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Kangaroo Care and Preterm Infants

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Abstract

Infants that are born near-term or before they reach their full gestational age of 40 weeks are at risk for facing future health problems and disparities in terms of proper development (Ladewig, London, & Davidson, 2012). This has been a major concern in the medical realm because of the high cost of managing preterm newborns and the complications that can develop. However, kangaroo care may aid in physical growth and cognitive development of these infants. The purpose of this integrative review was to determine if current research shows that kangaroo care has a positive effect on preterm infants in the following aspects: vital signs, infant mortality rates, behavioral development, parent-infant bonding, pain, and breastfeeding. Various databases, including Oxford Journals, PsychInfo, CINAHL, PubMed, and Medline were used to find twenty research studies that discussed kangaroo care in relation to various aspects of infant development. Through the analysis of these articles, it was found that kangaroo care has a positive effect on maintaining healthy vital signs, reducing rates of mortality, as well as behavioral development, breastfeeding rates, pain occurrence, and bonding between parents and infants. Recommendations have been made as to how to integrate this practice into standard care for NICU patients.
According to the Centers for Disease Control and Prevention (CDC), the incidence of preterm births, any birth before 37 weeks gestation, is one of every nine births in the United States (Centers for Disease Control and Prevention, 2014). Compared to full term infants, preterm infants are often subject to many obstacles and complications in the first few weeks of life due to underdeveloped body systems (Ladewig, London, & Davidson, 2012). Depending on the length of gestation, they may not be able to endure extra-uterine life without medical intervention (Ladewig, London & Davidson, 2012). They are at higher risks for lung disease, behavioral and social problems, poor vision, heart defects, and infection, compared to full term infants (Ladewig, London & Davidson, 2012). All of these potential complications can delay proper physical, psychosocial, cognitive, and behavioral development or result in infant death.

Kangaroo care may be one method of care that could positively affect a preterm infant’s outcome. Kangaroo care (KC), or kangaroo mother care (KMC), is a method that mothers use to bond with their newborns, which includes skin-to-skin contact between the mother and the baby. Preterm infants are not always able to participate in kangaroo care with their mothers within the first few days or weeks of life because they are frequently admitted to the Neonatal Intensive Care Unit (NICU). There can be a lot of anxiety and uncertainty associated with preterm infants and kangaroo care because the neonates can be so fragile and medical equipment can be intimidating to parents. A survey of 284 NICUs in Europe determined that routine offers of KC occurred with rates ranging from 41% to 100% (Nyqvist et al., 2010). This statistic provides evidence that not all hospitals are regularly offering KC or making it a priority in their standards of care. The purpose of this project was to identify, describe, and evaluate the evidence about the effects of kangaroo care on outcomes in preterm infants. Practice and research recommendations have been identified based on the critical appraisal of the evidence and known barriers to
providing this care in the NICU. The following PICOT question will be answered: In preterm infants, how does kangaroo care, compared with a lack of kangaroo care, affect vital signs, mortality rates, behavioral development, parent-infant bonding, pain occurrence, and breastfeeding rates?

**Methods**

Through the review of twenty studies published in professional practice journals, information was gathered about the differences between receiving kangaroo care and standard care in preterm infants. Correlations between the implementation of kangaroo care and various aspects of physical, psychosocial, cognitive, and behavioral development were identified through analysis of the twenty studies reviewed. These relationships were examined to determine whether kangaroo care has an effect on these aspects of infant development. The researchers used the following research databases in order to gather said studies: Oxford Journals, PsychInfo, CINAHL Plus with Full Text, PubMed, and Medline with Full Text. The studies used in this project varied from random controlled trials, case studies, and cohort studies. Keywords included in the searches were: kangaroo care, preterm infant, development, morbidity, mortality, health, vital signs, behavior, interaction, pain, breastfeeding, and bonding. Studies were excluded if they examined infants that were not born preterm and if kangaroo care was not an intervention used. Studies were also excluded if they were not written in English. In addition, articles were excluded if they were not published within fifteen years of the current date. Information about administration of kangaroo care and developmental factors in infants (vital sign regulation, mortality, behavioral development, parental-infant bonding, pain, and breastfeeding) was analyzed to form a conclusion about the effectiveness of using kangaroo care to benefit preterm
infants’ overall development. The researchers examined the validity, reliability, and possible limitations with each research study through an integrative review of literature.

**Review of Literature**

**Background**

The concept of Kangaroo care first emerged in 1970 in the midst of research being done on ways to improve mothers’ behaviors towards their infants within the first couple of hours after birth (Ludington-Hoe, 2011). According to Ludington-Hoe (2011), it was concluded that the practices being studied, including kangaroo care, improved attachment of mother and child. However, despite the positive outcome of the study, the first report of skin-to-skin contact being used in the hospital on a preterm infant wasn’t until 1983 in Columbia, South America (Ludington-Hoe, 2011). In the following years, many studies about kangaroo care and its effects on both term and preterm infants, as well as books and studies on how to best implement the practice were published and circulated around the world (Ludington-Hoe, 2011). Ludington-Hoe (2011) reported that today, the practice of skin-to-skin contact has been approved by the American Academy of Pediatrics, American Heart Association, National Association of Neonatal Nurses, and other prestigious organizations. Standard guidelines for kangaroo care are that the mother provides skin-to-skin contact for at least 60 minutes per day continuously in both term and preterm infants (Ludington-Hoe, 2011). In addition, the U.S. Centers for Disease Control and Prevention recommends kangaroo care begin within the first minute of life and lasting until the first breastfeeding session (Ludington-Hoe, 2011). The importance of this practice lies in its effects on physical, mental, psychosocial, and behavioral development of not only term infants, but preterm infants as well.
Vital Signs and Infant Mortality Rates

Many different research studies have been conducted to examine the effects of skin-to-skin care on preterm infants in terms of mortality and the ability to maintain physiologic homeostasis. If a preterm infant can maintain life and the physiologic factors that promote normal and healthy living conditions, the chances of the infant having an absence of adverse health effects is greater than if the infant cannot maintain homeostasis.

Kangaroo care has the potential to affect survival rates of preterm infants, especially those in developing countries that lack the resources to provide expert care to at-risk infants (Worku & Kassie, 2005). A randomized controlled trial performed by Worku and Kassie (2005) examined the differences in survival rates amongst 259 preterm infants, 123 of which were low birth weight. Half of the infants were provided with kangaroo care and the other half were treated with standard care. Standard care can be defined as having no restriction on time, position, or method of holding an infant (Worku & Kassie, 2005). In these studies, standard care is being used as a control group in order to ascertain information about the benefits of kangaroo care. The results of the Worku and Kassie study showed that the infants being treated with kangaroo care had a mortality rate of 22.5% as opposed to the 38% mortality rate seen in those receiving standard care. In addition, the study showed that infants that received kangaroo care while in the hospital were discharged an average of 24 hours sooner than the infants that did not receive kangaroo care. Ultimately, it was concluded that kangaroo care is an effective practice for promoting survival and overall health of preterm or low birth weight infants.

