

ABM Clinical Protocol #23: Non-Pharmacologic Management of Procedure-Related Pain in the Breastfeeding Infant

The Academy of Breastfeeding Medicine Protocol Committee

A central goal of The Academy of Breastfeeding Medicine is the development of clinical protocols for managing common medical problems that may impact breastfeeding success. These protocols serve only as guidelines for the care of breastfeeding mothers and infants and do not delineate an exclusive course of treatment or serve as standards of medical care. Variations in treatment may be appropriate according to the needs of an individual patient. These guidelines are not intended to be all-inclusive, but to provide a basic framework for physician education regarding breastfeeding.

Background

NEWBORNS AND YOUNG INFANTS routinely experience pain associated with commonly used invasive procedures such as blood sampling and intramuscular injections (e.g., vaccinations, vitamin K) and, in some countries, circumcision (the removal of some or all of the foreskin [prepuce] from the penis).¹ Reduction of pain is both a professional imperative and an ethical expectation because untreated pain has detrimental consequences² such as greater pain sensitivity in later childhood³⁻⁶ and may lead to permanent neuroanatomical and behavioral abnormalities as demonstrated in animal models.^{3,7} Moreover, pain is a source of concern and distress for new parents and may disturb mother-infant bonding.⁸ Pain reduction therapies are often underused for the numerous minor procedures that are part of routine medical and nursing care for neonates.^{9,10} Growing scientific and clinical evidence from both animal and human newborns points to the efficacy of natural, non-pharmacologic interventions to reduce pain due to minor procedures.

Purpose

The International Evidence-Based Group for Neonatal Pain and the American Academy of Pediatrics recommend that all neonatal units develop strategies to minimize the number of minor painful or stressful procedures and to provide effective non-pharmacologic and/or pharmacologic pain relief for newborns.¹¹ The purpose of this protocol is to provide health-care professionals with evidence-based guidelines on how to incorporate non-pharmacologic or behavioral interventions to relieve procedure-induced pain in the breastfeeding infant.

Soothing the Newborn

There are several techniques that have been shown to provide pain relief for newborns (0–28 days of age) undergoing painful procedures. In breastfed newborns, breastfeeding itself is the preferred method to alleviate procedural

pain. In addition to being safe, effective, natural, and without added cost, it provides an additional opportunity to promote and support breastfeeding. The individual components of breastfeeding (sucking, sweet taste, and warm contact) may be used separately or, preferably, in combinations when breastfeeding itself is not possible.

Breastfeeding or human milk

1. When available, breastfeeding should be the first choice to alleviate procedural pain in neonates undergoing a single painful procedure, such as venipuncture or heel lance.¹²⁻¹⁴ Breastfeeding should not be discontinued prior to the procedure. Studies show that when breastfeeding was stopped shortly before a painful procedure, no significant differences were found (compared to control groups) in outcomes in terms of the orogustatory, emotional, tactile, or thermal experience.¹⁵ When breastfeeding is not possible, whether because of the unavailability of the mother or difficulties with breastfeeding, consider the use of expressed human milk by dropper, syringe, or bottle, which has been shown to soothe newborns experiencing procedural pain.¹⁶⁻¹⁹ Administration of human milk can also be combined with sucking, by dipping a pacifier (dummy) in the milk, as described below for sucrose.
2. Although some studies have demonstrated the efficacy of human milk alone,^{17,20} human milk may not be equivalent to breastfeeding because of breastfeeding's multicomponent experience. Breastfeeding throughout the painful procedure is likely to be superior to human milk alone on the basis of synergism between the components of breastfeeding.^{15,20}

Skin-to-skin contact

1. Coordinating a breastfeeding session with the timing of the procedure is best, but, if this is not possible,

skin-to-skin contact can comfort infants undergoing a procedure such as a heel lance. Skin-to-skin contact also gives the mother a caretaking role during the procedure that is unobtrusive, and by diminishing infant stress, it can increase maternal confidence as to her value to the infant.²¹

2. Parental contact and sucrose may act synergistically to reduce pain in neonates. Therefore if feasible, this combination can be employed.²² Sucrose taste—first studied 20 years ago—is readily available for increasing the efficacy of other non-pharmacologic techniques.¹⁵ Sucrose administration is covered in more detail in the section below. Sucrose and pacifier can both be combined with the skin-to-skin component of parental contact.

