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Ergonomic Procedure for Heel Sticks and Shots in Kangaroo Care (Skin-to-Skin) Position

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Abstract

Kangaroo Care (KC) has been recommended as a pain-reducing strategy in neonates; however, KC has not been widely used to minimize procedural pain caused in part by nurses'/phlebotomists' discomfort when positioning themselves and the infant for blood drawing and injections. Therefore, an ergonomically designed setup incorporating the use of KC was introduced into clinical practice to facilitate blood draws and injections. The step-by-step procedure used for heel sticks and injections is presented in this manuscript. After implementing the ergonomic step-by-step protocol, complaints of discomfort by nurses and phlebotomists ceased, and an additional benefit was that infant pain responses were significantly reduced.

Keywords: pain; NICU care

Kangaroo care (KC), also called skin-to-skin contact between mother and infant, has been found to decrease pain responses in full-term[1,2] and preterm infants.[3–9] The evidence showing the positive effect of KC on pain has been provided by individual studies and systematic meta-analyses.[10–12] Thus, KC has been recommended as a pain-reducing strategy for heel sticks[11,13] and hepatitis B vaccine injections after birth for all healthy infants.[14–16] Yet, KC has not been widely used to minimize procedural pain in neonatal care units.[17,18] One reason for less-than-optimal use of KC for pain relief is that the position for conducting the blood draw/injection is uncomfortable, awkward, or unfamiliar for the nurse/phlebotomist responsible for conducting the blood sampling.[19] Thus, to facilitate routine use of KC as a nonpharmacologic intervention to reduce pain, an ergonomic procedure was developed and informally evaluated when we conducted a research project to examine effects of different durations of KC on reducing heel stick pain in preterm infants.[20,21] The results of implementing the ergonomic procedure are reported here.

Use of ergonomic science in nursing procedures has the intent to maximize productivity by reducing operator fatigue and discomfort and is designed to minimize physical effort and hence maximize efficiency.[19] Consequently, when ergonomic design is not available or used correctly, many nurses complain of pain when providing care.[22] When administering heel sticks and injections, ergonomics requires that the nurse or

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FIGURE 1 ■ Adjustable stool and recliner.

phlebotomist not bend over or maintain a bent position for the duration of time necessary to secure an adequate blood sample from a preterm or full-term infant's heel or to perform an injection. Thus, an adjustable stool was incorporated into the following procedure for ergonomically correcting the nurse's/phlebotomist's position during blood sampling and injection in KC (Figure 1). Several features of the stool that make it ergonomically appropriate are that the stool swivels in three directions, and the height of the seat is adjustable. The adjustable height ensures that the nurse's/phlebotomist's seated level is level with or slightly higher than the level of the infant in KC position. Therefore, when the blood sample is taken from the heel or an injection is given in the thigh, the phlebotomist/nurse maintains ergonomically correct positioning. In addition, the seat is wide enough to accommodate and allow for greater freedom of movement by the nurse/phlebotomist. Fifty-six heel stick procedures in KC position have been conducted in the authors' previous studies,[20,21] and nurses who administered the heel stick using the ergonomic procedure have reported greater comfort than experienced when bending over to administer the heel stick/injection.

STEP-BY-STEP PROCEDURE

The following is the step-by-step procedure that has worked well when heel sticks and injections were given while the infants were in the KC position. Steps that are relevant to both heel sticks and injections are numbered 1–15. When a step differs for heel stick than for injection, the heel stick procedure is labeled "a" and injection procedure is labeled "b."

1. Using either the standing or sitting transfer technique,[23,24] place the infant in the KC position, skin-to-skin and chest-to-chest with the mother (Figure 2). Be sure that the infant's back is covered by a receiving blanket folded in four or by a specifically designed KC wrap to prevent heat loss. The information about KC wraps is also available at the United States Institute for Kangaroo Care webpage (http://www.kangaroocareusa.org).
2. Allow the infant in KC for ten to 15 minutes because ten to 15 minutes of KC is sufficient for calming and onset of sleep prior to procedural disruptions such as heel sticks.[4,5,7,9,20,25] Although only two minutes of KC has reduced pain in full-term infants,[1] all of the available preterm infant studies have reported ten to 15 minutes of KC before the stick. Thus, based on our results and others identified earlier, ten to 15 minutes is recommended for preterm infants because mothers relax in KC within this time frame. Having the mother relaxed facilitates both positive maternal emotions and maternal involvement in pain management; most mothers desire to assist in relieving their infants' pain.[26–29] As one mother explained, "I know I am the best person to comfort my baby, and I am sure every mother feels that way."[12]
3. The nurse/phlebotomist then pulls the adjustable stool up to the side of the mother and adjusts the height of the seat so she is sitting at or slightly higher than the level of the infant.
4. Prepare equipment on top of a tray or on top of the mother's thigh next to the infant.

For heel sticks:

5a. Extract the infant's foot from beneath the blanket or wrap.

6a. Consider applying or not applying a heel warmer, depending on the unit's policy.[30,31]

7a. Encompass the foot within your hand so the foot is in the most dependent position possible, fostering gravity's facilitation of blood flow into the foot.

8a. Swab the lower lateral area of the heel facing the nurse/phlebotomist with an alcohol prep pad.

FIGURE 2 ■ Transfer the infant in the Kangaroo Care position.