One limitation of this project was that the researchers did not study or take into account the safety and effectiveness of kangaroo care in the community health setting. In Ethiopia, where this research was conducted, there is a strong community health system including many clinics.
Therefore, the fact that this study does not include data about practicing kangaroo care in the community health system is a limitation in and of itself. In addition, the researchers could only enroll 47.5% of the babies in the NICU they were studying. Even though they enrolled a large sample size of 259 infants, the fact that they could not enroll even 50% of the infants at the hospital due to most of these deliveries were performed at different health care facilities where the mothers were either not readily available after birth or were required to stay at the facility for a certain period of time. However, the validity of this study is acceptable. The researchers aimed to measure the mortality rates of preterm infants and ultimately, those factors were measured successfully. This study is also reliable because the sample size was quite large and the researchers took the proper precautions to make sure that the study was randomized.

Researchers have found that skin-to-skin contact affects physical health of preterm infants. Carbasse et al. (2013) conducted a cohort study examining a group of 96 very low birth weight preterm infants and their vital signs. Baseline measurements were recorded before the KC intervention and compared with the vital signs measured during and after kangaroo care. This study included both infants that were and were not being mechanically ventilated. It was found that during kangaroo care, the infants’ oxygen saturation tended to increase and the need for an external oxygen source decreased. Preterm infants that are being mechanically ventilated for long periods of time are at risk for developing respiratory distress syndrome (RDS) (Ladewig, London, & Davidson, 2014). Extended mechanical ventilation can cause damage to a premature infant’s fragile lungs. This can lead to the development of breathing difficulties due to the impact of excessive amounts of pressure and oxygen being pumped continuously into the lungs (Ladewig, London, & Davidson, 2014). Lessening the amount of external oxygenation that an infant requires can be beneficial in preventing these respiratory problems and ultimately, leading
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towards healthy respiratory system development. Keeping oxygen saturation levels stable may contribute to the future and overall health of vulnerable preterm infants.

A single limitation of this study was that a control group was not used. As opposed to having one group receive kangaroo care and another group receive standard NICU care, this study recorded the vital signs of infants during and after the kangaroo care interaction. The validity of this study is good considering the fact that the researchers were gauging whether or not kangaroo care was safe based upon the ability of the infant to regulate vital signs during the process. The reliability is a little less concrete due to the fact that this was not randomized. However, this study was not designed in a manner that required there to be a control group and a treatment group because each infants’ vital signs are different. Therefore, comparing each infant’s vital signs during and outside of kangaroo care practice gives a better comparison of individual infant reactions. This allowed the researchers to understand how skin-to-skin care affects the maintenance and regulation of vital signs as an indication to whether or not this is a safe practice for vulnerable infants.

An interesting case study performed by Jarrell, Ludington-Hoe, and Abouelfettoh in 2009 examined the effects of kangaroo care on a pair of twins that were born preterm. The study was designed to see if the infant’s vital signs would be affected by the implementation of kangaroo care. During the study, Twin A experienced tachycardia, tachypnea, and a decrease in oxygen saturation during kangaroo care. However, Twin B had a positive reaction to the implementation, showing a decrease in heart rate and respirations and an increase in temperature. All of these changes in vital signs for Twin B were alterations that fell within the normal limits of vital signs for healthy infants. The researchers made six conclusions as to why Twin A had an adverse reaction to the kangaroo care. Twin A was being mechanically ventilated and may not have been
positioned comfortably when receiving kangaroo care. Some infants respond to nursing interventions such as this with physiologic compromise such as increased heart and respiratory rates. Additional stressors included multiple extubation attempts and transitioning from the incubator to an open crib environment. Twin A also had bronchopulmonary dysplasia (BPD), a condition in which an infant’s lungs become inflamed and scarred due to abnormal development of the lung tissue (Ladewig, London, & Davidson, 2014). This condition causes respiratory distress and ineffective gas exchange, which usually requires medical intervention (Ladewig, London, & Davidson, 2014). BPD could have possibly developed in this infant due to a more immature cardiorespiratory system than Twin B.

One of the limitations of this study is that the twins were not placed on the same breast while participating in kangaroo care, which would have caused different conditions for each of the infants. Since the twins participated in kangaroo care at the same time, it was not possible for them to have the exact same conditions, causing a possible discrepancy in the data. In addition, the twins may have been handled differently by the staff members that transported them to and from their mother for the kangaroo care sessions. This could have negatively altered the results. The validity of the study is adequate due to the fact that the process measured exactly what the researchers intended, which was how a preterm infant’s vital signs would be affected by participating in kangaroo care. However, the reliability of this study is questionable. Simply the fact that this is a case study that focuses on a single pair of twins is enough of a reason to make the conclusion that the research cannot be used to make assumptions about how a majority of preterm infants will be affected by this practice. Therefore, this cannot be counted as a reliable representative of how infants will react and further research should be conducted on this subject.
Thermoregulation is of key importance in the care of preterm infants. Oftentimes, these vulnerable babies cannot physically regulate their own temperatures, leading to additional health concerns. Throughout time, this has been a widely studied topic and research has shown that aiding preterm infants in thermoregulation through medical interventions can increase preterm infant survival rates. Karlsson et al. (2012) conducted research to determine whether or not kangaroo care had an effect on a preterm infant’s thermoregulation. Infants’ temperatures were monitored during the process of kangaroo care. It was found that the infants’ temperatures did not differ extremely during the pretest (in the incubator before KC), during skin-to-skin care, and during the post test (back in the incubator after KC). The average temperature during the pretest and KC intervention was recorded as being 36.1 degrees Celsius. During the posttest the average temperature was measured as being 36 degrees Celsius. The researchers concluded that these temperature changes were not significant enough to show that kangaroo care has an adverse effect on maintenance of temperature in these infants. Ultimately, nurses should encourage kangaroo care with preterm infants because having normal temperatures can lead to positive health outcomes in these infants (Karlsson et al., 2012).

One of the limitations of this study is that a small sample size was used to gather data. The researchers only examined 26 infants, which is a very small percentage of the preterm infant population as a whole. Therefore, the reliability of this study is also not adequate to be able to predict how the entire population will respond during the practice of kangaroo care. The validity of this study is accurate because the researchers successfully determined how thermoregulation was affected by the practice of kangaroo care. Further research would need to be done on this subject in order to make an accurate assumption about the positive effects of practice in terms of skin-to-skin contact.
“Translating Research Findings Into Practice - the Implementation of Kangaroo Mother Care in Ghana”, by Bergh, Manu, and Nang-Beifubah (2012) studied the implementation of kangaroo mother care (KMC) in Ghana and compared their findings to previous research in order to assess the success of the method in reducing infant mortality rates. KMC and kangaroo care are both terms for skin-to-skin contact in mother-infant bonding. However the researchers used KMC in their analysis, therefore any discussion of their study will refer to kangaroo care as KMC. This study was a three-phase outreach intervention involving 38 hospitals in Ghana. Phase I included an introductory and steering committee workshop on how to manage the implementation of KMC. Phase II occurred six months later and included another steering committee workshop that focused on strengthening the teams’ knowledge of KMC. Phase III was a progress monitoring workshop, followed by an assessment of the level of KMC implementations with a debriefing meeting. Their study found that of the 38 hospitals, 26 practiced KMC and there was a decrease in infant mortality rates at these hospitals. The hospitals were scored to determine their progress in implementing KMC with the levels of achievement labeled as ‘creating Awareness’, ‘adopting the concept’, ‘taking ownership’, ‘evidence of Practice’, ‘evidence of routine and integration’, and ‘sustainable practice’. The twenty-six hospitals (68%) had successfully reached the level of ‘evidence of practice’ by the end of Phase III. This means that upon observation, the staff was oriented to KMC, infants were in KMC positions, and the staff was documenting KMC in patient records.

