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# Kangaroo Care and Improved Physiological Status in Preterm Infants

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## Cover Page Footnote

I would like to express my profound gratitude to Dr. Rachel Joseph (Project Chair), Professor, School of Nursing, Liberty University for their contributions to the completion of my project titled: Kangaroo Care and Improved Physiological Status in Preterm Infants.

# Kangaroo Care and Improved Physiological Status in Preterm Infants

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Liberty University Graduate 2023

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## Introduction

As preterm births worldwide continue to cause long-term sequelae for infants, it is imperative to implement interventions that promote better outcomes. Kangaroo care (KC), a simple yet meaningful intervention for both infants and their parents, is cost-effective and it requires only time and diligent monitoring. KC while a common practice with full-term newborns and their mothers or fathers, can be implemented safely for preterm babies. This practice needs more attention and emphasis to be normalized in the neonatal intensive care unit (NICU).

### Background

KC, often called skin-to-skin contact (SSC), was first practiced in 1978 in an overcrowded NICU in Bogota, Colombia. The practice was intended for use with preterm infants born before 37 weeks of gestational age or with a birth weight under 2500 grams (Pados & Hess, 2020). This practice was started by a pediatrician and professor, Dr. Rey-Sanabria, and became standard in Colombia and then abroad with the help of the Kangaroo Foundation (Pados & Hess, 2020). According to the World Health Organization (2021), over 15 million babies are born preterm (before 37 weeks of gestational age) every year. Studies have shown the benefits of KC on preterm outcomes. It is prudent to continue to assess these benefits and address barriers to implementing this care.

## Purpose

According to the World Health Organization (2021), every year, an estimated 15 million babies are born preterm. Complications from preterm births are the leading cause of death among children under five years of age, resulting in approximately 1 million deaths. Three-quarters of

these deaths could be prevented with currently known interventions. KC is a proven, cost-effective way to improve physiological outcomes for preterm infants.

This integrative review examined the association between KC and improved physiological status in preterm infants under 34 weeks of gestational age. This population was selected due to the gestational age cutoff for NICU admission, medical complexity, and physiological benefits. This integrative review aims to determine if KC has positive physiological effects on preterm infants in the NICU. Another goal of this review is to examine the barriers to implementing KC and ways to overcome these barriers.

## Research Question

Does KC have positive physiological effects on preterm infants, less than 34 weeks gestational age, in the NICU?

## Methods

The samples utilized in the literature review included preterm infants born at less than 34 weeks gestational age who were clinically stable enough to receive KC from their mothers in the NICU. Studies included sample sizes of 10–1,461 infants; the setting of each study included a single NICU and up to 11 NICUs. Gestational ages ranged from 22 weeks to 34 weeks, with birth weights ranging from 370 grams to 1,410 grams.

