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Comfort measures for peripheral I.V. catheter placement in children

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Abstract: I.V. catheter placement is one of the most common causes of procedural pain in children. Interventions to address this pain are readily available but inconsistently used in practice. The focus of this article is to identify and encourage best practice for pain mitigation in peripheral I.V. catheter placement in children.

Keywords: children, I.V. placement, jet-injected lidocaine, nursing, pain management, pediatrics, vascular access, therapeutic touch

PERIPHERAL I.V. catheters (PIVs) are placed in approximately 25 million people in the US each year. PIV placement is one of the most common procedures that children undergo once they enter the healthcare system. According to Rinke, nearly 44% of all hospitalized pediatric patients have a PIV.¹ This procedure, one of the most distressing interventions for pediatric patients, is associated with increased anxiety, fear, and

pain. PIV placements are not only mentally and physically distressing to children, but also distressing to the children's families, nurses, and other providers.²

In response to this issue, the American Society for Pain Management Nursing (ASPMN) has developed a position statement and clinical practice recommendations related to procedural preparation and comfort management.² Similarly, the In-

fusion Nurses Society has established an infusion therapy standard of practice. This includes criteria B for neonatal and pediatric patients, which notes that a nurse should always consider age-appropriate comfort measures during I.V. procedures.³ Although these guidelines and evidence for best practice are available, research indicates that use of pain mitigation techniques with PIV placement in children tends to favor those with lower evidence of effectiveness.⁴ If providing a good patient experience is nurses' primary obligation, they must do better than asking patients to "just hold still."

Methods

The authors reviewed the literature by searching databases including PubMed, Google Scholar, and CINAHL (Cumulative Index to Nursing and Allied Health Literature). They first reviewed existing literature on pediatric pain during PIV placement using the keywords pediatrics, painless, PIV placement, and nursing. Approximately 184 articles met this search criteria. Given the overwhelming evidence in support of using an intervention, they initially eliminated studies that compared interventions to placebo. However, they reconsidered these studies considering the lack of support from healthcare providers for always choosing an intervention. They noticed the jet-injected lidocaine (J-Tip) device appeared in the literature with notable results, so they conducted a more in-depth search, including articles that addressed the device specifically. They eliminated articles that were not specific to pediatrics or PIV placement, or those published before 2005. They then reviewed the 25 articles that met their criteria.

Review of the literature

Nonpharmacologic interventions. A recent Cochrane Review reported evidence supporting the efficacy of

distraction, hypnosis, combined cognitive-behavioral therapy, and breathing interventions for reducing children's needle-related pain and distress.⁵ Although the quality and overall evidence of efficacy remained low to very low, the authors suggested the potential benefits of using these interventions in clinical practice.⁵ Furthermore, many studies indicate that nonpharmacologic interventions are readily available and that nurses use these to mitigate pain related to PIV placement.^{6,7} Bergomi and colleagues studied a newer device called the BUZZY, which has had promising success in nonpharmacologic pain management.⁷ BUZZY is a small vibrating "bee" with blue ice-pack wings that provides distraction and helps block sharp pain. Although it is important to explore nonpharmacologic pain management measures, these interventions are often chosen for their convenience rather than their effectiveness.

Pharmacologic interventions.

The most common pharmacologic interventions studied included intradermal buffered lidocaine (1%), jet injectable (buffered) lidocaine (J-Tip), EMLA® (lidocaine 2.5%/prilocaine 2.5%), ELA-Max (4% liposomal lidocaine), and vapocoolant spray (ethyl chloride skin refrigerant). Developed in 2001, J-Tip is a U.S. FDA-cleared, sterile, single-use, and needleless IV system for use with Xylocaine (Lidocaine). This virtually painless device works using carbon dioxide gas that pushes lidocaine into the subcutaneous tissue.⁸ Jet needleless injection technology can create a spray-like pattern of medication once inside the subcutaneous tissue, which allows for broad dispersion and quick absorption. In their 2015 clinical practice guideline, the Emergency Nurses Association (ENA) has given their highest level of recommendation (Level A) to Subdermal Local Anesthetic with Needle-Free Delivery (using the J-Tip).⁸

A 2006 study comparing the J-Tip to EMLA in children ages 7 through 19 years reported that 80% of the children experienced no pain with jet injectable lidocaine, a significant difference compared with the 61% who rated no pain with EMLA.⁹

According to a 2008 study of 70 children ages 8 through 15 who underwent PIV insertion, the J-Tip proved more effective than ELA-Max at relieving pain.¹⁰ Among the study participants, patient-recorded pain intensity scores were significantly different immediately after PIV insertion, compared with before the procedure. According to self-reported pain intensity scores, the J-Tip provided greater anesthesia than did a 30-minute application of ELA-Max.¹⁰

In a 2015 study comparing the J-Tip to no preventive pain measures, a larger number of patients reported lower pain intensity scores with the J-Tip.¹¹ This was later supported by a 2017 study comparing 85 patients, in which mean pain intensity scores (out of 10) were 2.45 for patients who received the J-Tip and 5.8 for those who did not.¹²

Another 2015 study of 205 children compared the pain-relieving effects of the J-Tip, a vapocoolant spray, and a placebo of an empty J-Tip. No changes in pain intensity scores from baseline were reported for the J-Tip with lidocaine, before or after the PIV placement. There was, however, a significant increase in the pain intensity score after the PIV placement for both the vapocoolant spray and the J-Tip placebo.¹³