This decline in infant mortality rates, however, cannot be completely attributed to the KMC Ghana initiative because other initiatives regarding the care of newborns were being implemented at the same time. The fact that this program was not the only one occurring in these hospitals limits how the results can be interpreted. The hospitals that had implemented KMC in
their facilities scored low on the scale that assessed the use of KMC during the third phase. Therefore, even though the data shows that the hospitals used this in the care of their newborns, they did not fully implement the KMC. All of these factors affect the validity of this study but overall the validity is good. This is due to the fact that the goal of the research was to measure if the three phase intervention was able to teach and promote KMC. The intervention was successful because the hospitals’ scores indicated that they were utilizing this method of newborn care and the incidence of infant mortality decreased. This study is reliable because the methods that were used to assess if the initiative succeeded had been used before. The researchers suggested that the weight of the infants in the studies should be included in future investigations to possibly make the data more reliable in further studies.

All five articles examining the effects of kangaroo care on preterm infant vital signs and mortality showed that the practice can be effectively used to promote regularity of vital signs and decrease preterm infant mortality. This is an important practice to use, especially in developing countries. These countries do not have access to extensive medical knowledge or technology to benefit this vulnerable infant population and KC is free and a simple solution to high mortality rates.

**Pain Occurrence**

Preterm newborns may undergo many different painful procedures while in the hospital and one of the more common procedures is a heel stick. A newborn may have a heel stick for routine labs to test for the levels of hematocrit, hemoglobin, bilirubin, and glucose in the blood (Ladewig, London, & Davidson, 2012). Many studies have been conducted that show that skin-to-skin contact can be used as a non-pharmacological analgesic for preterm and full term infants.
alike. It is anticipated that if skin-to-skin contact is used before a heel stick, the painful response can be significantly reduced.

Ludington-Hoe, and Hosseini’s (2005) study “Skin-to-Skin Contact Analgesia for Preterm Infant Heel Stick” revealed that pain can produce physiologic disruption and skin-to-skin positioning is a good intervention to reduce pain during procedures. This study was a randomized crossover trial that involved the participation of 24 premature infants in a university-based NICU. The study explored whether or not preterm newborns who were held skin-to-skin during a heel-stick had reduced physiologic and behavioral pain responses. There were two groups of infants in this study. One group received 3 hours of incubator care followed by 3 hours of KC with a heel stick during each method of care. The other group received 3 hours of KC and then 3 hours of incubator care during each heel stick. This eliminated the limitation that the infants will each respond differently to the painful stimulus. The researchers were able to compare each infant’s individual response to the pain. The results of this trial found that heart rate and crying responses to pain were significantly reduced when infants were held skin-to-skin versus being in an incubator during the heel stick procedure.

Ludington-Hoe and Hosseini’s (2005) study was very successful in measuring the impact that KC has on an infant’s response to pain. Therefore the validity and reliability of their study is very high. There were even three infants receiving KC in the study who were in deep sleep when the heel stick was delivered and they did not cry at all. This was surprising to the researchers and supports the conclusion that skin-to-skin contact is an appropriate non-pharmacological pain intervention for preterm infants. This study accounts for the individualized reaction and pain response that occurs in the preterm infants because it measured the heart rate variability for each heel stick. One possible limitation to this study is that giving kangaroo care for 3 hours per heel
stick or any other painful procedure is not always possible for infants in the NICU setting. This can be due to the mother’s schedule, the fact that incubator care is more readily available, and other outside factors.

Johnston, Filion, and Walker’s (2008) study “Kangaroo Mother Care Diminishes Pain From Heel Lance in Very Preterm Neonates: A Crossover Trial” also examined the effect of KMC on heel sticks in a population of very preterm neonates. Very preterm infants are neonates that are between 28 0/7 and 31 6/7 weeks gestational age. They stated that skin-to-skin contact has been shown to effectively diminish the pain response from a heel lance in full term as well as preterm neonates. The researchers conducted this study on very preterm infants to see if this is also true in the younger population or if similar results would be obtained. Sixty-one very preterm neonates were observed at three different NICUs in Canada. A Premature Infant Pain Profile (PIPP) tool was used to measure pain and it included physiologic indicators such as heart rate and oxygen saturation, as well as behavioral indicators such as facial expressions. The PIPP also factors the weights for younger gestational age and sleep states into the score that can range from 0 to 21. PIPP scores were used to evaluate pain after a heel lance and it was found that these scores were significantly lower in the KMC condition versus no KMC. The investigators suggest that very preterm neonates may have internal mechanisms elicited through KMC that decrease pain response, but not as powerfully as in older preterm neonates. The pathophysiology of the decreased pain responses is unknown to the researchers yet they discuss that their findings may be caused by endorphin or serotonin release. Other non-pharmacological pain reducing measures such as non-nutritive sucking are also hypothesized to release endorphins or serotonin. Therefore, it is possible that the same internal mechanisms are in action during KMC.
One limitation of this study is that it did not include infants that were intubated or required supplemental oxygen. Many very preterm infants require these interventions so it is excluding a major part of the overall preterm population. Another limitation is that the person delivering the heel lance may have been more or less gentle for the infants in the KMC intervention. Also, the health care provider would have had to bend down towards the mother and baby or sit in a chair next to them in order to get the blood sample and that can potentially affect the way the heel lance was delivered. Some staff were even uncomfortable with the fact that the mother was observing them while they performed the heel lance. However, none of these limitations affect the validity or reliability of this study. Both the tools and methods used were reliable and the study accurately measured the pain response in very preterm infants.

“Effect of Kangaroo Care (Skin Contact) on Crying Response to Pain in Preterm Neonates” is a study conducted by Kostandy et al. (2008). When preterm infants experience a heel stick, crying commonly occurs and this can have an adverse physiological effect on the infant. This study looks at how the presence of kangaroo care affects the preterm infant’s crying response to a heel-stick compared to no kangaroo care. This prospective cross-over study included ten premature infants (30-32 weeks gestation) that were between 2 and 9 days old. They found that when kangaroo care was implemented, as compared to the incubator, reduced crying time during a heel-stick was observed. In addition, the KC intervention reduced crying in the recovery phases. This study proved that KC can reduce crying responses to a heel stick in stable preterm infants (Kostandy et al. 2008).

Kostandy et al. (2008) suggest that the results should be considered carefully because it is only a pilot study. However, the results are valid and there is a moderate reliability considering this fact. The researchers intentionally chose not to include infants that experienced
inflammation at the heel stick site in the final data. Future studies should be done to look at this aspect of a heel stick because inflammation can occur in invasive procedures and it can influence the sensation of pain that is felt by the individual. Another limitation is that maternal scent also has a role in affecting the infants’ response to painful stimuli. Maternal scent has a calming effect and would most likely reduce crying time. Kostandy et. al (2008) suggest that further studies should be done to see if the scent and presence of the mother without KC can affect the crying response to pain.

