Decreasing Pain in Pediatric Patients During Intravenous Catheter Insertions on the Pediatric Inpatient Surgery Unit

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Abstract

As healthcare in the United States transforms, the voice of advocacy for pediatric patients is also evolving. The act of inserting a peripheral intravenous (IV) catheter for medical care of a pediatric patient is one of the most common invasive procedures in the healthcare industry. However, the preventable pain accompanying such a common procedure is often overlooked. Pediatric patients are different than adults due to the lack of physiological and psychological development. When a peripheral intravenous catheter is inserted without pain prevention interventions, there are long-term and short-term consequences for the patient and family. In turn, there are many benefits attributed to utilizing pain prevention interventions during IV insertions. For this project, the standardization of topical analgesics for pain prevention interventions is the main focus for decreasing pediatric pain during IV insertion. For this evidence-based project, the purpose is to implement and standardize the use of topical analgesics for pain prevention interventions during peripheral IV insertions for pediatric patients. The aim of this project is as follows: By December 1, 2022, at least 85% of pediatric patients admitted on the inpatient surgical unit at East Tennessee Children's Hospital, requiring peripheral intravenous access, will receive topical analgesics as a form of pain prevention interventions.

Decreasing Pain in Pediatric Patients During Intravenous Catheter Insertions in Emergency Departments

I. INTRODUCTION

Focusing on decreasing pain and anxiety in pediatric patients during intravenous (IV) catheter insertions, not only at local pediatric hospitals but also within surrounding adult hospitals, is imperative to advancing patient and family centered care during the inpatient hospital experience. This unique population of pediatric patients can become easily overlooked during the busyness of a pediatric inpatient surgical unit. Utilizing proper topical analgesia to potential IV sites represents the focus of interventions for decreasing pain during IV insertions. Proper topical analgesics include Eutectic Mixture of Local Anesthetics (EMLA) composed of 2.5% lidocaine and 2.5% prilocaine, Lidocaine 4% (LMX) and vapocoolant spray, such as Painease Spray.

In the pediatric realm of healthcare, the focus is on the overall care of the patient and patient experience. However, there is also a unique aspect to healthcare regarding pediatrics. The focus shifts from patient centered care to patient and family centered care. Potts et al. (2012) stated, “Timely administration of analgesia affects the entire emergency medical experience and can have a lasting effect on a child’s and family’s reaction to current and future medical care” (p. e1391). Recognizing that pediatrics is a specific population within a community creates room for growth in this particular realm of healthcare. Understanding the foundation of pediatric pain in healthcare can begin on the pediatric inpatient surgical unit by considering how painful procedures, such as IV insertions, are handled by nursing staff. This component is vital to the progression of pediatric healthcare as a whole. Kennedy et al. (2008) emphasized, “Studies also suggest a correlation between childhood pain and fear associated with medical procedures and adult pain sensitivity, fear, and avoidance of health care” (p. S131).

These seemingly small interventions are often overlooked or disregarded, which increases levels of preventable pain in pediatric patients during inpatient visits.

Significance of the Problem

Pediatrics is a specific population. Simple procedures, such as IV insertions, can cause major stress, anxiety, and pain for the patient and the caregiver (Potts et al., 2012). Standardization of care regarding pain prevention during IV insertions in the pediatric population needs to be addressed in healthcare. Pediatrics is a distinct population due to the fact that this population is still developing mentally, emotionally, and physically. Studies are starting to surface and reveal the long-term effects of painful procedures that were not controlled. As mentioned by Kennedy et al. (2008) painful procedures from toddlerhood can affect a patient's long-term outlook on healthcare and lead to avoidance of routine health hygiene. Kennedy et al. (2008) also highlighted that preterm and term infants develop their pain pathways pre and postnatally, which could lead to more intense pain experiences than older children. Duerden et al. (2018) continued on this topic by stating, "Early exposure to repetitive procedural pain in very preterm neonates may disrupt the development of regions in somatosensory processing, leading to poor functional outcomes" (p. 878).

Ten years ago, there were nearly 1.25 million pediatric inpatient surgical cases nationwide ranging from bone fracture repairs to scheduled tonsillectomy procedure. These cases reflect children from 1-17 years of age (Witt et al., 2014). Transitioning from a national scale to a more local scale, the number of inpatient admissions at East Tennessee Children's Hospital totaled 3,846. According to ETCH's Annual Report (2020), for the 2019-2020 year, 569 of 3,846 admissions were on the inpatient surgery unit. Unfortunately, pain prevention interventions (PPI) were not included in the Annual Report for ETCH due to lack of audits.

However, the Pain and Palliative Care Team (PPCT) at ETCH has started focusing more on auditing PPI utilization during IV insertions and IV attempts, partially due to patient and family satisfaction scores dropping and comments regarding the lack of pain control for IV insertions. The PPCT has recently started working with the informatics team at ETCH to develop a way to audit and keep track of the total number of IV insertions and attempts based on charting by nursing staff on each unit. January 2021 was the first official month of tracking these numbers. The figures provided by this new tracking system exhibited nearly 75% of IV attempts in January did not incorporate PPIs. Per the Palliative Care Coordinator and member of the PPCT, with this new way of tracking IV insertions at ETCH, there are many aspects involved (personal communication, January 2021). The following items are included:

- Name and credentials of nurse inserting the IV
- Type of analgesia and/or pain prevention intervention utilized
- Whether the IV attempt was successful or unsuccessful
- Medical record number of the patient
- Date and time of insertion

All these sources of internal evidence are relevant. One more piece of information that would be valuable in tracking PPIs would be a pain assessment utilizing the Likert Scale. This scale would include how well the patient tolerated the IV insertion from the nurse's perception. The three tolerance observation options would include good, fair, or poor.

There are many distinctive aspects regarding the pediatric population receiving IVs in the community and nationally. Understanding the research regarding the benefits of topical analgesia is crucial for progressing evidence-based healthcare for these patients and their families. Access to adequate healthcare which provides sufficient pain control during IV

insertions for pediatric patients is not easily found or tracked. Regulating pain control through the standardization of PPIs is extremely important and can create medical experiences for these children that are easier and less painful. Creating a positive experience can lead to better health hygiene as these patients move into adulthood. However, there are always exceptions. The exception to utilizing topical pain prevention and/or distraction would be if an IV was needed emergently. For instance, if a patient was experiencing a prolonged seizure or if a patient went into cardiac arrest, an IV would need to be inserted immediately. Emergent IV insertions are not included in the data set previously mentioned.

Purpose and Goals

Currently, there is no standardization of care regarding pain prevention during IV insertions in the pediatric population at ETCH. This specific standardization is desired by ETCH due to declining patient satisfaction scores and comments specifically regarding pain during IV insertions on the pediatric IPS unit. The purpose of this project is to standardize pain prevention with the use of topical analgesics during IV insertions. The goals of this project consist of the following:

- Decrease preventable pain during IV insertions in the pediatric population by utilizing topical analgesics
- Increase the focus on patient and family centered care
- Increase overall patient satisfaction scores

By December 1, 2022, at least 85% of pediatric patients requiring peripheral intravenous access will receive pain prevention interventions in the form of topical analgesia on the pediatric inpatient surgery unit at East Tennessee Children's Hospital.

PICO Development and Statement

Cultivating a precise question which focuses on a desired change in a clinical setting is the first priority in generating change. Considering this PICO question, the patient/population (P) is the pediatric population. The (I) is the use of topical pain prevention interventions, as compared (C) to current practice and will result in a decreased in pain levels (O). The PICO question for this proposed project is, "In pediatric patients, does the use of pain prevention interventions, compared to current practice, decrease pain levels during intravenous catheter insertions on the pediatric inpatient surgery unit?"

Evidence-Based Practice Model Guiding Project

The Johns Hopkins Nursing Evidence-Based Practice Model (JHNEBP) will guide this project. The JHNEBP Model consists of three separate phases. These phases consist of practice question, evidence, and translation. These phases are also known as PET. The first phase is focused on the Practice question. The second phase is dedicated to Evidence, while the third phase is fixated on Translation of evidence into changes in practice. There are a total of 19 steps in the JHNEBP PET process. Breaking down the process of standardizing the use of PPIs to decrease pain in pediatric patients during IV insertions on the pediatric IPS unit is achievable with this specific model. The JHNEBP Model is centered around an open system which has interconnected factors. The JHNEBP Model also allows for external and internal factors to influence its open system (Dang & Dearholt, 2018).

Dang and Dearholt (2018) breakdown each of the following phases followed by each step for clarity. Steps 1-6 of the JHNEBP PET Process focused on developing a practice question and an EBP question that is answerable. The first six steps include the following:

- Recruit interprofessional team

- Define the problem
- Develop and refine the EBP Question
- Identify stakeholders
- Determine responsibility for project leadership

The development of the PICO question for this proposed project was achieved by identifying a clinical practice problem. The lack of standardization at ETCH in regards to pain prevention during IV insertion on the pediatric IPS unit is the identified clinical practice problem. Interprofessional team members have met to help refine the question to the highest potential and simplest form.

The second phase consists of steps 7-11. These steps focus on examining, evaluating, and synthesizing the evidence that is available regarding the chosen clinical practice problem. The second set of steps are essential in the discovery of sound evidence, as well as developing recommendations for change. Steps 7-11 include the following:

- Conduct internal and external search for evidence
- Appraise the level and quality of each piece of evidence
- Summarize the individual evidence
- Synthesize overall strength and quality of evidence
- Develop strong recommendations for change based on evidence synthesis

The last phase of the JHNEBP Model consists of steps 12-19. These steps include:

- Determine fit, feasibility, and appropriateness of recommendations for translation path
- Create action plan
- Secure support and resources to implement action plan
- Implement action plan

- Evaluate outcomes
- Report outcomes to stakeholders
- Identify next steps
- Disseminate findings

II. EVIDENCE

Literature Search Strategy

To answer the PICO question mentioned above, a literature search was started. Initially, three databases were utilized: CINAHL; PubMed; and Cochrane. Selecting key words for possible search terms was vital to yielding relevant search results. For the PICO question, the search terms included “pain”, “intravenous catheter”, “venipuncture”, “pediatric”, “inpatient”, “vapocoolant”, “topical analgesic”, “EMLA”, “LMX”, and “pain prevention”. As the searches progressed with the three referenced databases, these terms evolved and adapted. With regard to the search strategy, the search terms were combined with the Boolean terms (AND and OR) to obtain a generalized search of the topic.

