pain management in adults. The Likert-type scale items within this section did not identify participant attitudinal barriers regarding pain management specifically. Participants were asked if the onset time of local anesthetic injection was an important consideration for local pain management, and > 90% of participants reported “agreed” or “strongly agreed.” The question that directly followed this question assessed participants’ confidence that they could manage their patient’s interventional procedural pain in the clinical setting. Interestingly, the data regarding participants’ confidence showed less “strongly agreed” or “agreed” item response choices than the question assessing attitudes towards the time of onset. These results suggest that this sample may be more confident regarding their attitudes about pharmacologic actions than application of this knowledge. The participant’s responses reflected ambivalence in their selection of local anesthetic for interventional procedural pain management in adults. This finding suggests the need for further examination of APPs’ decision-making process regarding
choice of buffered versus non-buffered lidocaine hydrochloride 1% for procedural pain management in adults.

**Perception section**

The Perception Section found that pain control was a priority for greater than 95% of the participants. Several pain topics were addressed using the survey’s Likert-type items: a) the effectiveness of local anesthetic; b) pain control prioritization; c) judgement of patient pain intensity; d) interventions of acute and chronic pain; e) APP perception of effectiveness of local anesthetics; and f) APP ability to be supported in pain management decision making. More than 80% of percipients selected that acute and chronic pain requires different interventions, but 16.8% selected interventions should be the same or they were undecided. It was surprising to find that providers employed in a pain center were uncertain of their choice of interventions related to a knowledge deficit of pain pathophysiology. Two survey items specifically focused on local anesthetic use and management. These items had the highest frequency of being scored “neither agree nor disagree” on the survey, at greater than 30%. This finding of participant ambivalence regarding choice of local anesthetic needs further clarification.

The lack of statistically significant differences between the responses of NPs and PAs regarding their knowledge of and attitudes and perception about interventional procedural pain management in adults may be related to similar pain management training, job experience, or clinical mentors. No statistically significant correlation among knowledge, attitudes, and perceptions and APP experience, education level, gender, age, or type of APP were found.

**Limitations**

The limitation included small sample size, which limited the findings to only this sample. The sample was primarily Caucasian. Geographical diversity was limited to two states in the US.
The 48-item investigator created survey with two open-ended questions did not allow a great deal of insight into why the participants made their item selections.

Strengths

This DNP scholarly project provides new and relevant information regarding APPs’ knowledge, attitudes, and perceptions, and their deficits regarding interventional procedural pain management in adults. The study survey demonstrated content validity and administration utility. The on-line SurveyMonkey™ platform was secure, cost effective, easily used by participants.

Implications for Practice

This DNP scholarly project identified participants’ knowledge deficits regarding use of lidocaine hydrochloride 1% in interventional procedural acute pain management of adults. Participant ambivalence was seen in choosing the most effective pain management strategy for interventional procedural pain management in the adult setting. Most participants (75.9%) reported that they would benefit from continuing education. They expressed interest in pain management education regarding buffered lidocaine hydrochloride 1% in the interventional procedure pain management setting, being delivered through Webinars, on-line modules, and in-person training.

Implications for Research

Perhaps one of the reasons for challenges in achieving appropriate local pain management is that many APPs do not perceive their own knowledge deficits. Exploration of the effect of the APP and patient relationship and the shared decision-making process on the outcome of pain management in the interventional procedural setting could be useful to advance the evidence-base. Further research should be conducted on not only the knowledge base and confidence in pain management, but also APP awareness of knowledge deficits. This project
could be expanded to multiple clinical sites and use a refined survey tool to advance this program of scholarship.

**Conclusion**

It was concerning that this sample of APPs practicing in an interventional procedural pain management setting lacked the knowledge and training to effectively treat acute pain in adults. Findings from this DNP scholarly project addressed the gap in the current literature through reporting APP’s knowledge level of acute pain pathophysiology, and interventional procedural pain management strategies including local anesthetics, buffered lidocaine hydrochloride 1%, and other evidence-based treatments. An important unexpected finding was the lack of APP’s awareness and changes in perception when survey questions examined application of interventional acute pain management in adults. Participant’s (75%) acknowledged a need for further education regarding interventional procedural pain management in the adult clinical setting. Thus, a future scholarly project could be designed to test the effects of educational interventions regarding evidence-based procedural pain management in the adult setting on the knowledge, attitudes, and perceptions of APPs.
Appendix A

Informed Consent Script

TITLE: ADVANCED PRACTICE PROVIDERS’ KNOWLEDGE, ATTITUDES, AND PERCEPTIONS REGARDING USE OF BUFFERED VS. NON-BUFFERED LIDOCAINE HYDROCHLORIDE FOR INTERVENTIONAL PROCEDURAL PAIN MANAGEMENT IN ADULTS

