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Initiating Kangaroo Care in the Neonatal Intensive Care Unit

Karen Stadd
Walden University

Walden University

College of Health Sciences

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Karen Stadd

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Dr. Barbara Gross, Committee Chairperson, Nursing Faculty
Dr. Oscar Lee, Committee Member, Nursing Faculty
Dr. Debra Wilson, University Reviewer, Nursing Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
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Abstract

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MSN, University of Maryland, 1996

BSN, York College, 1992

Project Submitted in Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

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Abstract

Kangaroo care (KC) is a cost-efficient method to increase infant–parent bonding and neonatal health outcomes worldwide. Despite evidence supporting KC in critically ill infants, nursing perceptions regarding patient safety and interrupted work flow continued to impede practice in the local high-tech neonatal intensive care unit (NICU). Their current policy failed to address the 2-person transfer method recommended for safe practice. In addition, both staff and parents lacked training and education regarding the benefits and feasibility of KC. This doctoral project aimed to decrease practice barriers and promote earlier and more frequent KC by developing and integrating an evidence-based clinical pathway within a multifaceted champion-based simulated educational training program for NICU staff and parents. Published outcomes and generated organizational data for program synthesis connected the gap in practice. Kolcaba's comfort theory served as the guiding framework to ensure a partnership in care. This quasi-experimental quantitative study used the generalized liner model for data analysis. Study findings indicated that KC occurred 2.4 more times after the intervention compared to before ($p = 0.001$). Descriptive data revealed that KC episodes for intubated patients nearly doubled after implementation (11.1% from 6.2%). Post-survey scores for nursing knowledge and comfort level also improved after the intervention. Although earlier KC practice was non-conclusive ($p = 0.082$), future trials should control groups for day of life since admission. Disseminating the KC pathway can have a positive social change on family-centered care by increasing NICU nurses' knowledge, comfort, and adoption of this evidence-based practice as an expected routine standard of care.

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Acknowledgments

I would like to thank my faculty and clinical mentor for their guidance during this journey. Their wisdom and inspiration provided me with the motivation to persevere. Most importantly, my family and friends deserve recognition and appreciation for supporting me throughout this endeavor. My kids have been extremely patient and understanding when precious time was lost. We have all learned the importance of quality time over quantity of time. However, balancing work, school, and family life have been extremely challenging and overwhelming for everyone involved in this process. Ultimately, achieving this dream would have been impossible without my husband's love, understanding, support, patience, assistance, and advice. I am lucky and proud to say that he has been my rock since the beginning of time, during this program, and for whatever the future brings.

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Section 1: Nature of the Project

Introduction

Hospitalized neonates in the neonatal intensive care unit (NICU) are immediately separated from their mother after birth. Although this separation is warranted for neonatal survival, it often continues throughout the infant's hospitalization. The prolonged lack of physical contact leads to negative physical and psychological health disparities for both mother and child (Moore, 2014).

The American Academy of Pediatrics described the incubator as a toxic environment for growing premature and full-term infants (Ludington-Hoe, 2013). Affected neonates trying to survive in this unnatural habitat are often denied vital parental physical contact. However, parents in the NICU can safely provide physical contact during the evidence-based practice of kangaroo care (Almutairi & Ludington-Hoe, 2016).

Ludington-Hoe (2011) defined the nursing practice of kangaroo care (KC) as skin-to-skin or chest-to-chest contact between an unclothed infant and their parent's bare chest. The ventral skin-to-skin contact stimulates oxytocin release to modulate neurologic and physiologic changes in both the infant and KC provider (Ludington-Hoe, 2011). Several advantages include enhanced thermoregulation, physiologic stability, increased milk supply, improved growth, decreased infection, pain management, bonding, and decreased hospital duration (Jefferies, 2012). Furthermore, Ludington-Hoe and Abouelfettoh (2008) indicated that KC has the same proven beneficial outcomes for hospitalized premature infants as documented in stable full-term infants.

Despite current evidence supporting the ease and physiological outcomes of KC in critically ill infants, many providers are uncomfortable with this practice in the NICU. Frequently cited practice barriers among this vulnerable population include infant safety, parent readiness, and lack of institutional support (Hardy, 2011). The inconsistency in practice stems from both staff and patient knowledge deficits, compounded with outdated or absent policies and procedures for KC in critically ill neonates (McGowan, Naranian, & Johnston, 2017). However, Cooper et al. (2014) found that multifaceted simulation programs have increased the frequency of KC and positively impacted the culture of family-centered care. Therefore, efforts must be made to increase nurses' knowledge, comfort, and willingness to practice KC as standard of care.

In this doctoral project, I have elaborated on KC practice in the NICU, including the impact of integrating a clinical pathway within a champion-based simulated educational program. In the first section, I discuss the encountered problem statement, followed by the purpose of the doctoral project. The nature and significance of the doctoral project conclude Section 1.

Problem Statement

Nursing adoption of KC has progressed slowly in the United States, especially among critically ill neonates in the NICU. The March of Dimes NICU Family Support program found that only 8% of staff reported routine KC practice in their NICU, despite acknowledging the positive effects on infant–parent bonding. The study showed that ambivalent feelings were often attributed to staff's concerns for patient safety during

infant manipulation and transfer required for KC. Consequently, policies and procedures should include safety criteria and instructions for safe KC practice.

A national survey revealed that only 40% of NICUs had formal guidelines for KC, despite studies offering suggested guidelines for safe practice (Lee, Martin-Anderson, & Dudley, 2012). However, existing policies and procedures alone cannot eliminate barriers to practice. For example, the NICU nurses at the local NICU did not embrace KC as a routine standard of care, regardless of the existing policy and procedure. The inconsistency of KC practice was dependent upon each individual's level of knowledge, comfort, and skill with the intervention. According to Moore (2014), perceived barriers to KC impacted by nurse competency levels can be decreased through education and evidence-based policies. Therefore, NICU nurses require standardized education and training about the feasibility and benefits of KC for critically ill neonates.

The local NICU policy and procedure for KC lacked updated selection criteria and safe transfer techniques for intubated neonates with multiple intravenous lines. Consequently, the nurses remained uncomfortable with KC practice among critically ill neonates requiring assisted ventilation. However, the two-person transfer method can minimize risks of extubation, line dislodgement, and physiological disruption (Ludington-Hoe, Ferreira, Swinth, &Ceccardi, 2003). Therefore, this doctoral project entailed development of a KC pathway to provide accountability for evidence-based standards of care.

Staffing shortages and rapid turnover were another perceived barrier to implementing KC in the NICU under study. Ludington-Hoe (2011) argued that nurses'

work load is decreased during KC compared to incubator care because it improves physiologic stability and sleep. Although limited nursing staff may have prevented the two-person method for KC, the alternative solution was implementing a simulation training program that utilized KC champions within different disciplines besides nursing.

The staff and parents at the NICU under study did not receive standardized education or training for routine KC practice. Bidirectional parent and nurse knowledge deficits culminated in decreased initiation and advocacy for KC practice. However, unit-based multidimensional simulated educational programs have been shown to improve nurses' perception, value, competency, and comfort with infant transfer during KC hospitalization (Hendricks-Munoz & Mayers, 2014). According to Chan, Labar, Wall, and Atuna (2016), parents who understood the value of KC were more knowledgeable and confident to request KC early in their baby's hospitalization. Therefore, parental education was also included in the simulated educational training program to promote family-centered care within a high-tech environment.

Purpose

A Doctor of Nursing Practice (DNP) prepared nurse has the knowledge to synthesize research and apply the strongest evidence into clinical practice based on specific unit needs (Terry, 2015). Personalization of the evidence to fit a particular clinical question or patient need was exemplified in development of the KC pathway to promote safe KC practice in the NICU. Thus, the KC pathway served as an operationalized avenue for translating strong evidence into a standard of practice (see Figure 1).

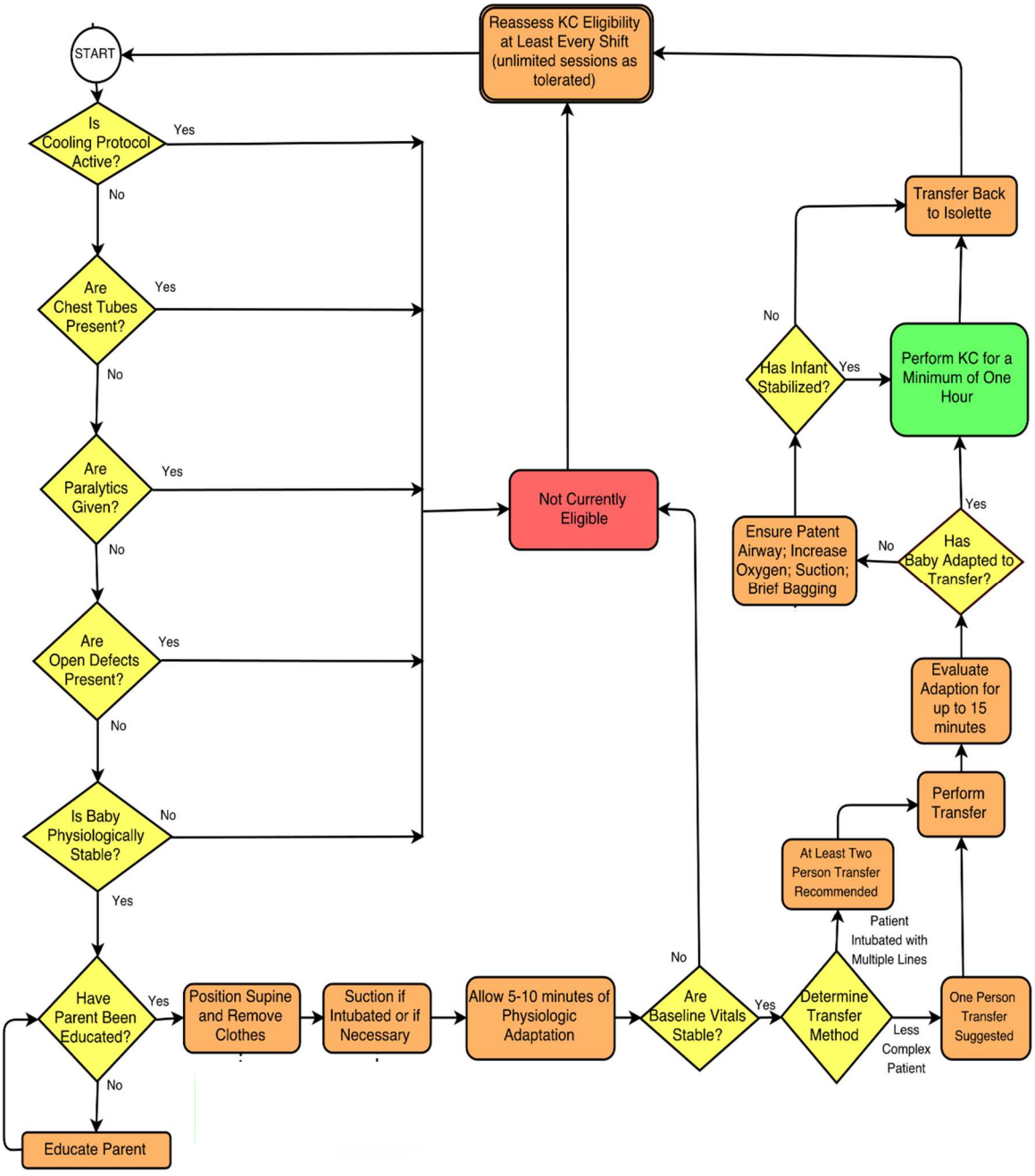

Figure 1. KC pathway. This pathway guides the process for delivering safe kangaroo care (KC) practice in the neonatal intensive care unit (NICU). First eligibility is determined, followed by preparation steps, mode of transfer, tolerance, and evaluation.