The first database utilized was CINAHL. For the first search, the key words used were “pain” AND “pediatric” AND “intravenous”. This search did not have any filters or limits applied and it yielded 597 initial results. A filter was added to yield results between 2016 and 2021. This filter yielded 113 results. Five abstracts were reviewed and four were kept for possible future use. The second CINAHL search consisted of the key terms “pediatric pain” AND “intravenous” AND “inpatient”. This search had a filter limiting results to the past 10 years. It yielded 33 results and four were reviewed while keeping two of the articles. The third CINAHL search was similar. No filters or limits were applied and the key terms used were “pediatric pain” AND “intravenous” AND “vapocoolant”. This search generated three results.

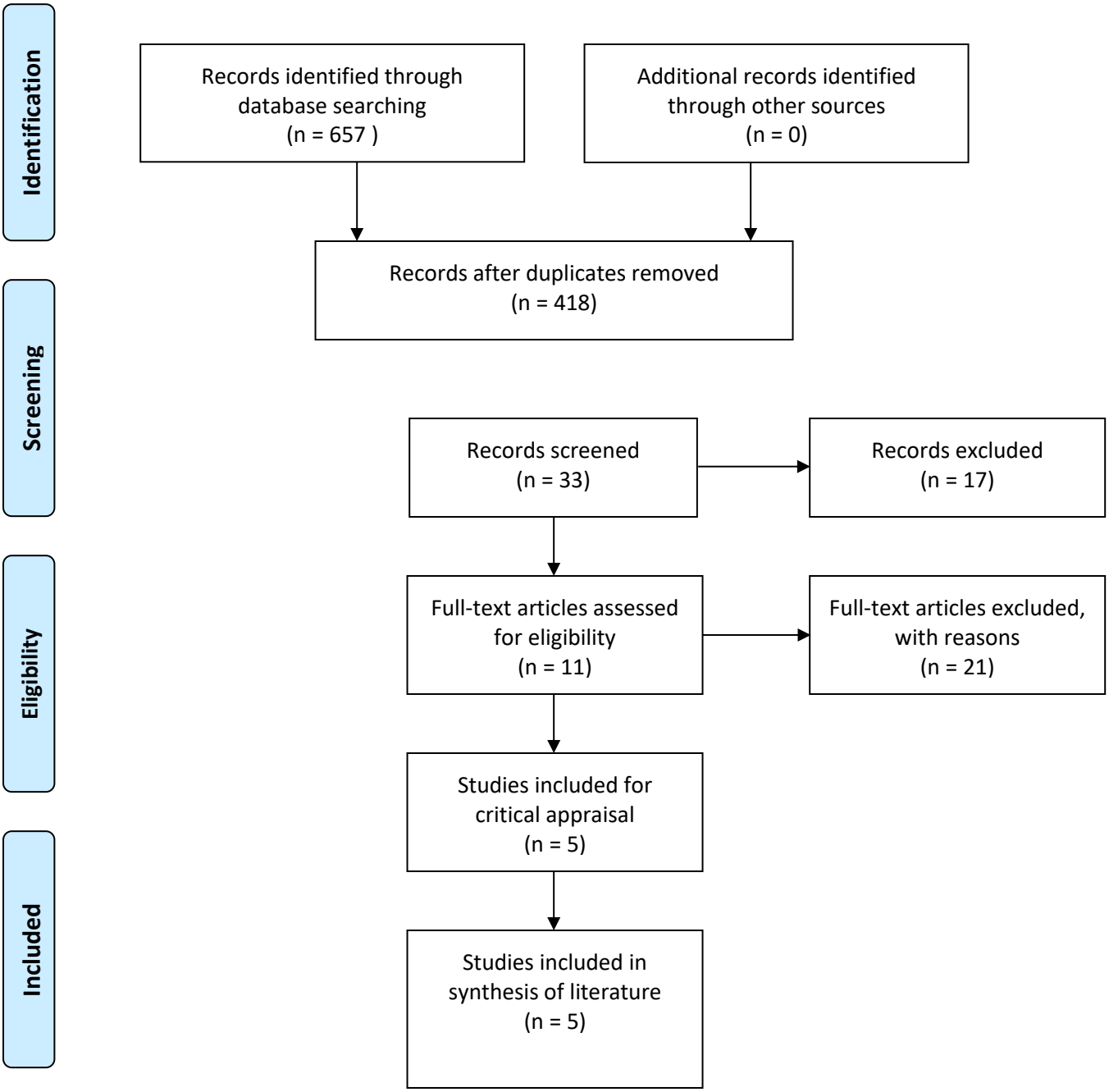
One abstract was reviewed and one article kept from this specific search. The last search via CINAHL used the key terms “pediatric pain” AND “intravenous” AND “EMLA”. As with the other three CINAHL searches, there were no filters or limits applied and there were 23 results. Two of these articles were reviewed and both were kept for future use.

The second database utilized was PubMed. For the PubMed searches, no limits or filters were applied. The key terms for the first search were “pain prevention” AND “intravenous catheter” AND “inpatient”. This search yielded 13 results, while two were reviewed only one was kept. The second PubMed search consisted of the terms “pain prevention” AND “intravenous”. A filter was applied to yield results from 2016 to 2021. This search generated 82 results. Three of the results were reviewed and one was kept for possible future use. The third PubMed search consisted of the key search terms “intravenous” AND “pediatric” AND “inpatient”. This search produced 359 results. Ten of these results were reviewed and one was kept.

Lastly, the third database applied was Cochrane. Two searches were conducted with this database. As with PubMed and CINAHL, there were no filters or limits applied for the searches. The first search consisted of the terms “pediatric pain EMLA” and yielded 34 results. Five of these 34 results were reviewed and zero were kept. The last search through Cochrane used the terms “intravenous catheter pediatric pain”. With this search, there were only two results. One of these results was reviewed and one was kept. Listed below is Figure 1 exhibiting the PRISMA Flow Diagram to the extent of completion that the search narrative allowed.

Figure 1

Adapted PRISMA Flow Diagram



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

Critical Appraisal of the Literature

The guidelines and multiple tools utilized for conducting critical appraisals of literature were from The Johns Hopkins Nursing Evidence Based Practice (JHNEBP) guidelines. The JHNEBP Appendix E: Research Evidence Appraisal Tool was one specific tool for guiding these appraisals of literature (see appendix A). This specific appraisal tool helped to identify whether the literature was quantitative, qualitative, or mixed methods. Throughout the tool, the evidence level and quality rating were obtained (Dang & Dearholt, 2018). There were five separate articles that were critically appraised in relevance to the desired PICO question. Table 1 illustrates the critical appraisal of each article.

Synthesis of Evidence

Pain during IV insertion in pediatric patients is an extremely preventable source of pain. The literature and research reviewed have proven true revealing there are many different topical analgesics to prevent pain during IV insertion. Pain scores in each research setting proved to decrease with a statistical significance. Of the five articles, all sample sizes were adequate and all were quality grade A. The evidence of each article revealed PPIs, ranging from J-Tip needless devices delivering 1% lidocaine in the desired IV placement area to the use of vapocoolant spray to aid in the decrease of pain levels during insertion. Table 2 reveals the synthesis of evidence for each article appraised.

Clinical Expertise Evidence

The thought of pain prevention during IV insertions for pediatric patients is not new. However, the clinical expertise backing and the evidence-based practice that is starting to support this concept is one step closer to standardizing PPIs for all IV insertions in the pediatric patient population. An increase in evidence has shown venipuncture as a major source

Table 1

Literature Evaluation

Article Citation	Conceptual Framework and Purpose	Design/Method	Sample/Setting	Major Variables Studied (and Their Definitions)	Measurement	Data Analysis	Findings	Appraisal: Worth to Practice
Singer, A. J., Taira, B. R., Chisena, E. N., Gupta, N., & Chipley, J. (2008). Warm lidocaine/tetracaine patch versus placebo before pediatric intravenous cannulation: A randomized controlled trial. *Annals of Emergency Medicine*,*52*(1), 41-47. doi:10.1016/j.annemergmed.2008.01.336	No conceptual framework **Purpose:** to compare the pain of intravenous cannulation in pediatric emergency department patients after applying a topical lidocaine/tetracaine patch versus a placebo.	RCT double-blind Random assignment of lidocaine/tetracaine versus placebo patch via computerized random-numbers table, placed on patients in triage potentially requiring an IV Level - I Quality Grade-A High Quality	N = 40 n = 20 patients w/ lidocaine/ tetracaine patch n = 20 patients w/ placebo patch Age b/w 3-17 yo **Attrition:** none noted **Setting:** suburban, academic, university-based ED	IV: lidocaine/ tetracaine patch placed on potential IV site in triage IV2: placebo patch DV: self-reported pain levels after insertion	The Visual Analog Scale (VAS) and the Wong Baker Faces Scale (WBFC) were both used as measurements for self-reporting pain post intravenous catheter insertion	Continuous nonparametric data (median and interquartile ranges) compared with a Mann-Whitney *U* test Parametric data (means and standard deviations) compared with a *t* test	Median pain: 18 mm w/ IQR 1-40 mm compared to placebo median of 35 mm w/ IQR 20-59 mm Mean pain: (SD) 9.3 (4.3) vs placebo mean (SD) of 10.8 (4.5).	**Strengths:** random placement of impregnated patch versus placebo by triage nurse; the same gauge catheter attempted to be used on each patient **Limitations:** small sample size, combination of ordinal and nominal data, children ages 3 and under not included, no control group that did not receive a patch There is no risk or harm if study intervention would be implemented into practice; feasible in practice as long as there would be 20 minutes before IV insertion

