Kangaroo care in the NICU, part 2:
Understanding the impact of kangaroo care
beyond neonatal vital signs

Kathy L. Morgan, BSN, NNP
Susan M. Ludington-Hoe RN, CNM, Ph.D., FAAN

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Article purpose
This article builds on Kangaroo care in the NICU, part 1: Understanding the impact of kangaroo care on neonatal vital signs. It is designed for registered nurses. Like part 1, it presents clinical scenarios related to kangaroo care (KC) that require critical thinking and clinical expertise to assess. The article focuses on the impact of KC beyond neonatal vital signs, such as parental engagement and strategies to incorporate KC in nursing practice. Evidence-based rationale and biobehavioral mechanisms of KC that support practice decisions are provided, along with directions for applying the knowledge gained from the clinical scenarios.

Objectives
After reading this offering, the learner will be able to:
1. Describe the physiologic impact of kangaroo care on neonatal endocrine, neurobehavioral, infectious and nutritional status.
2. Explain the appropriateness of kangaroo care for mother-infant dyads experiencing common clinical situations in the NICU.
3. Assess the neonate’s and the parent’s response to kangaroo care and take appropriate actions.

Introduction
Kangaroo care in the NICU is a two-part article. Part 1 presents the historical background of KC and recommendations on KC by professional organizations. It provides clinical scenarios on the effects of kangaroo care on heart rate, respiratory rate, blood pressure, oxygenation, temperature and pain through clinical scenarios. These scenarios require review of the evidence-base and the physiologic mechanisms to assess the clinical application of KC. Part 1 concludes with eight actions nurses can take to enhance the use of KC in the clinical setting.

Part 2 provides clinical scenarios related to infant metabolic processes (hypoglycemia and...
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hyperbilirubinemia), immunologic benefits (reduced infections), and mental, motor, state and feeding outcomes of KC. It also addresses the maternal and paternal effects of KC.

Kangaroo care is chest-to-chest, skin-to-skin placement of a newborn against a human chest, ideally his mother’s chest, to give the infant unlimited access to the breast for infant-led feeding. Many consider kangaroo care a “position” for delivering infant care (Nyqvist et al., 2010b); others consider it the natural habitat (ecological niche) of the newborn (Bergman, 2005; Bergman, Carney & Ludington-Hoe, 2010) or an intervention or therapy for an infant (Ludington-Hoe, 2013b).

Clinical scenarios on the effects of kangaroo care

Nurses are concerned about how the infant responds to KC. The following scenarios reflect the use and relevance of KC on the neonate, beyond vital signs, in the clinical setting. They cover hypoglycemia, hyperbilirubinemia, infection, neurobehavioral impact, sleep and awake states, feeding, transfer and effect on parents. Each scenario presents a clinical situation, a nurse’s action/response to the situation and evidence for accepting or rejecting the nurse’s action/response.

Clinical scenario 1: Hypoglycemia

Baby Jean:
• Is 28 weeks post-menstrual age (PMA)
• Is in an incubator
• Has slightly mottled skin

Ms. Mathur comes to the NICU to visit her daughter Jean. She notices Jean’s skin color and asks the nurse about it.

NURSE ISABELLE: That’s called mottling, and it usually means that the baby is cold. But if you look at her temperature on the incubator, it says 36.8 C, a perfect temperature for her. And she hasn’t had any drops in blood sugar either, which can happen when a baby gets cold.

MS. MATHUR: I can stay a few hours and want to kangaroo her. Is that OK?

NURSE ISABELLE: Of course you can. Don’t worry about her skin and don’t worry about her blood sugar. She will be fine.

What do you think?
Is Nurse Isabelle correct?

Answer
Yes, the response is correct and informative for the mother.

Evidence for the answer
Preterm infants are at risk for hypoglycemia due to:
• Decreased glucose stores
• Increased use of glucose due to immature metabolic systems
• Hypothermia
• Disease processes (for example, sepsis and respiratory distress syndrome [RDS])

Studies of premature infants report no hypoglycemia (Ludington-Hoe, et al., 1993) or a lower incidence of hypoglycemia (Rao, Udani & Nanavati, 2008; Suman, Udani & Nanavati, 2008) during KC than during incubator care and maintenance of euglycemia (Funk, Tilney, Mitchell & Walker, 2012). Kangaroo care has these effects because the mother provides heat to keep the infant warm so the infant does not have to use his own glucose stores to maintain body heat. Thus, KC is recommended as a treatment to prevent, and if necessary, reverse hypoglycemia without providing food intake (Laptook & Jackson, 2006; Munson et al., 2012).
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Clinical scenario 2: Hyperbilirubinemia

Baby Sara:
- Is 3 days old
- Is 34 weeks gestational age (GA)
- Weighs 2,200 grams
- Has ABO incompatibility
- Has hyperbilirubinemia and anemia
- Started phototherapy late on the day she was born
- Is on a bili bed with one bank of phototherapy lights over her and another bank tilted to cover her from the side of the incubator
- Has had a steadily rising total serum bilirubin for 2 days; today it is 16mg/dl.
- Has had decreasing hematocrit each day. It was 45 percent on her first day of life; today it is 35 percent.