As an experienced Neonatal Nurse Practitioner (NNP), my intention was to positively impact nursing practice by promoting earlier and more frequent KC practice. This practice change required both parent and staff education based on perceived barriers and attitudes toward KC practice. Thus, integrating the KC pathway within a multifaceted champion-based simulated educational training program positively altered the culture and practice of KC in the local NICU.

The evidence-based practice problem regarding neonatal KC was clearly delineated in a decision tree based on the five components of the acronym PICOT (patient group or condition, issue or intervention, comparative measurement method, outcome, and time frame). The guiding practice focused questions for this project are listed below:

- Does integrating a KC pathway within a multifaceted champion-based simulated educational training program for NICU staff and parents promote earlier and more frequent KC practice?
- Does integrating a KC pathway within a multifaceted champion-based simulated educational training program for NICU staff and parents increase KC practice for infants requiring invasive and noninvasive assisted ventilation?
- Does integrating a KC pathway within a multifaceted champion-based simulated educational training program for NICU staff and parents increase staff's knowledge and comfort level with KC?

Nature of the Doctoral Project

This doctoral project connected the gap in practice by using various sources of evidence to promote earlier and more frequent KC practice in the NICU, starting with the literature review obtained from PubMed, CINAHL, and Cochrane Library. According to Terry (2015), the literature review is guided by the research question and/or hypothesis. First, the broad scope of KC was dissected by exploring a multitude of journal titles and abstracts. After further review and synthesis, a practice problem guided the remaining literature review to critique and systematically organize the strongest supportive data to date. Consequently, emerging themes were identified to create an evidence-based appraisal tool.

Next, barriers to KC practice were identified to target educational and practice needs for program development in the NICU under study. Therefore, an informal needs assessment was conducted on NICU nurses and parents in the designated clinical site. This information culminated in a nonbiased approach for program development based on clearly defined goals and objectives (Kettner, Moroney, & Martin, 2017).

An electronic Likert scale questionnaire was used to rate the staff's level of knowledge and comfort with KC before and after the multifaceted educational intervention. Additionally, the electronic medical record (EMR) aggregated data on the patient's weight, day of life, respiratory support, and frequency of KC before and after simulated training. Data were compiled and organized using a comparative analysis method in efforts to confirm that a simulated educational program resulted in earlier and more frequent KC practice in the local NICU.

Significance

The NICU nurse uniquely influences the dynamic between infant and parent bonding (Kymre, 2014). As a result, NICU nurses are consistently recognized as an obstacle for advocating and implementing KC practice (Moore, 2014). However, researchers have suggested that prioritizing awareness and education can change nurses' attitudes, competence, and perception of KC (Hendricks-Munoz & Mayers, 2014). Therefore, integrating the KC pathway within a multifaceted educational training program was a promising method to advance KC practice in the NICU. The goal was to promote earlier and more frequent KC practice in the NICU by addressing perceived practice barriers.

Collaboration with all clinical NICU team members is crucial to enhance compliance and advocacy for KC practice (DiMenna, 2006). Consequently, this project required a multidisciplinary team approach to cultivate a positive environment of family-centered care. Stakeholders who provided direct patient care could physically assist with the two-person transfer method required for safe KC practice. This group of care providers not only included the bedside nurses, but also the respiratory therapists, occupational therapists, nurse practitioners, and the child life specialist. However, stakeholders not involved with direct patient care were also highly influential with enforcement of KC practice. For example, the lactation specialist was involved with KC because it increases milk supply and promotes bonding. The clinical nurse specialist was heavily involved with developing and revising unit-based policy and procedures to instill a culture of evidence-based practice. In addition, both the nurse manager and chief of

neonatology were eager to increase parent satisfaction scores and decrease length of hospitalization via the routine standard practice of KC. According to Hodges and Videto (2011), managerial input is essential for coordinating efforts to ensure program success.

Previous authors consistently emphasized that project champions are critical for successful quality improvement projects (Compas, Hopkins, & Townsley, 2008). According to Soni et al. (2014), enthusiastic staff champions become crucial motivational change agents, role models, and unit resources for routine KC practice in the NICU. As a result, this doctoral project strategically facilitated stakeholder involvement via utilization of self-selected staff champions to instill a sense of empowerment and pride.

Although education is essential for evidence-based practice changes, knowledge alone does not change or influence perceptions to practice (Soni et al., 2016). For example, many staff members and parents could have resisted routine KC practice in the NICU because of intellectual shortcomings and discomfort with new practice. The possibility existed that staff members would have refused to participate in the simulated educational process and disregarded the clinical pathway for safe KC practice. Additionally, various stakeholders may have felt burdened by the educational process and devalued KC practice. This contagious negative energy could have been detrimental to quality improvement efforts. Consequently, once incorporated, self-selected multidisciplinary champions would be crucial change agents and role models for routine KC practice.

Interrupting the process of attachment has been associated with maternal withdraw secondary to depression, anxiety, and guilt from having an infant in the NICU

(Flacking et al., 2012). Subsequently, the psychological wellbeing of parents in the NICU can have long-term effects on later childhood development and behaviors (Charpak et al., 2017). However, Flacking et al. (2012) discovered that KC has decreased separation and associated health disparities for both infants and parents. Positive social implications of KC include decreased rates of maternal depression and risk for child abuse (Flacking et al., 2012).

In conclusion, insufficient training and lack of a standard policy were key barriers to consistent KC practice in the NICU. This doctoral project targeted such barriers by developing and integrating an evidence-based clinical pathway within a multifaceted champion-based simulation educational program. Not only did this program promote earlier and more frequent KC practice in the NICU, it also provided a positive social change on family-centered care by creating a partnership in care. Disseminating the evidence-based KC pathway can potentially improve nurses' knowledge and comfort with KC practice in NICUs nationwide.

Summary

The systematic process of evidence-based practice reduces the gap between theory and practice by dismissing ungrounded opinions and traditions guiding practice (Grove, Burns, & Gray, 2013). Therefore, leading an evidence-based doctoral project on neonatal KC advanced the nursing profession by positively affecting health care delivery. To change the culture and practice of KC in the NICU under study, this project utilized staff champions to simulate an evidence-based clinical pathway. However, optimal

neonatal KC practice will not exist until all NICU team members willingly adopt the practice as a routine standard of care.

Cultivating change requires an appreciation for applying conceptual models and theories on evidence-based practice, leadership, and change (Kettner et al., 2017). Salient elements guiding this doctoral project are discussed in the next section of this manuscript. Additional proceeding topics include the relevance to nursing practice, local contextual background, and the DNP student role.

Section 2: Background and Context

Introduction

The NICU macroenvironment is bright and loud with a multitude of sensory activity and equipment. Hospitalized infants trying to survive in this stressful environment endure multiple painful procedures on a daily basis. Although extraordinary life-saving measures are provided in the high-tech NICU, it is an unnatural environment for newborns immediately separated from their mothers at birth. This abrupt separation and lack of physical contact not only affects infant–parent bonding, but it also has detrimental physical and neurological effects on the growing premature and term infant (Ludington-Hoe, 2013). However, skin-to-skin contact for infants and parents is possible in the NICU by providing opportunities for KC (Jefferies, 2012).

Despite strong evidence supporting KC in critically ill neonates, many NICU nurses are resistant to this practice secondary to fears of infant safety, lack of institutional support, and parent readiness (Lee et al., 2012). Although NICU nurses recognize and value the importance of infant–parent bonding, they appear task oriented and pride themselves on working in a specialized, fast-paced, high-tech environment. Therefore, the NICU environment focuses more on technologic and medical advancements rather than family-centered care. However, family-centered care is achievable in the NICU via the natural developmental intervention of KC (McGowan et al., 2017).

Integrating the KC pathway within a multifaceted champion-based simulated educational training program served as an operationalized avenue for translating evidence into clinical practice. The long-term goal is to increase KC practice in NICUs nationwide

by disseminating the evidence-based clinical pathway and doctoral project results. The guiding practice focused questions for this project are listed below:

- Does integrating a KC pathway within a multifaceted champion-based simulated educational training program for NICU staff and parents promote earlier and more frequent KC practice?
- Does integrating a KC pathway within a multifaceted champion-based simulated educational training program for NICU staff and parents increase KC practice for infants requiring invasive and noninvasive assisted ventilation?
- Does integrating a KC pathway within a multifaceted champion-based simulated educational training program for NICU staff and parents increase staff's knowledge and comfort level with KC?

Expanding and sharing knowledge as a nurse practitioner positively contributed to nursing practice by promoting earlier and more frequent KC in the NICU. The theoretical and conceptual foundations for implementing KC are described in this section. Additionally, the local background and context of neonatal KC are further addressed. Finally, the role of the DNP student and project team are discussed.

Concepts, Models, and Theories

The concept of KC was first introduced by Drs. Edgar Rey and Hector Martinez during 1979 in Bogota, Columbia (Campbell-Yeo, Disher, Benoit, & Johnston, 2015). Due to limited resources for neonatal care in underserved countries, nurses relied on parents to serve as a natural incubator for their infants (Campbell-Yeo et al., 2015). The noted physiological and neurodevelopmental outcomes from KC provoked various

studies supporting this practice in premature infants. By the early 1990s, KC spread to industrialized countries within the United States and Europe (Ludington-Hoe, 2011).

Researchers have used various terms when referring to neonatal KC. For example, there is an interplay between the word *attachment* and *bonding* throughout the literature. Additionally, the term *KC* is often used interchangeably with *skin-to-skin contact* or *chest-to-chest contact*. Furthermore, the sole KC provider is automatically considered to be the infant's mother. However, the KC provider can also be the infant's father, grandparent, or legal guardian (Ludington-Hoe, 2011). According to Hendricks-Munoz and Mayers (2014), fathers who practiced KC in the NICU demonstrated improved confidence and satisfaction with paternal parenting.

Several theoretical models guided this doctoral project, starting with the Johns Hopkins nursing evidence-based practice model. This model was developed to transfer research in to practice via applying problem solving to clinical decision making (White & Dudley-Brown, 2012). Combining the nursing process with research utilization promotes nursing autonomy, leadership, and interdisciplinary engagements (McEwen & Wills, 2014). Application of this model was conveyed by integrating a KC pathway into a multidisciplinary simulated educational program.

Translating evidence-based research into practice is successful when it anticipates causes of resistance and determines feasibility of implementing change (White & Dudley-Brown, 2012). For example, the NICU nurses at the local NICU resisted routine KC practice because of the limited staff and perceived increased workload. To motivate change, Lippett's model of change was used in this doctoral project. The seven steps of

Lippett's model emphasize strong leadership with utilization of unit resources to establish an action plan (White & Dudley-Brown, 2012). Therefore, input was gathered from influential NICU resources for administrative and clinical endorsement of KC.