Note. DV = dependent variable, IV = independent variable, RCT = randomized controlled trial, IQR = interquartile range, SD = standard deviation

Table 1

Article Citation	Conceptual Framework and Purpose	Design/Method	Sample/Setting	Major Variables Studied (and Their Definitions)	Measurement	Data Analysis	Findings	Appraisal: Worth to Practice
Kelly, S., Russell, J., Devgon, P., & Rosen, P. (2017). Transformation of the peripheral intravenous catheter placement experience in pediatrics. *The Journal of Vascular Access,18*(3), 259-263. doi:10.5301/jva.5000652	No conceptual framework **Purpose:** to compare the pain of intravenous catheter insertion with and without lidocaine administration via the J-Tip needle-free injection system	Non-randomized cohort case-control study Enrollment of patients from the ED and inpatient areas that were able to utilize the Wong-Baker Faces Pain Rating Scale for lidocaine infused J-Tip devices and no intervention prior to intravenous cannulation Level – II Quality Grade – A High Quality	N = 85 n = 41 patients received needle-free injected lidocaine pretreatment prior to intravenous cannulation n = 44 patients received zero pain prevention interventions prior to intravenous cannulation Age b/w 3-16 yo **Attrition**: none noted **Setting**: academic pediatric hospital	IV: lidocaine infused J-Tip administration DV: self-reported pain levels after insertion of intravenous catheter	The Wong Baker Faces Pain Rating Scale (WBFC) was used as the survey instrument to measure pain levels after intravenous cannulation	Continuous data with an independent sample t-test for age and a Pearson Chi-square for gender to ensure homogeneity of groups Assessing group differences in pain required a two-tailed independent sample t-test	Mean pain score of patients that received subcutaneous lidocaine was 2.45 Mean pain score of patients that did not receive subcutaneous lidocaine was 5.83	**Strengths:** adequate sample size, patients were able to self-report pain via survey instrument **Limitations:** was not randomized which allowed a possible selection bias, variation in catheter sizes and bevel shapes

Note. ED = emergency department, IV = independent variable, DV = dependent variable

Table 1

Article Citation	Conceptual Framework and Purpose	Design/Method	Sample/Setting	Major Variables Studied (and Their Definitions)	Measurement	Data Analysis	Findings	Appraisal: Worth to Practice
Stoltz, P., & Manworren, R. C. (2017). Comparison of children's venipuncture fear and pain: Randomized controlled trial of EMLA® and J-Tip needleless injection system®. *Journal of Pediatric Nursing,37*, 91-96. doi:10.1016/j.pedn.2017.08.025	No conceptual framework **Purpose:** compare self-reported pain and fear related to intravenous cannulation with EMLA cream or 1% lidocaine via J-Tip Needleless Injection System	RCT Random assignment to the group of 75 patients receiving EMLA cream or the group of 75 patients receiving subcutaneous lidocaine via the J-Tip needleless device were assigned via drawing sealed envelopes with the specific assigned group Level – II Quality Grade – A High Quality	N = 150 n = 75 patients with EMLA cream application prior to intravenous cannulation n = 75 patients with subcutaneous lidocaine via J-Tip device prior to intravenous cannulation **Attrition:** none noted **Setting:** peri-anesthesia care unit at Connecticut Children's Medical Center form November 2012 to February 2013	IV: EMLA cream IV2: lidocaine via J-Tip device DV: self-reported pain and fear levels after intravenous catheter insertion	Self-reporting of pain used the Visual Analog Scale (VAS) for a scale of 0-10 with 0 representing no pain and 10 representing severe pain Fear level was self-reported with the Children's Fear Scale (CFS) which utilized five different faces on a horizontal scale with different fear expressions	Independent sample *t*-tests examined equivalence of the two groups Independent sample *t*-tests compared mean pain scores reported with the VAS Analysis of variance for repeated measures compared the self-reported procedural fear scores	Mean pain with EMLA = 1.63 ± 1.659 Mean pain with J-Tip device = 2.99 ± 2.586 Children who received EMLA reported less pain	**Strengths:** randomized controlled trial, sufficient sample size to achieve significance **Limitations:** single site recruitment of patients, catheter placement site and size were not standardized, other non-pharmacologic methods of pain prevention were not documented if used

Note. IV = independent variable, IV2 = second independent variable, DV = dependent variable

Table 1

Article Citation	Conceptual Framework and Purpose	Design/Method	Sample/Setting	Major Variables Studied (and Their Definitions)	Measurement	Data Analysis	Findings	Appraisal: Worth to Practice
Lunoe, M. M., Drendel, A. L., Levas, M. N., Weisman, S. J., Dasgupta, M., Hoffmann, R. G., & Brousseau, D. C. (2015). A randomized clinical trial of jet-injected lidocaine to reduce venipuncture pain for young children. *Annals of Emergency Medicine,66*(5), 466-474. doi:10.1016/j.annemergmed.2015.04.003	No conceptual framework **Purpose:** Comparing pain in pediatric patients receiving an intravenous catheter with lidocaine via J-Tip device versus vapocoolant spray	Randomized single-dose clinical trial Patients and their experiences were recorded with each intervention and pain was scored by blinded physicians using the Face, Legs, Activity, Cry, and Consolability (FLACC) scale Level – I Quality Grade – A High Quality	N = 205 n = 96 patients in the intervention group which received 1% lidocaine via the J-Tip device and a spray of normal saline prior to intravenous cannulation n = 53 patients in the control group which received only vapocoolant spray prior to intravenous insertion n = 56 patients in the sham group which received a lidocaine free J-Tip injection and vapocoolant spray Age b/w 1-6 yo **Attrition:** none noted **Setting:** outpatient laboratory at a tertiary care children's hospital from July 1, 2013 through August, 8 2013	IV: 1% lidocaine injection via J-Tip and spray of normal saline IV2: vapocoolant spray application IV3: lidocaine free J-Tip injection with vapocoolant spray application DV: Observed pain by physician blinded to interventions with FLACC scale	The FLACC scale was utilized by physicians scoring pain of patients receiving the intravenous catheters. The physicians were blinded to each intervention	Group characteristics were compared using the X^2/Fisher's exact test The continuous and ordinal context was compared using the Kruskal-Wallis test along with the Mann-Whitney Test Comparison of pain scores were made utilizing the Generalized Estimating Equation (GEE)	Mean change from baseline to venipuncture for intervention group = 0.26; 95% CI Mean change for control group = 2.82, 95% CI Mean change for sham group = 1.68, 95% CI Pain scores were less in the intervention group compared to the control or sham groups	**Strengths**: randomized clinical trial; large enough sample size to maintain alpha at 0.05 **Limitations:** not able to use self-reported data due to patient ages, patient anxiety not included in this study, a plain control group with no treatment was not utilized due to ethical concerns about withholding usual care (vapocoolant was utilized as the control in this study)

Note. IV = independent variable, IV2 = Second independent variable, IV3 = Third independent variable, DV = dependent variable, CI = confidence interval

Table 1

Article Citation	Conceptual Framework and Purpose	Design/Method	Sample/Setting	Major Variables Studied (and Their Definitions)	Measurement	Data Analysis	Findings	Appraisal: Worth to Practice
Waterhouse, M. R., Liu, D. R., & Wang, V. J. (2013). Cryotherapeutic topical analgesics for pediatric intravenous catheter placement: Ice versus vapocoolant spray. *Pediatric Emergency Care,29*(1), 8-12. doi:10.1097/pec.0b013e31827b214b	No conceptual framework **Purpose:** to compare the efficacy of two popular cryotherapeutic treatments for pain control prior to intravenous catheter insertion	RCT Random assignment of ice application or vapocoolant spray prior to intravenous catheter insertion Level – I Quality Grade – A High Quality	N = 95 n = 50 patients were randomly assigned to receive ice as a topical analgesic prior to intravenous catheter insertion n = 45 patients received the vapocoolant spray, Painease, as the topical analgesic Age b/w 9-18 yo **Attrition:** none noted **Setting:** pediatric ED	IV: ice application IV2: vapocoolant spray DV: VAS as self-reported and observed VAS score given by PI and two physicians	Patients self-reported pain via the VAS during three separate time periods (baseline, pre-treatment, catheter insertion); the PI and two physicians also measured the patients' observed pain scores via the VAS	Median VAS scores compared with the Wilcoxon Rank Sum test	Average patient VAS regarding pain during intravenous catheter placement with Painease = 9 Average patient VAS regarding pain during intravenous catheter placement with ice application = 13	**Strengths:** Sufficient sample size, randomized controlled trial, VAS self-reported and observed **Limitations:** It can be difficult for children to differentiate between fear, anxiety, and physical pain in some cases. Use of distraction methods not documented or accounted for

Note. PI = principal investigator, RCT = randomized controlled trial, ED = emergency department, VAS = visual analog scale, DV = dependent variable, IV = independent variable, IV2 = second independent variable

Table 2

Synthesis of Evidence

Outcome	Singer et al., (2008)	Kelly et al., (2017)	Stoltz & Manworren (2017)	Lunoe et al., (2015)	Waterhouse et al., (2013)
Pain scores[1]	↓s	↓s	↓s	↓s	↓s
Fear scores[2]	∅	∅	↓c	∅	∅
Sample Size	45 patients	85 patients	150 patients	205 patients	95 patients
Level of Evidence	I	II	II	I	II
Quality of Evidence	A	A	A	A	A

Note. ↓=decrease; ↑=increase; ∅=not discussed in study; s=statistical significance; c=clinical significance; [1]= primary outcome; [2]= secondary outcome

of pain that is long lasting. Nonetheless, there are multiple PPIs (pharmacologic and nonpharmacologic) that are gaining traction in the evidence-based practice realm of healthcare (Kennedy et al., 2008). These PPIs are hard to ignore, especially when patients and their family members start asking for them before any type of venipuncture procedure.

