

Behavioral Approaches to Anxiety and Pain Management for Pediatric Venous Access

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ABSTRACT

Pediatric venous access causes unnecessary anxiety and pain in children and, in turn, can have detrimental consequences. Behavioral approaches to pediatric venous access distress management can be organized temporally. Specifically, preparation before the procedure includes providing children with sensory and procedural information in an age-appropriate manner and providing training in coping skills. It is important to consider the timing, format, and content of the approach to provide optimal preparation for the unique circumstances of the individual patient. In addition to the child patient, preparing parents and teaching them which specific behaviors might be most helpful to their child should prove valuable to both patient and parents. During the procedure, there are benefits to providing secure and comfortable positioning. In addition, researchers recommend that adults encourage children to cope and actively engage children in distracting activities. For infants, there is support for the distress-mitigation properties of swaddling, skin-to-skin contact, breastfeeding, and sucrose. After venous access, distraction and encouragement of coping should speed recovery. In sum, research in behavioral approaches to pediatric pain management has provided recommendations for minimizing children's anxiety and pain associated with venous access. *Pediatrics* 2008;122:S134–S139

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PEDIATRIC PAIN FROM medical procedures results in short-term suffering, but there are recent data to indicate that there are also long-term detrimental effects. Specifically, early painful insults might have lasting negative effects on neuronal development, pain threshold and sensitivity, coping strategies, emotionality, and pain perceptions.^{1,2} As an example, Bijttebier and Vertommen³ showed that children with a history of negative medical experiences showed high anxiety before venipuncture and were distressed and uncooperative during the procedure. Childhood medical pain has also been linked to later adulthood fear, pain, and avoidance of medical care.⁴ In addition, high pain at medical visits predicts missed future medical appointments and poor health care follow-up.^{5–7}

Fortunately, there is a rich body of data supporting behavioral strategies that mitigate the anxiety and pain associated with pediatric medical procedures generally,⁸ and children's needle-related pain in particular.⁹ Nonpharmacologic or behavioral approaches to acute pediatric pain are rooted in the gate-control theory.^{10,11} The theory suggests that descending nerve impulses from the brain, such as thoughts, beliefs, emotions, and attention, can influence the ascending pain signal from the tissue damage. For example, anxiety might heighten pain experience, whereas attention focused on a pleasant activity might decrease pain. Thus, behavioral interventions typically involve teaching coping, inducing relaxation, or providing distraction. Although literature documenting the efficacy of behavioral interventions for children's acute medical pain exists, the data regarding recommendations for a specific intervention for a specific patient facing a specific procedure can be elusive. That said, it can be argued that data addressing behavioral approaches for the management of pediatric acute pain are sufficiently mature to detail guidelines that should benefit most children. In general, behavioral approaches to children's pain management are grouped into those that occur before the medical procedure and those that are implemented at the time of the event.

PREPARATION FOR VENOUS ACCESS

Robust and consistent findings have indicated that pediatric patients facing acute medical events benefit from adequate preparation; a review on this topic has been published.¹² For example, researchers have documented that preparation helps children face a range of stressful events including anesthesia induction and surgery,^{13,14} dental procedures,¹⁵ magnetic resonance imaging,¹⁶ hospitalization,^{17,18} and ear piercing.¹⁹ There have been fewer studies on venous access, but the data that exist are consistent with those from other medical stressors.^{20–22} Thus, recommendations drawn from the larger preparation literature should be applicable to venous access. To simplify the data, recommendations can be made regarding the timing, format, and content of preparation. In addition, advice for parents can be posited.

Timing

In terms of timing, data suggest that information provided far in advance of the procedure is not recommended because it might serve to increase anxiety; children can dwell on and exaggerate the event²³ or might forget the pertinent information.²⁴ Conversely, information provided immediately before the medical procedure might not allow children sufficient time to process and handle the information, which can heighten stress.²⁵ It is also important to note that these findings are tied to the particular procedure. For example, same-day preparation might heighten distress for major procedures such as surgery²⁵ but benefit children undergoing minor procedures such as ear piercing.¹⁹ Thus, if venous access is part of a major medical procedure (eg, surgery), preparation a few days in advance might be ideal, whereas if it is for a minor procedure (eg, blood draw), same-day information provision should be adequate. Paralleling this advice, the timing of the information should be adjusted accordingly on the basis of whether the child perceives venous access to be a major procedure or a minor one.