Costs

It is important to remember that pain with PIV placements comes with its own cost to the patient and family in terms of distress and anxiety. Furthermore, the costs related to time, supplies, and avail-

ability of pharmacologic options must be considered. A recent study compared the ratio of the cost of each pain-reducing measure, including costs associated with time in the ED, with a decrease in pain.¹⁴ The researchers concluded that intradermal buffered lidocaine (1%) was the most cost-effective option, at \$1.60 per unit. This was followed by the J-Tip, at \$3.90; lidocaine cream 4%, at \$7.70; and EMLA, at \$9.30 per unit. Thus, intradermal buffered lidocaine and the J-Tip were identified as the most cost-effective pharmacologic interventions for pediatric I.V. placement.¹⁴

Implementing best practice

A 2015 study sought to outline the problems with implementation of pain mitigation in PIV placement in children.⁶ Lack of time was the number one barrier to pain management, noted by 42% of the health-care professionals surveyed. Additionally, 18% noted emergency situations, and 11% said they did not know the best method to use.⁶ Furthermore, the conclusions of this study suggest that incorporating pediatric PIV-related pain management content in nursing education curricula could improve patient outcomes. Adding specific, structured education to nursing programs could positively impact the use of these pain management methods throughout nurses' careers in clinical practice.⁶

As early as 2009, Pesaturo and Mathews reported their research on the use of this device, supporting it as the standard of practice in pediatric PIV placement.¹⁵ In a 2017 study, researchers surveyed medical and nursing teams to identify barriers to J-Tip use and initiated changes at monthly intervals in response to these barriers.¹⁶ The initiated changes included: order set changes, online education,

hands-on workshops, improved accessibility, standing order policy revision, and reminders. They collected biweekly data on PIV placements for all ED patients except Level I (critical) triage patients.¹⁶ This study demonstrated that the J-Tip could be implemented in hospitals with the right education and resources.

Despite the vast amount of research on the mitigation of pain in PIV placement, some clinicians remain uncertain about which strategies are most likely to be effective in different clinical situations.¹⁷ Existing guidelines emphasize combining different methods, such as analgesia and anxiety reduction, rather than determining which specific methods work best.¹⁸ This has been described as a 3P—pharmacologic, physical, and psychological—approach, whereby nurses' assessment of pediatric patients drives the selection of pain relief methods.¹⁹ As stated by the ASPMN, choosing a pain mitigation method involves a multifaceted approach that includes pain reevaluation and method changes throughout the procedure. Regardless of which method of pain relief is used for PIV placement in children, nurses have an obligation to choose something over nothing.²⁰

Adding to the complexity is the fact that PIVs are placed by numerous other providers, which requires team collaboration and establishment of consistent protocols for the procedure. Furthermore, when permitted by their state's professional regulations, nurses often delegate this task to unlicensed personnel who lack access to pharmacologic intervention. This creates an additional barrier, one that must be addressed by the nurse and through changes in policy and regulations.

Professional obligation

As stated by the American Nurses Association (ANA), advocating for the alleviation of pain and suf-

fering is a specific professional obligation that is foundational to the nurse-patient relationship (provision 2.4).²¹ Advocacy includes promoting and protecting patients, supporting their rights, and providing education to support parental decision-making through the principle of respect for the right to self-determination (provision 1.4).²¹ Unfortunately, parents and children frequently are not offered options for pain mitigation with PIV placement, other than distraction or being asked to hold still. This may be because of the urgency of the procedure, but it may also be attributable to a nurse's lack of knowledge or lack of intent to use a mitigation strategy when time is short. There may be many factors influencing a nurse's adherence to this professional obligation that have not yet been widely studied. Additionally, if the parent or guardian is absent, the nurse's role as an advocate becomes more vital in clinical decision-making. Ethical decisions about providing effective comfort are based on both a principle of nonmaleficence, limiting harm, as well as beneficence, providing good care. Nurses are further compelled to comply with professional guidelines.²² It is a nurse's professional obligation to practice within an evidence-based standard of care, which includes addressing the procedural pain associated with PIV placements.

Nurses who observe pediatric pain-related distress may themselves experience moral distress, constrained by lack of resources, knowledge, and time.²³ Children who are even briefly physically restrained and cry, or express outward signs of pain, may impact the professional's experience, creating emotional distress. Although many nonpharmacologic options, such as distraction, are reported in the literature to have some effective-

ness, many options for pharmacologic mitigation of the painful experience of I.V. placement go unused.²⁴

Knowledge, skills, and attitudes related to the standard of care for PIV placement pain are well established, but it is the attitudes that may create a barrier to changing practice. Phrases such as “just hold still,” “this won’t hurt,” “look away-don’t watch,” “squeeze my hand,” or “watch the cartoon” are unfortunately chosen over more effective methods for pain management during placement of PIVs. Johnson addresses this problem of hesitation to change practice, reporting nurses’ resistance to change for reasons such as: “it’s how I was taught,” “too time consuming,” and “not enough evidence.”²⁵ This study concludes that nurses have a professional responsibility to incorporate evidence into their practice to ensure the best possible outcomes for their patients.

The results of this literature review suggest that nurses should consider their practice and existing recommendations, evaluate strategies for pain mitigation, and make changes accordingly. This also reflects the ANA Code of Ethics provision 5, which states that nurses must maintain competence to achieve excellence in their practice with a commitment to lifelong learning.²¹ Obligations to professional ethics should drive a change in attitude toward planning for pain management and prioritizing the patient experience. This includes disclosing options to parents or guardians to enhance shared decision-making, valuing a best practice model, and coordinating team care.

Conclusion

A review of the literature indicates that both nonpharmacologic and pharmacologic methods have been

shown to successfully mitigate pain, distress, and anxiety during PIV placement in children, but there continues to be a gap between this research and its application to practice. There is a clear clinical, ethical, and professional obligation for the nurse to provide an effective individualized plan of care, in collaboration with parents and the healthcare team. The child’s experience is the focal point of patient care, and healthcare providers can offer more than a request to “just hold still.” ■

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