Recognizing that people resist change secondary to intellectual shortcomings, knowledge translation theories served as a framework for this doctoral project (White & Dudley-Brown, 2012). Resistance was apparent when nurses complained about constant changes and increased responsibilities. However, negative comments dramatically decreased after the staff become more comfortable implementing the practice change over time. Therefore, the knowledge-to-action model was utilized to depict how new knowledge progressively moves through a funnel until it is adopted and used (White & Dudley-Brown, 2012). Subsequently, the broad stage of primary research is eventually synthesized by scientists to produce tools needed for application of knowledge (White & Dudley-Brown, 2012). The knowledge-to-action model process was exemplified in this doctoral project by developing the evidence-based KC pathway to improve neonatal health outcomes and parent bonding.

Although education is fundamental for implementing any standard of care, knowledge alone does not change practice. Years of nursing experience have shown me that people need incentives, motivation, or consequences to change practice, regardless of improved patient outcomes. According to the innovation theory, the perception of an innovation determines uptake (Soni et al., 2016). Therefore, it was common for younger NICU nurses to role model their practice after highly respected senior nursing staff. This behavior was further explained in the underlying concepts of the social cognitive theory,

stating that behaviors arise from bidirectional interactions between people and their environment (Rogers et al., 2005). Consequently, interventions geared towards behavioral capacity, observational learning, and reinforcement can improve self-efficacy and behavior compliance (Knol et al., 2015). To positively influence peer opinions, I recruited staff champions to replicate practice change by observed behaviors. The champions in this study not only provided a trusting relationship among peers, but also created acceptance and approval among the nursing staff.

Facilitating positive parenting skills in the high-tech NICU environment remains a primary focus of family-centered care. Research demonstrated that early parent interactions and developmentally supportive caregiving practices can highly influence brain development (Carbasse et al., 2013). Therefore, the family-centered care theory was an appropriate foundation for neuro-behavioral development, which is underdeveloped in preterm infants (Charpak et al., 2017). Although the NICU under study have made great strides in developmental care with the recent single patient room design and newly revised visitation rules, notable tension existed between NICU nurses and parents regarding caregiver responsibilities. However, potential barriers to parent–infant interactions can be eliminated by fostering an ongoing partnership in care between the NICU staff and families (Pearson & Andersen, 2001). Harmonious contentment is achievable for the neonate, parent, and nurse via facilitating positive parenting skills and bonding through KC practice. Not only does KC empower parents to be the primary caregiver, it promotes professional and parental satisfaction by humanizing the practice of neonatology (Engler et al., 2002).

Another framework for this project was Bowlby's attachment theory. According to this ethological theory, attachment is innate and crucial for survival. Thus, newborns are biologically preprogrammed to form attachments to aid with survival (Bretherton, 1992). For example, infants produce behaviors of crying and smiling to stimulate caregiving from adults. Contrarily, failure to develop an attachment results in deprivation from maternal separation. Continual disruption of infant–mother attachment can result in long-term cognitive, social, and emotional difficulties for the infant (Bretherton, 1992).

Kolcaba's comfort theory was extremely applicable for this project because it entailed the total domain of comfort, while determining nurses' perception and comfort level with KC practice (Kolcaba, 2001). A holistic approach to comfort appropriately addressed developmental outcomes and self-regulatory behaviors among NICU patients who were separated from their mothers at birth. This midrange nursing theory proposed that nurses identify patients' comfort needs and design interventions to meet those needs (McEwen & Wills, 2014). Both patients and nurses are strengthened to engage in health-seeking behaviors if enhanced comfort is achieved by providing relief, contentment, and transcendence (Kolcaba, 2001). According to this theory, NICU nurses will routinely advocate for KC practice if they feel competent and comfortable with the practice (see Figure 2).

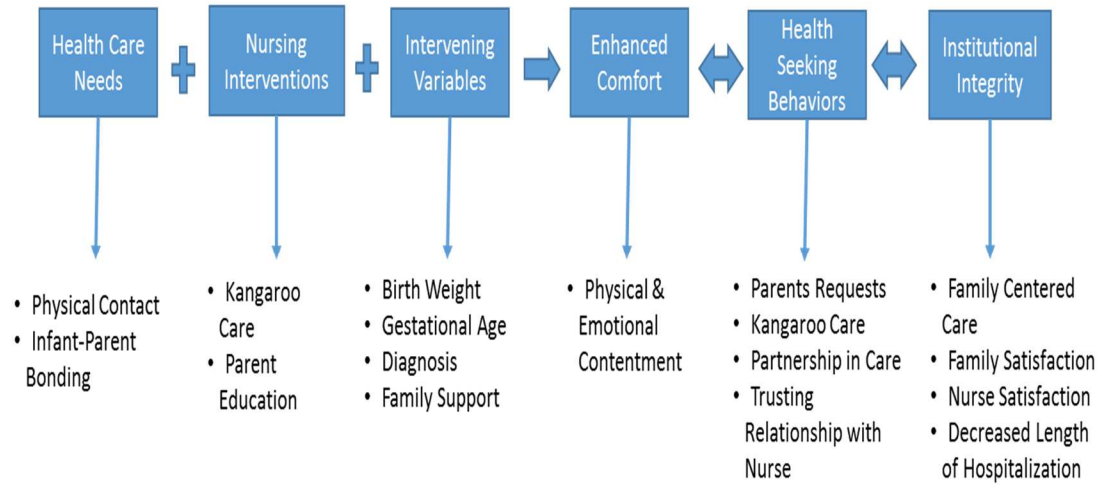

Figure 2. Application of Kolcaba's comfort theory. This visual representation applies Kolcaba's comfort theory to kangaroo care (KC) in the neonatal intensive care unit (NICU). The blue boxes depict the basic components of the comfort theory, where the text below translates the mapping to KC in the NICU.

Relevance to Nursing Practice

In 1970, the natural therapy of KC emerged out of necessity in underdeveloped countries with limited resources (Campbell et. al, 2014). However, industrialized countries electively emulated KC because of the noted positive benefits on neonatal survival and infant–parent bonding. Several proven advantages of KC practice include enhanced thermoregulation, physiologic stability, increased milk supply, improved growth, increased bonding, decreased infection, pain management, and shorter duration of hospitalization (Moore, 2014). Furthermore, providing KC to vulnerable premature infants has the same safety and physiological effectiveness as previously documented in more stable or older preterm infants (Lee et al., 2012). Multiple studies, clinical guidelines, and safety criteria have since emerged to support the evidence-based practice of KC in both term and preterm infants in the NICU.

Today, KC is a cost-efficient worldwide method to increase infant–parent bonding and neonatal health outcomes (Moore, 2014). The practice is now considered a vital component of developmental and family-centered care in the NICU (McGowan et al., 2017). Currently, more than 345 evidence-based reports have been published on KC practice among premature infants. Literature published since 2000 has suggested further investigation about the benefits of KC, barriers to practice, policies and procedures, participation rates, and methods to increase parent and nursing knowledge (Moore, 2014).

Despite evidence supporting the ease and beneficial outcomes of KC in critically ill infants, nurses in the United States are progressively slow to embrace KC as a routine standard of care (Ludington-Hoe, 2011). Among five partner hospitals, The March of Dimes NICU Family Support program concluded that only 8% of NICU staff reported routine KC practice (Cooper et al., 2014). Another national survey revealed that 20% of the nurse respondents identified lack of experience, education, and clinical guidelines as barriers to practice (Engler et al., 2002). Surprisingly, resistance to practice has continued regardless of the World Health Organization's (2003) practical guidelines for KC in both underdeveloped and developed countries. To reduce gaps of knowledge and practice, this doctoral project entailed developing and integrating an evidence-based KC pathway into a simulated educational training program for both NICU staff and families.

Variability and inconsistency with practice continues because the nursing decision to initiate KC is based upon individualistic experience and clinical judgment (Nvqvist, 2004). If a NICU staff member believes that KC is unsafe for their patient, they relay this apprehensive perception to the parent. Consequently, NICU nurses often wait for

parents to request KC before actual implementation. This behavior was portrayed in a national survey showing that 87% of KC practice was initiated by a parent request, rather than the bedside nurse (Engler et al., 2002). However, offering KC is within the nurse's scope of care as a patient advocate and parent educator.

Personal observations revealed that invalid perceptions of KC have continued to impede routine practice in the NICU secondary to patient safety concerns and interruption of daily workflow. Thus, NICU nurses' perceptions about KC will not change until they feel competent and safe with this practice in critically ill neonates. Results from a national survey (Engler et al., 2002) indicated that 80% of NICU nurses were fearful of intravenous and arterial catheter dislodgement, 77% were fearful of accidental extubation, and 16% were concerned with added time constraints involved with KC practice. Thus, Engler et al. (2002) validated that busy units with a higher acuity levels may limit or avoid KC practice secondary to nursing perceptions and competency with this skill. To overcome skepticism, NICU nurses require education and training about the feasibility and benefits of safe KC practice in vulnerable neonates. Hendricks-Munoz and Mayers (2014) demonstrated beneficial outcomes from simulated training in a study where nurses reported improved competency and comfort with KC on premature infants after receiving a comprehensive training program. These findings coincided with the recent American Academy of Pediatrics recommendation for using simulation training programs as a method to promote nursing acceptance of KC (Baley, 2016). Most interestingly, the International Network of Kangaroo Mother Care offers an

international conference every 2 years to certify and credential kangaroo caregivers and providers (Ludington-Hoe et al., 2008).

Nursing resistance to KC is most evident among complex neonates who require assisted ventilation with multiple indwelling lines (Hunt, 2008). According to Hunt (2008), KC is either denied or delayed until hospitalized neonates are bigger, older, and more stable. Findings of a national survey revealed that 73% of parents with extubated infants were offered opportunities for KC, compared to 45% of parents with intubated infants (DiMenna, 2006). However, Eichel (2001) showed that KC can be offered to intubated infants. Based on these findings, Eichel created an updated policy for implementing safe KC to intubated neonates weighting less than 1,500 grams with umbilical or central lines. Eichel's revised policy and procedure demonstrated that suctioning and tube feedings can simultaneously occur during KC sessions without negative consequences or needed interruptions of KC practice. Similarly, Ludington-Hoe et al. (2003) conducted an experimental research study on KC with ventilated infants weighing less than 600 grams. The researchers in this study established a KC protocol for intubated preterm infants using a two-staff member standing transfer method to minimize risks of extubation, line dislodgement, and physiological disruption (Ludington- Hoe et al., 2003). Assurance was provided knowing that none of the study participants encountered negative consequences or inadvertent extubations. Consequently, the two-person transfer method was incorporated into the evidence-based KC pathway to ensure safe practice.