Format

A variety of formats have been examined for preparation, such as computer programs,²⁶ videos,^{27,28} puppets,²⁹ written summaries,³⁰ and live models.³¹ Typically, the formats combine some diversion along with didactics and experiential learning. It has been argued that live models (in person or video), rather than puppets, are recommended for younger children, because younger children might not have sufficient cognitive maturity to understand that the doll represents themselves.³² When using written or verbally presented material, there are some data to suggest that memory will be improved if photographs or other illustrations are used.³³

It should be noted that the format of the preparation should include an interactive dialogue between the provider and the patient (ie, the child should not be viewed as a passive recipient of information). Children should be encouraged to ask questions and engage in the process so that their fears might be allayed.³⁴ In terms of who should perform the preparation, there are few data to support a clear recommendation. Research has shown that medical staff, parents, or other personnel can effectively prepare the pediatric patient. Both peer models and adult models are effective media for teaching coping skills.¹² Given the brevity of venous access, preparation might be adequate in a verbal format with visual aids while encouraging the pediatric patient to ask questions and engage in the dialogue. If models are used, younger children will fare better with live models than with cartoons or puppets.

Content

The content of the preparation program is likely the most critical consideration. Given that there may be competing demands for children's attention and that young children have difficulty contemplating future emotional states, the content must be clear and concrete.

The content should contain information about both sensory and procedural expectations.^{19,22,35} The child should learn, step by step, what to expect in concrete and simple terms and what they will physically and emotionally experience during the venous access. Accurate expectations will allow patients to gain a sense of control and mastery and to be able to engage in their own unique coping. For example, Kolk et al³⁶ demonstrated that a parent-read story-preparation program that incorporated both procedural and sensory information reduced anxiety before and during venipuncture for children aged 3 to 8 years. It is also recommended that the information be presented in a detailed rather than vague fashion³⁷ and that emotive language should be avoided, because it might heighten anxiety.³⁸ For example, rather than simply telling the school-aged child first that his or her arm will be cleaned, a clinician might tell the child to expect to feel a cold sensation during cleansing with an alcohol pad. The clinician should continue to walk the child through the steps of the venous access and outline procedural and sensory information in a calm voice and with age-appropriate language.

In addition to sensory and procedural information, a third content area for preparation before procedures is coping-skills training.⁸ In fact, a survey of medical professionals indicated that they perceived coping-skills training to be more effective than relaxation training, modeling, puppet shows, play therapy, and narrative therapies.³⁹ Coping-skills training typically involves instructing the child in relaxation (eg, diaphragmatic breathing, imagery, progressive muscle relaxation) or distraction (eg, counting backward, imagery, repeating a mantra, solving problems).

There are some caveats to these content recommendations. In general, children ≥ 7 years of age show greater benefit from preparation information than younger children.⁴⁰ In addition, children who have had experience with the procedure (eg, repeated venous access for oncology patients) should receive less information, if any at all, because some data indicate that excessive information can heighten anxiety.^{41,42} Children who have had high distress with other procedures benefit from an emphasis on coping-skills training.¹² Last, coping-skills training might be tailored to match with children's natural coping styles⁴³; the literature, however, is somewhat ambivalent in this area.⁴⁴

Parents

The majority of the preparation literature has focused on adequately preparing the child for the medical stressor. That said, many preparation programs include the parents via direct targeting of parents' anxiety⁴⁵ or by training them to be coaches for the pediatric patient.⁴⁶ It is important to engage the parents, because parents often have high anxiety that deserves attention and parent anxiety is strongly predictive of child procedural anxiety.^{47,48} In addition, research suggests that parents' behavior during children's procedures accounts for a great deal of the variability in children's coping and distress.⁴⁹ Specifically, adult distraction and coaching in coping behavior has been shown repeatedly to lower child dis-

TABLE 1 Suggested Language for Parents or Health Care Providers

Language to Avoid	Language to Use
You will be okay; there is nothing to worry about (reassurance)	What did you do in school today? (distraction)
This is going to hurt/this won't hurt (vague; negative focus)	It might feel like a pinch (sensory information)
The nurse is going to draw your blood (vague information)	First, the nurse will clean your arm, you will feel the cold alcohol pad, and next . . . (sensory and procedural information)
You are acting like a baby (criticism)	Let's get your mind off of it; tell me about that movie . . . (distraction)
It will feel like a bee sting (negative focus)	Tell me how it feels (information)
The procedure will last as long as . . . (negative focus)	The procedure will be shorter than . . . (television program or other familiar time for child) (procedural information; positive focus)
The medicine will burn (negative focus)	Some children say they feel a warm feeling (sensory information; positive focus)
Tell me when you are ready (too much control)	When I count to 3, blow the feeling away from your body (coaching to cope; distraction; limited control)
I am sorry (apologizing)	You are being very brave (praise; encouragement)
Don't cry (negative focus)	That was hard; I am proud of you (praise)
It is over (negative focus)	You did a great job doing the deep breathing, holding still . . . (labeled praise)