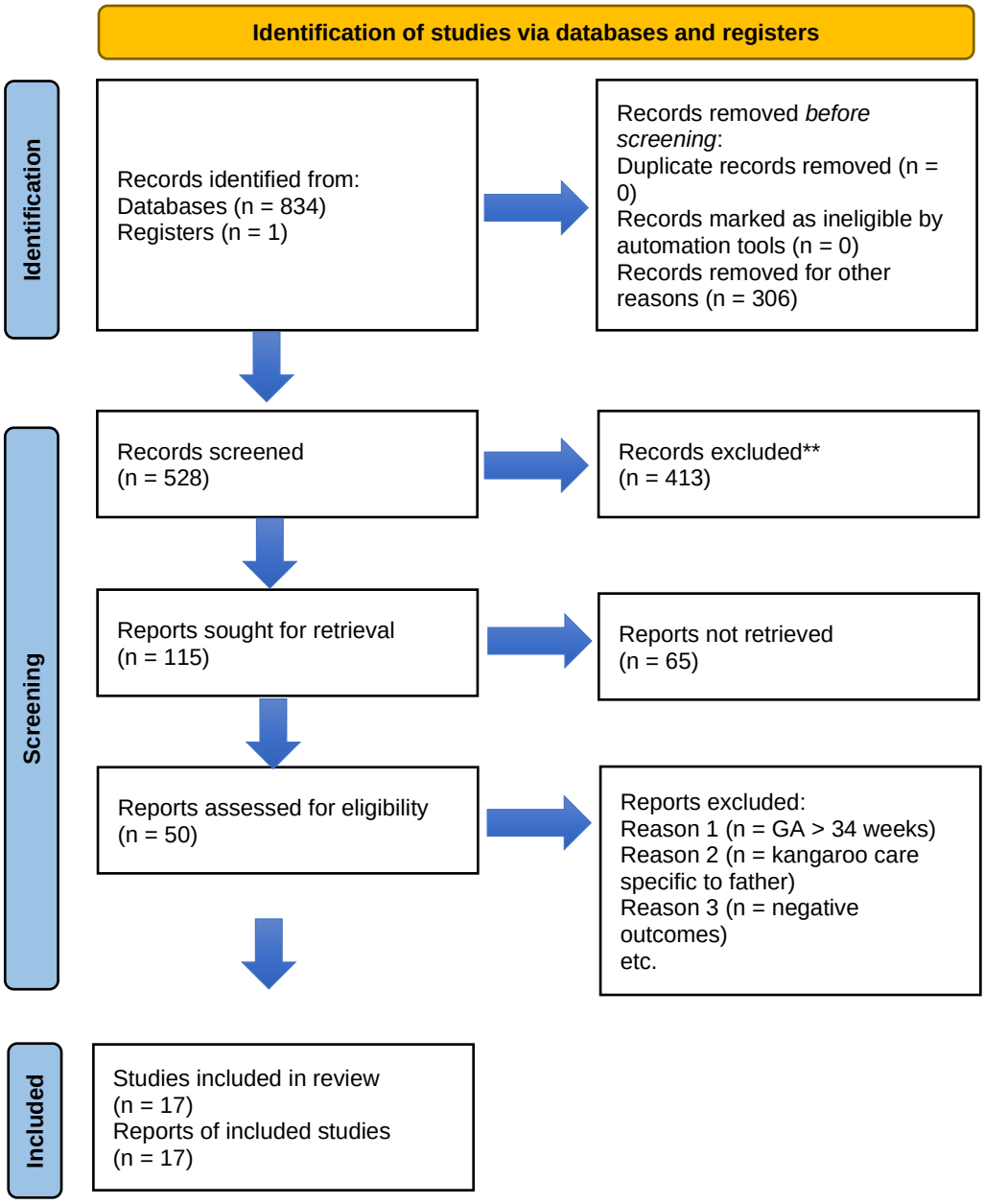
The inclusion criteria for this integrative review consist of publications on preterm infants born before 34 weeks of gestational age admitted to the NICU. Exclusion criteria included publications on infants with gestational age greater than 34 weeks, infants with congenital anomalies, infants requiring surgery, or those on sedation or analgesia (Hurley & Harrison, 2020).

Search terms such as neonatal intensive care unit, NICU, kangaroo care, benefits, preterm infant, and physiological status were used to retrieve peer-reviewed publications. Databases used include Medline, BioMed, and Pro Quest. Of the 834 articles initially found, this was narrowed down to 528, and later to 115. Finally, 17 of the most pertinent articles were used for this integrative review.

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework was utilized for this integrative review (Figure 1). The Whittemore and Knafl methodology was utilized to analyze articles through problem identification, literature search, data evaluation, data analysis, and presentation.

**Figure 1**

*PRISMA Flow Diagram*



## Results

The number of articles reviewed was 17 peer-reviewed articles. Of these articles, five are Melnyk's Level 1 (systematic reviews), two are Melnyk's Level 2 (RCT), one is Melnyk's Level 4 (cohort study), four are Melnyk's Level 5 (review of qualitative studies), three are Melnyk's Level 6 (single descriptive), and two are Melnyk's Level 7 (expert opinion).

The integrative literature review revealed five themes related to the positive effects of KC on preterm infant outcomes and barriers to implementing this care. The themes identified to support KC in preterm infants included reducing pain, improving growth, increasing oxytocin, and lowering heart rate. The final theme addressed the barriers to implementing KC. Common barriers to providing KC included environment, provider beliefs, practice variation, and parent presence.

