Breastfeeding as a Pain Intervention When Immunizing Infants

Cheryl Tansky and Claire E. Lindberg

ABSTRACT

Pain is a perception that is often overlooked in the infant population, especially with regard to immunizations. Evidence has shown that infants do perceive and remember pain, demonstrating heightened pain responses to other painful procedures later in life. However, there has been very little research to determine a natural, cost-effective intervention to pain perception in the infant population. Breastfeeding is an intervention that incorporates those qualities, and its ability to decrease infants' pain perceptions has been recently studied. This article presents a review of the current literature on breastfeeding as an intervention to the pain caused by immunizations, as well as minor painful procedures in general. The evidence has demonstrated significant positive outcomes to decreased pain perception in the infant population when breastfeeding is used as an intervention. Nurse practitioners should use this evidence to encourage breastfeeding mothers to use the act of nursing their infants as a distraction to the pain produced by routine immunizations in the primary care setting.

Keywords: breastfeeding, EMLA, gate-control theory, immunizations, infant, injections, newborn, pain, vaccinations

CLINICAL ISSUE

According to the current Centers for Disease Control and Prevention (CDC) guidelines,[1] infants 18 months and younger are scheduled to receive a total of 27 required immunizations, including the oral rotavirus vaccine. These infants typically receive 18 of these immunizations between birth and 6 months and may receive 1 to 6 immunizations with each well-child visit.[1] Most often, infants undergo routine immunizations without adequate intervention to decrease the pain caused by the injections.

Unfortunately, infants have limited means to cope with pain because they "cannot rub a painful area and stimulate non-nociceptive touch fibers that would block the pain sensation, nor can they distract themselves through visualization."[2] There also are no current systemic pharmacological treatments that are appropriate to provide pain relief during minor procedures, such as immunizations, in this age group.[3] A topical cream consisting of prilocaine and lidocaine decreases the pain associated with circumcisions[4] and venipuncture;[5] however, its effectiveness for vaccinations is limited by the fact that it only penetrates about 5 mm into the skin and by the need to apply it at least 1 hour prior to a painful procedure.[4,6,7]

According to Puchalski and Hummel,[2] "full-term infants exposed to short-term pain early in life have an increased response to later painful procedures."[2] In addition, pain anticipation may occur in infants who are repeatedly exposed to noxious stimuli.[4] Short- and long-term sequelae of pain related to immunizations necessitate that health care practitioners provide effective interventions to manage infants' pain to help convey comfort and aid in the prevention of long-lasting effects that are potentially harmful to the overall health of the infant.[8]

An intervention that is natural, cost-effective, and has no ill-effects would be ideal for use in primary care settings for infants receiving immunizations. Research has shown that breastfeeding is a natural and effective intervention to decrease pain perception in infants during vaccinations;[9,10] as well as during venipuncture and heel-sticks.[3,11,12] It encompasses 3 components that are comforting and analgesic to infants: taste, suckling, and skin-to-skin contact.[11]

THEORETICAL FRAMEWORK

Gate-control theory explains that "the *substantia gelatinosa*, a functional unit of densely packed cells which extends the length of the spinal cord, is the site of a transmission-blocking action which 'closes a gate' to impulses entering the spinal cord on their way to the transmission cells" when non-nociceptive touch fibers are stimulated.[13,14] Conversely, "when open, the gate permits sensory input to reach the transmission cells in the dorsal horn of the spinal cord," allowing the perception of pain to get through.[13,14] This potential blocking mechanism can result in little or no pain perception regardless of the intensity of the painful stimuli, and can be activated through touch-stimuli of the skin such as scratching, rubbing, etc.[13]

Repeated exposure to painful stimulation can result in pain anticipation.

The gate-control theory also discusses the idea of central control through modulation of nerve impulses in descending fibers from the brain.[14] The gate tends to close when cognitive activities such as distraction (eg, breastfeeding) are processed along these fibers, therefore preventing the transmission of pain[6] through a "descending blocking action."[13] This mechanism also affects various pain entities such as anxiety, anticipation, and memory of prior experiences.[13]

The gate-control theory has been validated in children with a quasi-experimental design study that compared the effects of touch and bubble-blowing on the pain caused by routine DTP vaccinations in the 4- to 6-year age range.[6] The study found that the children who were allowed to blow bubbles or who had their legs stroked near the injection site during vaccination rated their pain perception lower than the control group that did not use any form of distraction ($P = 0.013$).[6] Like blowing bubbles or stroking a child's leg, breastfeeding can be considered a "distraction" that "closes the gate," allowing little or no pain sensation to get through during the immunization process.