INFORMED CONSENT SCRIPT

You are invited to participate in a research study entitled, ADVANCED PRACTICE PROVIDERS’ KNOWLEDGE, ATTITUDES, AND PERCEPTIONS REGARDING USE OF BUFFERED VS. NONBUFFERED LIDOCAINE HYDROCHLORIDE FOR INTERVENTIONAL PROCEDURAL PAIN MANAGEMENT IN ADULTS. This study is being conducted by a Georgetown University Doctor of Nursing Practice student to examine the knowledge level, attitudes, and perceptions of nurse practitioners (NP) and physician assistants (PA) regarding their use of buffered versus non-buffered lidocaine hydrochloride for interventional procedural pain management in adults. You are eligible for this study because you are either a nurse practitioner or a physician assistant who, is an employee of The Pain Center of Arizona and Florida, LLC.
Participation in the study is entirely voluntary. You can choose not to participate at all or to leave the study at any time. Regardless of your decision, there will be no effect on your relationship with the researcher, your employer, or any other consequences.

If you agree to participate, you will be asked to fill out 1 survey regarding your knowledge level, attitudes, and perceptions of the use of buffered versus non-buffered lidocaine hydrochloride 1% for interventional procedural pain management in adults. This survey should take about 20 minutes to complete. The survey will be administered via SurveyMonkeyTM. You will have 2 weeks to complete and submit the survey via the SurveyMonkeyTM system.

All your responses to this survey will remain anonymous and cannot be linked to you in any way. No identifying information about you will be collected at any point during the study, and your survey will be identified only with a random number generated by SurveyMonkeyTM. Once you submit your completed survey, there will be no way to withdraw your responses from the study because the survey contains no personal identifying information.

Study data will be kept in digital format in a secure database at SurveyMonkeyTM. Access to digital data will be protected through encrypted passwords. Only system administrators will have access to the data. Only the research team will see the data for data analysis purposes.

There are no anticipated risks associated with this study. Although you may not experience any direct benefits from participation, information collected from this study will add to our understanding of the knowledge, attitudes, and perceptions of NPs and PAs regarding their use of
buffered versus nonbuffered lidocaine hydrochloride 1% for interventional procedural pain management in adults.

If you have any questions regarding the survey or the research project in general, please contact the principal investigator, Jodi F. Rowlett, MSN, FNP-C, RN, BSN at (804) 221-3906 or via e-mail at jfr58@georgetown.edu. By completing and submitting this survey, you are indicating your consent to participate in this study.

Jodi F. Rowlett, MSN, FNP-C, RN, BSN Doctor of Nursing Practice Student Georgetown University School of Nursing & Health Studies
Appendix B

Survey Instrument

Knowledge, Attitudes, and Perceptions of Nurse Practitioners and Physician Assistants Regarding the Use of Buffered Versus Non-Buffered Lidocaine Hydrochloride 1% for Interventional Procedural Pain Management in Adults

Please answer this STUDY ELIGIBILITY QUESTION before starting the survey.

Are you a nurse practitioner or a physician’s assistant whose practice includes interventional procedural pain management in adults?

☐ Yes
☐ No

If you answered no to this eligibility question, you are not eligible to participate in this study, and you should now close the survey.

SURVEY

The purpose of this research survey is to examine the knowledge, attitudes, and perceptions of nurse practitioners and physician assistants regarding the use of buffered versus non-buffered lidocaine hydrochloride 1% for interventional procedural pain management in adults.

For the purposes of this research study:

1. Pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage (Benzon, Rathmell, Wu, Turk, Argoft, & Hurley, p.114, 2014).

2. Lidocaine hydrochloride 1% (Xylocaine®) is defined as a crystalline compound (synthetic compound), used as a local anesthetic to numb tissue in a specific region (Benzon, et al., p. 380-381, 2014).

3. Sodium bicarbonate is defined as a common salt or baking soda. Sodium is the most important cation in the extracellular fluid, and bicarbonate is the most important buffer in the body (Benzon, et al., p. 380-381, 2014).

4. Buffered lidocaine hydrochloride 1% is defined as an anesthetic that is mixed with 8.4% sodium bicarbonate to aid in pain reduction when infiltrating the skin (Benzon, et al., p. 380-381, 2014).
5. **Subcutaneous Injection** is defined as an injection made into the subcutaneous tissues. Subcutaneous injections may be given wherever there is subcutaneous tissue. (Benzon, et al., p. 602-604, 2014).

6. **Anesthetic** is defined as a substance that causes lack of feeling or awareness, dulling pain to permit surgery and other painful procedures (Current Practice of Interventional Radiology, 1991).

7. **Interventional Procedures** are defined as making a cut or a hole to gain access to the inside of a patient’s body for clinical treatment (Current Practice of Interventional Radiology, 1991). **INSTRUCTIONS**: Please answer the following questions to the best of your knowledge. The Survey will take approximately 20 minutes to complete. Thank you so much for your time.