Besides promoting infant–parent bonding, KC provides a mutual trusting partnership in care between NICU nurses and parents (Griffin, 2006). However, Kymre and Bondas (2013) suggested that NICU nurses have often perceived parent readiness as a practice barrier. Therefore, parent education is also required to change the culture and practice of neonatal KC. Positive impacts of a multifaceted educational program for both nurses and parents were confirmed in a study by the March of Dimes Family Support Program (Cooper et al., 2014). In this study, nurse focus groups were used to address the feasibility and significance of implementing KC, where parent education emphasized their role and overall benefits of KC. Cooper et al. (2014) found that parents who understood the value of KC were more knowledgeable and confident requesting KC early in their baby's hospitalization. After implementing the multifaceted educational program, nurses reported positive attitudes toward KC, increased transfer of ventilated babies and more parental requests for KC (Cooper et al., 2014). The researchers in the study concluded that participants born less than 28 weeks gestation received KC by 12 days of age compared to those without the intervention (Cooper et al., 2014). Thus, nurses will advocate for KC earlier and more frequently if parent readiness is apparent.

Many NICU patients endure multiple painful procedures daily for survival. As a method to decrease pain sensitivity, the American Academy of Pediatrics recommends KC to increase opioid peptides and cholecystokinin release (Ludington-Hoe et al., 2008). Despite evidence-based recommendations, may NICU patients are being denied KC as a nonpharmacological method for pain control. Furthermore, when KC practice does occur, it varies in duration from a few minutes to hours (Mcgowan et al., 2017).

However, evidence-based guidelines recommend at least 60 minutes of uninterrupted KC during a full sleep cycle to promote neonatal brain development (Lundington-Hoe, 2011). Recognizing that sound sleep is crucial for brain development in growing premature and full-term infants, the KC pathway enforced a minimum duration of 1 hour.

Local Background and Context

Research, patient care and education constitute the visionary mission for the NICU under study. This world renowned regional academic medical center serves as a state-wide provider in Maryland, encompassing a patient population of various cultures, demographics and socioeconomic status. The institution consists of numerous pediatric departments, including a 45 bed NICU. This NICU is credentialed by the Joint Commission and certified as a level IV NICU, indicating capability to care for the most complex and critically ill newborns.

The highly trained NICU nurses at the designated clinical site remained inconsistent with KC practice, especially among critically ill neonates who are intubated with multiple indwelling intravascular lines or catheters. Feelings of discomfort existed because the current policy and procedure for KC lacked updated safety criteria and does not address specific transfer technique for safe practice. This knowledge deficit prevented nurses from educating parents about available KC opportunities. However, the evidence-based clinical pathway minimized this barrier by providing instructions on the two-person transfer method to minimize risks of extubation, line dislodgement, and physiological disruption (Ludington-Hoe et al., 2003). Not only did the pathway provide safety criteria selection for KC practice, it anticipated the needs of the neonate and KC

provider. Additionally, the clinical pathway increased acceptance of KC by providing a unit standard that nurses were expected to follow.

Nurses in the local NICU will not embrace KC as routine standard of care until they feel competent and safe with the skill. Practice change requires supervised reinforced simulated hands-on training programs, which have been have been successfully implemented and recommended for nursing education and competencies (Hendricks-Munoz & Mayers, 2014). This doctoral project aimed to decrease practice barriers and promote earlier and more frequent KC in the NICU by developing and integrating an evidence-based clinical pathway within a multifaceted champion lead simulated educational training program for staff and parents.

The limited nursing staff and rapid turnover in the local NICU could have prevented feasibility for the two-person method needed for safe transfer during KC. However, practice change is most successful when it collaboratively includes the unique perspective of all stakeholders involved (Mangan & Mosher, 2012). Therefore, an interdisciplinary approach was used to compensate for the limited nursing staff by designating champions within various disciplines besides nursing. All self-appointed staff champions were clinically able to assist nurses with the two-person transfer technique for KC.

Parents in the NICU are often anxious and insecure about having a premature infant. There have been many encounters in the local NICU where overwhelmed parents have conveyed fears about touching or inadvertently harming their infant. Consequently, parents in the NICU also need education on the benefits, safety and feasibility of KC.

According to Chan, Labar, Wall, and Atuna (2016), parents with this knowledge were more likely to request KC and took an active role as their infant's primary care provider. To promote family-centered care and facilitate parent readiness for KC in NICU under study, parent education was an integral component of the simulated educational program.

Role of the DNP Student

The highly specialized role of a neonatal nurse practitioner (NNP) stems from clinical expertise and effective communication skills with parents, providers, and clinical staff members. As an experienced NNP, the DNP student was well positioned to influence multidisciplinary team efforts by understanding competing barriers preventing adoption of KC in the NICU. The combined roles facilitated creation of a supportive environment sharing a common vision of family-centered care.

Personal experiences have fostered an appreciation for the long- term sequela and parental stressors associated with a prolonged NICU hospitalization. Motivation for this doctoral project stemmed from witnessing parents hopelessly sitting at their infant's bedside, knowing that their baby meets criteria for KC. Although situations existed when infants were medically unstable for KC, alternative developmental supportive interventions could have been implemented to assist with caregiving techniques and family-centered care.

Vast experiences as an NNP provide recognition that neonatal nurses serve as patient advocates and parent educators for the provision and safety of KC. Therefore, barriers to KC practice in the local NICU were identified prior to developing a standardized simulated educational program to encourage routine practice. Subsequently,

this DNP project tailored activities to address stakeholders' needs and concerns regarding the practice change of KC.

The DNP enhanced leadership skills necessary for leading quality improvement projects to improve patient outcomes. Fortunately, personal and professional relationships with the staff were positive, well received, and nonthreatening. This mutual respect enabled open ended discussions for successful program development and evaluation. However, biases potentially existed because many staff members have become close friends over the years. Therefore, it was essential not to inadvertently or advertently cross these boundaries for study purposes.

Summary

In conclusion, neonatal nurses uniquely influence the ongoing infant–parent dynamics (Kymre, 2014). As a result, NICU nurses are consistently recognized as an obstacle for advocating and implementing the practice of KC (Moore, 2014). Thus, optimal KC practice in the NICU will not exist until the nursing profession endorses the practice as a routine standard of care during the neonatal period (Ludington-Hoe, 2011). Researchers have suggested that this practice change requires prioritizing awareness and education for both NICU staff and parents (Cooper et al., 2014). Therefore, this doctoral project required a systematic literature review to create a KC pathway within a multifaceted champion-based simulated educational training program for NICU staff and family. Published outcomes and operational data for program synthesis are addressed in the third section of this manuscript.

Section 3: Collection and Analysis of Evidence

Introduction

The NICU environment has changed over decades to protect and promote neonatal development. For example, single patient rooms have been successful in minimizing noxious macroenvironmental conditions in the NICU under study. However, the NICU continues to remain a stressful environment for growing premature and full-term infants who are separated from their parents after birth. According to Ludington-Hoe (2011), the NICU is a source of posttraumatic stress for affected neonates trying to survive in this unnatural habitat.

Ludington-Hoe (2013) insinuated that a comforting microenvironment is achievable in the NICU for both infants and parents via KC practice. Consequently, Ludington –Hoe insisted that developmental and family-centered care strategies in the NICU must encompass the micro- and macroenvironment for successful transformation. Although it is impossible to change the NICU macroenvironment, the warm pleasing touch of KC can offset negative environmental effects by providing physiological and neural behavioral stability for both infant and KC provider (Ludington-Hoe, 2013).

Nursing adoption of KC has progressed slowly in the United States, especially among vulnerable premature infants in the NICU (Ludington-Hoe, 2011). Although Carbasse et al. (2013) recommended KC for intubated premature infants, nurses at the local NICU have denied this practice to hospitalized neonates secondary to their medical condition, weight, and gestational age. To decrease perceived practice barriers impacted

by nurse competency levels, this doctoral project integrated the evidence-based KC pathway within a multifaceted champion lead simulated educational program.

Expanding and sharing knowledge on KC practice positively influenced the nursing profession by promoting earlier and more frequent practice in the NICU. Furthermore, disseminating the KC pathway can potentially reduce the gap between scientific evidence and clinical practice. This practice change required a team approach with multidisciplinary staff champions to guide routine KC practice in the NICU. Further elaboration of the practice focused questions, sources of evidence, literature review, project planning, and methods for data collection are included in this section of the manuscript.

Practice-Focused Questions

Research has demonstrated that KC practice in the NICU should occur sooner and more frequently for optimal effects (Nyqvist et al., 2010). However, supportive evidence indicated that NICU nurses are inconsistent with this practice secondary to knowledge deficits, absent or outdated guidelines, and patient safety concerns associated with competency skills (Almutairi & Ludington-Hoe, 2016). This doctoral project was my attempt to decrease barriers to KC practice in the local NICU by developing and integrating an evidence-based KC pathway into a multifaceted champion-based simulated educational training program.

The NICU nurses in this study were uncomfortable practicing KC, especially among critically ill infants who are intubated with multiple lines. Implementing the KC pathway ameliorated feelings of discomfort by providing evidence-based criteria and

instructions on the two-person transfer method to minimize risks of extubation, line dislodgement, and physiological disruption (see Figure 1). However, the nurses perceived that short staffing would prevent feasibility for the two-person transfer method required for safe KC practice. Therefore, this doctoral project compensated for short staffing by recruiting interdisciplinary KC champions to physically assist nurses with the two-person transfer technique.

Nursing discomfort with KC not only culminates in decreased patient advocacy for practice, but also decreases promotional parent education needed to enhance parent readiness (Kymre & Bondas, 2013). Subsequently, both NICU nurses and parents require education about KC for it to become a routine standard of care. However, the nursing staff and parents in the NICU under study did not receive standardized educational training on KC practice. Therefore, for this project I developed integrated the KC pathway within a champion-based simulated educational training program for the NICU staff and parents.

Each champion received an in-service regarding the KC pathway and were offered simulated hands-on training with manikins. All nurses (including champions) and parents were encouraged to view a simulated educational video entitled *"Skin to Skin Care: A Guide for Nurses and Families"* (Primitive World Production, 2005) in separate forums. The video was purchased from Children's Hospital of Philadelphia (CHOP) as a standardized universal educational tool on KC for NICU nurses and parents. Sharing this evidence-based video empowered NICU nurses and parents to request earlier and more frequent KC practice.

Comparing the pre- and post-test surveys regarding KC practice determined if the staff's knowledge and comfort level improved after the proposed intervention. Nurse competency barriers were targeted by combining the simulated educational video and the KC pathway within the champion-based educational program. The nursing workload and limited staff barrier were addressed by having multidisciplinary champions available to physically assist nurses with KC practice. Finally, the barrier of parent readiness was addressed by providing a separate simulated educational parent video on KC. The parent video indirectly decreased nurses' workload by eliminating the time required for parent education. The guiding practice focused questions for this project are listed below:

- Does integrating a KC pathway within a multifaceted champion-based simulated educational training program for NICU staff and parents promote earlier and more frequent KC practice?
- Does integrating a KC pathway within a multifaceted champion-based simulated educational training program for NICU staff and parents increase KC practice for infants requiring invasive and noninvasive assisted ventilation?
- Does integrating a KC pathway within a multifaceted champion-based simulated educational training program for NICU staff and parents increase staff's knowledge and comfort level with KC?

Operational Definitions

Key aspects of the doctoral project were operationally defined for clarification purposes. For example, the term *KC* is often used interchangeably with *skin-to-skin*

contact or *chest-to-chest contact*. For this doctoral project, I defined KC as the act of skin-to-skin contact between the infant's and care provider's bare chest. The KC care providers for this project included the hospitalized infant's legal guardian, biological mother, and/or father.