Cong, Ludington-Hoe, and Fu (2009) conducted a study on how kangaroo care affects a preterm infant’s heart rate variability in response to heel stick pain. According to the researchers the heel stick is the most common painful procedure for preterm infants in neonatal intensive care units and the resulting pain can cause the infant to experience tachycardia and tachypnea if not managed. This study aimed to answer whether or not implementing KC results in decreased pain from a heel stick. The autonomic system of the body includes the parasympathetic and the sympathetic and is the involuntary part of the nervous system. The parasympathetic nervous system slows the heart rate when the body is relaxed and the sympathetic increases the heart rate when the body is stressed. Therefore, when put in a stressful situation, such as a heel stick, the body’s autonomic sympathetic nervous system will take over and cause the infant’s heart rate and breathing to increase. When subjected to heel stick pain, preterm infants were either in incubator care (IC) or in KC. This is a randomized cross-over trial that observed fourteen preterm infants between 30-32 weeks gestational age and less than nine days postnatal age. Continuous ECG data was collected during the procedure from two chest electrodes and then converted by computer software to numerical values to determine the high and low frequency bands. High frequency (HF) bands reflect parasympathetic function and low frequency (LF)
bands reflect sympathetic function and these are the units used to measure the autonomic response in this study. Heart rate variability was found to be significantly lower in KC than it was in IC for both the baseline and heel stick periods of assessment. The LF/HF ratio decreased from baseline to heel stick and then increased in the recovery period. This means that there was an increase of parasympathetic influence (HF) that balanced out the sympathetic response to the heel stick. Cong, Ludington-Hoe and Fu (2009) concluded that KC may be helpful in mediating the physiologic response to painful procedures in preterm infants.

However, one limitation of the study found by Cong, Ludington-Hoe and Fu (2009) is that infants often showed differences in behavioral and physiologic responses to pain so there is no adequate way to be completely accurate when measuring the physiologic response that the infant displays. There is also no way of knowing exactly how much pain the infant is in. Cong, Ludington-Hoe and Fu (2009) attempted to decrease these factors by evaluating the crying response and facial grimacing along with the heart rate variability. They also examined what painful procedures the infants in the study had already undergone. Pain is a subjective experience and it is very possible for humans to become accustomed to certain painful procedures, or to be desensitized to a heel stick in comparison to a circumcision or other surgery. Although it is impossible to completely rid this study from the previously discussed limitations, this study’s validity is very high and the results are reliable. The researchers convey that their study is the first of its kind and that future studies should be conducted to look at heart rate variability alongside the pain response (Cong, Ludington-Hoe & Fu, 2009).

Akcan, Yiğit, and Atıcı (2009) conducted a study that measured the effect of kangaroo care on pain in premature infants during invasive procedures. Newborn infants are commonly subjected to many medical interventions, such as surgical procedures, without receiving
appropriate pain medication. Their study assessed the effectiveness of kangaroo care, implemented by mothers, on pain in preterm infants throughout the process of an invasive procedure. In this study the painful stimulus was a heel stick to obtain a blood sample. This was a comparative, randomized, controlled study with a total of 50 premature infants (25 in KC group, 25 in control group) with gestational ages ranging between 26 and 36 weeks and postnatal ages ranging between zero and 28 days. For infants in the KC group, PIPP scores were significantly lower at each measurement during or soon after the invasive procedure as compared to the control group. Therefore, KC starting 30 minutes before and continuing 10 minutes after an invasive procedure was found to be effective in decreasing pain in premature infants.

There are a few limitations that must be considered when reviewing this study by Akcan, Yiğit, and Atıcı (2009) because the results may be slightly skewed for several reasons. While the procedure was being performed, there were several people in the room including the mother, family members, and researchers, who were watching the nurse closely. Some of the nurses felt uncomfortable with this and may have given the heel stick differently than if they were in a situation with less pressure. The baseline vitals and PIPP scores were supposed to be taken immediately before the heel stick. However, the very preterm infants that were receiving KC will have different baselines than the incubator care infants because KC usually improves the infants’ baseline vital signs. Another limitation is that infants who were on ventilators or using supplemental oxygen were not included in this study. The researchers suggest that further studies should include these populations in order to get more reliable and valid results. These limitations are minor and do not affect the validity or reliability of the results in this study significantly (Akcan, Yiğit & Atıcı, 2009).
Johnston et al. (2012) conducted a randomized crossover study on “Alternative Female Kangaroo Care for Procedural Pain in Preterm Neonates: A Pilot Study”. This study’s purpose was to determine the feasibility and effect of kangaroo care for pain relief from a heel lance in preterm neonates provided by either the infant’s mother (MKC) or an unrelated alternate female (AFKC). The mothers were asked to self-report amount and type of holding using diaries to accurately measure the effect that KC has on preterm neonates. This study was conducted in Canada on 18 preterm neonates between 28 and 37 weeks gestational age within 10 days of life from two university-affiliated level III NICUs. There was a 48% participation rate, with only 40 of the possible 82 cases having maternal consent for AFKC. The effect on the PIPP score was a small decrease across the first 2 minutes of the procedure. Furthermore, there was little to no difference between the PIPP scores of the AFKC infants and the MKC infants. However, the high refusal rate of mothers to have an alternative non-related woman give KC provides strong evidence that the use of AFKC is a less desirable substitute. The selection criteria also excluded mothers who did not understand English or French. Therefore, women from other cultures in which there are multiple caregivers and who would have been more likely to accept an alternate female may have not been represented in this small sample.

One limiting factor of the study was the low participation rate of 48%. This greatly diminished the researcher’s sample size and could have affected the results. However, 40 subjects is still a decent sample size and it does not affect the validity or reliability of this study. The main reason for refusal was the mothers’ discomfort with other women providing kangaroo care to their newborns (Johnson et al., 2012). Preterm neonates are already potentially fragile so it is understandable that a mother would be very reluctant to trust another woman to care for her newborn.
There are six studies that examined the effect of kangaroo care on the pain response of preterm infants. All six found that the use of KC during painful procedures, such as a heel stick, reduced the pain that the infant experienced. This was shown by decreased crying times and reduced PIPP scores, as well as a study that looked at heart rate variability.

**Breastfeeding Rates**

Many hospitals have implemented KC policies because it is thought that it has positive effects on breastfeeding rates. Breastfeeding has shown to have positive impacts to the health of preterm infants. The findings in three articles were reviewed to determine if current research supports this hypothesis.

The first article was a randomized controlled trial conducted by Hake-Brooks and Anderson (2008) that analyzed the rates and exclusivity of breastfeeding among preterm infants that received kangaroo care as compared to those that received standard care. In this study, standard care is defined as no restriction or instruction as to how to hold or care for the baby. Exclusive breastfeeding means that the only nutrition the infant received was from breastfeeding. A total of 66 preterm infants were studied over an eighteen month period. It was determined that the infants receiving kangaroo care breastfed for an average of 5.08 months while the standard care group of infants breastfed for an average of 2.05 months. This means that the infants receiving kangaroo care breastfed two and a half times longer than the infants not receiving skin-to-skin care. In addition, the infants receiving skin-to-skin contact breastfed more exclusively than those receiving standard care. This is important because breastfeeding plays an important part in the protection of infants against various illnesses because breast milk contains various antibodies that are transferred from the mother to the baby (Ladewig, London, Davidson, 2014). Therefore, according to Hake-Brooks and Anderson (2008), the benefit of this positive
correlation would be that babies who breastfeed exclusively and for longer durations have more likelihood of avoiding illness.