Sucrose and sucking (in combination or separately)

Sucrose taste has been shown to be effective analgesia for newborns and young infants for minor procedures,^{23–25} but not for more painful experiences like bladder catheterizations:²⁶

1. *Sucrose and pacifier.* The combination of oral sucrose and pacifier or non-nutritive sucking is remarkably soothing.²⁷ This technique offers pain reduction to infants undergoing a wide variety of painful procedures, including heel lance, umbilical or percutaneous venous or arterial catheter insertion, central venous line placement, subcutaneous or intramuscular injection, lumbar puncture, circumcision, and endotracheal suction.^{1,25,28} Because pain reduction achieved when using both sucrose and non-nutritive sucking is similar to that with breastfeeding, using a pacifier (dummy) dipped in 24% sucrose (by weight) solution whenever breastfeeding is not possible is an effective option.^{27,29} Sucrose administration should begin 2 minutes prior to the procedure. If use of a pacifier is not an available or acceptable option, sucrose can also be combined with sucking by dipping a clean, gloved (or non-gloved parental) finger in the sucrose solution. If sucking a pacifier or finger is not an option, administer a sucrose solution orally before the procedure.¹ When parents are present, they should be educated that sweet substances other than breastmilk and pacifiers both are recommended in the newborn period only for procedural pain.
2. *Glucose versus sucrose.* Glucose has also been shown to be an acceptable and effective alternative analgesic.^{30,31} Taste difference is not a factor. Studies in rat³² and human³³ newborns have not shown a preference for sucrose over glucose. The commercial availability of sucrose (table sugar) may have increased its use.
3. *Sucrose by syringe.* If use of a pacifier is not possible, administer 0.5–2 mL of a 24% sucrose solution orally via syringe 2 minutes before the painful procedure.^{1,34} Several 24% sucrose solutions are commercially available. Sucrose administered by oro- or nasogastric tube is not analgesic.
4. *Pacifier alone.* While pacifiers alone may decrease crying associated with painful procedures, they do not have the same affect on physiological parameters such as heart rate or vagal tone.^{35,36} Moreover, sucking a paci-

fier has been found to reduce pain only when the suck rate exceeds 30 sucks/minute.²⁵ A pacifier (or clean gloved or parental finger) should be used as the sole soothing intervention only if breastfeeding, human milk, sucrose (or glucose), and skin-to-skin contact are unavailable because non-nutritive sucking has consistently been found to be better than no intervention at all.³⁷

5. *Sucrose better than human milk?* At least one study indicates that sucrose is more effective than human milk, when both are administered orally via syringe, at reducing infants' cry time, recovery time (heart rate peak returns to baseline), and change in heart rate.²³ The sugar in human milk is lactose, which has been shown to be an ineffective analgesic agent.³² The analgesic component of human milk may be attributed to its fat content or other constituents.

Soothing the Premature Newborn

Less research has been completed for this population, but there are several techniques that can be used to relieve pain in premature newborns. Breastfeeding may be problematic secondary to the medical status of the infant. Preterm infants may be medically compromised and/or may be developmentally unable to suck or swallow. In such cases, individual components of breastfeeding or a combination of the components of breastfeeding (e.g., contact and sweet taste) are available. Concerns about prolonged sucrose exposure in the premature infant are real.³⁸ One study documented infants born at <31 weeks who were given a higher number of sucrose doses had lower scores in motor development and attention when assessed at term.³⁹ There are no uniform gestational age criteria for studies on analgesia used in preterm infants. The following recommendations are based on studies of infants with an average gestational age of 30 weeks or greater. Not all studies have included infants between 28 and 30 weeks in gestational age, however, and it is unclear if the following recommendations are applicable to that age range. The data do not allow us to extrapolate these recommendations to the smallest premature infants (<27 weeks).