INFANTS' PERCEPTION OF PAIN

Studies evaluating response to immunization in infancy show that infants perceive pain, show signs of remembering the sensation,[2] and develop pain anticipation.[4]

A prospective cohort study examined the effect of neonatal circumcision on subsequent pain responses of infants during vaccination.[15] The authors compared 3 groups (N = 87) of infants. Group 1 was circumcised using the anesthetic cream EMLA (n = 29), Group 2 underwent circumcision with a placebo (n = 26), and Group 3, the control group, was uncircumcised (n = 32). The infants' pain responses were then re-evaluated during routine immunization at 4 to 6 months of age.[15]

Results showed that males who were circumcised, especially those in the group who underwent the procedure with the placebo, had a significantly greater pain response to their routine immunizations than those who were circumcised with the use of the EMLA cream or who were not circumcised ($P < 0.05$),[2,15] suggesting that infants do perceive and remember pain. Caution should be utilized before applying the study findings to female infants.

Further literature review explains that infants' response to pain is more exaggerated than adults', resulting in increased cortisol production, secretion of antidiuretic hormone leading to water retention, and the breakdown of carbohydrates, fat, and protein for energy.[4] This reaction causes an increased metabolic rate, which raises the susceptibility for complications.[4]

This response to pain provides strong rationale for interventions to reduce infants' pain perception during minor painful procedures.

These findings suggest that an intervention, such as breastfeeding, during minor painful procedures could be utilized so that the pain perception and memory of pain will possibly be diminished or eliminated in breastfed infants undergoing routine immunization.

Based on the gate-control theory, the 3 components of breastfeeding may provide a distraction to pain perception by stimulating non-nociceptive nerve fibers that "close the gate" to painful stimuli, therefore decreasing infants' perception of pain.

The 3 components of breastfeeding may provide a distraction to pain perception by stimulating non-nociceptive nerve fibers that "close the gate" to painful stimuli.

The focus of this article will be to discuss the evidence that breastfeeding does indeed have an analgesic effect in infants who are being immunized, and therefore should be promoted and utilized by nurse practitioners (NPs) in current practice as a means to reducing pain during this common procedure.

REVIEW OF LITERATURE

An electronic search was conducted utilizing multiple databases including CINAHL, MEDLINE, PubMed, and Cochrane Library. The internet search engines Google and Yahoo were also accessed, as well as reference lists from journal articles. The following key words were used: infant, newborn, breastfeeding, vaccinations, injections, immunizations, EMLA, gate-control theory, and pain. Results from the search included in the literature review were limited to the past 5 years from peer-reviewed journals unless significant information was found in older references. Breastfeeding was found to be utilized as an intervention in 6 studies. Those studies are reviewed below and can be referenced in Table 1.

BREASTFEEDING AS AN INTERVENTION

Studies have demonstrated that using non-nutritive sucking, sweet oral solutions (glucose or sucrose), and skin-to-skin contact decrease pain perception in infants.[3] Recently, breastfeeding has also been studied as an alternative to painful procedures, with positive outcomes.

A prospective, randomized, controlled trial conducted by Phillips et al[12] in California included healthy, full-term, breastfed newborn infants (N = 96) who were undergoing heel- sticks for routine newborn screening. The infants were randomly separated into 3 groups: Group 1 (n = 32) was breastfed, Group 2 (n = 39) was given pacifiers while being held by their mothers, and Group 3 (n = 25) was given pacifiers while being held by research assistants (nonmaternal holding). The primary outcome variable was crying during and post procedure (percentage of infants that cried and mean percentage of time spent crying).[12]

The *percentage of infants that cried* during the procedure (Group 1 = 69% versus Group 3 = 100%; $P = < 0.01$) and for 3 minutes post procedure (Group 1 = 28% vs. Group 3 = 60%; $P = 0.03$) shows that breastfeeding provided more analgesia when compared to pacifier use with nonmaternal holding. Breastfeeding and pacifier use with maternal holding were both useful at providing analgesia when compared to pacifier use with nonmaternal holding, as demonstrated by the *percentage of time the infants cried* during the procedure (Group 1 = 33%; Group 2 = 45%; Group 3 = 66%; $P = < 0.01$ between Groups 1 and 3; $P = < 0.03$ between Groups 2 and 3). No statistical significance was found between Groups 1 and 2 with regard to how many infants cried and for how long.[12]