Mr. and Ms. Depp are visiting their daughter Sara. Neither mom nor dad has had a chance to hold Sara since early on the day she was born. They ask Nurse Kathy if they can hold Sara in kangaroo care.

What do you think?
- Should Nurse Kathy allow the parents to kangaroo Sara?
- What should Nurse Kathy say to the parents?

Answers

Nurse Kathy should not allow the parents to give kangaroo care to Sara. She can encourage the parents to sit beside Sara’s incubator, gently massage her across the shoulders/upper back and to speak softly to her. Nurse Kathy can explain the rationale for the hyperbilirubinemia and tell Sara’s parents that as Sara’s serum bilirubin and hematocrit stabilize, as happens in the course of ABO incompatibility, the need for phototherapy decreases. Nurse Kathy can explain that once Sara is in need of only one bank of phototherapy, Sara can be held in kangaroo care providing a bili blanket is available, with the expectation that KC will not adversely affect bilirubin decrement and may even shorten the duration of phototherapy (Samra, El Taweel & Cadwell, 2011).

Evidence for the answer

Though Nurse Kathy’s response may reflect reluctance to do KC due to uncertainty about KC’s effects on serum bilirubin, an uncertainty that is common for nurses (Flynn & Leahy-Warren, 2010), several reasons support the nurse’s decision not to allow Sara’s parents to hold her in KC:

- Sara is unstable because her diagnoses and clinical lab values indicate that she has an active hemolysis occurring, most likely from the ABO incompatibility.
- Sara has three sets of phototherapy ordered; providing this dose of phototherapy to an infant while in kangaroo care may not be feasible. Receipt of double phototherapy has been a contraindication to KC (van Zanten et al., 2007). Using three banks of phototherapy during KC has not been tested. A randomized controlled trial of ten mothers who securely held a bili-blanket against their infants’ backs for 1 hour of KC had the same decrement and rebound in serum bilirubin levels as infants treated in an incubator (Ludington-Hoe & Swinth, 2001) for 1 hour with only one bank of phototherapy lights in physiologic jaundice cases. No randomized controlled trials have been conducted with three banks of lights or in infants with hemolytic jaundice.
- When an infant has a rising serum bilirubin requiring triple phototherapy and signs of active hemolysis, the infant may be approaching exchange level. Nothing should interrupt the treatment of maximal phototherapy, hydration and, possibly, medications (immune globulin).
Clinical scenario 3: Infection

Baby Jeffrey:
- Is 32 weeks GA
- Is 10 days PMA (33 3/7 weeks)
- Is in room air
- Is taking full enteral feeds of expressed breast milk
- Has completed a 7-day course of ampicillin and gentamycin for presumed sepsis

Ms. Martinez is visiting her son Jeffrey and talks to the nurse about holding her son in KC:

MS. MARTINEZ: I don’t want Jeffrey to get another infection, so I don’t think I’ll hold him in kangaroo care.

NURSE SHARON: Ms. Martinez, holding Jeffrey in kangaroo care is not going to give him an infection or make the one he is getting over worse. Kangaroo care can help him avoid another infection.

What do you think?
- Is Nurse Sharon’s response correct?
- Why or why not?

Answers
Nurse Sharon’s response is correct. Kangaroo care can help prevent and ameliorate infections.

Evidence for the answer
Treatment and prevention of sepsis in premature infants is a major challenge as these infants have a higher risk of acquiring infection because of their immature immune system than babies born later. Cochrane meta-analyses (Anderson et al., 2003; Conde-Agudelo et al., 2003, 2011) have confirmed the findings of randomized controlled trials (Lazaro-Medina, Ospina-Diaz & Ariza-Raiño, 2012; Mendes & Procianoy, 2008, 2009; Rao et al., 2008) that KC reduces the risk of and number of nosocomial infections in preterm infants.

The Canadian Pediatric Society recommends KC as a method to reduce the number of infections in premature infants (Jefferies & Canadian Paediatric Society, 2012). Many mechanisms have been identified that explain how KC decreases infections (Table 1).