Words or phrases that are helpful to 1 child may be threatening to another; parents and health care providers should select their language carefully.

stress,⁵⁰ other adult behavior is positively associated with child distress (eg, criticism, apologizing, giving control), and some evidence exists that reassurance (eg, saying, "everything is okay; you are going to be alright") might cause or exacerbate child distress.⁵¹ As such, preparing parents for their children's upcoming venous access might include informing and training them in beneficial behavior (ie, coaching to cope, distraction) and encouraging them to avoid behaviors that are not helpful (eg, excessive reassurance, criticism). Some examples of language to avoid and encourage in parents and health care providers are listed in Table 1. Not only will well-prepared parents be able to minimize their children's pain and anxiety, but having the parents assume an active coaching role has been shown to reduce their own anxiety.⁴⁶

INTERVENTION DURING VENOUS ACCESS

Whereas preparation programs would be conducted at some time before the venous access, additional behavioral approaches are helpful during the procedure itself. First, simply using correct positioning techniques can prove beneficial to the patient. Second, behavioral interventions for distress management have empirical support. For example, Powers⁵² found that behavioral interventions for pediatric acute painful procedures met criteria for "empirically supported" treatments. The intervention packages typically included relaxation,⁵³ breathing exercises,⁵⁴ rehearsal,⁵⁵ reinforcement for appropriate behavior,⁵³ and imagery.⁵⁶ A key component across these interventions, especially for young children, is distraction.⁸ For neonates and young infants, sucrose has been shown to be an effective pain-management intervention.⁵⁷

Positioning

There are sparse empirical data regarding the optimal positioning of children during venous access. However, tentative recommendations can be made on the basis of the few available studies and anecdotal evidence. First, although the literature is mixed regarding the benefits of parent presence versus absence during

children's medical procedures,⁵⁸ pediatric patients and their parents generally prefer for the parents to be present.⁵⁹ During the venous access, research suggests that children should be held by the parent, ideally in the parent's lap and facing him or her.^{20,60} Stephens et al⁶⁰ recommend children as young as 3 to 5 months who have some head and trunk control to be held in this manner. The arm of the infant or child can be above or below the parent's shoulder, and the child's arm and hand should be secure on a flat and stable surface. Younger infants might be held in the parents' arms and swaddled for comfort.⁶¹

Distraction

Distraction has been shown to minimize children's fear, anxiety, and pain associated with acute painful medical procedures, with a number of studies examining children's venous access.⁶²⁻⁶⁴ Distraction stimuli vary and include movies,⁶⁵ interactive toy robots,⁶⁶ virtual-reality goggles,⁶⁷ music,⁶⁸ bubble-blowing,⁶⁹ and short stories.⁷⁰

As for a rationale for the pain-reducing effects of distraction, McCaul and Malott⁷¹ hypothesized that the brain has a limited capacity to focus attention on stimuli; if attentional resources are devoted to focusing on a distracting task, there is little left for attending to painful stimuli. It has also been suggested that distraction alters nociceptive responses by triggering an internal pain-suppressing system.⁷² Cohen⁶⁵ argued that distracters divert attention away from painful stimuli and from other stimuli that have been classically conditioned to produce distress (eg, medical equipment). In addition, some distracting stimuli may induce behaviors that are incompatible with distress, such as laughing while watching a funny movie. Regardless of the reason, distraction seems to be an excellent pain-management intervention for children.

A meta-analysis indicated that distraction for pediatric pain management was equally effective across gender and ethnic groups but was most effective for children <7 years old.⁶³ In selecting the best distracter, data have been inconclusive. For example, Mason et al⁷⁰ found an

TABLE 2 Guidelines for Sucrose for Venous Access

1. Administer 2 mL of 25% sucrose solution by syringe into the infant's mouth (1 mL in each cheek) or allow infant to suck solution from a nipple (pacifier) for no more than 2 minutes before the start of the painful procedure
2. Sucrose may be given for >1 procedure within a relatively short period of time, but it might not be effective if administered more than twice in 1 h
3. Sucrose seems to be more effective when given in combination with a pacifier; nonnutritive suck also contributes to calming the infant and decreasing pain-elicited distress

Contraindications: avoid use if the patient (1) is under nil-per-os restrictions, (2) has fructose intolerance, (3) is low birth weight or preterm (<28 weeks' gestation) and has not begun oral feeds, or (4) has a recent history of glucose intolerance.