A second randomized, controlled study conducted by Carbajal et al[3] took place in a maternity ward and included full-term breastfed infants (N = 180) undergoing routine venipuncture. The infants were randomly and evenly divided into 4 groups (n = 45). Group 1 infants were breastfed starting at 2 minutes before the procedure and continuing throughout; infants in Group 2 were held by their mothers without being breastfed starting at 2 minutes prior to venipuncture; Group 3 infants were placed on a table and received 1 mL of sterile water without a pacifier as a placebo; and Group 4 was laid on a table and received 1 mL of 30% glucose followed by sucking on a pacifier. The researchers utilized the Douleur Aigue Nouveau-ne (DAN) behavioral scale as

Table 1. Summary of Relevant Research on Breastfeeding Used as an Intervention to Decrease Pain Perception in Infants

Study	Setting	Methods	Demographics	Control and Treatment Groups	Results	Conclusions
Phillips et al[12]	A hospital in California	Prospective controlled trial to compare analgesic effects of breastfeeding vs. pacifier use in infants undergoing heel-sticks; and to compare analgesic effects of pacifier use with maternal holding vs. non-maternal holding.	96 healthy breastfed infants. Breastfed group: 32 (42% male, 58% female); mean age 37.1 hours. Pacifier-mother group: 39 (33% male, 67% female); mean age 36 hours. Pacifier-other group: 25 (48% male, 52% female); mean age 37.6 hours.	All subjects randomly assigned to 1 of 3 groups: breastfeeding, mothers who offered a pacifier, and research assistant who offered a pacifier (pacifier-other, nonmaternal holding group).	Percentage of infants who cried in breastfeeding group vs. pacifier-other group: 69% vs. 100%, respectively ($P < 0.01$). Percentage of infants who cried 3 minutes post procedure in breastfeeding group vs. pacifier-other group: 28% vs. 60%, respectively ($P = 0.03$). Percentage of time crying in breastfeeding group vs. pacifier-other group: 33% vs. 66%, respectively ($P < 0.01$).	Breastfeeding is more analgesic than pacifier use with nonmaternal holding.
Carbajal et al[3]	Hospital maternity ward	Random controlled trial to investigate the efficacy of breastfeeding for pain relief during venipuncture.	179 full-term newborn infants. Breastfeeding group: 23 boys, 21 girls, median age 3 days. Mothers' arms group: 24 boys, 21 girls, median age 3 days. Placebo-sterile water group: 22 boys, 23 girls, median age 3 days. 30% glucose plus pacifier group: 24 boys, 21 girls, median age 3 days.	All subjects randomly assigned to 1of 4 groups: breastfeeding, maternal holding, placebo, or 30% glucose plus pacifier.	Median pain scores for breastfeeding, maternal holding, placebo, and 30% glucose plus pacifier were 1 (0-3), 10 (8.5-10), 10 (7.5-10), and 3 (0-5), respectively, with the DAN scale; and 4.5 (2.25-8), 13 (10.5-15), 12 (9-13), and 4 (1-6), respectively, with the PIPP scale ($P < 0.0001$) among the groups.	Breastfeeding effectively reduces pain response during minor invasive procedure in full-term infants.
Gray et al[11]	Two hospitals in Massachusetts	Prospective controlled trial to determine whether breastfeeding is analgesic in infants undergoing heel lance.	30 full-term, breastfed infants. Breastfeeding group: 7 males, 8 females, mean age 46 hours. Control group: 6 males, 9 females, mean age 40 hours.	All subjects randomly assigned to 1 of 2 groups: breastfeeding or control.	Breastfed infants cried only 4% and grimaced only 8% during entire blood collection vs. control infants, 43% crying and 50% grimacing ($P = 0.0002$ and $P = 0.0001$). Mean increase in heart rates above baseline for breastfed infants was 6 bpm vs. 29 bpm for control infants ($P = 0.001$).	Breastfeeding is a potent analgesic intervention in infants during heel-lance procedure for blood collection.