### Table 1. KC and infections

<table>
<thead>
<tr>
<th>KC decreases infection by a variety of mechanisms:</th>
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<tbody>
<tr>
<td>• <strong>KC enhances skin hydration</strong> (Abouelfettoh et al., 2011). Hydration is one component of skin-barrier functioning that plays a role in decreased infection. Skin is the first line of defense against infection.</td>
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<tr>
<td>• <strong>An infant becomes colonized to his mother's flora</strong> (Kitajima, 2003). Infections are less likely to spread from one mother-infant dyad to another (Gangal, 2007; Jefferies &amp; Canadian Paediatric Society, 2012), although this spread has occurred in 24/7 kangaroo mother care wards housing eight or more mothers in a single room (Sakaki, Nishioka, Kanda &amp; Takahashi, 2009; Visser, Delport &amp; Venter, 2008).</td>
</tr>
<tr>
<td>• <strong>An infant passes antigens to his mother</strong> during KC, and the mother responds by passing antibodies back to the infant. The antibodies fight the infant’s antigens during KC even 2 to 3 days later (Ludington-Hoe, 2010, 2011a; Schanler, 2001).</td>
</tr>
<tr>
<td>• <strong>IgA antibodies, zinc and enzymes that offer immunity are passed in colostrum</strong> to infants who suckle early at the breast (Odent, 1989).</td>
</tr>
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</table>
Clinical scenario 4: Neurobehavioral impact

Baby Nancy:
- Is 27 weeks PMA
- Is 25 weeks GA
- Was initially intubated for 2 days
- Was on nasal continuous positive airway pressure (CPAP) for 7 days
- Is on a nasal cannula 1.0 liter per minute (LPM) with 25-percent FiO2
- Has completed 7 days of antibiotics for presumed sepsis
- Is on advancing feeds of expressed breast milk
- Started kangaroo care on day 3 of life

Ms. White is visiting her daughter Nancy in the NICU. Ms. White is very quiet today, and Nurse Melitza asks her if anything is wrong. Ms. White asks: “Do you think Nancy will be OK after all she’s been through? I worry that she may have long-term problems because she was born so prematurely. Is there anything I can do to help decrease the likelihood of her having long-term problems?”

What do you think?
How should Nurse Melitza respond to Ms. White?

Answer
Nurse Melitza can tell Ms. White about premature infants, neurodevelopment and KC.

Evidence for the answer
Kangaroo care accelerates brain maturation, brain complexity and brain connectivity (components of brain structure and function that are necessary to support normal brain development) when it is given 4 days per week for 1.5 hours per day from 32 to 40 weeks PMA (Ludington-Hoe et al., 2006; Scher et al., 2009, Kaffashi, Scher, Ludington-Hoe & Loparo, 2013). Infants who have KC have better mental function at term age (Feldman, Weller, Sirota & Eidelman, 2003), 6 months (Feldman, Weller, Sirota & Eidelman, 2002), 12 months (Hickson, et al., 2006; Ogi et al., 2001; Ohgi et al., 2002; Tessier et al., 2003), 10 years (Feldman, Rosenthal & Eidelman, 2013) and 16 years (Schneider, Charpak, Ruiz-Pelaez & Tessier, 2012). However, psychomotor functioning has not been any different in KC preterm infants than in non-KC preterm infants at various ages (Conde-Agudelo et al., 2003, 2011). KC accomplishes improvement in brain and neurobehavioral development Table 2).