According to the American Academy of Pediatrics, prematurity is defined as less than 37 completed weeks of gestation (Baley, 2015). For this doctoral project, I categorized gestational age into four subsections for organizational study purposes. The first subsection included infants born prior to 28 completed weeks of gestation, followed by infants born at 29 to 34 $^{6}/_{7}$ completed weeks of gestation. The third subset included late preterm infants born at the ages of 34 to 36 $^{6}/_{7}$ completed weeks of gestation. The final fourth group consisted of full-term infants born after 37 completed weeks of gestation.

Birthweight was also delineated into four categories for study purposes to explore KC practice in the NICU. Extremely low birthweight infants weighed less than 1,000 grams. Very low birthweight infants weighed between 1,001 to 1,500 grams, followed by low birthweight infants weighing between 1,501 to 2,500 grams. Finally, a full-term infant weighing above 2,501 grams was considered a normal birthweight.

Various terminologies were used when referring to a patient's mode of respiratory support. A patient in room air had no form of respiratory support, where a patient on a regular nasal cannula received oxygen up to 1-liter flow. A heated high flow nasal cannula provided greater than 1-liter flow for oxygen delivery. For this study, noninvasive ventilation modes of respiratory support were defined as continuous positive

airway pressure (CPAP) or synchronized inspiratory positive airway pressure (SIPAP). Both modes delivered oxygen with a constant pressure through nasal prongs or a face mask, but additional sigh breaths were provided with SIPAP. Patients received invasive ventilation via an endotracheal tube, secured with adhesive cloth tape and marked for placement at the lip. Invasive modes of ventilation were delivered either by a conventional mechanical ventilator, or with high frequency ventilation via the oscillator or jet ventilator.

Many terms were used to describe various continuous indwelling vascular catheters. Intravenous fluids were provided via a peripheral intravenous catheter (PIV), umbilical venous catheter (UVC), or a percutaneous central venous catheter (PICC). Arterial fluids were provided via a peripheral radial arterial line or via an umbilical arterial catheter (UAC). All umbilical catheters were sutured intact, where all other intravascular catheters were secured with adhesive tape on an arm board.

Sources of Evidence

An exhaustive and comprehensive literature review was required to understand factors influencing adoption of KC in the NICU. This doctoral project included both published outcomes and generated organizational data as sources of evidence pertaining to identified study variables. Pertinent study findings and the organization's operational data are further elaborated for project purposes.

Published Outcomes

Currently, the vast evidence base for KC consists of nearly 1,600 published studies. Published literature from the year 2000 to present were searched using Pub MEd,

CINHAL, and the Cochrane Library. The MeSH terms used alone or in combination included *kangaroo care, skin-to-skin care, kangaroo mother care, family centered care, developmental care, neonatal intensive care unit, preterm infant, nursing barriers, guidelines, evidence based practice, parent education, nursing education,* and *maternal infant bonding*. All resources for this doctoral project were peer reviewed, published in professional journals, and written by experts in the field of neonatal care. Although selected studies were not solely performed in the United States, the results were limited to the English language.

This literature review focused on the benefits, safety, and effectiveness of KC practice. In addition, barriers and methods to improve adoption were further examined to develop a multifaceted champion-based simulated educational program for KC in the NICU under study. Identified emerging themes used to guide this search included benefits and safety of KC, barriers, policies, procedures and safety criteria, training programs, champions, and parent education. After viewing article titles and abstracts within the literature review, at least 50 articles met inclusion criteria for critical appraisal.

Benefits and Safety

The search resulted in over 900 articles on the physiologic, neurobehavioral, and parental benefits of KC. A meta-analysis of 23 studies of 190 term infants and 326 preterm infants showed that there was an increase in body temperature, increased oxygen saturation, and no change in heart rate during periods of KC (Mori, Khanna, Pledge, & Nakayama, 2010). Although most studies were conducted with stable non-ventilated preterm infants, prematurity did not affect the stability of these parameters (Mori et al.,

2010). Contrarily, Bohnhorst, Gill, Dordelmann, Peter, and Poets (2004) reported increased desaturations and bradycardia during KC from positional changes inherent during KC. Therefore, patients must be prudently monitored to assure correct head positioning for airway patency during KC (Baley, 2015). According to Ludington-Hoe (2011), concerns regarding patient safety in the NICU can be diminished by careful planning and monitoring for routine KC practice.

Based on the recommendation from a 2010 Cochrane Database met-analysis, Carbasse et al. (2013) conducted a 1-year prospective observational study on the safety and effectiveness of early KC in a level III NICU with stable premature infants born before 33 weeks gestation. The authors identified safety as no accidental extubations or worsened clinical status. Effectiveness was defined as improvement in physiologic stability, based on vital signs, body temperature, and oxygen requirements (Carabasse et al., 2013). Clinical stability was operationally defined by Carbasse et al. as less than 50% oxygen requirement, ventilator rate less than 50, and no adverse respiratory events requiring medical intervention during the previous 12 hours. The study consisted of 96 preterm infants with a median gestational age of 28 weeks gestation with a birthweight of 1,070 grams. Out of the 141 observed sessions, Carbasse et al. noted that 18% were intubated, 52% were required nasal CPAP, and 30% were breathing room air. The majority of the patients had central venous access, with 11% with an intact umbilical venous catheter. Physiologic parameters were measured 5 minutes prior to transfer from the incubator, during KC, and 5 minutes after return to the incubator. The study results showed a significant difference in the subjects' oxygen saturation, oxygen requirement,

and heart rate stability during KC compared to baseline measurements (Carbasse et al., 2013). The mean axillary temperature decreased moderately during transfer, but was only transient. There were no significant physiologic differences observed between intubated and non-intubated infants, and no extubations occurred. Thirteen percent of the sessions required minor intervention for apnea and bradycardia, but none required termination of KC (Carbasse et al., 2013). Based on the study findings, Carbasse et al. concluded that KC was safe and beneficial for clinically stable premature infants, including those ventilated and weighing less than 1,000 grams.

A randomized controlled trial of KC found that mortality and growth could be optimized via routine KC practice (Charpak, Ruiz-Pelaez, Figueroa, & Charpak, 2001). Not only did the authors report increase breast milk supply, but the study also revealed a shortened length of hospitalization among infants who received KC compared to the control group (Charpak et al., 2001). Similarly, a recent Cochrane review (Conde-Agudelo & Diaz-Rossello, 2016) evaluated the morbidity and mortality among low birthweight infants who received either continuous or intermittent KC. The results indicated that KC was associated with a reduction in the risk of mortality, nosocomial infections, hypothermia, and length of hospitalization. Compared to conventional neonatal care, KC was found to increase infant growth, breastfeeding and mother–infant attachment (Conde-Agudelo & Diaz-Rossello, 2016). However, many of these studies were conducted in low or middle-income countries on a small sample size of stabilized low birthweight infants. Consequently, large randomized trials are needed in high-income

settings to evaluate if continuous or intermittent KC improves morbidly and morality in low birthweight and premature infants.

Neurobehavioral advantages of KC include longer periods of quiet sleep, more organized sleep–wake cycles, improved state regulation, and decreased crying (Jefferies, 2012). These findings have been attributed to decreased levels of cortisol and increase release of oxytocin in both the infant and parent during KC (Hardy, 2011). Electroencephalographic data during behavioral-based sleep studies confirmed that premature infants demonstrated increased quiet sleep with shorter durations of high quality active sleep during KC (Feldman & Eidelman, 2003). In 2006, Ludington-Hoe et al. conducted a similar study that showed sleep organization greatly improved during KC, compared to the chaotic sleep arousal patterns noted in the incubator. Consequently, infants who receive KC are more likely to adapt to the unnatural NICU environment (McGowan et al., 2017).

Endogenous mechanisms elicited through KC have proven analgesic effects (Campbell-Yeo et al., 2015). However, most studies selectively focused on minimizing heel stick pain in preterm infants. Johnston et al. (2003) conducted a crossover design showing that infants at or above 30 weeks gestation demonstrated decreased pain and crying during heel lancet procedures when receiving KC. Similarly, Johnston et al. (2008) concluded that infants less than 28 weeks gestation had decreased pain scores during KC, and the recovery time to maintain homeostasis was shorter. A more recent randomized control study confirmed that infants in the KC group demonstrated less

tachycardia with shorter durations of crying and facial grimacing during heel sticks compared to the incubator group (Gao et al., 2015).

Recent longitudinal studies have provided compelling evidence regarding long-term benefits of KC. Feldman, Rosenthal, and Eidelman (2014) compared premature infants who received an hour of KC for 14 consecutive days against case-matched control subjects receiving standard incubator care. By 10 years of age, the group of premature infants who received KC as neonates showed attenuated stress response, increased autonomic functioning with organized sleep, better cognitive control, and reciprocal mother–child relationship (Feldman, Rosenthal, & Eidelman, 2014). Charpak et al. (2017) currently discovered new long-term findings after conducting a 20-year cohort study on premature infants who received KC. Study participants who received KC had significantly larger cerebral volumes of total gray matter, cerebral cortex, and left caudate nucleus than control participants at 20 years later. The effects of KC at 1 year of age on IQ were still present 20 years later. Although neurologic examinations identified the same rate of cerebral palsy in both groups, motor functional deficits were more present in the control group. After adjusting for weight and gestational age at birth, Charpak et al. noted that KC had a significant protective effect against mortality. However, social and behavioral outcomes from KC had the most lasting effects 20 years after the intervention. Not only were parents more adaptive and nurturing, their children experienced less school absenteeism, reduced hyperactivity and aggressiveness as young adults. Additionally, this study implied that promoting KC with fathers promoted ongoing

paternal involvement needed for child development and later cognitive capacity (Charpak et al., 2017).

Barriers

At least 2,952 articles were reported on barriers hindering KC practice in the NICU. Most of the descriptive studies reported insufficient educational training, parent readiness, increased nursing work load, lack of a standard KC policy and managerial support. In 2002, Engler et al. conducted a national survey on 537 NICU nurses regarding knowledge and barriers to KC practice. Although the nurses were knowledgeable about KC, reluctance to practice were associated with fears of infant safety (Engler et al., 2002). Similarly, Chia, Sellick, and Sharon (2006) studied 34 NICU nurses ranging in age and year of employments within a large public hospital. The self-reported questionnaires showed that practice barriers were identified as heavy nursing staff loads, insufficient nurse and parent education and lack of a structured KC policy (Chia, Sellick, & Sharon, 2006). Another recent study conducted face-to-face interviews with 15 NICU nurses and 30 mothers in a smaller secondary hospital (Solomon & Rosant, 2012). The authors concluded that obstacles to practice included parent education, inadequate nursing staff training, lack of a standard KC care policy and managerial support, regardless of the percentages of mother and nurse supporters of KC. The above study findings suggested that nurses and parents need education and skill training to overcome barriers to KC practice in the NICU (Solomon & Rosant, 2012). Additionally, it is recommended for knowledgeable NNPs to develop evidence-based policies and procedures for safe KC practice (Engler et al., 2002).