### *Kangaroo Care and Preterm Infant Outcomes*

The literature review found strong evidence supporting the positive relationship between KC and improved preterm infant outcomes. These outcomes have been examined, and the positive physiological outcomes seen in preterm infants when KC is utilized prompt further investigation. Physiological outcomes include reduced pain, increased growth, increased oxytocin levels, and decreased heart rate.

### *Kangaroo Care and Pain*

KC can be an effective intervention to reduce neonatal pain. Hurley and Harrison (2020) found that KC is as effective in reducing pain in preterm neonates during painful procedures as 24% sucrose. The study highlighted no added benefit to using both KC and sucrose; KC should be considered an alternative to sucrose (Hurley & Harrison, 2020). A meta-analysis found that kangaroo mother care (KMC) significantly benefits pain reduction over standard care (Sharma & Ruikar, 2022). According to this study, neonates in the NICU receive an average of 10 pain-inducing procedures, and 79% of them are without any analgesia. KMC is an important intervention in reducing procedural pain in infants due to its advantages over standard care (Sharma & Ruikar, 2022).

### *Kangaroo Care and Preterm Infant Growth*

Preterm infant growth can be affected by KMC and its duration of use. Charpak et al. (2021) studied the effects of KMC on growth in preterm infants and found that the duration of KC was directly related to growth. Weight gain was higher when the duration of KC was at least

8 hours per day (Charpak et al., 2021). Orahood (2021) posited that KC improves mortality rates, promotes a better sleep-wake cycle, leads to fewer incidents of infections, and promotes increased weight gain in infants. KMC should be initiated as soon as possible and for as long as possible to promote preterm infant and low birth weight infant growth (Charpak et al., 2021). A systematic review by Chan et al. (2016) found that KMC, compared to conventional care, is more effective, reduces the risk of hypothermia and illness, shortens the length of NICU stay, and improves growth, breastfeeding, and attachment. Interestingly, the benefits of KMC remained 20 years later in infants who were studied, and long-term social and behavioral improvements were identified (Stockwell, 2017). Although these findings were seen in infants who received KMC as low birth weight infants, the limitations exist in that many of the positive changes were small and not directly attributable to KMC (Stockwell, 2017).

***Skin-to-Skin Contact and Oxytocin***

As seen in one study, SSC can raise oxytocin levels in infants and ~~in~~ parents. Vittner et al. (2018) examined the relationship between SSC and oxytocin levels in the mother, father, and infant. Results of this study showed salivary oxytocin levels increased significantly during SSC for mothers, fathers, and infants, indicating a release of oxytocin during SSC. This study indicates that SSC can effectively reduce parent and infant stress in the NICU (Vittner et al., 2018). Pados and Hess (2020) studied the effects of SSC on short-term physiologic stress outcomes in preterm infants in the NICU. They found that SSC improves short-term cardiorespiratory stress outcomes and strong evidence that SSC reduces cortisol and increases oxytocin levels in preterm infants (Pados & Hess, 2020).

***Preterm Infant Heart Rate and Kangaroo Care***

Ludwig et al. (2021) studied preterm infant heart rates during a Family Nurture Intervention consisting of, on average, four 1-hour SSC sessions per week. Results showed a significantly lower heart rate in the Family Nurture Intervention group than controls (Ludwig et al., 2021). Cristóbal Cañadas et al. (2022) studied the effects of KMC on the physiological stress parameters of premature infants. The authors found that infants who received KMC had a higher mean heart rate, oxygen saturation, and temperature; however, the results were not statistically significant (Cristóbal Cañadas et al., 2022). Vogl et al. (2021) examined the effects of KMC and kangaroo father care (KFC) on preterm infant heart rate, periodic breathing, and apnea. The results showed a significant difference between heart rate variability pre-KC and during KC,

with no significant difference in the number of apneas but a trend toward reduced periodic breathing (Vogl et al., 2021).