<table>
<thead>
<tr>
<th>Table 2. KC and brain and neurobehavioral development</th>
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<tr>
<td>KC improves brain and neurobehavioral development by:</td>
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<tr>
<td>- Providing high levels of cerebral oxygenation to the brain (Martin &amp; Ludington-Hoe, 2010)</td>
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<tr>
<td>- Accelerating maturation of brain areas responsive to sensory stimulation (Scher et al., 2009)</td>
</tr>
<tr>
<td>- Improving sleep cycling (Ludington-Hoe et al., 2006; Scher et al., 2009) which is needed for brain maturation (Scher, 2008)</td>
</tr>
<tr>
<td>- Providing multisensory stimulation in a pleasing manner (Feldman, 2004)</td>
</tr>
<tr>
<td>- Enhancing maternal and paternal attention to and interactions with the infant, even when not in KC (Charpak et al., 2005; Gathwala, Singh &amp; Balhara, 2008; Tallandini &amp; Scalembra, 2006; White-Traut, Wink, Minehart &amp; Holditch-Davis, 2012)</td>
</tr>
<tr>
<td>- Enhancing the home environment by providing appropriate toys and books, sensitivity to infant’s cues, positive dialogue with infant and a safe environment (Feldman et al., 2002)</td>
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<tr>
<td>- Providing the pleasing, calming human touch that directly activates areas of the brain sensitive only to this type of stimulation (Kress, Minati, Ferraro &amp; Critchley, 2011; Lindgren et al., 2011)</td>
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</table>
Provision of KC by mothers is especially important because infants can distinguish maternal touch, which positively alters brain pathways in ways that other people’s touch cannot (Fabrizi et al., 2011). For example, a nurse holding an infant in KC during a heelstick does not diminish infant pain as well as a mother holding her infant in KC (Johnston et al., 2012). Maternal skin-to-skin touch travels a privileged, exclusive pathway to her infant’s brain (Löken, Wessberg, Morrison, McGlone & Olausson, 2009) to directly diminish the brain’s perception of pain and eradicate the memory and neuropathways that cause adverse long-term effects (Meek & Huertas, 2012). A mother’s touch is a channel of social information (Morrison, Löken & Olausson, 2010) about what an infant’s mental and emotional state should be to maintain physical and social well-being (Björnsdotter, Morrison & Olausson, 2010). It conveys to the infant that mother is here and the infant is safe with her (Morrison et al., 2010). So, without KC, premature infants are at increased risk of having brain and neurobehavioral impairments (Parsons, Young, Murray, Stein & Kringelbach, 2010).

Clinical scenario 5: State regulation

Baby Becky is:
- 30 weeks GA
- 31 weeks PMA
- On a nasal cannula at 1.5 LPM and 25-percent FiO₂
- In an incubator

Mr. and Mrs. Johnson are visiting their daughter Becky. It is afternoon and Becky has just finished a gavage feeding. Mrs. Johnson notices that Becky appears to be sleeping and then becomes restless and kicks her legs and cries. Then she settles down briefly before repeating the restless behavior again. Mr. and Mrs. Johnson observe this sleep-agitation-sleep pattern for 30 minutes.

MRS. JOHNSON: Becky seems so restless. She is quiet for 2 to 5 minutes and then becomes agitated, moving, kicking and crying. Why does she do this? Is this normal behavior for her? I wish we could help her sleep longer and not be so agitated.

NURSE JOAN: Becky’s behavior is common in preterm infants in incubators. You can help Becky sleep better with KC.

What do you think?
- Is Nurse Joan’s response correct?
- What should she say to Mrs. Johnson?

Answers

Nurse Joan’s response is correct. She can explain to Becky’s parents how KC affects a baby’s state. State is a baby’s level of consciousness. States range from quiet sleep to crying.
- Becky’s behavior indicates Becky’s state. She is capable of demonstrating the behaviors of 12 different states (Table 3).

Table 3. Sleep and awake states

<table>
<thead>
<tr>
<th>1. Quiet regular sleep</th>
<th>2. Quiet irregular sleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Active sleep</td>
<td>4. Very active sleep</td>
</tr>
<tr>
<td>5. Drowsy</td>
<td>6. Quiet alert</td>
</tr>
<tr>
<td>7. Quiet awake</td>
<td>8. Active awake</td>
</tr>
<tr>
<td>9. Very active awake</td>
<td>10. Fussy</td>
</tr>
</tbody>
</table>

Anderson, Behnke, Gill, Cohen, Mearel & McDonie, 1990

- Becky sleeps a little bit and then wakes up and moves and cries and is agitated because she doesn’t sleep as well or as long in an incubator as she does on her mother’s chest during KC. Unfortunately, infants do not have normal sleep patterns in incubators.
- Mrs. Johnson can help Becky sleep better by giving her KC for at least 60 minutes each time so Becky completes one full sleep cycle.
Completing a sleep cycle helps the brain develop and produces better sleep and better brain functioning.

Evidence for answer

The importance of sleep to infant development is only beginning to be understood. Table 4 identifies various sleep states. Active and quiet sleep are important for normal neurosensory and cortex development (Calciolari & Montirosso, 2011).