Patient and Family Preferences and Values

Understanding how a patient's preferences and values, as well as their family's preferences and values, impact pediatric healthcare is crucial for this specific DNP project. Since this project focuses on pain prevention interventions for pediatric patients prior to IV catheter insertion on the pediatric IPS unit, involving family is a pivotal point in providing proper care for the patient. Shave et al. (2018) reviewed the common belief that parents have an innate ability to perceive their child's body language during anxious situations. Understanding and supporting a parent or caregiver's level of knowledge and preferences before initiating a procedure, such as inserting an IV, can be utilized as a source of nonresearch evidence in this specific project. Dall'Oglio et al. (2018) consider a family centered care (FCC) approach as an approach in which all family members are considered care recipients and have the potential to "benefit from information sharing, participation, and collaboration in the care given" (e18).

With regards to using a patient-centered approach during development, implementation, and evaluation of this DNP project, a specific approach is going to include gathering patient and family feedback via patient satisfaction surveys (PSS) at ETCH. Though the patient satisfaction survey is the same hospital wide, patients and families that were assessed on the pediatric IPS unit and had IV placement, answer survey questions on that portion exclusively. Gathering data based on patient and family responses to the PSS can help guide and create evidence for this specific DNP project.

Recommendations for Practice

Once multiple critical appraisals were reviewed and evidence gathered regarding a topic of practice change, it was crucial to understand and portray the strength of such a recommendation. Regarding PPIs prior to IV insertion in pediatric patients, there is strong evidence to support the validity and need for standardization of such interventions. Though there are multiple topical analgesics for pain prevention prior to IV insertions, each intervention is deemed effective over current practice of no intervention utilized. However, some interventions are more effective than others, as proven in the research reviewed. Tables 3 and 4 express the recommendation and the strength of such recommendation regarding PPIs and IV insertions on pediatric patients.

Table 3

Recommendation for Practice Change

Recommendation	References in Support of Recommendation	Rationale	Level of Evidence (JHNEBP Tool)	Quality Rating (JHNEBP Tool)
1. It is recommended to implement standardized pain prevention interventions prior to intravenous catheter insertions for pediatric patients on the pediatric IPS unit.	Singer et al., (2008)	The authors found adequate pain relief was more common in the group of pediatric patients having the lidocaine/tetracaine patch placed before intravenous (IV) catheter insertion. There was statistically significant data in regards to pain rating via the visual analog scale between the lidocaine/tetracaine group and the placebo group upon IV insertion.	I	A
	Stoltz & Manworren (2017)	EMLA application, versus an injection of lidocaine via J-Tip device, prior to IV insertion was found to be superior for pain prevention based on patients' self-reported pain during insertion	II	A
	Kelly et al., (2017)	The authors' results revealed consistency in using needle-free injection of lidocaine as an effective intervention for pain prevention in patients who require IV insertion. This was compared to a second group of pediatric patients that had received lidocaine free injections	II	A

	Lunoe et al., (2015)	The subcutaneous injection of 1% lidocaine via the J-Tip needleless device was found, by the authors during the randomized clinical trial, to decrease pain associated with intravenous catheter insertions in pediatric patients. These results were compared to a second group of patients that did not receive any lidocaine prior to intravenous catheter insertion	I	A
	Waterhouse et al., (2013)	Painease, a vapocoolant spray, was found to be superior in pain control when compared to ice application as a topical analgesic prior to intravenous catheter insertion	I	A

Table 4

Strength of Recommendation

Recommendation	Strength of Evidence for Recommendation	References in Support of Recommendation
1. It is recommended to to implement standardized pain prevention interventions prior to intravenous catheter insertions on pediatric patients on the pediatric IPS unit.	Given the level of evidence and quality ratings found in the JHNEBP, the overall strength of the evidence provided is considered “good and consistent evidence” which suggests “considering a pilot of change” (Dang & Dearholt, 2018).	Singer et al., (2008) Stoltz & Manworren (2017) Kelly et al., (2017) Lunoe et al., (2015) Waterhosue et al., (2015)

III. IMPLEMENTATION

Project Setting and Population

The setting for this DNP project will take place on the pediatric IPS unit of a free-standing pediatric hospital that serves the counties of East Tennessee, as well as counties in Southeast Kentucky and Southwest Virginia. This free-standing hospital cares for patients ranging in ages from newborn to 23 years and is one of four certified Comprehensive Regional Pediatric Center in the state of Tennessee. According to the hospital's annual report, in 2019-2020, this IPS unit saw nearly 600 pediatric patients. The unit is staffed by registered nurses (RNs), medical doctors (MDs), physician assistants (PAs), nurse practitioners (NPs) unit techs, and a multitude of ancillary staff. Hospital-wide in 2020, there were nearly 7,600 patients and families assisted by Interpretive Services (IS). The top three languages interpreted were Spanish, Swahili, and Akateko. The pediatric IPS unit serves a diverse population in the southeast region.

Participants

Specifically, the focus of this project will be on the pediatric patient population on the IPS unit who require an IV for treatment. The patients to be included will range in ages between 7 – 21 years of age, which will allow the use of the of an age-appropriate pain scale. The project will utilize the Likert scale. The Likert scale includes the following ratings for pain: good, fair, or poor. Good represents no pain at all and progresses to poor, which represents the patient did not tolerate the IV insertion well due to noticeable pain from the inserting nurse. The patients that will be included in this project will be non-emergent patients arriving to the unit via scheduled surgery or from an emergency department (ED) admission. Patients that had previously received an IV in the ED or the operating room have the potential to lose, or

accidently remove, the IV – which would create a need for a new IV to be inserted. These patients requiring a new IV would be included for this project.

Barriers and Facilitators

There are multiple barriers involved that need to be recognized and mitigated before interest and support are acquired. Regarding this DNP project, there are four different categories of barriers to consider. Understanding which stakeholder is involved with each category is important for mitigation purposes. Being aware of an organization's leadership and whether the infrastructure is suitable for advancing an EBP initiative is priority (Dang & Dearholt, 2018). Understanding the type of barrier, as well as the stakeholders involved, is essential in moving forward with a project change. Table 5 illustrates the barriers for implementation for this specific DNP project, as well as the mitigation approach for each barrier.

Identifying facilitators for this DNP project is just as pertinent as identifying barriers when aspiring to create a successful and supportive EBP setting (Dang & Dearholt, 2018). The facilitators for this DNP project are intertwined with the hospital's organizational culture and leadership support. For example, pediatric IPS staff understand the culture of the hospital and the mission of improving the health of children through multiple routes. Some of these routes include comprehensive care and education. Decreasing pain during IV insertions is a large part of constructing a culture of comprehensive care. Table 6 illustrates the facilitators for implementation and the facilitator aids for this project.

Upon assessing an organization for a project change, an analysis of the strengths, weaknesses, opportunities, and threats (SWOT) is beneficial. A SWOT analysis was conducted

Table 5

Barriers for Implementation

Category	Stakeholder	Description of Barrier	Barrier Mitigation
Attitudes	IPS Nursing Staff	Nursing staff resistance to change due to staff possibly perceiving an increase in patient care time for PPIs	EBP regarding efficient time for each PPI management
	IPS Manager and ANM	Hesitancy to EBP change due to other issues, such as staffing, that needs to be resolved first	Providing evidence and resources of the Triple Aim in healthcare expressing why EBP culture is necessary
Knowledge and Skills	IPS Manager and ANM	Unaware of current EBP regarding topical PPIs for pediatric IPS units	Provide evidence-based resources and current practice changes concerning topical PPIs
	IPS Nursing Staff	Unaware of what PPIs are options prior to IV insertion; unaware of storage of such PPIs on the IPS unit	Education and training (hands on and CBL) on the types of PPI available and where each PPI is located in the unit

Note. IPS = Inpatient Surgery Unit, ANM = Assistant Nurse Manager, PPI = Pain Prevention Intervention, IV = Intravenous, EBP = Evidence Based Practice

Category	Stakeholder	Description of Barrier	Barrier Mitigation
Resource: Time	FTAC	Limited meeting times with limited time slots allotted to each topic	Utilize other resources for consultation, such as surveys or video chats
	PPCC	More time demanded for meetings and project attention on top of other daily duties	Create a streamlined plan for meetings and dates ahead of time
	PPCC	More time demanded for meetings and project attention on top of other daily duties	Create a streamlined plan for meetings and dates ahead of time
Resource: Financial	IPS Manager	ETCH has been in a financial low due to COVID-19, which decreases the amount of finances available to extra resources (such as creating new CBLs for educating staff)	Incorporate education during other aspects of workplace education, such as having a station available during the quarterly ETCH days mandatory in-person education

Note. PPCC = Pain and Palliative Care Coordinator, IPS = Inpatient Surgery Unit, CBL = Computer Based Learning, FTAC = Family and Teen Advisory Council, ETCH = East Tennessee Children's Hospital

Table 6

Facilitators for Implementation

Category	Stakeholder	Description of Facilitator	Facilitator Aid
Organizational Culture	ETCH IPS Staff	The mission of ETCH is to "Improve the health of children" through many routes including comprehensive care and education. Decreasing pain during IV insertions is a large part of creating a culture of comprehensive care	Utilizing literature to show the benefits of EBP PPI on the IPS unit
	FTAC	Families and patients are the foundation of culture at ETCH. Creating relationships with past and present families/patients through FTAC can help give insight to PPI needs that might be otherwise overlooked	By understanding and listening to family and patient thoughts regarding PPI, EBP can transform into standard practice at ETCH
Data Collection	PPCT	Beginning January 2021, data collection consisting of PPI with each IV insertion has started being tracked based on nursing charting	This creates a new visual and system of reviewing how often PPIs are being utilized on the IPS unit based on age, gender, and interventions used during IV insertion
Leadership Support	IPS Nursing Staff	By creating specific times for education and proper understanding of EBP PPIs for the IPS staff allows for the staff to have protected time which reflects support from leadership	Providing education in segments limits the staff from becoming overwhelmed by new information on top of daily tasks at work