Table 1. *continued* Summary of Relevant Research on Breastfeeding Used as an Intervention to Decrease Pain Perception in Infants

Study	Setting	Methods	Demographics	Control and Treatment Groups	Results	Conclusions
Efe and Ozer[9]	Healthy child clinic in Turkey	Prospective controlled trial to examine the pain-relieving effect of breastfeeding during immunizations.	66 healthy infants. Breastfeeding group: 17 males, 16 females, mean age 2.79 months. Control group: 20 males, 13 females, mean age 3.08 months.	All subjects randomly assigned to 1 of 2 groups: breastfeeding or control.	Mean crying duration for breastfeeding group was shorter than control group: 35.85 seconds vs. 76.24 seconds, respectively (P = 0.001).	Breastfeeding is associated with significantly reduced crying time in infants during immunizations.
Dilli et al[10]	Well-child unit in Turkey	Prospective controlled study to investigate interventions that affect pain reduction during vaccination.	158 infants under 6 months of age. Breastfeeding group: 73 infants. Control group: 85 infants.	All subjects randomly assigned to 1 of 2 groups: breastfeeding or control.	Median crying time for the breastfeeding group was shorter than control group: 20 seconds vs. 150 seconds, respectively (P = 0.001). Median NIPS score was less for breastfeeding group than control group: 3.0 (0-6) vs. 6.0 (0-7), respectively (P = 0.001).	Breastfeeding has demonstrated effective pain reduction during routine vaccination.
Bilgen et al[16]	A hospital in Turkey	Prospective controlled trial to investigate the effectiveness of breastfeeding in reducing pain in infants undergoing heel-sticks.	130 healthy, full-term, breastfed infants. 25% sucrose group: 17 boys, 18 girls, median baseline heart rate (MBHR) 120 bpm. Human milk group: 14 boys, 19 girls, MBHR 120. Sterile water group: 18 boys, 16 girls, MBHR 119 bpm. Breastfed 2 minutes prior group: 10 boys, 18 girls, MBHR 120 bpm.	All subjects randomly assigned to 1 of 4 groups: 25% sucrose group, human milk group, sterile water group, or breastfed 2 minutes prior group.	The median crying time for the 25% sucrose group was 36 seconds vs. 51 seconds for the breastfed 2 minutes prior group (P = 0.0003). Median IBCS scores were 3.0 (3-5) for the 25% sucrose group and 5.0 (3-6) for the breastfed 2 minutes prior group (P = 0.001). The percentage change in heart rate after heel-prick was significant at 3 minutes between the 25% sucrose group and the breastfed 2 minutes prior group (P = 0.007).	25% sucrose significantly reduced the crying time and pain score when compared with breastfeeding.

primary measure, with ranges of 0 (no pain) to 10 (maximum pain) and the premature infant pain profile (PIPP) scale as secondary measure, with ranges of 0 (no pain) to 18 (maximum pain) to assess the outcomes.[3]

Results showed that 16 infants in Group 1 demonstrated no adverse responses to venipuncture, and 35 exhibited minimal or no pain (median DAN score = 1).[3] No reduction in response to pain from venipuncture was found in Groups 2 or 3 (median scores = 10 for both), and the median score for Group 4 was 3 according to the DAN scale.[3] PIPP scale median scores were as follows: Group 1 = 4.5, Group 2 = 13, Group 3 = 12, and Group 4 = 4.[3]

This study showed that breastfeeding was at least as effective at decreasing the level of infant pain as using 30% glucose plus sucking on a pacifier during a minor painful procedure. There was no significant difference between pain scores on the DAN and PIPP scales between Groups 1 and 4. Babies who were breastfed had significantly less pain on both scales than Groups 2 and 3 ($P < 0.0001$).[3]

A third randomized, controlled study conducted by Gray et al[11] included healthy, full-term breastfed infants (N = 30) from 2 different hospitals in Massachusetts. This study was conducted to demonstrate if breastfeeding provided analgesia in infants undergoing a heel-lance procedure.

The infants were randomly separated into 2 groups: 15 in the breastfeeding group, 15 in the control group. The breastfeeding group was allowed to nurse during blood collection, while the infants in the control group were swaddled and kept in their bassinets during the procedure. Crying, facial grimacing, and heart rate were used to measure the outcomes of this study.[11]

Crying time and median NIPS scores were significantly lower in the breastfed group.