Extrapolating identified nursing needs from existing literature was the first step in determining the accuracy of perceived barriers and knowledge deficits (Kettner et al., 2017). For example, a recent study used The Neonatal Unit Clinician Assessment Tool for assessing the NICU staffs' knowledge and confidence in skills with KC (Higman, Wallace, Law, Bartle, & Blake, 2015). This instrument was based on a review of approximately 170 published reports in the World Health Organization's Kangaroo Care Network reference library. Knowledge was assessed with 10 questions, where only one of four response options is correct. Confidence in practice was evaluated with eight questions using a 10-point Likert scale from *no confidence* to *very confident*. A previous study utilized the Kangaroo Care Questionnaire to evaluate nurses' practice, knowledge, barriers, and perceptions of KC (Engler et al, 2002). Information on the current KC practice was elicited with quantitative items. Practice question consisted of a 5-point summated rating scale from very uncomfortable to very comfortable. The knowledge scale consisted of true or false items, and barriers were addressed using a 5-point Likert scale from not influential at all to very influential (Engler et al., 2002). Both descriptive studies revealed that a lack of formal training and evidence-based guidelines impedes confidence with KC practice.

Policies and Safety Criteria

There were at least 893 articles for KC policies, procedures and safety criteria yielded at least 893 articles. The review suggested that the transfer technique is considered a major factor affecting physiological stability during KC in ventilated infants (Ludington-Hoe et al., 2003). Nue, Browne, and Vojir (2000) conducted a quantitative

study involving 15 intubated low birthweight infants. The physiologic and behavioral effects of KC were compared during the standing versus the sitting method for transfer. Despite the method of transfer, the study participants experienced some degree of physiological or behavioral distress during transfer. However, observations quickly returned to baseline and patients experienced less variation in oxygen saturation, heart rate, and improved ability to self-regulate during periods of KC. The authors concluded that the benefits outweigh the initial stress caused by transfer (Nue, Browne, & Vojir, 2000). Ludington-Hoe et al. (2003) reported similar transient motor disorganization during KC transfer for intubated infants less than 26 weeks gestation. However, this was the first experimental study to establish selection criteria for safe KC practice. Additionally, the study created a protocol for intubated preterm infants using a two-staff member standing transfer method to minimize risks of extubation, line dislodgement, and physiological disruption. Safe position of the infant and ventilator tubing were also addressed, along with the recommended standing position to minimize heat loss during transfer. No negative physiologic or behavior compromises were noted during this study. Despite the small sample size, this study concluded that KC can be safely practiced with ventilated infants if a suitable transfer technique is applied (Ludington-Hoe et al., 2003).

Training Programs

More than 153 articles related to training programs for neonatal KC, with most focusing on nursing and parent education. Although a national survey of neonatal nurses recommended hands on simulated educational videos to improve KC practice, limited studies existed with this methodology for KC training (Engler et al., 2002). According to

Moore (2014), hands on training sessions with realistic manikins can successfully build confidence with return demonstrations and debriefings. Subsequently, Hendricks-Munoz and Mayers (2014) performed a prospective cohort study on neonatal nurses to determine if a simulated nursing training program increased KC. The nurses were involved in role playing with high fidelity mannequins controlled by a biomedical engineering technician. Various medical scenarios were emulated during return demonstrations of KC, followed by educational debriefings. The study outcomes revealed that nurse competency in infant transfer during KC improved from 30% to 93% after simulated training, especially among patients requiring assisted ventilation (Hendricks-Munoz & Mayers, 2014).

Almutairi and Ludington-Hoe (2016) recently conducted the first study to determine effects of a KC certification course on nurses' knowledge and skill confidence. The Kangaroo Care Knowledge and Skills Confidence Tool was administered to 68 nurses before and after a 2.5-day training course. Measures of central tendency, dispersion and paired t tests were conducted on 57 questionnaires. The post-test knowledge and confidence scores were significantly higher following a certification continuing education course. This quasi-experimental study recommended to compliment continuing education for KC with certification training programs (Almutairi & Ludington-Hoe, 2016).

Champions

A randomized controlled trail assessed the impact of external facilitation with champions to implement guidelines for KC in the NICU (Wallin, Rudberg, & Gunningberg, 2004). The study also used change groups as an enabling approach to

accomplish change with champion support. The author insinuated that practice change requires learning through social interactions with respected and knowledgeable facilitators of change. Overall, learning and behavior change were attributed to a social phenomenon (Wallin et al., 2004).

Eichel (2001) recognized the importance of champions to promote a revised policy and procedure for intubated infants weighing less than 1000 grams with umbilical or central lines. After providing staff education and competency-based in-service education, the expanded policy was clinically implemented. According to Eichel (2001), infants experienced more sound sleep with fewer episodes of apnea, bradycardia and or desaturations during KC. Additionally, KC became a routine practice for critically ill patients. The author concluded that self-appointed "pioneer nurses" were the most successful factor in overcoming nursing resistance (Eichel, 2001). This corresponds to a retrospective cohort study on 648 infants in a rural Indian NICU (Soni et al., 2016). The authors discovered that KC practice decreased by 45% when physician campions were withdrawn from the NICU. The study recommends training health care workers and community stakeholders as KC champions to maintain a standard of care (Soni et al., 2016).

Parent Education

The practice of KC not only benefits hospitalized neonates, but also the parents who are abruptly separated from their infant at birth. A multitude of studies emphasized the need for parent education to mitigate parent readiness as barrier for KC (Hardy, 2011). The March of Dimes NICU Family Support Program validated that earlier and

more frequent KC occurred by educating both parents and nurses about the benefits and feasibility of KC (Cooper et al., 2014). Positive outcomes were portrayed by Cooper et al. (2014) when infants born less than 28 weeks gestation received KC by 12 days of age, compared to the control group who did not receive KC until 31 days of life. In addition, parents were empowered and more comfortable requesting KC after receiving education, awareness, encouragement and comfort components of KC (Cooper et al., 2014). These findings coincided with a recent study showing that NICU nurses are challenged to share care giving responsibilities of critically ill neonates with their parents (Kymre & Bondas, 2013). Nurses in the study felt forced to balance the infant's developmental needs with parent readiness for KC. The authors concluded that nurses must advocate a shared responsibility in caring for hospitalized neonates by educating parents about the benefits and feasibility of early and frequent KC practice (Kymre & Bondas, 2013).

Generated Operational Data

The EMR at the local NICU generated data on each subject's medical diagnosis, respiratory support, intravascular devices, gestational age, post-menstrual age, birth-weight, day of life since admission, parental visitation, and the frequency and tolerance of KC. Given that all clinical NICU team members were required to enter patient data and interactions into the EMR, factual baseline data for KC practice were portrayed before and after the intervention. The EMR also determined if KC practice occurred earlier and more frequently after the proposed intervention, despite the patient's level of acuity, gestational age, weight, respiratory support and intravascular devices. If KC was not performed during a documented parent visitation, it was assumed that the practice was

not offered or initiated during that secession. Data from the EMR was manually collected 2 months before and after the intervention for study purposes. Comparing the frequency and timing of KC before and after the intervention determined the program's effectiveness based on measured outcome variables.

Electronic surveys were created for this doctoral project to examine nurses' knowledge and comfort level with KC before and after program implementation. The survey questions were extracted from recent needs assessment tools and predetermined set list of nursing practice, knowledge and barriers described in the literature. The anonymous questionnaire consisted of seven concise questions that were easy to answer in a short time frame. All questions were rated on a 5-point Likert scale from strongly disagree to strongly agree. Clarity and redundancy were evaluated by three NICU staff members with at least 5 years of neonatal experience, and three new graduate nurses.

Participants and Analysis

Participants consisted of hospitalized patients in the local NICU during the study, regardless of their gestational age, birth-weight, day of life, venous access and respiratory support mode. However, patients were not study candidates if deemed clinically unstable for KC (labile vital signs, oxygen saturations and blood gases). Additional exclusion criteria included patients receiving whole body cooling or paralytics. NICU Patients were also disqualified if they had intact chest tube(s), arterial catheter (peripheral or umbilical), fresh tracheostomy, and unrepaired open intestinal wall or spinal cord defects. To prevent skewed data, patients transferred from an outside hospital prior to 2 weeks of life were eliminated from the study.

KC practice was evaluated 2 months before and after the intervention on all NICU patients who met study criteria. Aggregating data from the EMR reflected the frequency of KC practice pre intervention compared to post intervention. Additionally, patient data from the EMR was used to determine if KC occurred more frequently in infants with invasive and noninvasive ventilation after the intervention compared to before the intervention.

One hundred and fifty staff nurses were employed in the local NICU during the study duration. All study subjects were encouraged to participate, regardless of their age, gender, years of experience, and weekly hours. Participants received a pre-survey before viewing the simulated evidence-based KC video. After a month of champion led KC training, the post-survey was administered to the same nurses who completed the pre-survey. Comparing the pre- and post-survey responses determined if the nurses' level of comfort and knowledge improved after integrating the KC pathway within a multifaceted a champion-based simulated educational training program.

Approximately 32 voluntary clinical staff members were recruited as KC champions in the NICU under study. The majority of the champions consisted of eager staff nurses and respiratory therapists, where the remainder were nurse practitioners, a physical therapist, occupational therapist and child life specialist. All staff champions viewed the simulated educational video and were offered an in service regarding the KC pathway.

Procedures and Strategies

A multidisciplinary team approach with strategic planning was essential to change the culture of KC in the NICU under study. The first step required submitting an introductory article in the electronic NICU newspaper to inform the staff about the upcoming project, and to recruit any KC champions. All clinical and nonclinical team members in the local NICU received a monthly edition of the Preemie Press via their work e-mail. This strategic method used a catchy slogan to facilitate stakeholder awareness and recruitment of staff champions. The title of the article was "Hop To It: Are You Kanga-Ready." There was also a cartoon figure of a kangaroo hopping with a baby kangaroo in her pouch. To motivate the staff and encourage ongoing participation, a blog was posted each month in the Preemie Press regarding the next upcoming phase of the project.

One week after the program announcement, a voluntary electronic pre-survey was administered to all NICU nurses, including potential nurse champions. Immediately following completion of the pre-survey, a simulated evidence-based educational video on KC was available for viewing. The video (without access to the pre-test) was provided to non-nursing KC champions, which included the respiratory therapists, NNPs, physical therapists, and the child life specialist. A 4-week time frame was allotted for the NICU nurses to complete the pretest and view the video. During this time frame, self-appointed multidisciplinary clinical staff champions were recruited. Various influential subspecialty meetings were attended to navigate disagreements and illicit champion buy in. The subspecialty NICU staff meetings included nurses, physicians, respiratory therapists,

NNPs, physical therapists, and child life. Based on stakeholder suggestions, minor revisions were made to the KC pathway to instill a sense of empowerment and pride. Additionally, it was decided for nurse lead rounds to include the last date when KC occurred. This input contributed to the ongoing evaluation process for project improvement.

Following recruitment of self-selected KC champions, the champions were educated about the KC pathway. A 3-week time frame was allotted to provide scheduling opportunities for champions to attend a voluntary simulated training class with manikins. However, it was difficult to educate champions from nursing and respiratory therapy because they refused to come in on their off days. Although a simulated training workshop with manikins was offered to all the champions, only the physical therapist, occupational therapist and child life specialist desired enrollment. Therefore, a mini in-service was offered to the remaining champions daily for 2 weeks based on their individualized work schedules.