Note. PPCT = Pain and Palliative Care Team, ETCH = East Tennessee Children's Hospital, IPS = Inpatient Surgery Unit, PPI = Pain Prevention Intervention, IV = Intravenous, EBP = Evidence Based Practice, FTAC = Family and Teen Advisory

Table 7

SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
Already focused on patient and family centered care	Resources are currently in the process of being developed (or are newly developed) to keep up with data related to IV insertions and pain prevention	Quarterly education for staff to educate on the "why" of pain prevention importance	Staff can exhibit the "this is the way we've always done it" outlook on change regarding simple policies
Mission and vision statements coincide with the goals of this project	Data collection is based solely off nursing charting	Multiple IV insertions are ordered on every shift, which allows for multiple different learning opportunities regarding the different types of topical PPIs	Nursing staff not taking interest in the "why" behind the proposed project
Management team for the IPS unit supports gathering data for the support of this project	No current mandatory standard of care/policy regarding pain prevention with IV starts	Gaining support from other IPS Pain Champions (representatives) from the PPCT	No one likes change
The topical pain PPIs are all relatively low cost		IV insertions can be intimidating for newer nurses - knowing they are doing everything they can to make their patient more comfortable could increase their confidence levels	The possibility of support from management and multidisciplinary teams falling through due to multiple other projects/changes in the department
Quarterly computer-based learning education helps bridge any gaps of new knowledge/change for nursing staff			

Note. IPS = Inpatient Surgery Unit, IV = intravenous, PPCT = pain and palliative

for the IPS unit of the hospital that will be used for this project. Internal aspects of the organization, such as the strengths and weaknesses, were reviewed. Likewise, external aspects of the organization, such as opportunities and threats, were analyzed (Teoli et al., 2020). Table 7 exhibits the SWOT analysis conducted for the ED of this hospital.

Project Stakeholders

Stakeholders and their teams assume multiple responsibilities when they agree to assisting and being a part of a DNP project. For example, there are seven interdisciplinary stakeholders and teams involved in this project ranging from the DNP student and IPS management to the Family and Teen Advisory Council (FTAC). For each stakeholder, there is a list of corresponding responsibilities. Stakeholders are affiliated with a specific agency, and with this project there are two agencies involved. Table 8 reveals this project's stakeholders, their responsibilities, and their affiliated agencies. This team of stakeholders was formed based on the involvement and ability to share insight of an IV insertion on a pediatric patient. Members from FTAC could potentially have personal accounts in which the project could benefit from regarding pain with IV insertion as a patient. On the contrary, IPS management, contributes to the sustainability aspect of such a possible project change. After discussing what aspects of stakeholders this project might benefit from with the IPS Nurse Managers, this team was formed.

Implementation Approach

Implementation of the project will utilize the 19-step process of the Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) Process. This process is comprised of three phases known as the PET phase involving the Practice Question, Evidence, and Translation (Dang & Dearholt, 2018). By using this specific implementation approach, the essential steps are broken

down into detailed phases while the key stakeholders involved with each step are identified. The essential steps and stakeholders necessary for each step are seen in Table 9. The projected timeline for this project is also displayed within Table 9. Taking into account ethical considerations, we sought Internal Review Board (IRB) determination from The University of Tennessee and the hospital the project will take place in. It was determined by both entities that this project received an exemption letter for non-human subjects research.

Implementation for this project consists of an educational inforgraph being placed on the IPS unit. The inforgraph provides information regarding pain prevention interventions and the benefits of topical analgesics prior to IV insertion. The infograph to be used is shown in Figure 2. Two weeks of baseline data will be collected prior to hanging eight infographs in highly trafficked nursing areas on the IPS unit. The inforgraph will be left up on the unit for four weeks and the implementation data will be gathered for those four weeks. Utilizing the EHR, the Likert scale will be audited for the patients in the applicable age range to this project.

Table 8

Stakeholders, Responsibilities & Affiliated Agencies

Name/Title	Responsibilities	Affiliated Agency
DNP Student	Project leader, apply EBP, responsible for collection of data/analysis and disseminating results	UTK
Pain and Palliative Care Coordinator	Leader of PPCT, consult for data collection strategies and education related opportunities for staff related to project	ETCH
IPS Nurse Manager	Leader of project department, oversee and approve project procedures/implementation	ETCH
IPS ANM	Assists in approval of changes and proposed tasks in department related to PPI	ETCH
DNP Committee and Statistician	Statistical consulting regarding PPIs utilized versus current practice during IV insertions	UTK
IPS Nursing Staff	Consult for input before, during, and after project change and implementation	ETCH
FTAC (ages 12-21)	Serves as subject matter experts regarding PPI from previous experiences	ETCH

Note. PPCT = Pain and Palliative Care Team, ED = Emergency Department, ANM = Assistant Nurse Manager, PPI = Pain Prevention Intervention, IV = Intravenous, EBP = Evidence Based Practice, FTAC = Family and Teen Advisory Council, UTK = University of Tennessee Knoxville, ETCH = East Tennessee Children's Hospital

Table 9

Implementation Plan & Project Timeline using the JHNEBP PET Process

Essential Steps	Responsibility of Key Stakeholder(s)	Projected Time Frame
Step 1: Recruit interprofessional team • Recognize potential interprofessional team members who would have an interest in the DNP project topic	DNP student	January 2021
Step 2: Define the problem • Lack of standardization regarding PPI during IV insertions on the IPS unit in pediatric patients • Accumulate data, quantitative and qualitative, exploring PPI and pain levels with IV insertions in pediatric patients on the IPS unit	DNP student Community member IPS nursing staff IPS nurse manager/ANM FTAC	January 2021
Step 3: Develop and refine the EBP question • Question development using the PICO mnemonic	DNP student DNP project chair	January 2021
Step 4: Identify stakeholders • Identify and determine appropriate key stakeholders to facilitate the development of the DNP scholarly project • Determine roles of stakeholders based on the person, group, or department involvement within ETCH	DNP student Community member	February 2021
Step 5: Determine responsibility for project leadership • Establish key leadership members to facilitate responsibilities • Review and evaluate responsibilities for specific stakeholders	DNP student DNP project chair Community member	March 2021
Step 6: Schedule team meetings • Establishing meeting dates for interprofessional teams regarding standardizing PPI with IV insertions for pediatric patients	Community member DNP student DNP project chair	June 2021

Essential Steps	Responsibility of Key Stakeholder(s)	Projected Time Frame
• Plan ahead and schedule future interprofessional meetings regarding DNP project implementation	IPS nursing staff IPS nurse manager/ANM FTAC	
Step 7: Conduct internal and external search for evidence • Engage with librarians to understand, develop, and utilize search plans along with specific search terms • Review clinical practice guidelines • Conduct literature searches over multiple databases • Gather sources of data outside library resources	DNP student Community member UTK librarian	January 2021-September 2021
Step 8: Appraise the level and quality of each piece of evidence • Appraise research and nonresearch evidence, determining level, type, and quality of evidence with appropriate appraisal tool	DNP student	February 2021-August 2021
Step 9: Summarize the individual evidence • Identifies the sums of the evidence and documents the total by utilizing the Synthesis and Process Recommendations Tool	DNP student	March 2021-June 2021
Step 10: Synthesize overall strength and quality of evidence • Determine the strength and overall quality of evidence gathered focusing on the level, quality, quantity, consistency and applicability to the DNP project	DNP student	March 2021-June 2021
Step 11: Develop strong recommendations for change based on evidence synthesis • Form a recommendation for practice change based on the overall appraisal and synthesis of evidence	DNP student	September 2021
Step 12: Determine fit, feasibility, and appropriateness of recommendation(s) for translation path	DNP student DNP project chair	September 2021

Essential Steps	Responsibility of Key Stakeholder(s)	Projected Time Frame
• Conduct a team meeting including key stakeholders to discuss recommendations while addressing relevant questions from the Synthesis Process and Recommendations Tool • Assess recommendations to identify any modifications needed	Community member IPS nursing staff IPS nurse manager/ANM FTAC PPCC	
Step 13: Create action plan • Develop a standardized process regarding PPI in pediatric patients prior to IV insertions while soliciting feedback from IPS nursing staff	DNP student DNP project chair Community member FTAC IPS nursing staff	September 2021
Step 14: Secure support and resources to implement action plan • Maintaining previously obtained approval from ETCH as DNP project site for implementation of DNP project • Verify stable resources and financial plan	DNP student DNP project chair Community member	November 2021
Step 15: Implement action plan • Educate IPS nursing staff with educational flyer via QR code access and via email for the IPS department. • Implement practice change in the IPS to require the standardization of PPI with IV insertions on pediatric patients on the IPS unit	DNP student Community member PPCC	March 2022
Step 16: Evaluate outcomes • Analyze data findings with statistician • Conduct team meeting to review outcomes	DNP student DNP project chair Community member	July-August 2022

Essential Steps	Responsibility of Key Stakeholder(s)	Projected Time Frame
	Statistician	
Step 17: Report outcomes to stakeholders	DNP student	October 2022
• Distribute results of outcomes with key stakeholders	Community member	
• Solicit feedback from key stakeholders related to outcomes	DNP project chair	
Step 18: Identify next steps	DNP student	October 2022
• Analyze and revise next steps based on feedback amongst interprofessional team	DNP project chair Community member	
• Suggest adjustments as needed		
Step 19: Disseminate findings	DNP student	November 2022
• Defend project	DNP project chair	
• Present, publish, and disseminate findings		

Note. PPCC = Pain and Palliative Care Coordinator, CBL = Computer Based Learning, PPI = Pain Prevention Intervention, IPS = Inpatient Surgery Unit, IV = Intravenous, FTAC = Family and Teen Advisory Council, UTK = University of Tennessee Knoxville, ETCH = East Tennessee Children's Hospital, DNP=Doctor of Nursing Practice, ANM = Assistant Nurse Manager

Note. Adapted from "The Revised Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) Model" by D. Dang and S.L. Dearholt, 2018, Johns Hopkins Nursing Evidence-Based Practice: Model and Guidelines, pp. 46-57. Sigma Theta Tau International.