Adapted from Zempsky WT, Cravero JP; American Academy of Pediatrics, Committee on Pediatric Emergency Medicine and Section on Anesthesiology and Pain Medicine. *Pediatrics*. 2004;114(5):1348–1356.

interactive robot to be more effective than a story book, whereas MacLaren and Cohen²¹ showed movies to be superior to an interactive toy. Theoretically, optimal distraction stimuli involve multiple modalities (eg, vision, hearing, touch) and produce positive affective states that are incompatible with distress.⁶² It is also important to select age-appropriate stimuli and ones that involve the parents as coaches. The latter recommendation stems from findings that children rarely engage in coping without the assistance of coaches.⁶⁶ Fine-grained analyses of procedural phases have shown that it is critical that distraction be used before the procedure to reduce anticipatory anxiety, during the procedure, and after the procedure to enhance recovery.⁸ The only contraindications for distraction stem from literature indicating that it might be best to match the intervention to coping style.⁴⁴ As such, if a child finds that watching and being involved in the procedure decreases anxiety and pain, encouraging distraction might not be advisable. In general, given the strong support for distraction, lack of apparent negative adverse effects, low cost, and ease of use, it should be routinely used with venous access procedures, especially for children ≤7 years old.

Interventions for Young Infants

Distraction has been shown to be an effective intervention for young children, including infants from 1 to 24 months old who are undergoing brief stressful medical events,^{50,65} but it has not been sufficiently evaluated for younger infants (eg, birth to 6 months). Evidence-based behavioral methods for these very young patients in-

clude sucrose, nonnutritive sucking, and skin-to-skin contact.

Sucrose water (12%–50%; typically 1 packet of sugar in 10 mL of water) given immediately before an acute painful procedure has been shown to decrease pain in neonates and infants up to ~4 to 6 months of age.^{57,73,74} Results from a systematic review of the literature support using sucrose to provide pain relief to infants undergoing venous access.⁷⁵ As for the mechanism, some have suggested that sucrose works via the activation of endogenous opioids,⁷⁶ although others have not found support for this hypothesis.^{77,78} Sucrose administration is typically done by dipping a pacifier into a solution or instilling it directly into the mouth with a syringe. Although most of the research has examined neonate and infant immunizations, there have been some investigations with venous access, and the findings have consistently supported the pain-management effects of sucrose.^{79,80} Table 2 provides a suggested protocol for administering sucrose.

Research has also shown that nonnutritive sucking (at a rate of or exceeding 30 sucks per minute) is an effective analgesic, especially when combined with sucrose.⁸¹ Other well-supported behavioral interventions for infants undergoing acute painful procedures include breastfeeding^{82,83} and skin-to-skin contact.^{84–86} Therefore, sucrose administration, breastfeeding, and skin-to-skin contact should be considered as evidence-based interventions for venous access pain reduction in neonates and young infants. Whereas sucrose is recommended primarily for infants ≤6 months of age, breastfeeding and skin-to-skin contact should benefit young and older infants alike.

CONCLUSIONS

Behavioral interventions for venous access should be implemented from the point in time when the procedure is initially scheduled until the procedure is complete (Table 3). Preparing the child and the family for the event is important while also taking into consideration the timing, format, and content of the intervention. Providing distraction and coaching for the child in coping skills throughout the venous access procedure will prove helpful in managing fear, anxiety, and pain. With neonates and young infants, breastfeeding, providing sucrose, and skin-to-skin contact are recommended.

TABLE 3 Guidelines for Behavioral Interventions for Venous Access

Preprocedure	Procedure	Postprocedure
Provide clear, nonemotive, and detailed age-appropriate sensory and procedure information	Distraction	Praise coping efforts
Train in coping skills	Encourage coping	Distraction as necessary
Select distraction stimuli	Avoid negative behavior	Encourage coping as necessary
	Breastfeed and provide skin-to-skin contact for young infants	
	Position children facing parents and in laps with arm secured; young infants should be held by parents and swaddled	

"Preprocedure" indicates days to hours before the procedure; "procedure" refers to the time span immediately before the procedure through several minutes after the procedure; and "postprocedure" is from several minutes after the procedure until up to hours later.

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