Hake-Brooks and Anderson gathered no evidence showing reasons why mothers ceased breastfeeding which is one limitation of the study. Another limitation was that the data about duration and exclusivity of breastfeeding was gathered solely by the mothers’ reports. This could have caused some data discrepancy because mothers may have given false information to try to give the researchers the outcome they were seeking from the study. In addition, mothers may not have accurately reported how long they breastfed or may have given an estimate based on their own judgement of time. This could leave room for error, however, it is not very feasible to have a researcher with each and every mother-infant dyad participating in the study at all hours of the day. Therefore, gathering data by mothers’ reports was necessary through 18 months of age. Another possible limitation of this study is that the mothers and infants in the kangaroo care group were given extra attention by the researchers through education about the process and how to care for their infants in this specific manner. This may have caused a biased discrepancy between the control and treatment groups. However, the extra education that the kangaroo care group dyads received was necessary in order to ensure that the mothers were practicing kangaroo care properly and that they understood what they needed to do for the study. This research has good validity, as it measured what the researchers intended. The reliability is also intact, despite the study’s limitations. This is simply because the limits were necessary in order to conduct the study properly. However, Hake-Brooks and Anderson (2008) suggested that research should be conducted on this topic in order to get an accurate answer about how breastfeeding is affected by skin-to-skin care.
A second study by Heidarzadeh, Hosseini, Mashallah, Tabari and Khazaee (2013) was a cross sectional study that evaluated “The Effects of Kangaroo Mother Care on Breast Feeding at the Time of Discharge”. Their research states that exclusive breastfeeding is one of the most important and essential components of KMC. This study was performed in Iran and measured the occurrence of exclusive breastfeeding of infants at discharge and if the use of KMC can be a positive influence. The study observed 251 premature newborns between May 2008 and May 2009 in a NICU in Alzahra University Hospital in Tabriz. The results indicated that there was an increase in the amount of time the women exclusively breastfeed using KMC. Of the KMC group, 62.5% of the infants were breastfeeding exclusively at the time of discharge. This is much greater than in the control group, in which only 37.5% of the infants were exclusively breastfeeding at the time of discharge. Therefore, this study has found that KMC is more effective and increases exclusive breastfeeding.

This study was found to be reliable and the results valid because the maternal age, birth weight of the infants, mode of delivery, and the 5 minute APGAR score did not affect the results. During the experiment, the mother was not the only one to give the infants KC. The fathers were also involved and this is a possible limitation. Father implemented KC is a very accurate depiction of the reality of caring for a newborn because the parents often work together to provide care. Overall, it helps the mother find time for herself and the father is able to bond with his infant. However, this may have influenced the occurrence of exclusive breastfeeding at the time of discharge.

The last study was conducted by Flacking, Ewald, and Wallin (2011). In their article, “Positive Effect of Kangaroo Mother Care on Long-Term Breastfeeding in Very Preterm Infants” the long term effects of breastfeeding were explored. One global public health
recommendation for infants is that they should be exclusively breastfed for the first six months of life. This recommendation especially applies to preterm infants because they are even more vulnerable to infections and other complications. The researchers aimed to investigate the use of KMC and its association with breastfeeding at one to six months of age in mothers of very preterm (VPT) and preterm (PT) infants. VPT infants are less than 32 gestational weeks and PT infants are between 32 and 36 gestational weeks of age. It is a prospective longitudinal study that was conducted in NICUs of four counties in Sweden and included 103 VPT and 197 PT singleton infants and their mothers. The study found that VPT dyads that breastfed at one, two, five, and six months spent more time in KMC per day than the dyads not breastfeeding at these times. The incidence of breastfeeding at six months of age for PT infants was 58% and 43% for VPT infants. In the PT dyads, “no statistically significant differences were found in the amount of KMC per day between the dyads that breastfed and the dyads that did not” (Flacking, Ewald, & Wallin, 2011, p. 190). However, this data supports the use of KMC in the hospital because it influences the time spent breastfeeding in VPT dyads. Consequently, KMC has a positive effect on the process of breastfeeding, specifically in the dyads with the most vulnerable population.

One limitation for this prospective study is that the results might be biased due to what the mothers personally preferred. If a mother was in favor of breastfeeding, it is possible that she also favored KMC and vice versa. The interviews were also conducted over the telephone and this method of data collection is not always completely accurate and unbiased. The mothers self-reported the amount of time that they spent using the KMC method so the data they provided could have been unintentionally altered. Overall, the study has a high validity but the results may have questionable reliability. The results did not show a significant positive effect of KMC on the PT dyads and further studies should be done to explore why this may have occurred.
The research findings of these three studies support the hypothesis that kangaroo care improves exclusive breastfeeding rates amongst preterm infants. However, a common challenge in collecting data in these studies was ensuring that the mothers’ provided accurate information regarding breastfeeding and time engaged in KC.

**Behavioral Development and Parent-Infant Bonding**

Additional research studies explored the possible impact of KC on the infants’ behavioral development and parent-infant bonding. It is hypothesized that kangaroo care assists in the development of these two aspects. Six studies were reviewed to explore this possible relationship.

White-Traut, Wink, Minehart, and Holditch-Davis performed a randomized controlled trial in 2012 to examine the rates of engagement and disengagement behaviors among infants being treated with kangaroo care as opposed to infants being treated with auditory, tactile, visual, and vestibular (ATVV) care. Engagement behaviors were defined by the researchers as facial brightening, hands opening, facial or mutual gaze, cyclic extremity movement, and relaxation posture. Some disengagement behaviors that were examined included eyes clinched, gaze aversion, finger splay, struggling movements, crying, whining, fussing, and hunger posture. Twenty-six mother infant dyads were examined and it was found that infants being provided ATVV care had a higher percentage of engagement and disengagement behaviors than those being treated with kangaroo care. Therefore, it was determined that ATVV care provided for healthy behavioral development to a higher extent than the kangaroo care intervention. It was concluded that kangaroo care does have a positive effect on behavioral development in preterm infants. However, kangaroo care may not be the best option as an intervention to foster
behavioral development. Therefore, it is important to consider the other options, such as ATVV that are built to promote behavioral development as well.

The first limitation of this study is simply a small sample size. White-Traut, Wink, Minehart, and Holditch-Davis (2012) noted that the small sample size affects the generalization of these results, but does not mean that it is unreliable research. Another limitation is that it was conducted in the NICU, meaning that the data doesn’t account for the practice of these methods outside of a hospital setting. In the NICU, there could have been various factors that affected the behaviors of these infants that would not have been experienced in a different setting. The researchers addressed this limitation, stating that the NICU is the main setting in which mothers will be practicing these techniques with their infants. The researchers sacrificed some of their control over the environment in order to gain some validity about practice in the NICU. Lastly, a third limitation lies in the fact that one person who was entering the codes had knowledge of what the researchers were studying, whereas a second coder was unaware of the focus of the study. This could have skewed the data due to the fact that certain pieces of data that were coded were not done blindly. This study is valid because it did measure what the study was designed to measure. However, the reliability is not fully clear, mainly due to the fact that some of the data could be biased.