IV. OUTCOMES AND EVAL

Outcome Measures

For this DNP project, the main outcome measure consists of utilizing the Likert scale. The specific scale is used for various kinds of ratings and can be used for different perceptions. This specific use of the Likert scale can be used for patients from a nurse's perception of how the patient tolerated the IV insertion. The Likert scale includes the following ratings for pain: good, fair, poor. Good represents no pain at all and progresses to poor, which represents the patient did not tolerate the IV insertion well due to immense pain. The outcome measure for the project will focus on pain scores for IV insertion with and without topical analgesia pre and post implementation.

To deem the PPI of topical analgesics successful, the data will need to show a decrease in pain with IV insertions utilizing topical analgesia. The data will be gathered from a six-week period from patients' charts ranging from 7-21 years of age. The Likert scale was first utilized in 1932 and has proven to be an effective way to objectively and subjectively measure perceptions, rate certain systems, and can also be utilized in a questionnaire format (McCleod, 2019). For this project, a three-point Likert scale will be utilized by the nurse inserting the IV and charted under the IV insertion intervention. Table 10 displays the essential data points which will be collected for statistical analysis. All data points will be retrieved from patient charts, pain audits, or electronic health records (EHR).

Data Collection and Security

Six weeks of data points will be gathered prior to project implementation for baseline statistics. The baseline statistics will allow for comparison regarding pre and post implementation of topical PPIs. The data will be gathered via a secure data table created by the

PPCT at the hospital. The data table gathers the specific data points from patients' charts and compiles data for IV insertions based on units in the hospital. The table can be viewed in intervals of months. The table is secure and it only accessible on hospital property and intranet.

Table 10

Decreasing Pain in Pediatric Patients During IV Insertions in the ED Evaluation Plan

Variable Name	Variable Code	Variable Description	Data Source	Possible Range of Values	Level of Measurement	Time Frame for Collection
Age	AGE	Age in number of years at time of IPS registration	EHR/ chart review	#	Ratio	Six weeks
Gender	GEN	Guardian-reported gender of patient at time of IPS registration	EHR/ chart review	1 = Male 2 = Female 3 = Other	Nominal	Six weeks
Race	RACE	Guardian-reported gender of patient at time of IPS registration	EHR/ chart review	1 = White 2 = Black or African American 3 = Asian/Pacific Islander 4 = Native American or Native Indian 5 = Other	Nominal	Six weeks
Ethnicity	ETH	Guardian-reported ethnicity at time of IPS registration	EHR/ chart review	1 = Hispanic or Latino 2 = Not Hispanic or Latino	Nominal Dichotomous	Six weeks

Variable Name	Variable Code	Variable Description	Data Source	Possible Range of Values	Level of Measurement	Time Frame for Collection
Visit Timing	YEAR	Year in which IPS visit requiring IV insertion occurred (2021 = preimplementation, 2022 = postimplementation)	EHR/ chart review	1 = 2021 2 = 2022	Nominal Dichotomous	Six weeks
Pain Prevention Intervention (PPI)	PPI	PPI utilized during IV insertion	EHR/ chart review	1 = Yes 2 = No	Nominal Dichotomous	Six weeks
Type of PPI	PPIT	Type of PPI utilized during IV insertion	EHR/ chart review	1 = EMLA cream 2 = LMX cream 3 = PainEase Spray	Nominal	Six weeks
Likert Scale	LS	Quality Likert score utilizing pain perception from an observational standpoint	EHR/ chart review	1 = Good 2 = Fair 3 = Poor	Nominal	Six weeks

Note. EHR = Electronic Health Record, PPI = Pain Prevention Intervention, IV = Intravenous, IPS = Inpatient Surgery Unit

The data retrieved from this secure live table will be entered into a protected data excel sheet and kept aggregate. The data spreadsheet will be saved in OneDrive for HIPPA/PHI security. There will be a password to retrieve the spreadsheet. If the data needs to be transferred to the statistician during consultation, the data spreadsheet will be retrievable via the UT Vault. The UT vault is a secure and encrypted transfer tool for file sharing. It is also HIPPA/PHI approved.

Data Analysis

Data analysis was conducted with the assistance of Cary Springer, a statistician at the University of Tennessee, Knoxville. Data was compiled and entered on a spreadsheet for the pre and post implementation timeframes. Data was analyzed based on the utilization of topical analgesia as a PPI, and also if PPI was offered but declined by the patient. The newest version of the Statistical Package for the Social Sciences (SPSS) software application was utilized during this analysis. A chi-square test will be performed for topical analgesics utilized and for topical analgesics offered pre and postimplementation. Descriptive statistics will be reported for each of these tests.

Findings, Significance and Implication

When retrieving data from the pain audit and patient charts, it was discovered the Likert scale previously referenced no longer existed in the charting system. The tolerance of the procedure was only documented if the nurse inserting the IV felt the need to add a subjective comment regarding patient tolerance. This unforeseen aspect changed the way the data was calculated. Instead of processing a chi-square test on each Likert scale component for pre and post implementation, the obtainable data was processed regarding whether or not an analgesic was utilized as a pain prevention intervention with a chi-square test. A second chi-square test

was also calculated regarding whether or not topical analgesics were offered prior to IV insertion.

Upon calculating the two chi-square tests, it was found that topical analgesics were utilized 75% of the time during the two-week baseline period, and 53.3% of the time during the four-week implementation period. There was no statistical significance found due to the p-value equaling 0.177. However, it was noted topical analgesics were offered 75% of the time during the baseline period and 60% of the time during the implementation period. The was also no statistical significance due to the p-value equaling 0.339.

It is important to note there were seven kids and 12 insertions during the baseline period, and 26 kids with 50 insertions during the implementation period. There were multiple attempts that were accounted for, as well, since first attempts were unsuccessful at times. It is also important to note there were other methods of pain prevention interventions happening at the same time, with and without topical analgesics. This creates multiple confounding factors in the data set, which ultimately creates a limitation on this set. Other limitations found include the lack Likert scale utilization, the overlap of confounding factors, multiple aspects of care impacting the patient's tolerance level during the time of insertion, and the nurse's comment being the only subjective data regarding tolerance for this set. There was a total of five comments from nurses upon insertion stating the patient tolerating the procedure well. All of these occurrences incorporated a topical analgesic into the IV insertion procedure. Due to these multiple limitations, the efficacy of topical analgesics could have been impacted during this time.

Pain in the pediatric population during IV insertion has been proven to be preventable. Preventing pain during the placement of an IV on the pediatric IPS unit significantly impacts the patient, the patient's family or caregivers, the nursing staff, and the provider. Preventing pain

with the utilization of PPIs is significant for the patient because it decreases the trauma associated with the pain of an IV, which can promote long term health hygiene for the patient. Parents, or other family members, are impacted by being actively involved in their child's care and also witnessing that PPIs are significant and recognized - even in a busy pediatric IPS. Preventing pain during IV insertions is substantial to nursing staff because the patient can start the procedure knowing the pain will be less, if not completely nonexistent. And overall, the prevention of pain during IV insertion will be significant to the provider if the patient and family are less anxious. Understanding the long and short-term significance for the entire team creates the bigger picture for this DNP project. Preventing pain during IV insertions in the pediatric realm of healthcare can create healthcare environments where the patient is less traumatized and anxious, the parents are caregivers are involved, and the nursing staff can start IVs without complications related to the pain of the procedure.

Sustainability of continuing the use of PPIs in the form of topical analgesics during IV insertion on the pediatric IPS unit after project implementation is over could be difficult to obtain. However, if the data reveal topical analgesics to be effective for pain prevention during IV insertion at this hospital, standardization of utilizing PPIs during IV insertion is the next step. Standardizing PPIs will be sustained by changing the policies and procedures involved in starting IVs on the pediatric IPS unit at this hospital. This could be a change in the standing order set to include topical analgesics for every IV ordered by a provider. With this specific project, sustaining the intervention will be advantageous for future patients, families, nurses, and providers.

DNP Outcomes

This project will incorporate scientific underpinnings for practice by changing nursing processes resulting in a positive change in the patient's health status. It will incorporate organizational and systems leadership for quality improvement and systems thinking by creating and evaluating a process of care delivery to meet current and future needs of the pediatric population on the pediatric IPS unit. This project will include clinical scholarship and analytical methods for EBP by utilizing critically appraised research within the project and creating a baseline of change for pain prevention interventions. This project will incorporate information systems/technology, along with patient care technology, for the improvement of healthcare by utilizing patient satisfaction surveys via online surveys and incorporating that into the implementation and evaluation portions of this project. Health care policy for advocacy in health care will be seen in this project by understanding previous experiences of pain and IV insertions from FTAC members and their experiences. These interactions will advocate for a change in the policy regarding PPIs and IV insertion. Interprofessional collaboration for improving patient outcomes will be seen throughout this project as the stakeholders are composed of a multidisciplinary team. This project will incorporate preventing population health issues by promoting health hygiene at a young age starting with decreasing preventable pain during IV insertions. Lastly, this project will incorporate advanced nursing practice by the overall design, implementation, and evaluation of an intervention based on evidence-based nursing science.

Dissemination

The most important part of any evidence-based project is the dissemination of process, findings, and overall implications of the project. For this DNP project, dissemination will be focused primarily at a facility, community, and national level. Creating a PowerPoint

presentation exemplifying the findings, lessons learned, and encouraging a Likert scale to be placed back into the required charting will allow for further projects to take place at this facility. Creating a time to present to the stakeholders regarding the results and what can be improved as a whole will be imperative for such dissemination. Compiling and submitting a manuscript for publishing amongst a peer-reviewed journal within one year of final defense is also a dissemination option that will reach far more people to help progress pediatric healthcare. This plan for dissemination will allow the progress and limitations found during this project to be built upon for future projects by future scholars.