9a. Use a spring-loaded lancet to administer the heel stick and then put the used lancet on the equipment preparation area and take the capillary or blood-collection tube to the lanced site.
10a. Gently squeeze the foot from the side until a full drop of blood appears, taking precautions to avoid aggressively pressing the foot back against the tibia, which increases the risk of overstretching or injuring the Achilles tendon and contributing to further discomfort and pain for the infant (Figure 3).
11a. Capture the blood with the capillary/collection tubes and place filled capillary/collection tubes on the equipment preparation area.
12a. Consider placing or not placing a bandage over the lanced area according to the unit's policy.
13a. Reposition the foot beneath the insulating blanket or wrap used for KC.

For injections:

5b. Extract and expose the infant's thigh from beneath the blanket while keeping the rest of the infant's body beneath the blanket.

FIGURE 3 ■ Heel stick in the Kangaroo Care position.

6b. Position the thigh so that the lateral side for the injection faces the nurse.
7b. Swab the site with alcohol and allow being dry.
9b. Hold the lateral thigh muscle between thumb and fingers and inject the medication.
9b. Consider placing or not placing a small bandage over the injection site according to the unit's policy.
10b. Place the leg back underneath the insulating blanket or wrap.

Concluding steps relevant to both heel sticks and injections are the following:

14. Assess and document infant's pain response to heel stick/injection using a standardized method of measurement as required by the Joint Commission[32] and as stated in the recommendations on pain assessment and management set forth by the National Association of Neonatal Nurses.[33] The most widely used pain assessment tools appropriate for premature or term infants are the following: Premature Infant Pain Profile (PIPP); Crying, Requires Oxygen Saturation, Increased Vital Signs, Expression, Sleeplessness (CRIES); Neonatal Pain Agitation and Sedation Scale (N-PASS); Neonatal Infant Pain Scale (NIPPS); Neonatal Facial Coding System (NFCS); Pain Assessment Tool (PAT); Echelle Douleur Inconfort Nouveau-Né: Neonatal Pain and Discomfort Scale (EDIN); and Pain Assessment in Neonates (PAIN).[11,34] New tools including the Scale for Use in Newborns (SUN)[35] and Bernese Pain-Scale for Neonates (BPSN)[36] are also used for pain assessment in neonates.
15. After the heel stick/injection, leave infant in KC for at least 20 minutes (Figure 4) because peak pain response commonly occurs within 20 minutes of completion

FIGURE 4 ■ Kangaroo Care position after the procedure.

of pain stimulus.[4] Letting the infant have at least 20 minutes of KC also minimizes early maternal–infant separation, which is considered a stressor for both parties, and 20 minutes of KC decreases the likelihood of long-term negative sequelae of pain in the infant's brain.[37] If the infant is agitated or uncomfortable, continue KC, a form of pleasing touch that stimulates C-afferent nerves that in turn cause a release of oxytocin in the brain that relaxes and comforts the infant.[38,39] Oxytocin also causes an increase in pain threshold and an increase in endogenous opioids, further minimizing infant pain. KC also decreases cortisol secretion in mother and infant via vagal stimulation by KC's soothing touch.[4]

EVALUATION

Prior to the use of the adjustable stool, nurses and phlebotomists who were using KC to manage infant pain often complained that their position was uncomfortable, awkward, made their backs hurt, and that they simply could not bend over as long as needed to complete the blood draw. Some even proclaimed "I hate doing this heel stick in KC. It is so difficult and painful to me!" After introducing the adjustable stool and demonstrating the ease of access to the infant's leg/foot with the stool, comments changed. Examples of specific comments were as follows: "I feel much better than I did before." "Oh, this stool is very comfortable. I love this stool and I can do the heel stick easily." "Oh, this is great now. Thank you. No problems." "This stool is easy to move and makes getting everything so much easier." Thus, resistance on the part of the staff to conducting heel sticks and injections in KC seemed to dissipate. In addition, infant pain was significantly less with KC than with incubator heel stick as measured by behavioral, physiological, hormonal, and autonomous responses.[4,5,12,20] The potential for more use of KC to manage infant procedural pain exists if nurses and phlebotomists are comfortable in the procedure. During KC, mothers read books or magazines, fell asleep, or used handheld mirrors to watch their infants' faces before or after the heel stick. If a mother was asleep at any time while holding the infant in KC, a nurse was at the mother's side to ensure patient safety and that the infant would not fall from the mother. All mothers in the study in which the adjustable stool was used[20,21] were awake throughout the heel stick. No mother expressed anxiety about being present and holding the infant during the painful procedure, a testimony to oxytocin's anxiolytic effect in the amygdala of mothers that occurs during skin-to-skin contact.[40] All mothers from our studies[4,5,20] indicated that they would like to do KC for the next heel stick or injection, similar to other studies in which all mothers said they wanted to be involved in actively managing their preterm infant's pain and would do so by holding their infants in a tucked position during heel stick.[26,41] Fathers also wanted to be involved in their infants' care and pain management but are not as effective as mothers' KC.[41]

SUMMARY

Because KC is recommended to reduce procedural pain, many practitioners have tried to conduct heel sticks and injections when infants were in the KC position. But up until now, conducting these procedures with infants in KC has been awkward. The use of an adjustable stool and a step-by-step procedure for conducting heel sticks and injections have been described. A recommendation for ten to 15 minutes of KC prior to the heel stick/injection, continuing KC throughout, and for 20 minutes after the heel stick/injection has been made and supported by rationale. In conclusion, using an ergonomic protocol during a painful procedure in the KC position has been an effective method for increasing staff comfort and securing satisfactory samples in our previous research studies. The ergonomic procedure supports nonpharmacologic management of pain in preterm and full-term infants; nonpharmacologic management of pain is recommended by the Joint Commission.

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