Each champion received a monthly calendar to document when they participated or facilitated KC. Champions were encouraged to either practice, assist, or promote KC on at least three patients a week. Monthly documentation not only held champions accountable for proof of action, but also reinforced practice replication of observed behaviors. However, champions were not penalized for incomplete documentation, refusal of in-service training, or terminating their role in this study.

The parent version of the simulated KC video was uploaded into each bedside iPad for parent education. Nurses received email notifications about encouraging parents

to view the new KC video. Additionally, the KC pathway was displayed at each patient bedside as visual and mental reminders to both parents and nurses.

Two months after launching the KC champions and parent video, a voluntary post-survey was administered to the NICU nurses (including nurse champions) who completed the pre-survey and viewed the simulated video. For consistency purposes, the pre- and post-survey questions were identical. However, nondescript identifiers were used to ensure the same group of nurses are being compared before and after the intervention.

Project failure often occurs when the program hypothesis holds no value for involved stakeholders (Kettner et al., 2017). Therefore, all staff members contributing to KC practice received positive recognition on their yearly evaluation to ensure professional satisfaction, practice replication and program success. Additionally, a contest was created for the champion who performed the most KC during the study. The winner received a gift certificate and had their photograph displayed in the unit as the "Kangaroo Care Champ."

Protections

All health care providers have a legal and ethical obligation to do no harm. Therefore, the Walden Institutional Review Board (IRB) approved the doctoral project prior to data collection and implementation (IRB # 08-22-17-0599756). The IRB approval provided assurance that appropriate steps are taken to protect the rights and welfare to human subjects participating in a research study. This process confirmed that the study's benefits outweigh the risks, and that equitable selection was based on sound

inclusion and exclusion criteria (White & Dudley-Brown, 2012). Consequently, data were only collected if it addressed the approved research questions.

Anonymity was used in this doctoral project to safeguard subject's privacy and confidentiality. Informed consent was attached to the questionnaire to assure full disclosure about the study before subjects choose to participate or not. No NICU staff members were forced to participate in this study or would have been penalized for withdrawing from the study.

Analysis and Synthesis

Multiple software programs were utilized for data analysis and synthesis. First, the Excel software program was used to create a spread sheet for recording, tracking, and organizing patient data collected before and after the intervention. The My Learning software determined which nurses actually viewed the KC video, proceeding completion of the pre-test. The pre- and post-test questionnaire responses were collected and analyzed via the Qualtrics software. Finally, the Statistical Package for the Social Sciences (SPSS) software guided statistical analysis for comparative measures, based on the level of measurement for each variable being studied. The generalized linear model (GLM) allowed statistical analysis of the frequency and timing of KC before and after the intervention, where descriptive statistics compared the staff's knowledge and comfort level. Data analysis began with instructing the SPSS program to organize all variables in a frequency distribution to interpret collected data and detect outliers. After data cleaning was completed, a new set of frequency distributions were compiled to reflect any corrections (Grove et al., 2013).

Summary

Although the practice of KC emerged out of necessity in underdeveloped countries with limited resources, it is now considered the most natural and beneficial developmental intervention for hospitalized neonates worldwide (Ludington-Hoe, 2013). Today, a compelling body of literature suggests that KC promotes physiologic and psychosocial effects for both the infant and KC provider (Baley, 2016). Despite the steady increase of KC in the United States, NICU nurses remain inconsistent with this practice, especially among critically ill neonates in the NICU (Moore, 2014).

Prior to this DNP project, the nursing staff and parents in the NICU under study did not receive standardized education on KC. Furthermore, the existing unit policy for KC failed to address the two-person transfer technique for safe practice. Consequently, many nurses did not advocate this practice secondary to patient safety concerns associated with competency skills and parent readiness. However, the evidence-based KC pathway provided safety criteria and instructions on the two-person transfer method used to minimize risks of unintentional extubation and line dislodgement (Ludington-Hoe, 2011). Recognizing that evidence-based tools alone do not automatically ensure practice change, this doctoral project empowered NICU staff and parents to request earlier and more frequent KC by integrating the KC pathway within a multifaceted champion-based simulated educational training program.

In conclusion, translation of research in to practice positively affects patient care outcomes by combining clinical expertise with patient data. When gaps of knowledge are identified, opportunities are provided to generate new clinical research studies based on

evidence-based practice (Fawcett & Garity, 2009). This doctoral project exemplified how translating evidence-based research into practice required intensive planning, implementation, and ongoing evaluation of change. Disseminating the findings, implications, and recommendations of this doctoral project can humanize the NICU environment by cultivating a family-centered approach to neonatal health care delivery.

Section 4: Findings and Recommendations

Introduction

KC is a cost-efficient method to increase infant–parent bonding and neonatal health outcomes (Campbell-Yeo et al., 2015). Despite evidence supporting KC in the high-tech NICU, nurses at the local NICU remained inconsistent with this practice. Practice barriers stemmed from patient safety concerns, knowledge deficits, decreased staff, interrupted daily work flow, and an unsupportive culture of family-centered care. Although an established policy and procedure existed for KC, it failed to address the two-person transfer technique recommended to minimize risks of extubation, line dislodgement, and physiological disruption. Consequently, many ambivalent nurses did not embrace this evidence-based practice, especially among vulnerable intubated patients with multiple lines. This contagious negative energy had detrimental effects on family-centered care in this NICU because parents and staff lacked standard training and education regarding the benefits and feasibility of KC.

The purpose of this doctoral project was to develop and integrate an evidence-based KC pathway within a multifaceted champion-based simulated educational training program for NICU staff and parents. The aim was to ameliorate feelings of discomfort with KC by providing inclusion criteria and instructions on the two-person transfer method recommended for safe practice. KC was promoted in the setting of increased patient acuity and rapid staff turnover by recruiting multidisciplinary champions to physically assist nurses with patient transfer during KC. The goal was to promote earlier

and more frequent KC in the NICU by increasing nurses' knowledge and comfort with this practice.

The DNP prepared nurse has the knowledge to synthesize research and apply the strongest evidence into clinical practice based on specific unit needs (Terry, 2015). Personalization of the evidence to fit a particular clinical question or patient need was depicted via the KC pathway to promote safe practice in the NICU under study. Thus, the KC pathway served as an operationalized avenue for translating strong evidence into a standard of care. Integrating the KC pathway within a multifaceted simulated educational training program for NICU staff and parents demonstrated how new evidence-based programs are incorporated for practical implementation based on clinical expertise and patient values. Disseminating the evidence-based pathway can improve nurses' knowledge and comfort with KC practice in NICUs nationwide. The guiding practice focused questions for this project are listed below:

- Does integrating a KC pathway within a multifaceted champion-based simulated educational training program for NICU staff and parents promote earlier and more frequent KC practice?
- Does integrating a KC pathway within a multifaceted champion-based simulated educational training program for NICU staff and parents increase KC practice for infants requiring invasive and noninvasive assisted ventilation?

- Does integrating a KC pathway within a multifaceted champion-based simulated educational training program for NICU staff and parents increase staff's knowledge and comfort level with KC?

An exhaustive and comprehensive literature review was required to understand factors influencing adoption of KC in the local NICU. Currently, the vast evidence base for KC consists of nearly 1,600 published studies. Published sources from the year 2000 to present were searched using Pub MEd, CINHAL, and the Cochrane Library. All resources for this doctoral project were peer reviewed, published in professional journals, and written by experts in the field of neonatal care. Although selected studies were not solely performed in the United States, the results were limited to the English language. Identified emerging themes used to guide this search included benefits and safety of KC, barriers, policies, procedures and safety criteria, training programs, champions, and parent education. After viewing article titles and abstracts within the literature review, at least 50 articles met inclusion criteria for critical appraisal.

Generated organizational data were also used as sources of evidence pertaining to identified study variables. An electronic Likert scale survey was used to rate the staff's level of knowledge and comfort with KC before and after study implementation. The survey was extracted from a predetermined set list of nursing practice, knowledge, and perceived barriers to KC described in the literature.

The EMR was used to aggregate data on the patient's weight, gestational age, day of life, respiratory support, intravenous access, and frequency of KC before and after the multifaceted educational intervention. Data from both the EMR and surveys were

compiled and organized using statistical comparative analysis methods. Elaboration of the statistical findings and implications are discussed in the final section of this manuscript.

Findings

This study sample consisted of 68 NICU patients with 172 observations. There were 32 unique patients (70 observations) in the pre-implementation group, compared to 36 unique patients (102 observations) in the post-implementation group. Earlier KC practice was designated by the day of life since admission that KC occurred. Correlation was interpreted by the GLM analysis with a lognormal distribution for age. On average, the infants' age of life during KC was 64% higher in the post-intervention time frame compared to the preintervention period. This relationship was non-conclusive ($p = 0.082$) to determine if the intervention promoted earlier KC practice in the NICU under study (see Table 1). Insignificant results were attributed to patient groups not being controlled for day of life since admission. For example, many acutely ill patients born during the pre-intervention period required prolonged hospitalization. These neonates were never discharged home during the pre-intervention time frame, and were therefore much older during the post-intervention time frame. Consequently, some hospitalized infants were older during the designated study time frame, while other patients were newly born.

Table 1

GLM for Earlier KC

	(1)
	GLM model with Lognormal distribution
time	1.641
	[0.940,2.865]
N	120

Note. A generalized linear model (GLM) with a lognormal distribution for day of life since admission was used to statistically evaluate multiple observations for study participants. The day of life since admission was compared at the time of kangaroo care (KC), by time period.

The frequency of KC practice was determined by the number of documented KC episodes performed by time period. Correlations were statistically analyzed via the GLM, using a Poisson distribution accounting for multiple observations from the same patient over different time frames (see Table 2). Study findings appearing in Table 2 showed that KC occurred 2.4 more times after the intervention compared to before the intervention ($p = 0.001$). The increased percentages of KC episodes post-intervention compared to the decreased episodes pre-intervention are graphically depicted in Figure 3. KC practice never occurred 53% of the time during the pre-intervention period, which significantly decreased to 25% of the time during the post-intervention period. The maximum episodes of KC during the pre-intervention time frame were 4 times a week. However, this only occurred 3.1% of the time compared to 11.1 % of the time after study implementation. The maximum episodes of KC during the post-intervention time frame increased to 6 times a week (see Figure 3).

Table 2

GLM for Frequency of KC

	GLM model with Poisson distribution of KC performed
	RR (95%CI)
Post- vs. preintervention	2.407**
	[1.400,4.138]
N	172

Note. A generalized linear model (GLM) with a Poisson distribution was used to compare the number of kangaroo care (KC) episodes performed by time period, accounting for multiple records for the same patient.