Mean cry levels were reduced by 91% and facial grimacing by 84% in the breastfed group. Mean increase in heart rate was also significantly lower in the breastfed group (mean = increase of 6 beats per minute [bpm] above baseline) when compared to the control group (mean = increase of 29 bpm above baseline) ($P = 0.001$). This study also demonstrates that breastfeeding is useful in reducing pain perception in infants. The fact that 11 of the 15 breastfeeding infants did not cry at all suggests that breastfeeding may block pain transmission.[11]

Two studies done in Turkey utilized breastfeeding as an intervention during routine immunization.[9,10] The first study was a prospective randomized controlled trial conducted by Efe and Ozer,[9] which included healthy, full-term infants (N = 66) presenting to a university healthy child clinic for routine 2-, 3-, or 4-month immunization (a combination injection that includes diphtheria and tetanus toxoids and acellular pertussis vaccine). Infants were assigned to either the breastfeeding group (n = 33), in which the infants were encouraged to breastfeed before, during, and after the procedure; or the control group (n = 33). Control group infants were swaddled in a blanket with the leg being injected left uncovered while the baby was placed on a soft-surfaced treatment table. In addition, control group infants were soothed vocally by their mothers, who held their legs during the procedure. After the procedure, the infants were cuddled by their mothers and were allowed to use a pacifier.[9]

Researchers measured audio-recorded duration of crying beginning immediately after injection to cessation of crying up to the maximum time of 3 minutes, and oxygen saturation and heart rates during injection and after removal of the needle.[9]

Total duration of crying was significantly shorter in the breastfeeding group (mean [M] ± standard deviation [SD] duration, 35.85 ± 40.11 seconds) versus the control group (M ± SD duration, 76.24 ± 49.61 seconds), $P = 0.001$; although there was no significant difference between the 2 groups in heart rate or oxygen saturation. Another important finding of this study was that 9 of the 33 breastfed infants did not cry while undergoing the immunization process. An important limitation in this study is the inability to generalize the findings to infants receiving multiple injections.[9]

The second study was a prospective, controlled, randomized study conducted by Dilli et al[10] that included 250 healthy infants and children (ages 0 to 48 months) who attended a well-child unit of the Department of Pediatrics in Turkey. A subset of infants under the age of 6 months (N = 158) who received single or multiple immunizations were divided into either the breastfeeding (n = 73) or control (n = 85) group.

The 2 outcome measures were crying time (measured from needle insertion until all crying ceased) and the Neonatal Infant Pain Scale (NIPS), which includes 6 categories (facial expression, cry, breathing pattern, arm and leg movements, state of arousal) that are each assigned a score of 0 or 1, with the exception of the cry category, which can also be assigned a 2. A score of greater than 3 indicates pain, with 7 being the maximum score.[10]

Crying time and median NIPS scores were significantly lower in the breastfed group when compared to the control (non-breastfed) group.[10] The results were as follows: crying time recorded in seconds for the breastfed group (median = 20.0, range = 0-120) versus the control group (median = 150, range = 0-180), $P = 0.001$; and the NIPS scores for the breastfed group (median = 3.0, range = 0-6) versus the control group (median = 6.0, range = 0-7), $P = 0.001$.[10] These results demonstrate that breastfeeding during routine immunizations provides effective analgesia in infants up to 6 months of age.[10]

A study conducted by Bilgen et al[16] included healthy term infants (N = 130) who were undergoing a routine heel prick at a hospital in Turkey. The infants were randomly assigned to 1 of 4 groups: Group 1 (n = 35) was given 25% sucrose; Group 2 (n = 33) was given their mother's milk; Group 3 (n = 34) was given sterile water; and Group 4 (n = 28) was breastfed 2 minutes prior to the procedure. Crying times and heart rate were evaluated over 3 minutes from the time of heel prick. The infant body coding system (IBCS) behavioral pain scale was used to measure 6 different variables: hand, foot, arm, leg, head, and torso movements of the infants over a 2-minute duration beginning with the heel prick. The infants, excluding Group 4, were given 2 mL of the test solutions (sucrose, mother's breast milk, or sterile water) via syringe for less than 1 minute. The heel prick was then performed 2 minutes after the solutions were given. The breastfed group was allowed to nurse for 2 minutes prior to the heel-stick being performed; however, these infants were not allowed to nurse during the heel-stick or immediately after.[16]

Having signs that are clearly visible in the waiting area about breastfeeding during immunization may prompt mothers who have not yet tried it to ask about it.