<table>
<thead>
<tr>
<th>Table 4. Sleep states and the sleep cycle</th>
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<tbody>
<tr>
<td><strong>Active sleep</strong></td>
</tr>
<tr>
<td>Eyes closed, irregular respiratory pattern, body movements present</td>
</tr>
<tr>
<td><strong>Quiet sleep</strong></td>
</tr>
<tr>
<td>Eyes closed, regular respiratory pattern, no body movements</td>
</tr>
<tr>
<td><strong>Indiscriminant sleep</strong></td>
</tr>
<tr>
<td>Chaotic; neither active nor quiet sleep; occurs often in incubators and is useless in terms of rest, brain growth and development</td>
</tr>
<tr>
<td><strong>Sleep cycle</strong></td>
</tr>
<tr>
<td>A 60-minute cycle that includes:</td>
</tr>
<tr>
<td>• Five to 10 minutes of active sleep, accompanied by frequent arousals to awake and crying states</td>
</tr>
<tr>
<td>• A long period of deep, quiet sleep, hopefully 40 to 50 minutes, with very few minor arousals (fluttering eyes, only lip movements or slight flutter of a finger), so minor the infant returns to deep quiet sleep.</td>
</tr>
<tr>
<td>• A return to active sleep for 2 to 5 minutes.</td>
</tr>
<tr>
<td>Scher, 2011</td>
</tr>
</tbody>
</table>

Premature infants in an incubator demonstrate chaotic, fragmented sleep patterns. Their sleep states last 2 to 10 seconds, and they frequently transition between active sleep, quiet sleep and indiscriminate sleep. Even if an infant is quiet with her eyes closed and looks like she is sleeping, she may not be asleep. If she is, her sleep cycles are still very immature (Scher, 2008). When her eyes are closed, she is in active sleep if she has any limb, trunk, head or face movements. Infants in an incubator are most often in active sleep. Improving, preserving and protecting sleep in preterm infants are of utmost importance (Laudert et al., 2007; Liu et al., 2007).

Kangaroo care clearly improves sleep. Premature infants in KC go into active sleep within 5 minutes (Ludington-Hoe et al., 2006). Within 10 minutes of KC onset, they go into deep quiet sleep of good duration (27 to 40 minutes) (Ludington, 1990) with few arousals (Ludington-Hoe et al., 2006). The sleep patterns of infants in KC are cyclical and like those of mature infant sleep.

Because one complete sleep cycle takes 60 minutes (Scher, 2008), KC should be given for 1 or more hours. The longer a preterm infant is in KC, the more sleep cycles are completed, the better the infant’s sleep organization is (DiMenna, 2006) and the better the infant’s brain development (Scher et al., 2009; Kaffashi et al., 2013). Sleep in KC is better than sleep anywhere else.

Clinical scenario 6: Feeding

Baby Zachary:
- Is 33 weeks PMA
- Is 30 weeks GA
- Is in room air
- Is on full enteral feeds of fortified expressed milk by nasogastric tube
- Wakes for his feeds every 3 hours
- Gains weight steadily
- Is ready for transfer to the NICU step-down unit where he will stay until discharge

Ms. Yamily is visiting her son Zachary. She has been holding Zachary in KC every day for 2 to 3 hours each time, sometimes several times a day, often while his feeding is being gavaged. Zachary has attempted to suckle at the breast for brief
periods. Ms. Yamily’s milk supply is sufficient to meet Zachary’s increasing demands as she frequently pumps while sitting at the bedside or while Zachary is in KC. She tells Nurse Victoria: “I notice that Zachary has been trying to latch on to my breast when I hold him in kangaroo care. Should I let him try to nurse?”

What do you think?
- How should Nurse Victoria respond to Ms. Yamily?
- Is Zachary likely to be successful during self-controlled breastfeeding at 34 weeks PMA?

Answers
Nurse Victoria can tell Ms. Yamily that now is a good time to allow Zachary to go to the breast. At 33 weeks PMA, some infants can coordinate sucking, swallowing and breathing without compromise. Ms. Yamily probably has a well-established breast milk supply, and she has been doing all the right things to prepare Zachary for successful breastfeeding.

Evidence for the answers
Transitioning a preterm infant from nasogastric feeds to breastfeeds can be challenging. Kangaroo care has been shown to be a powerful, positive intervention that promotes successful breast milk feeds and transitions preterm infants to breastfeedings (Edwards & Spatz, 2010; Meier 2001, 2003; Meier, Patel, Bigger, Rossman & Engstrom, 2013; Nyqvist, 2005, 2008; Spatz, 2012). Kangaroo care naturally encourages and accelerates transition (Meier et al., 2001, 2008) (Table 5).