**DEMOGRAPHIC INFORMATION**

**Please fill in the information or select the best response(s) from the possible item choices. Some questions ask you to select all responses that apply.**

1. What is your age? _____ years

2. What is your gender?
   - Male
   - Female

3. What is your ethnicity?
   - Hispanic or Latino
   - Not Hispanic or Latino

4. What is your race? Please select all that apply.
   - American Indian/Alaskan Native
   - Asian
   - Native Hawaiian or another Pacific Islander
   - Black or African American
   - Caucasian

5. What US state do you work in: __________

6. What type of advanced practice provider are you?
   - Nurse Practitioner
   - Physician Assistant
7. What is your highest level of education?

- MS
- MSN
- Doctor of Nursing Practice (DNP)
- PhD in Nursing
- Other. *Please specify* ________________

8. What is your advanced practice provider specialty?

- Family Practice
- Acute care
- Women’s health
- Adult geriatric
- Pain management
- Other: *Please specify* ________________

9. With which professional association are you credentialed?

- American Association of Nurse Practitioners (AANP)
- American Association of Colleges of Nursing (AACN)
- Physician Assistant National Certification Exam (PANCE)
- Other: *Please specify* ________________
- None

10. How many years of experience as an advanced practice provider do you have? _______

11. In your practice, you treat patients with which type(s) of pain duration?

- Acute only
- Acute and chronic pain
- Intermittent (comes and goes)
- Other. *Please specify* ________________

12. What is your primary practice affiliation?

- Hospital-based practice
- Private medical office
- Private free-standing clinic
13. What is your primary practice location?

- Public free-standing clinic
- Ambulatory care center
- Other: Please specify. ______________________

14. On average, how many hours per week do you practice? Please specify: _____ hours per week

15. Do you receive annual training and/or continuing education regarding interventional procedural pain management in adults?

- Yes
- No

KNOWLEDGE SECTION

*Please select the best response(s) from the possible item choices.*

16. How would you rank your general knowledge of acute pain management in adults?

- None
- Some
- Moderate
- Good
- Very good
- Excellent

17. What is your general knowledge of interventional procedural pain management in adults?

- None
- Some
- Moderate
- Good
- Very good
- Excellent
18. How would you rank your knowledge of pathophysiology of interventional procedural pain in adults?

 o None
 o Some
 o Moderate
 o Good
 o Very good
 o Excellent

19. What type of training have you received for managing interventional procedural pain in adults? *Please check all that apply.*

 a. Formal academic education
 b. Post-doctoral training
 c. Continuing education
 d. Clinical mentor
 e. On the job training
 f. No formal training
 g. Other: Please specify. ____________

20. What experience level do you have in managing interventional procedural pain in adults?

 o None
 o Some
 o Moderate
 o Good
 o Very good
 o Excellent

21. What is your knowledge level regarding the rationale to use of *non-buffered* lidocaine hydrochloride 1% for interventional procedural pain management in adults?

 o None
 o Some
 o Moderate
 o Good
 o Very good
 o Excellent
22. What is your knowledge level regarding the use of *buffered* lidocaine hydrochloride 1% for interventional procedural pain management in adults?

   o None
   o Some
   o Moderate
   o Good
   o Very good
   o Excellent

23. What is your knowledge level of evidence-based practice recommendations supporting the choice of either buffered or non-buffered lidocaine hydrochloride 1% for interventional procedural pain management in adults?

   o None
   o Some
   o Moderate
   o Good
   o Very good
   o Excellent

24. Which of the following pain management interventions do you use for interventional procedural pain management in adults? Please select all that apply.

   o Lidocaine hydrochloride 1%
   o Lidocaine hydrochloride 1% with 8.4% sodium bicarbonate (buffered)
   o Lidocaine hydrochloride 1% with epinephrine
   o Lidocaine hydrochloride 2%
   o Other. *Please specify:* ________________________

25. How would you rate the frequency of treating your patients with local anesthetics for interventional procedural pain management in adults in your practice?

   o Daily
   o Monthly
   o Weekly
26. How would you describe the amount of your experience with injecting anesthetics locally for interventional procedural pain management in adults?

- Some
- Moderate
- Good
- Very good
- Excellent

27. Local anesthetic treatment is effective for interventional procedural pain management in adults.

- Very strongly agree
- Strongly agree
- Agree
- Disagree
- Strongly disagree
- Very strongly disagree

**PERCEPTION SECTION**

*Please select the best response(s) from the possible item choices.*

28. I think that local pain control is a priority for my patients.

- Very strongly agree
- Strongly agree
- Agree
- Disagree
- Strongly disagree
- Very strongly disagree

29. I think that the patient is the most accurate judge of the presence of their acute pain.

- Very Strongly agree
- Strongly agree
- Agree
- Disagree
- Strongly disagree
- Very strongly disagree
30. I think that the patient is the most accurate judge of the intensity of their acute pain.