The results of this study concluded that the intervention of 25% sucrose significantly decreased the crying times and pain scores of infants when compared to the intervention of breastfeeding 2 minutes prior with median crying times of 36 seconds versus 51 seconds ($P = 0.0003$), as well as median IBCS scores of 3 versus 5 ($P = 0.001$). The percentage change in heart rate post heel-stick was also found to be significant at the 3-minute interval between Groups 1 and 4 ($P = 0.007$).[16]

Contrary to other more recent studies,[3,9-12] the breastfed group in this study had less favorable outcomes regarding a decrease in pain perception. This could possibly be due to the fact that infants in the breastfed group were not allowed to breastfeed during or after the painful procedure.[3-16] Another possible limitation is that it was not documented if the infants were weighed pre and post breastfeeding, which would indicate if milk transfer occurred. Some of the infants may have received little to no milk transfer during the 2 minutes prior to the heel-stick, thereby having a negative effect on the outcome. An important factor to consider was that all the infants were fed 1 hour before the study was conducted.[16]

CLINICAL IMPLICATIONS

According to the gate-control theory, distraction can modify the response to both painful stimuli and pain perception.[17] The literature review has shown that using some type of distraction as an intervention to decrease pain has positive and significant outcomes in infants and young children. In addition, 5 studies have shown that breastfeeding is effective when used as a distraction to infant pain;[3,9-12] including 2 studies that directly addressed breastfeeding during routine immunizations.[9,10] The Bilgen et al[16] study, which was the only study that did not show that breastfeeding was useful as an intervention to pain, had some major limitations and was implemented in a significantly different manner. These findings suggest that consideration should be given to promoting breastfeeding as an intervention during immunizations. Maternal education about this option by NPs, midwives, or other clinicians during prenatal visits

can be performed when feeding options are discussed. Education on this topic in this setting allows ample time for questions and discussion and may actually help promote breastfeeding in general.

Another option is to provide education to parents in the hospital during the immediate postpartum period, where valuable resources such as maternity nurses and lactation consultants are available to help assist the breastfeeding mother nurse while her infant is being vaccinated. Because it is recommended that infants receive their first immunization in the hospital,[1] this would be the ideal setting to promote the intervention and to witness its effect. Hospital policies that provide for this intervention for all breastfeeding mothers are in keeping with the current focus on pain management in the hospital setting. Support for such policies can be accomplished through education of the maternity unit staff by clinical nurse leaders, nurse managers, lactation consultants; and pediatric, family, or neonatal NPs. Mentioning this intervention in printed educational material on breastfeeding is also another way to provide reinforcement. Parental education in the hospital allows time for discussion and explanation of the evidence demonstrating the efficacy of the intervention. This would potentially decrease the time required for education in the primary care setting, where time can be very limited.

Another suggestion would be to provide handouts in the gynecological/obstetrics office, the hospital, and primary care settings that summarize the results of the research in an easy-to-follow format that mothers can read in the waiting area, hospital room, or at home. The topic can then be brought up again during the office visit by the NP prior to the infant receiving vaccinations. The NP can reinforce the information provided in the handout by answering questions and allowing the mother to make the decision whether to breastfeed during the immunizations.

Having signs placed in the primary care office that are clearly visible in the waiting area that state, "If you wish to breastfeed your infant during immunizations, please let the staff know upon entering the exam room," can also be utilized to help remind mothers to breastfeed while their infant is being vaccinated, and may prompt other mothers who have not yet tried it to ask the NP about it.

Office staff who call the mothers to inform them of their infants' well visits the day before can be encouraged to remind the mothers to try not to feed their infants immediately before their appointments. Instead, it can be suggested that the infants be fed 1 to 2 hours prior to their appointment time so that it might make latching on much easier at the visit. This can also be printed on reminder cards that are mailed to the infants' homes.

Some disadvantages to breastfeeding during immunizations in the primary care setting include the time needed for the infant to latch on prior to vaccinations and the possibility that the staff or the mother may be uncomfortable with having the infant undergo immunization while nursing. Some mothers may feel uncomfortable having a breast exposed while nursing, while some staff may feel uncomfortable about vaccinating an infant who is being held so close to the mother. These fears can be minimized through proper education and encouragement. As far as the timing is concerned, once the NP has finished the physical exam, the mother should be encouraged to have her infant start nursing; that way, when the nurse comes in with the vaccines, the infant will already be latched on and no extra time should be needed for this to occur.