Putting even the smallest premature infant to the breast early on for spontaneous suckling increases the likelihood of successful breastfeeding (Hurst, Valentine, Renfro, Burns & Ferlic, 1997; Meier, 2003). Daily KC sessions starting within a few days of birth, even in 23-week GA infants, has been a major contributor to the 99-percent exclusive breastfeeding rate among inner city, low-income mothers at Rush Hospital in Chicago (Meier et al., 2013). Placing the infant at the breast in KC familiarizes the infant with the scent and feel of the mother’s breast (Isaacson, 2006), increases production and letdown of breast milk (Meier, Brown & Hurst, 1998) and dramatically decreases maternal stress (Lasiuk et al., 2013), which can adversely affect breast milk production and breastfeeding success. Kangaroo care increases the duration and exclusivity of breastfeeding through 1 (Conde-Agudelo et al., 2011) and 3 months (Cerezo, de Leon & Gonzales, 1992) of life.

If Zachary is not successful at breastfeeding this time, Nurse Victoria can advise Ms. Yamily not to be discouraged. Breastfeeding is a learned skill, and it takes time for premature infants to learn the skill.

Clinical scenario 7: Transfer after cesarean birth

Baby Anna:
- Is 2 days old
- Is 28 wks GA
- Is on nasal CPAP (+5, 30-percent FiO2) after being intubated for 12 hours and receiving surfactant
- Has a peripheral IV and is scheduled to get a a peripherally inserted central catheter (PICC) line later today
- Is NPO (nil per os, nothing by mouth)
- Is on antibiotics to rule out sepsis pending blood culture results.

Ms. Kolozek is visiting her daughter Anna. This is her first visit to Anna after having a cesarean birth (c-section). Ms. Kolozek has told Nurse Sue that
she wants to hold Anna skin-to-skin today. Nurse Sue sees that Ms. Kolozek is guarding her abdomen with one hand and uses the other for support by holding onto the incubator.

NURSE SUE: Are you up to that today? You look like you might be in some pain.

MS. KOLOZEK: Yes, oh yes, I really want to hold my baby skin-to-skin today. I haven’t held her yet, and I really need to hold her in my arms and feel her soft skin.

NURSE SUE: If I put you in a comfortable chair and support your legs and put Anna on your chest, do you think you can sit for at least 1 hour? If you can do this, then you can try kangaroo care today, and we’ll see how it goes.

What do you think?

Is Nurse Sue’s response correct?

Answer

Yes, Nurse Sue has given a good response and one that suggests that kangaroo care is possible even with the mother’s physical condition.

Evidence for the answer

Nurse Sue recommends a sitting transfer (Table 6), primarily because the mother is a recent c-section patient and is in some discomfort. Completing a standing transfer is often difficult for mothers within 3 to 4 days of a c-section (Gale, Franck & Lund, 1993). Ms. Kolozek needs support when standing, a condition that makes sitting transfer the best option at this time.

Nurse Sue recommends 1 full hour of KC, the amount of time needed to complete one cycle of sleep. In case 1 hour sounds too long to Ms. Kolozek, Nurse Sue has reassured her by saying “We’ll see how it goes,” meaning that she will assess responses to transfer and KC in both mother and infant as recommended (Jarrell, Ludington-Hoe & Abouelfettoh, 2009; Trotter, 2005). Infant physiologic changes accompanying transfer do occur (Hardy, 2011; Hedberg et al., 2011), especially in infants 25 to 30 weeks PMA (Bauer, Pyper, et al., 1998), but they usually resolve quickly upon transfer completion (Eichel, 2001).

Table 6. Transfer into KC

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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<tbody>
<tr>
<td>1.</td>
<td>Place a receiving blanket folded in fourths underneath the infant in the incubator.</td>
</tr>
<tr>
<td>2.</td>
<td>Flex the infant’s arms and legs toward her chest. Wrap the blanket ends around her to contain her arms and legs so that flailing of extremities and cold stress are prevented.</td>
</tr>
<tr>
<td>3.</td>
<td>Remove the infant from the incubator and slowly lift her into an upright position.</td>
</tr>
<tr>
<td>4.</td>
<td>Turn the infant toward her mother.</td>
</tr>
<tr>
<td></td>
<td>• Sitting transfer: The mother sits beside the infant’s incubator and the infant is placed upright on the mother’s chest.</td>
</tr>
<tr>
<td></td>
<td>• Standing transfer: The mother stands beside the infant’s incubator and the infant is placed upright on the mother’s chest. The mother steps backwards until she feels the chair against her leg and sits down gently.</td>
</tr>
<tr>
<td>5.</td>
<td>Gently withdraw the ends of the blanket from the infant’s front and use them to cover the mother’s breasts and lateral sides of her chest.</td>
</tr>
<tr>
<td>6.</td>
<td>Use additional blankets and screens as necessary to provide privacy and warmth.</td>
</tr>
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</table>

Nurse Sue recommends KC for Ms. Kolozek because the pleasant touch of the infant on the mother’s ventral surface initiates oxytocin release in the mother’s brain, decreasing maternal pain perception and discomfort (Lindgren et al., 2011). KC also can alleviate Ms. Kolozek’s stress and depression about Anna’s premature birth and about not being able to hold her daughter (de Alencar, Arraes, de Albuquerque & Alves, 2009).