In a second study by Chiu and Anderson (2009), a randomized controlled trial evaluated feeding and learning scores of 100 preterm infant mother dyads after separating the infants into either a group that received kangaroo care or a group that received standard care. These scores were obtained using the Nursing Child Assessment Satellite Training Program’s Feeding and Learning scales. Each scale has six subcategories: sensitivity to cues, response to infant distress, social-emotional growth fostering, clarity of cues, cognitive growth fostering, and
responsiveness of the child to the caregiver. These scales measure various factors concerning behavioral development such as feeding, learning, and teaching. During observations of learning and feeding, observers ranked behaviors in the subcategories with a yes or no based on occurrence, which then were translated into scores. The study showed that scores for feeding were comparable between skin-to-skin care infants (60.9) and standard care infants (61.4). Teaching scores were lower for skin-to-skin contact infants (55.1) as compared to the control group (56) only at six months of age. The researchers concluded that more studies need to be done in a more concise and functional manner in order to really determine whether or not kangaroo care is beneficial in terms of behavioral development (Chiu & Anderson, 2009).

A limitation of Chiu and Anderson’s 2009 study is that the kangaroo care group had a higher rate of follow-up visits than the control group, which could have affected the results of the study. Also, since the sample of infants was so different, this could have skewed certain results one way or another, making it hard to determine what effect skin-to-skin care has on preterm infants, if any. In addition, the scoring of certain behaviors that the researchers gathered from video tapes were scored as either present or absent, giving no quantifying number to the scores. Therefore, if a specific behavior was not explicitly seen on the tapes, it was simply recorded as absent. Quantifying the behaviors seen on the video tapes could have drastically changed the results that were published from this study. Therefore, the reliability of this study is very low. It is hard to determine what kind of effect, if any, kangaroo care had on the sample of preterm infants. Also, the validity of this study is questionable because the researchers were not able to come up with a conclusion based on the evidence they gathered during the study. Further research definitely needs to be conducted on this subject and this style of study needs to be
altered in a way that allows for researchers to see the effect that skin-to-skin care has on these infants (Chiu & Anderson, 2009).

Skin-to-skin contact may have an effect on the length of time that mothers hold their infants and use physical contact to bond. In a randomized controlled trial performed by Anderson et al. (2003), 32 preterm infants were studied to determine the effect that kangaroo care has on the duration of human contact that infants receive. The study separated the infants into two groups: one receiving kangaroo care and another receiving standard care. The results of the study showed that the kangaroo care group was held roughly twice as long as the standard care group. This is an important finding because human contact has been shown to affect mother or father-infant bonding as a newborn and later on in life (Anderson et al., 2003).

The significant limitation of the Anderson et al. study was that some of the mothers participating in this research were afraid of holding their infants because they thought it would be a risk for the child’s safety. This definitely may have skewed the data because many of these infants may have been held a lot more if their mothers were not afraid of harming them. The validity of this study is sufficient seeing as these measurements were intentional. However, the reliability may have been skewed due to the fact that some of the mothers (especially those whose infants were in the NICU) were reluctant to hold their infants (Anderson et al., 2003).

A recent study being reviewed was completed by Feldman, Rosenthal, and Eidelman (2014) examining the effects of kangaroo care on various aspects of behavioral development and the mother-child relationship throughout the first ten years of life. A total of 146 pairs of mothers and child dyads were divided into kangaroo care and non-kangaroo care groups. These dyads were surveyed after discharge from the hospital and when the child was three, six, twelve, and 24 months, as well as five and ten years of age. Data was gathered through examination of various
behaviors exhibited between mothers and children by video and other numerical data (age, stress test results, lab values, infant development scores), as well as observation methods. The results showed that those infants that received skin-to-skin care displayed increased maternal attachment behaviors, such as longer periods of time spent bonding with infants, and behavioral development by the age of six months. In addition, by ten years of age, the kangaroo care group showed less drastic stress responses (sympathetic nervous system symptoms), more organized sleep patterns, and better behavioral control (more synchronous exchanges of behavior within the dyads). The kangaroo care group also displayed more mother-child reciprocity in conversation and conflict at the ten-year old mark than the non-kangaroo care group. These factors all affect behavior and the mother-child bond, as well as show that kangaroo care can have lasting effects on preterm infants (Feldman, Rosenthal & Eidelman, 2014).

One limitation of Feldman, Rosenthal, and Eidelman’s (2014) data was that it did not take into account data that could have been collected about the interaction between fathers and infants. In addition, the researchers mentioned a lack of randomization in this study because only neurologically intact infants of low social risk were recruited to participate. This was in an attempt to eliminate the factors that independently could negatively affect infant development. The fact that it does not include breastfeeding rates and father data does not affect reliability or validity since the study simply aimed to gather information about how kangaroo care affects human contact. These are simply measures that could be implemented if the study was repeated. However, the fact that there was a lack of randomization within this research warrants skepticism. The researchers did take specific steps when matching the control and treatment groups in order to prevent bias, but the fact that the groups were not randomized is a huge barrier to ensuring the reliability of this study.
Neu and Robinson conducted a study in 2010 on “Maternal Holding of Preterm Infants During the Early Weeks After Birth and Dyad Interaction at six Months”. This randomized controlled trial examines the dyad or relationship between mother and infant and how it is benefited from KC. Early dyad interaction was an important factor in terms of determining the success of co-regulated interactions. Co-regulation was defined as an aspect of “interaction during which the dyad functions as an integrated entity to regulate each other’s behavior” (Neu & Robinson, 2010, p. 401). In other words, the mother and infant work together as one dyad to interact and influence each other’s behavior. The purpose of this study was to examine if the promotion of kangaroo care for healthy preterm infants during an eight week intervention aided in co-regulation between mother and infant at six months of age. The sample size was 65 mother-infant dyads with a mean gestational age at birth of 33 weeks, with 50% of infants being male, and 50% being non-white. One group of dyads was encouraged to hold their infant using KC and the other group was encouraged to use blanket holding. The mothers self-reported the amount and type of holding using diaries that were reviewed weekly. The diaries were analyzed in conjunction with weekly visits by a Registered Nurse (RN) to assist the mother with emotional support, as well as encourage infant holding and information about infant development. The results show that the dyads who were supported in kangaroo care displayed more co-regulated behavior during play than dyads in the blanket holding group. Therefore, dyads supported in practicing kangaroo care in the early weeks of life may develop more co-regulated interactional strategies than other dyads. The researchers believe that this is beneficial to both the mother and the infant because the dyad is able to be more flexible when unexpected situations and behaviors occur, making interactions overall more satisfying for both members of the dyad.
One limitation of this study is that there was a loss of twenty five percent of the sample and this may have affected the results because a significant part of the population was lost. Another limiting factor of this study may be that since it was a self-reporting study, the data could be misinterpreted by the researchers or altered by the mothers’ own perceptions. Also, the researchers express their concern that giving the mothers a diary to write about holding their infants may have prompted more holding of the infants. These limitations do not affect the validity of the study because the tools and method used are accurate and the results are reliable.