Another potential downside of using breastfeeding as an intervention to pain is the possibility of the infant associating it with the painful stimuli, therefore affecting the nursing relationship with the mother.[16] However, this has not been confirmed as an observation found in any of the research studies reviewed.

SUMMARY

According to the research, immunizations tend to be the most common health care-related painful experience that infants and children undergo.[6] Therefore, it can be concluded that NPs in the primary care setting, as well as in the obstetrics office and the hospital setting, should offer the suggestion of using breastfeeding as an intervention in the breastfed infant population because the evidence has shown that it does decrease the infants' perception of pain while receiving their immunizations. Also, no harm has been found to come from its use, and it is readily available and cost-effective, therefore making it a very logical choice in the outpatient setting. JNP

References

1. Center for Disease Control and Prevention, Department of Health and Human Services. 2009 Childhood and adolescent immunization schedule. *Available at: http://www.cdc.gov/nip/recs/child-schedule.htm*. Accessed February 5, 2009.
2. Puchalski M, Hummel P. The reality of neonatal pain. *Adv Neonatal Care*. 2002; 2:233-247.

3. Carbajal R, Veerapen S, Couderc S, Jugie M, Ville Y. Analgesic effect of breastfeeding in term neonates: randomized controlled trial. *Br Med J*. 2003;326:13-15.
4. Henry PR, Haubold K, Dobrzykowski TM. Pain in the healthy full-term neonate: efficacy and safety of interventions. *Newborn Infant Nurs Rev*. 2004;4:106-113.
5. Lander JA, Weltman BJ. Topical anaesthetics (EMLA and AMETOP creams) for reduction of pain during needle insertion in children (Protocol). *Cochrane Database Syst Rev*. 2002;(4):Art No: CD004236. doi: 10.1002/14651858.
6. Sparks L. Taking the "ouch" out of injections for children. *MCN Am J Matern Child Nurs*. 2001;2:672-678.
7. Coleman MM, Solarin K, Smith C. Assessment and management of pain and distress in the neonate. *Adv Neonatal Care*. 2002;2:123-139.
8. Mitchell A, Boss BJ. Adverse effects of pain on the nervous systems on newborns and young children: a review of the literature. *J Neurosci Nurs*. 2002;34:228-236.
9. Efe E, Ozer ZC. The use of breast-feeding for pain relief during neonatal immunization injections. *Appl Nurs Res*. 2007;20:10-16.
10. Dilli D, Kucuk IG, Dallar Y. Interventions to reduce pain during vaccination in infancy. *J Pediatr*. 2009;154:385-390.
11. Gray L, Miller LW, Philipp BL, Blass EM. Breastfeeding is analgesic in healthy newborns. *Pediatrics*. 2002;109:590-593.
12. Phillips RM, Chantry CJ, Gallagher MP. Analgesic effects of breast-feeding or pacifier use with maternal holding in term infants. *Ambul Pediatr*. 2005;5:359-364.
13. Siegele D. The gate control theory. *Am J Nurs*. 1974;74:498-502.
14. Melzack R, Wall PD. Pain mechanisms: a new theory. *Science*.1965;150:971-979.
15. Taddio A, Katz J, Ilersich AL, Koren G. Effect of neonatal circumcision on pain response during subsequent routine vaccination. *Lancet*.1997;349:599-603.
16. Bilgen H, Ozek E, Cebeci D, Ors R. Comparison of sucrose, expressed breast milk, and breast-feeding on the neonatal response to heel prick. *J Pain*. 2001;2:301-305.
17. Stevens B, Johnston CC. Pain in the infant: theoretical and conceptual issues. *Matern Child Nurs J*. 1993;21:3-14.

Cheryl Tansky, MSN, CRNP, CEN, FNP-BC, is an NP in the preadmissions/surgical procedure unit at Riddle Memorial Hospital in Media, PA; she can be reached at Jakch@aol.com. *Claire E. Lindberg, PhD, RN, APN, is professor of nursing at the College of New Jersey and a family nurse practitioner in Ewing, NJ.*

In compliance with national ethical guidelines, the authors report no relationships with business or industry that would pose a conflict of interest.

1555-4155/10/$ see front matter

doi:10.1016/j.nurpra.2009.09.014