Nurse Sue says that Ms. Kolozek’s legs will be supported. For 6 weeks following birth, the incidence of thrombophlebitis is high when the mother’s legs are dangling or crossed; elevated support reduces thrombophlebitis risk (Davidson, London, and Ladewig, 2012).
Clinical scenario 8: Maternal effects

Baby Aiden is:
- 27 weeks GA
- 6 days old
- On N-CPAP +4 and 30-percent \( \text{FiO}_2 \)
- On increasing feeds of expressed breast milk and parenteral nutrition

Ms. Thompson is visiting her son Aiden in the NICU. She had been reluctant to hold Aiden in KC because she was so upset about Aiden's premature birth and afraid she would hurt Aiden if she held him. For the first 2 to 3 days, she cried whenever she visited Aiden in the NICU.

Since day 4, Ms. Thompson has held Aiden in KC once each day for about 2 hours each time. Ms. Thompson is becoming more comfortable each time she does KC.

***MS. THOMPSON:*** I'm still a little nervous, but I'm not afraid I'll hurt him anymore. I really look forward to our KC sessions because I feel so close to him. I really feel like his mother now. I feel this way because Aiden knows me now, and I'm beginning to know him. I can hold him, and that is what mothers do — hold their babies!

What do you think?
How does kangaroo care influence these usual feelings in mothers of preterm infants?

**Answer**
KC replaces negative feelings with positive ones and strengthens positive feelings and involvement with the infant. KC empowers parents, too.

**Evidence for the answer**
Ms. Thompson experiences common emotional effects of KC on mothers (Table 7). Kangaroo care, even just one session, diminishes maternal upset (Affonso, Bosque, Wahlberg & Brady, 1993; Affonso, Wahlberg & Persson, 1989). Early studies referred to maternal upset as “psychological hemorrhage,” and KC clearly reduced the upset even when recalled 2 years later (Affonso et al., 1989).

Feelings of maternal discomfort with KC usually are resolved within three to four KC sessions (Morelius, Theodorsson & Nelson, 2005). Most mothers can competently transfer infants into and out of KC with assistance after three to four supervised transfers (Ludington-Hoe et al., 2008).

KC provides opportunities for both emotional and physical closeness of mother and infant (Flacking et al., 2012). Ms. Thompson’s comment that she looks forward to KC because she feels close to Aiden during KC is an example of a mother’s expression of a “craving for closeness” (Fenwick, Barclay & Schmied, 2008, p. 83).

<table>
<thead>
<tr>
<th>Table 7. Emotional effects of KC on the mother</th>
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<tr>
<td>- Being relieved of upset feelings about having a premature birth</td>
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<td>- Feeling increased comfort with doing KC</td>
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<tr>
<td>- Feeling increased closeness to her infant</td>
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<tr>
<td>- Feeling like she’s a mother now</td>
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<tr>
<td>- Feeling like she’s beginning to know her baby</td>
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<td>- Feeling like she finally has a role as a parent</td>
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<td>- Feeling like she has ownership of and authority over her infant (Fenwick, et al., 2008)</td>
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<tr>
<td>- Feeling enhanced bonding/attachment (Tessier et al., 1998)</td>
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<tr>
<td>- Decreases or eliminates depression (Discenza, 2011)</td>
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<tr>
<td>- Being empowered (Dalbye, Calais &amp; Berg, 2011; Discenza, 2012; Feldman et al., 2002)</td>
</tr>
<tr>
<td>- Decreases short term stress (Flacking, Thomson, Ekenberg, Lowegren &amp; Wallen, 2013) and long term stress (Feldman et al., 2013)</td>
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</table>
Mothers strive to change from feeling like an outsider to having "authority and ownership" of their infant (Fenwick et al., 2008, p.72; Heermann, Wilson & Wilhelm, 2005; Wigert, Johansson, Berg & Hellstrom, 2006.) Transforming from outsider to mother occurs swiftly with KC (Flacking et al., 2013). Because interventions to promote positive maternal psychosocial outcomes are needed to decrease feelings of stress, anxiety and loss of control, family-focused and developmentally supportive interventions are needed (Obdiat, Bond & Callister, 2009). Extensive reviews of KC literature show that KC is definitely family-focused (Tessier, Cristo, Nadeua & Schneider, 2011) and developmentally supportive to infants and parents in many ways (Ludington-Hoe, 2010).