1. Skin-to-skin contact provides effective pain reduction for premature newborns.^{40,41}
2. In very-low-birth-weight neonates (27–31 weeks of gestation) undergoing consecutive heel lances, a pacifier dipped in sucrose or in water significantly reduced pain compared with infants who did not receive any intervention.⁴²
3. The value of sucrose as a pain reducer in the preterm infant is well established.^{39,43–45} The recommended dosage in this population is 0.1–0.4 mL of 24% sucrose solution.^{1,44} Further pain reduction can be achieved when preterm infants receive 24% sucrose as three doses (0.1 mL, 2 minutes apart given 2 minutes and immediately prior to heel lance and 2 minutes after lance) rather than as a single dose.⁴⁵
4. The efficacy of breastfeeding and human milk as a pain reducer for the preterm or low-birth-weight infant is not well established in the current literature and should be the subject of further research; no studies have been performed specifically in this population. Regardless, if

a mother wishes to breastfeed or provide her infant with human milk instead of sucrose, this should not be discouraged.

5. Skin-to-skin contact plus sucrose has not been formally evaluated in premature infants, but may provide pain reduction for the preterm or low-birth-weight neonate.

Soothing the Older Infant (1 Month to 1 Year of Age)

Breastfeeding or its components as an analgesic technique has not been fully researched across this older population. For children older than a year, the focus of published literature is on the use of distraction techniques, which falls outside the scope of this protocol.⁴⁶

1. *Sucrose*. Two recent meta-analyses of 10 and 14 randomized clinical trials (RCTs) on infant pain^{47,48} found sucrose to be an effective pain management strategy for infants and children up to 12 months of age. Two milliliters of 25% sucrose was effective during vaccination up to 6 months of age;⁴⁹ however, 2 mL of 24% sucrose was not effective for possibly more painful procedures like bladder catheterization in children older than 1 month of age.²⁶ Increasing the concentration of sucrose solution may be more effective as the infant ages.⁴⁸ One study explored the pain-relieving qualities of sucrose in children up to 48 months of age⁵⁰ and found effectiveness compared to no treatment. Others, however, report lack of effectiveness with lower concentrations and younger ages.^{49,51} Sucrose taste alone was effective for one vaccination up to 12 months of age⁵² but did not demonstrate similar analgesia for multiple (three) vaccinations.⁵³ The higher concentrations of sucrose solutions may be more effective at older ages;⁵⁴ however, the majority of studies used differing concentrations, therefore precluding recommendations on the optimal concentration and dose.^{47,48}
2. *Maternal/caretaker behavior*. It has been noted that maternal behavior during a painful procedure accounts for up to 26% of infant pain behavior during both the procedure and the recovery period.⁵⁵ Maternal distress was an especially important determinant of pain behavior in infants with low vagal tone compared to infants with high vagal tone.⁵⁶ Giving parents a caretaking role, such as securing or distracting the child, can reduce parental sense of helplessness. When parents are unavailable or unable to play a caretaking role, consider recruitment of another person (e.g., nurse) to help secure and/or distract the child.²²
3. If the infant is still breastfeeding, the mother should be invited to try it. Although the efficacy of breastfeeding and human milk as a pain reducer for older infants has not been extensively studied, there is potential benefit/minimal risk.
4. The upper age limit of effectiveness of sucrose as a pain reducer has not been fully studied, and sucrose therefore cannot be recommended as a pain reducer in infants older than 12 months at this time.^{22,47,49} A recent publication of workshop proceedings reviews the evidence for other techniques such as physical, psychological, and pharmacological interventions and has shown a range of non-pharmacologic treatments to be

effective at reducing older childhood vaccine injection pain.^{47,57–59}

Recommendations for Future Research

Further research is needed to establish the most effective non-pharmacologic methods to treat procedural pain for both premature newborns and infants out of the newborn period. In particular, research should focus on the potential of breastfeeding and human milk to reduce pain for premature newborns, newborns experiencing multiple painful procedures, and the older breastfeeding infant. Research is also needed on the effectiveness and effect of increasing concentrations of sweet tastes across different ages in early childhood, as well as the comparison of different combinations of analgesic treatments for older infants/toddlers experiencing procedure-induced pain.

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