Conclusion

Working in the realm of healthcare is followed with many responsibilities. Working in the pediatric realm of healthcare is accompanied with many more responsibilities. Creating a patient and family centered environment is the evidence-based future of the pediatric realm. Understanding the preventative pain and the duties that manifest from such education is imperative to creating advancement and change. Pain prevention interventions are significant in the overall healthcare of children and the way the view healthcare as they transition into adulthood. Topical analgesics during pediatric IV insertions have been proven to be effective. This project revealed topical analgesics are being utilized for IV insertions on the pediatric IPS unit, but the percentage of utilization is fairly low. Standardizing topical analgesics for pain prevention interventions prior to IV insertions should still be considered a priority.

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Appendix A

Johns Hopkins Nursing Evidence-Based Practice Research Appraisal Tool

Johns Hopkins Nursing Evidence-Based Practice Research Evidence Appraisal Tool

Evidence level and quality rating:		_____
Article title:		Number:
Author(s):		Publication date:
Journal:		
Setting:	Sample (composition and size):	
Does this evidence address my EBP question?	❑ Yes	❑ No Do not proceed with appraisal of this evidence.

Is this study:

■ **QuaNtitative** (collection, analysis, and reporting of numerical data)

Measurable data (how many; how much; or how often) used to formulate facts, uncover patterns in research, and generalize results from a larger sample population; provides observed effects of a program, problem, or condition, measured precisely, rather than through researcher interpretation of data. Common methods are surveys, face-to-face structured interviews, observations, and reviews of records or documents. Statistical tests are used in data analysis.

Go to **Section I: QuaNtitative**

■ **QuaLitative** (collection, analysis, and reporting of narrative data)

Rich narrative documents are used for uncovering themes; describes a problem or condition from the point of view of those experiencing it. Common methods are focus groups, individual interviews (unstructured or semistructured), and participation/observations. Sample sizes are small and are determined when data saturation is achieved. Data saturation is reached when the researcher identifies that no new themes emerge and redundancy is occurring. Synthesis is used in data analysis. Often a starting point for studies when little research exists; may use results to design empirical studies. The researcher describes, analyzes, and interprets reports, descriptions, and observations from participants.

Go to Section II: QuaLitative

■ Mixed methods (results reported both numerically and narratively)

Both quaNtitative and quaLitative methods are used in the study design. Using both approaches, in combination, provides a better understanding of research problems than using either approach alone. Sample sizes vary based on methods used. Data collection involves collecting and analyzing both quaNtitative and quaLitative data in a single study or series of studies. Interpretation is continual and can influence stages in the research process.

Go to **Section I** for QuaNtitative components and **Section II** for QuaLitative components

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Section I: QuaNtitative			
Level of Evidence (Study Design)			
A. Is this a report of a single research study?		❑ Yes	❑ No Go to B.
1. Was there manipulation of an independent variable?		❑ Yes	❑ No
2. Was there a control group?		❑ Yes	❑ No
3. Were study participants randomly assigned to the intervention and control groups?		❑ Yes	❑ No
If Yes to questions 1, 2, and 3, this is a randomized controlled trial (RCT) or experimental study. If Yes to questions 1 and 2 and No to question 3, *or* Yes to question 1 and No to questions 2 and 3, this is quasi-experimental (some degree of investigator control, some manipulation of an independent variable, lacks random assignment to groups, and may have a control group). If No to questions 1, 2, and 3, this is nonexperimental (no manipulation of independent variable; can be descriptive, comparative, or correlational; often uses secondary data).	❑ LEVEL I ❑ LEVEL II ❑ LEVEL III		
Study Findings That Help Answer the EBP Question			
Complete the Appraisal of QuaNtitative Research Studies section.			

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B. Is this a summary of multiple sources of research evidence?		❑ Yes Continue	❑ No Go to Appendix F
1. Does it employ a comprehensive search strategy and rigorous appraisal method? If this study includes research, nonresearch, and experiential evidence, it is an integrative review. See Appendix F.		❑ Yes	❑ No Go to Appendix F
2. For systematic reviews and systematic reviews with meta-analysis (see descriptions below): a. Are all studies included RCTs? b. Are the studies a combination of RCTs and quasi-experimental, or quasi-experimental only? c. Are the studies a combination of RCTs, quasi-experimental, and nonexperimental, or non-experimental only? A <u>systematic review</u> employs a search strategy and a rigorous appraisal method, but does not generate an effect size. A <u>meta-analysis</u>, or systematic review with meta-analysis, combines and analyzes results from studies to generate a new statistic: the effect size.	❑ Level I ❑ Level II ❑ Level III		
Study Findings That Help Answer the EBP Question			
Complete the Appraisal of Systematic Review (With or Without a Meta-Analysis) section.			

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Appraisal of QuaNtitative Research Studies			
Does the researcher identify what is known and not known about the problem and how the study will address any gaps in knowledge?	❑ Yes	❑ No	
Was the purpose of the study clearly presented?	❑ Yes	❑ No	
Was the literature review current (most sources within the past five years or a seminal study)?	❑ Yes	❑ No	
Was sample size sufficient based on study design and rationale?	❑ Yes	❑ No	
If there is a control group: ▪ Were the characteristics and/or demographics similar in both the control and intervention groups?	❑ Yes	❑ No	❑ N/A
▪ If multiple settings were used, were the settings similar?	❑ Yes	❑ No	❑ N/A
▪ Were all groups equally treated except for the intervention group(s)?	❑ Yes	❑ No	❑ N/A
Are data collection methods described clearly?	❑ Yes	❑ No	
Were the instruments reliable (Cronbach's α [alpha] > 0.70)?	❑ Yes	❑ No	❑ N/A
Was instrument validity discussed?	❑ Yes	❑ No	❑ N/A
If surveys or questionnaires were used, was the response rate $\geq$ 25%?	❑ Yes	❑ No	❑ N/A
Were the results presented clearly?	❑ Yes	❑ No	
If tables were presented, was the narrative consistent with the table content?	❑ Yes	❑ No	❑ N/A
Were study limitations identified and addressed?	❑ Yes	❑ No	
Were conclusions based on results?	❑ Yes	❑ No	
Go to Quality Rating for QuaNtitative Studies section			
Appraisal of Systematic Review (With or Without Meta-Analysis)			
Were the variables of interest clearly identified?	❑ Yes	❑ No	
Was the search comprehensive and reproducible? ▪ Key search terms stated	❑ Yes	❑ No	
▪ Multiple databases searched and identified	❑ Yes	❑ No	
▪ Inclusion and exclusion criteria stated	❑ Yes	❑ No	
Was there a flow diagram that included the number of studies eliminated at each level of review?	❑ Yes	❑ No	

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Were details of included studies presented (design, sample, methods, results, outcomes, strengths, and limitations?	❑ Yes	❑ No
Were methods for appraising the strength of evidence (level and quality) described?	❑ Yes	❑ No
Were conclusions based on results?	❑ Yes	❑ No
■ Results were interpreted.	❑ Yes	❑ No
■ Conclusions flowed logically from the interpretation and systematic review question.	❑ Yes	❑ No
Did the systematic review include a section addressing limitations *and* how they were addressed?	❑ Yes	❑ No
Quality Rating for QuaNtitative Studies		
Complete quality rating for quaNtitative studies section.		
Circle the appropriate quality rating below **A High quality**: Consistent, generalizable results; sufficient sample size for the study design; adequate control; definitive conclusions; consistent recommendations based on comprehensive literature review that includes thorough reference to scientific evidence. **B Good quality**: Reasonably consistent results; sufficient sample size for the study design; some control, and fairly definitive conclusions; reasonably consistent recommendations based on fairly comprehensive literature review that includes some reference to scientific evidence. **C Low quality or major flaws**: Little evidence with inconsistent results; insufficient sample size for the study design; conclusions cannot be drawn.		
Section II: QuaLitative		
Level of Evidence (Study Design)		
A. Is this a report of a single quaLitative research study?	❑ Yes Level III	❑ No Go to Section II. B
Study Findings That Help Answer the EBP Question		
Complete the Appraisal of Single QuaLitative Research Study section.		

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Appraisal of a Single QuaLitative Research Study		
Was there a clearly identifiable and articulated:		
▪ Purpose?	❑ Yes	❑ No
▪ Research question?	❑ Yes	❑ No
▪ Justification for method(s) used?	❑ Yes	❑ No
▪ Phenomenon that is the focus of the research?	❑ Yes	❑ No
Were study sample participants representative?	❑ Yes	❑ No
Did they have knowledge of or experience with the research area?	❑ Yes	❑ No
Were participant characteristics described?	❑ Yes	❑ No
Was sampling adequate, as evidenced by achieving saturation of data?	❑ Yes	❑ No
Data analysis: ▪ Was a verification process used in every step by checking and confirming with participants the trustworthiness of analysis and interpretation?	❑ Yes	❑ No
▪ Was there a description of how data were analyzed (i.e., method), by computer or manually?	❑ Yes	❑ No
Do findings support the narrative data (quotes)?	❑ Yes	❑ No
Do findings flow from research question to data collected to analysis undertaken?	❑ Yes	❑ No
Are conclusions clearly explained?	❑ Yes	❑ No
Go to Quality Rating for QuaLitative Studies section.		
B. For summaries of multiple quaLitative research studies (meta-synthesis), was a comprehensive search strategy and rigorous appraisal method used?	❑ Yes Level III	❑ No Go to Appendix F.
Study Findings That Help Answer the EBP Question		
Complete the Appraisal of Meta-Synthesis Studies section.		