Accelerated and enhanced sense of knowing one’s own infant is common in KC moms (Jeffries & Canadian Pediatric Society, 2012). Ms. Thompson’s comment “I can hold him, and that’s what mothers do” indicates that she is taking a parental role in the care of her son. Not participating in the care of their infants causes much maternal psychological stress (Wigert et al., 2006). KC helps parents assume and implement the parental role sooner than parents who don’t do KC (Lasiuk et al., 2013). By using KC, parents gain confidence, competence, a sense of control, a better mood (de Macedo et al., 2007) and a reduced sense of helplessness (Lasiouk et al., 2013).

For years parents have been separated from their preterm infant with limited visitation and minimal or no holding until the infant is stable. Separation from the infant has caused or contributed to many of the unpleasant and adverse feelings that parents have with a preterm birth (Wigert et al., 2006). The paradigm of separation of parent and infant is now shifting to one of non-separation that allows parents to be primary caregivers in the NICU throughout their baby’s hospitalization (Flacking et al., 2013; Nyqvist & Engvall, 2009). Maternal presence is a prerequisite for normal neurodevelopment (Flacking et al., 2012; Parsons et al., 2010). Maternal-infant bonding is critical for normal development of long-term attachments (Feldman, Gordon & Zagoory-Sharon, 2011; Uvnas-Moberg, Arn & Magnusson, 2005) and neurosensory development in the preterm infant (Flacking et al., 2012).

“Mothers who provided KC report more positive feelings towards the infant and a better sense of the parenting role. The physical bonding may reduce maternal depression and increase familiarity with the infant and his or her interactive signals” (Feldman et al., 2002, p. 16).

Clinical scenario 9: Paternal effects

Mr. Jones has not held his son Ben at all. When asked if he would like to do kangaroo care, he says, “I thought that was only for mothers and infants.” Nurse Janis explains that dads can and should do KC.

What do you think?

Is Nurse Janis correct in telling Mr. Jones that he should do KC?

Answer

Yes, Nurse Janis is correct. KC has many benefits for fathers.

Evidence for the answer

While research on KC with fathers is more limited than research with mothers, some clear and distinct benefits have been identified. Fathers report that KC makes them feel in control of their infant and an important, active contributor to their baby’s care (Blomqvist, Rubertsson, Kyleberg, Joreskog & Nyqvist, 2011; Fegran, Helseth & Fagermoen, 2008). With KC, the paternal relationship with the infant changes from impersonal to one characterized by “belonging” and “protecting the child” (Fegran et al., 2008, pg. 814). Fathers also report they have increased confidence in their role (Gregson & Blacker, 2011); enhanced attachment and closeness (Franck, Bernal & Gale, 2002); and significantly higher levels of love for the infant when holding the infant in KC (Gloppestad, 1998). Evidence is beginning to emerge that early paternal involvement in the care of the infant is necessary, meaningful and critical to the infant’s development (Johnston et al., 2007). Fathers have better interactions with the infant after KC.
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(Ludington-Hoe, Hashemi, Argoted, Medellin & Rey, 1992). KC is an easy way to involve fathers in meaningful experiences with their infants.

What to do now

These scenarios provide the evidence base regarding clinical benefits of KC for preterm infants. Their purpose is to peak the nurse’s desire to determine patient eligibility for KC and to administer it in a safe manner. Table 8 lists suggestions for further actions for nursing practice. Part 1 of Kangaroo care in the NICU contains details on these actions.

Table 8. What to do now

1. Stay current with kangaroo care research.
2. Regularly update NICU staff about KC so that attitudes and practice keep pace with the science.
3. Use KC more often, for more hours, with more families.
4. Try innovative and unique applications of KC.
5. Recognize that KC can and does help promote exclusive breast milk feeds early in the infant’s hospital course.
6. Administer KC safely with good positioning and monitoring, as needed.
7. Provide parents with the education they need to overcome any reluctance to do KC.
8. Involve mother and father as much as possible.

Conclusion

Infants have consistent, hardwired (not culturally dependent) responses to KC. KC has many physiologic and biobehavioral benefits for babies, mothers and families. Babies are programmed to do better on their mothers’ chests than anywhere else. Using critical thinking skills to advance evidence-based KC practice places the nurse in a position to best meet the health care needs of the neonate and his parents.

Links for this activity

- Continuing nursing education test
- References