The final study reviewed was conducted by Tallandini and Scalembra (2006) and explored the relationship between the mother-infant bond and development of behavior comparing a group of infants that received kangaroo care and a second group that received standard care. The infants’ and mothers’ behaviors were observed a few days after birth and again at 38 weeks after birth. It was found that at the first point of examination, the two groups had similar scores in the following categories: general distress, Nursing Child Assessment Feeding Scale, social and cognitive growth, clarity of cues, and responsiveness to parents. However, at the second examination point, the infants that had been receiving kangaroo care had lower general distress scores, but higher scores in the categories previously mentioned. In addition, the mothers who were providing kangaroo care to their infants spent more time with their babies than did the standard care mothers. This ultimately promotes mother-infant bonding (Tallandini & Scalembra, 2006).

One limitation of this study was that it was not randomized at the individual level. The study purposefully excluded mothers that were against the notion that they would not be able to choose whether their child received kangaroo care or whether they received standard care. Therefore, it was not a totally inclusive study. In addition, the characteristics of the mothers in
the kangaroo care group might have influenced their behavior, temperament, and actions towards their infants and may have altered the results. Also, this study did not take into account the behaviors and attitudes of the staff at the hospitals where the research was taking place. The validity of this study is intact, but the reliability may not be as accountable due to the lack of inclusion of the study.

The six studies that were reviewed provide evidence regarding the relationship between KC and behavioral development and maternal-child bonding. Although each study had its limitations, it was determined that overall their studies presented reliable information.

**Synthesis of Evidence**

**Vital Signs and Infant Mortality Rates**

All five of the research studies examined in the review of literature regarding vital sign regulation and infant mortality rates support the use of kangaroo care for preterm infants because of the positive effects this practice has on these factors in infant health. As previously discussed, the ability to regulate and maintain stable vital signs promotes a positive environment that fosters growth and development of infants with compromised health due to prematurity. In addition, kangaroo care can be a beneficial practice in more rural or poverty stricken countries as a means of increasing preterm infant survival rates. In many of these areas, medical equipment and vast knowledge about modern medicine may be limited. Therefore, kangaroo care is an inexpensive means of creating a positive environment for preterm infants, increasing their chances for survival.

**Pain Occurrence**

All six research studies that examined the response to a painful stimulus during kangaroo care support the use of kangaroo care as a non-pharmacological analgesic. The heel stick is a
very common and painful procedure that preterm infants experience regularly and it can cause adverse consequences. If a preterm infant is in pain, crying time and stress response can increase. Pain can interfere with bonding between mother and infant, breastfeeding, and it can disrupt an infant’s ability to maintain normal functions of vital organs of the body. The mother is then stressed as a result of the infant’s stress response. Kangaroo care can be a very effective method for pain reduction and can be calming for both the infant and the mother.

**Breastfeeding Rates**

The three research studies examining the effects of kangaroo care on breastfeeding rates in preterm infants were shown to have positive correlations between these two factors. Infants that experienced kangaroo care were more likely to breastfeed more frequently, more exclusively, and for a longer period of time compared with infants that did not receive this care. Breastfeeding has been shown to promote infant growth and development, while giving infants important antibodies in order to be able to fight illnesses that may affect them throughout the beginning portion of their lives. This is especially important in preterm infants that may already be compromised in their general health, ability to grow, and immune system functioning.

**Behavioral Development and Parent-Infant Bonding**

Of the six studies that were examined regarding the effects of kangaroo care on behavioral development and parent-infant bonding levels, four out of the six concluded that kangaroo care was an effective practice for promoting these developmental needs in preterm infants. The study performed by White-Traut, Wink, Minehart, and Holditch-Davis (2012) discussing the effects of kangaroo care versus ATVV (auditory, tactile, visual, and vestibular) therapy on the behavioral development of preterm infants, concluded that ATVV therapy was more effective in promoting positive behavioral development in preterm infants than skin-to-skin
care. However, even though ATVV therapy is more effective in promoting behavioral
development, kangaroo care is also a good option for fostering this growth (White-Traut, Wink, Minehart, & Holditch-Davis, 2012). In the study conducted by Chiu and Anderson (2009) examining feeding and teaching scores it was concluded that their data could not conclusively support the use of either standard or kangaroo care in promoting behavioral development. The research conducted was proven to be invalid and unreliable based on the limitations experienced. Therefore, while kangaroo care may not always be the best method to yield optimal behavioral development in preterm infants, it certainly can promote parent-infant bonding. Ultimately, KC should not be ruled out as an effective practice in this respect.

**Recommendations**

The research discussed and examined throughout this report suggests that the practice and implementation of kangaroo care for vulnerable, preterm, and low birth weight infants is beneficial. This practice can be used to foster physical and behavioral growth and development by affecting vital sign regulation, infant mortality rates, pain levels, breastfeeding rates, behavioral development, and parent-infant bonding in a positive manner. Therefore, this method of care should be offered to all infants and parents, including those with special health concerns.

However, in the United States, kangaroo care is practiced intermittently, as opposed to continuous skin-to-skin care. Intermittent kangaroo care could be a mainstay practice for a wide variety of reasons, including lack of time, parents needing rest, family and friends visiting, or medical equipment barriers. Because of this, the best possible practice of kangaroo care has been defined as at least 60 minutes of continuous skin-to-skin holding between a caregiver and the infant based on evidence-based practice research. This standard has become accepted for both full-term and preterm infants. The time standard of 60 minutes has been accepted because it
allows infants to complete one full sleep cycle. This hour long cycle can be implemented many times throughout a single day (Neonatal Network, 2011). However, some parents practice kangaroo care anywhere from a few minutes to multiple hours at a time. Internationally, there are many cultures that practice kangaroo care as a continuous method of care and will hold their infants skin-to-skin all hours of the day and night. While kangaroo care is typically not used for procedural pain, research has shown that it is very beneficial in reducing the incidence of this phenomenon and therefore, should be put into place as a standard protocol for infant procedures (Neonatal Network, 2011).

As previously discussed, there has been a lot of research on the effects of practicing kangaroo care on healthy, full-term infants. However, preterm infants are one population for which there are a large number of barriers to parents practicing kangaroo care. Preterm infants are a vulnerable population due to the fact that they have not had the time to develop physically, putting them at risk for other health problems. That being said, preterm infants do not always receive kangaroo care because there are many barriers to providing these infants with skin-to-skin contact. A study conducted in 2013 by Blomqvist, Frolund, Rubertsson, and Nyqvist examined what some of the barriers to providing Kangaroo Care in the NICU might be and how to address these issues. Some of the barriers that were reported by parents were hospital routines in the NICU, staff attitudes and schedules, mother’s condition after birth, and the presence of visitors or family (especially siblings of the newborn). In addition, infant-related factors such as accessory equipment (ventilators, monitors, etc.), longer feeding time, periods of apnea, hyperthermia and other negative infant reactions were all identified as reasons for ceasing kangaroo care (Blomqvist, Frolund, Rubertsson, & Nykvist, 2013). In addition, mothers’ attitudes towards providing skin-to-skin care may be affected by the set-up and design of NICUs
and special care nurseries. These areas can be busy and open to visitors and healthcare workers, which may make mothers uncomfortable about performing kangaroo care. All of these are barriers to the practice of kangaroo care with preterm infants and are issues that need to be addressed in the hospital setting, specifically in the NICU. Taking into account the vulnerability of preterm infants and the benefits that kangaroo care can have on promoting normal development and growth, it is imperative that nurses promote and assist in the providing of skin-to-skin care with these infants as best as possible.