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Appraisal of Meta-Synthesis Studies		
Were the search strategy and criteria for selecting primary studies clearly defined?	❑ Yes	❑ No
Were findings appropriate and convincing?	❑ Yes	❑ No
Was a description of methods used to:		
■ Compare findings from each study?	❑ Yes	❑ No
■ Interpret data?	❑ Yes	❑ No
Did synthesis reflect:		
■ New insights?	❑ Yes	❑ No
■ Discovery of essential features of phenomena?	❑ Yes	❑ No
■ A fuller understanding of the phenomena?	❑ Yes	❑ No
Was sufficient data presented to support the interpretations?	❑ Yes	❑ No
Complete Quality Rating for QuaLitative Studies section.		
Quality Rating for QuaLitative Studies		

Circle the appropriate quality rating below

No commonly agreed-on principles exist for judging the quality of quaLitative studies. It is a subjective process based on the extent to which study data contributes to synthesis and how much information is known about the researchers' efforts to meet the appraisal criteria.

For meta-synthesis, there is preliminary agreement that quality assessments should be made before synthesis to screen out poor-quality studies[1].

A/B **High/Good quality** is used for single studies and meta-syntheses)[2].

The report discusses efforts to enhance or evaluate the quality of the data and the overall inquiry in sufficient detail; and it describes the specific techniques used to enhance the quality of the inquiry. Evidence of some or all of the following is found in the report:

- **Transparency:** Describes how information was documented to justify decisions, how data were reviewed by others, and how themes and categories were formulated.
- **Diligence:** Reads and rereads data to check interpretations; seeks opportunity to find multiple sources to corroborate evidence.
- **Verification:** The process of checking, confirming, and ensuring methodologic coherence.
- **Self-reflection and self-scrutiny:** Being continuously aware of how a researcher's experiences, background, or prejudices might shape and bias analysis and interpretations.
- **Participant-driven inquiry: Participants shape the scope and breadth of questions; analysis and interpretation give voice to those who participated.**
- **Insightful interpretation:** Data and knowledge are linked in meaningful ways to relevant literature.

C **Lower-quality studies contribute little to the overall review of findings and have few, if any, of the features listed for High/Good quality.**

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Section III: Mixed Methods

Level of Evidence (Study Design)

You will need to appraise both the quaNtitative and quaLitative parts of the study independently, before appraising the study in its entirety.		
1. Evaluate the quaNtitative portion of the study using Section I. Insert here the level of evidence and overall quality for this part:	Level	Quality
2. Evaluate the quaLitative part of the study using Section II. Insert here the level of evidence and overall quality for this part:	Level	Quality
3. To determine the level of evidence, circle the appropriate study design: **(a) Explanatory** sequential designs collect quaNtitative data first, followed by the quaLitative data; and their purpose is to explain quaNtitative results using quaLitative findings. The level is determined based on the level of the quaNtitative part. **(b) Exploratory** sequential designs collect quaLitative data first, followed by the quaNtitative data; and their purpose is to explain quaLitative findings using the quaNtitative results. The level is determined based on the level of the quaLitative part, and it is always Level III. **(c) Convergent** parallel designs collect the quaLitative and quaNtitative data concurrently for the purpose of providing a more complete understanding of a phenomenon by merging both datasets. These designs are Level III. **(d) Multiphasic** designs collect quaLitative and quaNtitative data over more than one phase, with each phase informing the next phase. These designs are Level III.		

Study Findings That Help Answer the EBP Question

Use the Appraisal of Mixed Methods Studies section.

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Appraisal of Mixed Methods Studies[3]			
Was the mixed-methods research design relevant to address the quaNtitative and quaLitative research questions (or objectives)?	❑ Yes	❑ No	❑ N/A
Was the research design relevant to address the quaNtitative and quaLitative aspects of the mixed-methods question (or objective)?	❑ Yes	❑ No	❑ N/A
For convergent parallel designs, was the integration of quaNtitative and quaLitative data (or results) relevant to address the research question or objective?	❑ Yes	❑ No	❑ N/A
For convergent parallel designs, were the limitations associated with the integration (for example, the divergence of quaLitative and quaNtitative data or results) sufficiently addressed?	❑ Yes	❑ No	❑ N/A

Quality Rating for Mixed-Methods Studies

Circle the appropriate quality rating below

A **High quality**: Contains high-quality quaNtitative and quaLitative study components; highly relevant study design; relevant integration of data or results; and careful consideration of the limitations of the chosen approach.

B **Good quality**: Contains good-quality quaNtitative and quaLitative study components; relevant study design; moderately relevant integration of data or results; and some discussion of limitations of integration.

C **Low quality or major flaws**: Contains low quality quaNtitative and quaLitative study components; study design not relevant to research questions or objectives; poorly integrated data or results; and no consideration of limits of integration.

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Appendix B

Project Site Letter of Support

CHILDREN'S HOSPITAL

East Tennessee Children's Hospital • 2018 Clinch Ave. • P.O. Box 15010 • Knoxville, TN 37901 • (865) 541-8000

April 21, 2022

Casey Morrison
2018 Clinch Ave. Knoxville Tn 37901

Dear Breonna Scott,

I am pleased to write this letter of support on behalf of East Tennessee Children's Hospital indicating our commitment and support for your DNP Scholarly Project entitled Pain prevention interventions.

East Tennessee Children's Hospital (ETCH) supports the anticipated collaboration of the University of Tennessee, Knoxville, College of Nursing (CON) to improve the quality of care. A relationship with the CON is ideal for applying evidence-based strategies to meet the community's needs to promote health promotion and disease prevention through quality improvement and evidence-based practice. ETCH will provide a venue for the execution of the DNP Scholarly Project. This letter also documents our commitment to support the CON in the conduction of this project. ETCH does have an IRB. Our IRB do not request to make the IRB determination on the project.

ETCH is pleased to partner with the CON to implement research and data to promote the use of pain prevention interventions. I understand that Breonna Scott will be collecting data anonymously and will not name any individuals or our facility in any publications or professional presentations. We look forward to this partnership and anticipate learning the outcomes of this project.

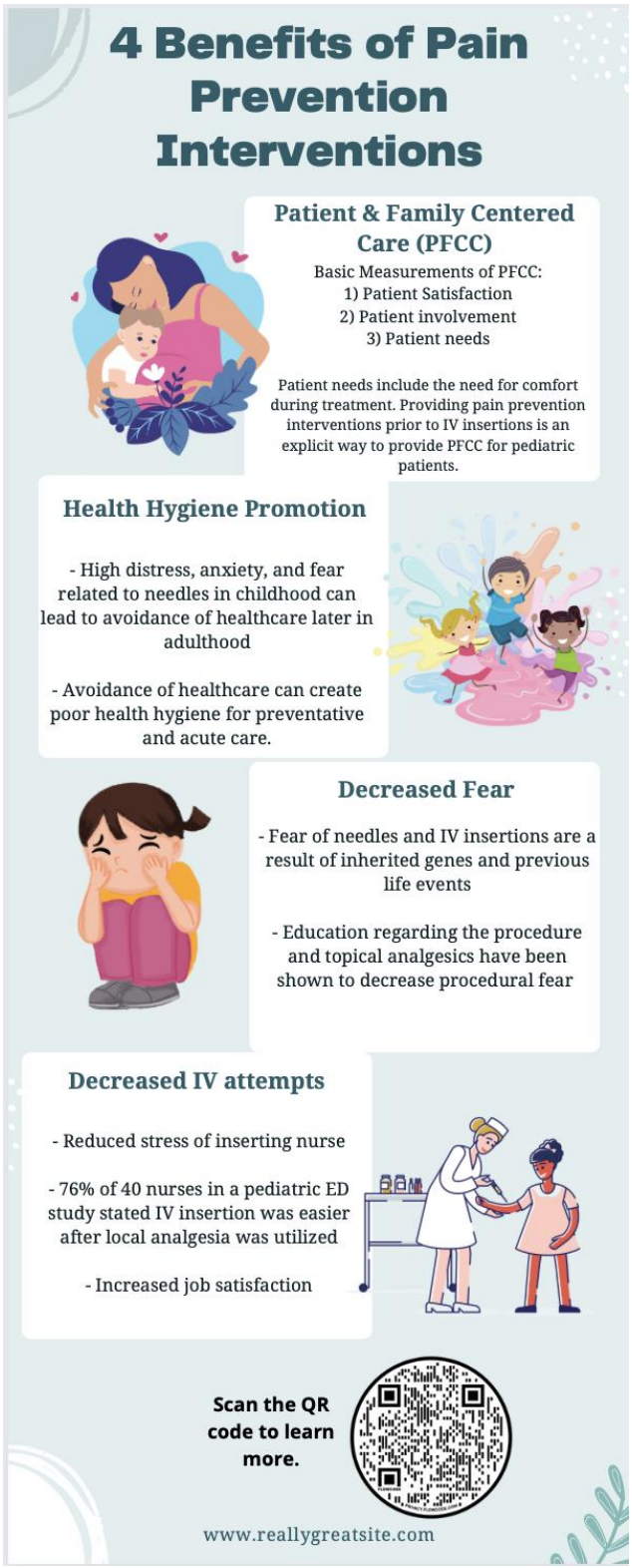
Sincerely.

Casey Morrison BSN

Director of Inpatient Services and PICU

Leading the Way to Healthy Children

Appendix C


4 Benefits of Pain Prevention Interventions
Patient & Family Centered Care (PFCC)
Basic Measurements of PFCC:
1) Patient Satisfaction
2) Patient involvement
3) Patient needs
Patient needs include the need for comfort during treatment. Providing pain prevention interventions prior to IV insertions is an explicit way to provide PFCC for pediatric patients.
Health Hygiene Promotion
- High distress, anxiety, and fear related to needles in childhood can lead to avoidance of healthcare later in adulthood
- Avoidance of healthcare can create poor health hygiene for preventative and acute care.
Decreased Fear
- Fear of needles and IV insertions are a result of inherited genes and previous life events
- Education regarding the procedure and topical analgesics have been shown to decrease procedural fear
Decreased IV attempts
- Reduced stress of inserting nurse
- 76% of 40 nurses in a pediatric ED study stated IV insertion was easier after local analgesia was utilized
- Increased job satisfaction
Scan the QR code to learn more.
www.reallygreatsite.com