- Very Strongly agree
- Strongly agree
- Agree
- Disagree
- Strongly disagree
- Very strongly disagree

31. I think that both acute and chronic pain require similar interventions.

- Very strongly agree
- Strongly agree
- Agree
- Disagree
- Strongly disagree
- Very strongly disagree

32. Use of buffered lidocaine hydrochloride 1% is effective in providing local Interventional procedural pain management in adults.

- Very strongly agree
- Strongly agree
- Agree
- Disagree
- Strongly disagree
- Very strongly disagree

33. Non-buffered lidocaine hydrochloride 1% is more effective than buffered lidocaine 1% for the management of interventional procedural acute pain in adults.

- Very strongly agree
- Strongly agree
- Agree
- Disagree
- Strongly disagree
- Very strongly disagree
34. Research has shown that the percentage of people who over-report the intensity of their pain is:

a. 10-20%
b. 20-40%
c. 40-60%
d. 60-80%
e. 80-100%

35. The advanced practice provider’s recommendation for type of local anesthetic to be used is respected by other members of the healthcare team.

- Very strongly agree
- Strongly agree
- Agree
- Disagree
- Strongly disagree
- Very strongly disagree

36. I think that my greatest reason to not use buffered lidocaine 1% in my practice with patients for interventional procedural pain management is the following:

a. Buffered lidocaine hydrochloride 1% is less effective than non-buffered lidocaine 1%
   b. Lack of time to add the buffering agent to the lidocaine hydrochloride 1%
   d. Lack of my knowledge regarding when to use buffered lidocaine hydrochloride 1%
   e. Lack of access to the buffering agent

37. Interventional procedural pain management in adults is a necessary component of best practice.

- Very strongly agree
- Strongly agree
- Agree
- Disagree
- Strongly disagree
- Very strongly disagree
38. Patients who report pain intensity that I do not perceive as equal to the pain stimulus are over-reacting.

- Very strongly agree
- Strongly agree
- Agree
- Disagree
- Strongly disagree
- Very strongly disagree

ATTITUDE SECTION

Please select the best response(s) from the possible item choices.

39. What local anesthetic do you *most* prefer to use for interventional procedural acute pain management in adults?

- a. Lidocaine hydrochloride 1%
- b. Lidocaine hydrochloride 1% with 8.4% sodium bicarbonate (buffered)
- c. Lidocaine hydrochloride 1% with epinephrine
- d. Lidocaine hydrochloride 2%
- e. Other: Please specify. __________________

40. Onset time of local anesthetic injection effect is an important consideration for acute local pain management.

- Very strongly agree
- Strongly agree
- Agree
- Disagree
- Strongly disagree
- Very strongly disagree

41. I am confident that I can manage my patient’s Interventional procedural acute pain.

- Very strongly agree
- Strongly agree
- Agree
- Disagree
- Strongly disagree
- Very strongly disagree
42. I believe that patients with acute local pain should receive different pain management strategies than patients with chronic systemic pain.

  o Very strongly agree
  o Strongly agree
  o Agree
  o Disagree
  o Strongly disagree
  o Very strongly disagree

43. Comparable stimuli in different people produce the same intensity of pain.

  o Very strongly agree
  o Strongly agree
  o Agree
  o Disagree
  o Strongly disagree
  o Very strongly disagree

44. Patients with acute pain should be encouraged to tolerate as much pain as they can before requesting pain relief measures.

  o Very strongly agree
  o Strongly agree
  o Agree
  o Disagree
  o Strongly disagree
  o Very strongly disagree

45. I select the type of local anesthetic for patient’s Interventional procedural acute pain based on my perceptions of the local anesthetic agent’s effectiveness for this procedure.

  o Very strongly agree
  o Strongly agree
  o Agree
  o Disagree
  o Strongly disagree
  o Very strongly disagree
46. I believe that inadequate local acute pain management has negative patient outcomes.

- Very strongly agree
- Strongly agree
- Agree
- Disagree
- Strongly disagree
- Very strongly disagree

OPEN-ENDED QUESTION SECTION

Please enter your responses for the following two questions.

47. Do you think you would benefit from additional education regarding the use of buffered versus non-buffered lidocaine hydrochloride 1% for interventional procedural pain management in adults?

48. Which educational modality would be the most useful for you to receive information regarding the use of buffered versus non-buffered lidocaine hydrochloride 1% for interventional procedural pain management in adults?

- Continuing educational conferences
- Lecture by interventional pain specialist
- Teaching videos
- Other
References


http://dx.doi.org/10.1177/2049463715583142

http://dx.doi.org/10.1016/j.acpain.2006.05.002