In response to the barriers covered in the previous paragraph, there are a variety of strategies and interventions that can be done to overcome these obstacles and provide preterm infants with the chance to be able to experience the benefits of kangaroo care. There were four major barriers stated that relate to factors not pertaining to the infant. First, the barrier of hospital routines should be taken over as a direct responsibility of the health care team. If parents wish to participate in kangaroo care with their infants, it is the job of the health care team working with that family to help foster this wish, even if it requires rearranging hospital schedules. Members of the healthcare team should keep the family informed of routines and schedules, allowing for them to budget time for skin-to-skin care with the professionals caring for the child. This should be something stressed to staff during huddles on NICU floors. Team rounds are a great way for the healthcare team to communicate with the family about the plan for the day in order to ensure that the family has time to spend skin-to-skin with the infant.

This strategy can also be applied to the second external barrier of staff attitudes and schedules. Health care professionals often have hectic schedules and multiple patients to think about throughout each day, which can make it hard to find flexibility in the timing of certain interventions. However, if upper level administrators and unit managers promote flexibility and
patient-centered schedules, this will ultimately be translated well into nursing practice. It is also crucial that floor nurses work as a team to assist one another when able, in order to avoid chaos and frustration. In addition, fostering positive attitudes of health care professionals regarding the promotion of kangaroo care begins with education at the collegiate level. Teaching all health care profession students that have the potential to work with infants about the importance and benefits of kangaroo care is something that, if introduced early as a part of formal education, will continue to grow in the same manner.

A third external barrier is the mother’s condition after birth. This can be overcome by assisting fathers in administering kangaroo care when needed. Research has been conducted on the benefits of father-administered kangaroo care for both the father and the preterm infant. The Seventh International Workshop on Kangaroo Mother Care provides simple guidelines stating that kangaroo care should be implemented as soon as possible after birth regardless of who is giving it and that the father is an appropriate substitute when the mother is compromised (Neonatal Network, 2011). This can prevent fragile infants from not receiving this care simply because the mother is not available to provide it.

Lastly, the presence of visitors and family members is a barrier to willingness to practice kangaroo care. If a mother wishes to perform kangaroo care but does not wish to ask family and friends to leave, the nurse may step in and politely ask the family to leave while the mother performs skin-to-skin care. In addition, fathers may also perform kangaroo care while the mother visits with family, and vice versa. This would allow for the infant to experience bonding while still being able to interact with family members and friends that are visiting. Another recommended solution is fostering nurse-parent communication about scheduling kangaroo care times. If the parents establish a set schedule for kangaroo care with the nurse, it holds both
parties accountable for ensuring that the infant receives skin-to-skin care, regardless of whether or not the family has visitors. If set times are established, the family and nurse know that the infant is set to receive this bonding at a certain point in the day. However, it is important to remember that these set schedules do need to be adaptable per the family’s wishes. Therefore, nurses need to remember to remind family members about when established kangaroo care times arrive and work with the family to be able to rearrange schedules and ensure that kangaroo care is implemented accordingly. Once again, this may return to the fostering of adaptability in scheduling by huddles, unit managers, and the health care team during rounds.

In regards to the first infant-centered barrier of excess equipment, a teaching program for nurses, physicians, midwives, nurse practitioners, and other hospital staff could be implemented nationwide in order to present the research about kangaroo care and its benefits. These teaching classes need to not only present the benefits of skin-to-skin care with infants that are full-term and lacking health concerns, but for those that may be vulnerable in terms of health as well. All NICU staff should participate in this education program in order to begin the implementation of kangaroo care in this setting. This will allow the practice of kangaroo care to reach infants with health concerns and their parents. Education to NICU staff may also include ways to work around or with equipment, such as ventilators, oxygen, and IV lines, while performing this method of care. Laying out specific guidelines for working around physical barriers and educating NICU staff of these methods will make it easier for everyone involved in the care process to be able to aid in the implementation of skin-to-skin care. In addition, NICU staff will be more willing to promote kangaroo care for vulnerable infants if they feel educated and confident when dealing with the subject (Neonatal Network, 2011).
A second notable barrier to skin-to-skin care is longer feeding time of preterm infants. More time needs to be allowed for feeding of these infants, which leaves less time for nurses, physicians, respiratory therapists, and other healthcare professionals to be able to perform certain medical interventions. This, in turn, leaves less room for therapeutic care, such as skin-to-skin time. It is important to remind mothers that they are able to position their infants in such a way that they can feed while being skin-to-skin with their infants. While this may not be the same as strict kangaroo care, it allows for additional bonding between baby and mother. Also, this positioning can apply to both formula feeding and breastfeeding. Nurses should be encouraged to assist mothers in using skin-to-skin contact while performing other tasks with their babies.

The final infant-centered concern is that infants may experience periods of apnea, hyperthermia, or other unstable physiologic states while participating in kangaroo care. It is certainly the case that not all infants may react positively to kangaroo care because each infant is different. There is no way to predict whether or not an infant will do well during kangaroo care. If an infant does not respond well to kangaroo care and his or her stability is altered it is not advised to attempt kangaroo care until the infant’s health condition improves to a point where they can maintain homeostasis. This means that it may be beneficial to gradually wean infants into increasingly longer periods of kangaroo care and monitoring the infants while participating in skin-to-skin contact.

As previously stated, more research should be conducted about the effects of kangaroo care on preterm and low birth weight infants, as well as babies with other adverse health conditions. In order to ensure quality care for patients, it is crucial to gain more research about how skin-to-skin care will affect these infants in an attempt to weigh the costs and benefits of this practice. Research should be conducted to explore the best way to implement kangaroo care
with infants on external equipment, such as ventilators or IV lines. By performing more research about this specific subject, NICU staff may be more willing to offer and implement kangaroo care in the hospital setting with vulnerable infants (Neonatal Network, 2011).

In terms of the proper method of practicing kangaroo care, the Neonatal Network released a list of objectives that should be achieved in hospitals in order to promote the use of kangaroo care with all infants. Kangaroo care should begin as close to immediately after birth as possible for all infants and should be practiced 24/7 for the first two to three days of life, or as frequent as possible (Neonatal Network, 2011). Swaddled holding will be replaced by kangaroo care holding and infants will instead be held using kangaroo care for painful procedures, feeding, sleeping, and in times of alertness. Content about kangaroo care should also continue to be put in all maternity, pediatric, and medical nursing textbooks and care guides for all healthcare professions to educate the coming generations about this practice. Obstetric orientation programs should be developed to promote kangaroo care for all infants during hospital stays. Promoting skin-to-skin care should be part of accreditation and performance reviews for nurses. Lastly, information should be published about the benefits of kangaroo care and continuing the use of the method for the first three months of life for all infants. These objectives are designed to promote kangaroo care for all infants within the next thirty years as a set timeframe (Neonatal Network, 2011). With these guidelines in place, health care professionals can successfully overcome the aforementioned barriers and kangaroo care will continue to become the highest standard of care for preterm infants.
References