***Quality Improvement and Kangaroo Care***

Several factors were reported as reasons for the lack of utilization of KC, and the barriers to its implementation were studied. Nation et al. (2021) studied a quality improvement project designed to increase SSC for infants born before 29 weeks of gestation. The study examined barriers to implementation, including medical complexity and staff misconceptions. Pre- and post-surveys were utilized to evaluate comfort level with SSC and perceived barriers to its use. The quality improvement project included an updated unit-specific SSC protocol and education tailored to identified barriers (Nation et al., 2021). The study found a statistically significant increase in nurses' comfort level when utilizing SSC for intubated patients and patients with central lines postintervention. Overall, rates of SSC increased in infants younger than 29 weeks of gestation who required intubation and central lines, possibly due to an increase in nursing comfort level (Nation et al., 2021).

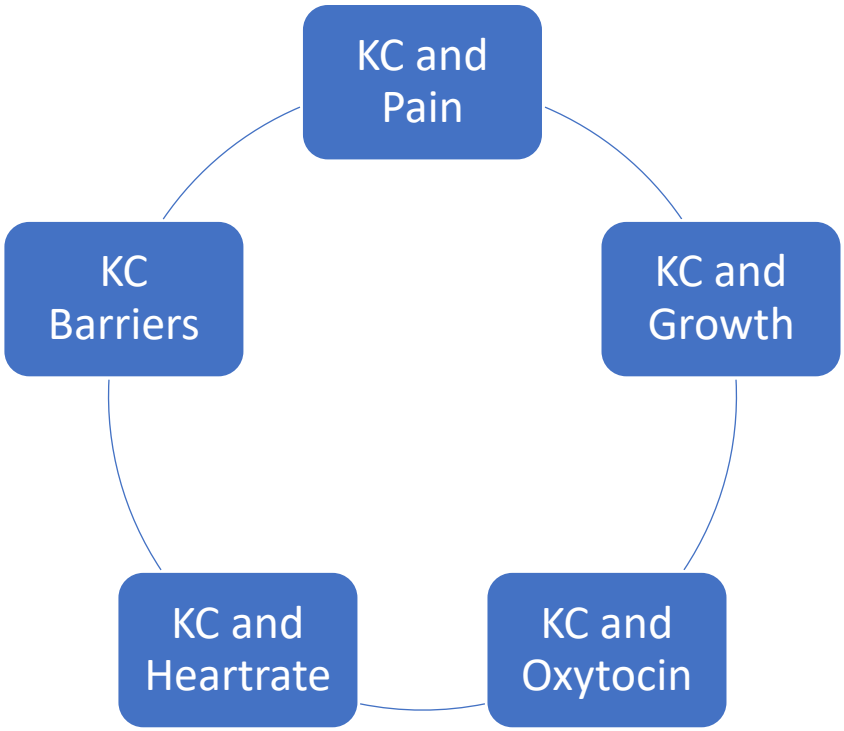
A qualitative study by Coutts et al. (2021) conducted in 11 NICUs in British Columbia examined the barriers to and enablers of KC. Four significant barriers were identified to KC: the physical environment, healthcare provider beliefs, clinical practice variations, and parent presence (Coutts et al., 2021). Fluharty et al. (2021) examined barriers to KC that originated from policies. The study revealed inconsistencies in implementing KC practice due to policies, including variability in infant age and weight criteria, medical equipment in place, duration and frequency, documentation, and ongoing monitoring requirements (Fluharty et al., 2021).

***Parent Infant Closeness in the NICU***

Increased parental presence and the availability of family rooms in the NICU have shortened infants’ hospital stays (He et al., 2021). A quality improvement project called Close Collaboration with Parents was implemented to examine the benefits of increased parental presence and SSC in the NICU (He et al., 2021). This intervention increased parental presence from 453 to 620 minutes daily. The time spent in SSC before the intervention was 76 minutes per day and 114 minutes after. The study concluded that this project aimed at parenting interventions could promote parent-infant closeness and SSC in the NICU (He et al., 2021). Another study found that skin-to-skin contact promotes physical closeness, calmness, bonding, and breastfeeding (Shattnawi et al., 2022). A summary of the findings is given in Figure 2.

**Figure 2**

*Summary of the Findings of the Review: Effect of KC on Neonatal Outcomes*




The review of the evidence revealed a correlation between KC and improved neonatal physiological outcomes. KMC is shown to reduce mortality and morbidity in preterm neonates, prevent hypothermia and infection, improve maternal infant attachment, and increase exclusive breastfeeding (Mohammadi et al., 2021). Studies also showed that KC led to reduced pain, higher weight gain, increased oxytocin, improved cardiorespiratory stress, lowered heart rate, higher oxygen saturation, and increased temperature (Orahood, 2021). The results support using KC in the NICU for preterm infants and address ways to overcome barriers to implementing this care.

## Discussion

The literature review evaluated 17 articles related to the physiological benefits of KC in preterm infants in the NICU. In addition to the articles reviewed, policies and procedures for implementing KC were evaluated. The literature review provided evidence to support the use of

KC for preterm infants in the NICU. The review also presented barriers and challenges to implementing this intervention and ways to overcome these.

Overall, using KC in preterm infants less than 34 weeks of gestation has been shown to reduce pain, improve weight gain, increase oxytocin, improve cardiorespiratory stress, lower heart rate, increase oxygen saturation, and increase temperature in the infant. The literature review provided ways to overcome barriers to implementing this intervention in the NICU. These strategies included unit-specific protocols, education, and increased parental presence.

This integrative review supported staff and parents' continued education on KC's benefits. The use of this intervention to improve outcomes for preterm infants depends on the availability of the resources to provide the education and training as well as appropriate staffing to ensure a safe and quality experience. Quality improvement projects such as those mentioned in this review have been shown to increase the use of the intervention.

Overall, the literature supported the purpose of this review. This integrative review aimed to examine the direct relationship between KC and the physiological status of preterm infants under 34 weeks of gestational age. The gaps identified include small sample sizes and a need for more randomization of subjects. In addition to examining KC's positive effects, some articles examined the barriers to implementing KC in the NICU. Another gap in the research is that most articles examined the effects of KMC, and fewer examined the effects of KFC. Further research solely examining the correlation between KC and the outcomes of the neonate would be helpful.

**Implications for Practice**

The literature review supports KC as an intervention to improve the physiological outcomes of preterm neonates. There is evidence to support the positive outcomes that KC has on neonates' growth, vital signs, stress outcomes, and pain. The purpose of this integrative review was to support the use of KC in the NICU to impact outcomes positively. Implications for practice include improved use of KC for preterm infants in the NICU. The findings in this literature review can potentially impact preterm infant outcomes by leading to improved physiological status while the infants are in the NICU. Among the studies included in this integrative review, all had results indicating that using KC for preterm neonates had more positive than negative implications.

Education is needed for NICU staff and providers as well as for parents. This can be accomplished by utilizing quality improvement projects and interventions. Parental presence

must be increased to increase the use of KC in the NICU. NICUs can provide better opportunities for privacy for parents visiting the bedside, making the environment more comfortable. Many NICUs have options for private rooms or curtains between patients that can help make the environment more conducive to KC. To further improve the environment, education is needed for staff to promote a quiet, low-light atmosphere that is calming to parents and infants.

Further research is needed to examine the use of KC for preterm infants who are critically ill. Determining which preterm infants are good candidates for KC needs to be a joint effort among providers, nurses, and parents. More research needs to be conducted to facilitate optimal decision-making to evaluate the safety and effectiveness of using KC among highly preterm infants because extremely preterm infants typically require extra hands during KC to help with endotracheal tubes, central lines, and other assistive technology. Further research comparing KMC and KFC needs to be conducted. Most research is solely focused on the mother providing this intervention. However, when the mother is unstable or unable to provide SSC, the next best thing is KFC.

## Conclusion

In conclusion, there is a positive correlation between KC and improved neonatal physiological outcomes, as evidenced by the examination of 17 journal articles included in this integrative review. Studies showed that KC led to reduced pain, more significant weight gain, increased oxytocin, improved cardiorespiratory stress, lowered heart rate, higher oxygen saturation, and increased temperature. The results support using KC in the NICU for preterm infants and address ways to overcome barriers to implementing this care.

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