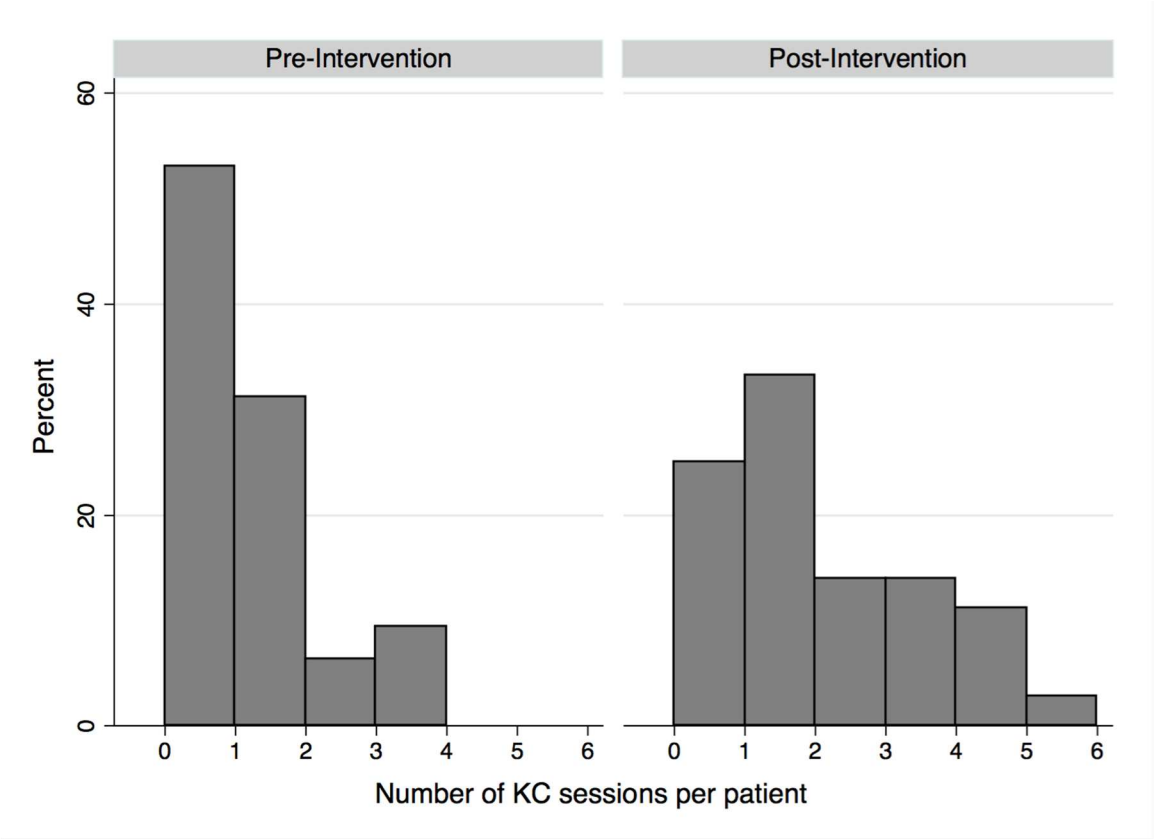

Figure 3. Number of times KC performed. This graph depicts how many sessions of kangaroo care (KC) were performed for study participants during the pre-implementation and post-implementation period.

Descriptive statistics appearing in Table 3 strongly implied that the overall frequency of KC episodes for intubated patients (invasive ventilation) was higher after the study intervention. The percentage of KC episodes for intubated patients nearly doubled after study implementation. Intubated patients only received KC 6.2% of the time pre-intervention, which markedly increased to 11.1% of the time post-intervention. Patients on high frequency ventilation never received KC during the pre-intervention time frame. However, KC occurred 2.8% of the time for infants requiring high frequency

ventilation during the post-intervention time frame (see Table 3). Furthermore, none of the intubated study participants were unintentionally extubated during KC practice.

Table 3

Respiratory Support and Intravenous Access with KC

	Time Period					
	Preintervention		Postintervention		Total	
Respiratory Support						
Conventional Ventilation	2	6.20%	3	8.30%	5	7.40%
High Flow Nasal Cannula	4	12.50%	6	16.70%	10	14.70%
High Frequency Oscillator Ventilation	0	0.00%	1	2.80%	1	1.50%
Nasal Cannula	2	6.20%	5	13.90%	7	10.30%
Nasal Continuous Positive Airway Pressure	1	3.10%	5	13.90%	6	8.80%
Room Air	5	15.60%	5	13.90%	10	14.70%
Nasal Synchronized Positive Airway Pressure	1	3.10%	2	5.60%	3	4.40%
missing	17	53.10%	9	25.00%	26	38.20%
Total	32	100.00%	36	100.00%	68	100.00%
Intravenous Access						
None	2	6.20%	4	11.10%	6	8.80%
PICC	8	25.00%	13	36.10%	21	30.90%
PIV	4	12.50%	7	19.40%	11	16.20%
UVC	1	3.10%	3	8.30%	4	5.90%
missing	17	53.10%	9	25.00%	26	38.20%
Total	32	100.00%	36	100.00%	68	100.00%

Note. This table shows the number and percentage of kangaroo care (KC) episodes that occurred with various modes of respiratory support and types of intravenous access.

Descriptive statistics portrayed in Table 3 also suggested that the frequency of KC episodes increased for patients requiring noninvasive modes of respiratory support. Patients on nasal CPAP received KC 13.9% of the time post-intervention, compared to only 3.1% of the time pre-intervention. Similarly, study findings showed increased KC

episodes for patients on SIPAP after the intervention (5.6% from 3.1%). During the post-intervention time frame, the number of KC episodes more than doubled for patients on a regular nasal cannula (13.9% from 6.2%). Interestingly, the KC episodes for patients in room air only increased by 1.7% after the study intervention (see Table 3). Minimal improvement most likely occurred because there were more study participants in room air prior to the intervention.

This study supports current evidence that nurses lack education and training skills necessary to provide effective and safe KC practice. In terms of nurses' knowledge, 16.2% of the nurses felt that 30 minutes was a moderately adequate time frame for KC practice. After the intervention, the post-survey revealed increased knowledge because a lower number of nurses (11.2%) felt that 30 minutes of KC was moderately adequate. Similarly, the pre-survey showed that 17.6 % of the nurses felt that 30 minutes was a moderately inadequate duration for KC, compared to 30.0 % of nurses on the post-survey. The post-survey revealed that 52.2% of the nurses strongly agreed that KC can decreased length of hospital stay and infection rates. Knowledge was gained after the intervention because fewer nurses (36.3%) answered *strongly agree* to this same question on the pre-survey (see Table 4).

Table 4

Pre- and Post-survey Results

	Time Period					
	Preintervention		Postintervention		Total	
Wait for the parent to request KC						
Never	63	22.70%	16	20.00%	79	22.10%
Occasionally	115	41.40%	33	41.20%	148	41.30%
About half the time	49	17.60%	22	27.50%	71	19.80%
Most of the time	32	11.50%	6	7.50%	38	10.60%
Always	9	3.20%	3	3.80%	12	3.40%
missing responses	10	3.60%	0	0.00%	10	2.80%
Total	278	100.00%	80	100.00%	358	100.00%
Hesitant to offer KC for intubated patients						
Never	16	5.80%	4	5.00%	20	5.60%
Sometimes	129	46.40%	50	62.50%	179	50.00%
About half the time	33	11.90%	14	17.50%	47	13.10%
Most of the time	65	23.40%	10	12.50%	75	20.90%
Always	22	7.90%	2	2.50%	24	6.70%
missing responses	13	4.70%	0	0.00%	13	3.60%
Total	278	100.00%	80	100.00%	358	100.00%
NICU has adequate staffing to support KC						
Extremely adequate	25	9.00%	6	7.50%	31	8.70%
Somewhat adequate	100	36.00%	41	51.20%	141	39.40%
Neither adequate nor inadequate	24	8.60%	5	6.20%	29	8.10%
Somewhat inadequate	87	31.30%	21	26.20%	108	30.20%
Extremely inadequate	31	11.20%	7	8.80%	38	10.60%
missing responses	11	4.00%	0	0.00%	11	3.10%
Total	278	100.00%	80	100.00%	358	100.00%

(table continues)

	Time Period					
	Preintervention		Postintervention		Total	
KC for preemies in humidity/neuro protective bundle						
Extremely comfortable	26	9.40%	7	8.80%	33	9.20%
Moderately comfortable	56	20.10%	17	21.20%	73	20.40%
Slightly comfortable	32	11.50%	17	21.20%	49	13.70%
Neither comfortable nor uncomfortable	33	11.90%	5	6.20%	38	10.60%
Slightly uncomfortable	40	14.40%	13	16.20%	53	14.80%
Moderately uncomfortable	48	17.30%	14	17.50%	62	17.30%
Extremely uncomfortable	30	10.80%	7	8.80%	37	10.30%
missing responses	13	4.70%	0	0.00%	13	3.60%
Total	278	100.00%	80	100.00%	358	100.00%
30 minutes of KC is adequate						
Extremely adequate	17	6.10%	5	6.20%	22	6.10%
Moderately adequate	45	16.20%	9	11.20%	54	15.10%
Slightly adequate	37	13.30%	11	13.80%	48	13.40%
Neither adequate nor inadequate	40	14.40%	3	3.80%	43	12.00%
Slightly inadequate	35	12.60%	17	21.20%	52	14.50%
Moderately inadequate	49	17.60%	24	30.00%	73	20.40%
Extremely inadequate	44	15.80%	11	13.80%	55	15.40%
missing responses	11	4.00%	0	0.00%	11	3.10%
Total	278	100.00%	80	100.00%	358	100.00%
KC can decrease hospitalization and infection rates						
Strongly disagree	18	6.50%	0	0.00%	18	5.00%
Somewhat disagree	9	3.20%	2	2.50%	11	3.10%
Neither agree nor disagree	30	10.80%	6	7.50%	36	10.10%
Somewhat agree	108	38.80%	30	37.50%	138	38.50%
Strongly agree	101	36.30%	42	52.50%	143	39.90%
missing responses	12	4.30%	0	0.00%	12	3.40%
Total	278	100.00%	80	100.00%	358	100.00%

(table continues)

	Time Period					
	Preintervention		Postintervention		Total	
How many times per month do you incorporate KC						
Never	1	0.40%	0	0.00%	1	0.30%
Sometimes	58	20.90%	18	22.50%	76	21.20%
About half the time	70	25.20%	19	23.80%	89	24.90%
Most of the time	112	40.30%	38	47.50%	150	41.90%
Always	26	9.40%	5	6.20%	31	8.70%
missing responses	11	4.00%	0	0.00%	11	3.10%
Total	278	100.00%	80	100.00%	358	100.00%

Note. These questions were provided to NICU nurses before and after the intervention. This table shows the number of responses and percentages for each answer to every question.

Nurse comfort definitely increased after launching the champion-based simulated training program. The pre-survey reported that 23.4% of nurses were hesitant with offering KC to intubated patients most of the time, which markedly decreased to 12.5% post-intervention. Only 11.5% of nurse respondents on the pre-survey were slightly comfortable with KC for premature infants in humidity and under the neuro protective bundle. This number almost doubled on the post-survey (21.2%), proposing that earlier KC practice occurred since premature neonates require humidity and neuroprotective bundle within the first 2 weeks of life (see Table 4). Improved comfort with KC also appeared in Table 3, reflected by an increased percentage of KC episodes for patients with an intact umbilical venous catheter during the post-intervention time frame (8.3% from 3.1%). Additionally, only 6.2% of KC episodes during the pre-intervention time frame were offered to parents but declined. This number increased to 25% during the post-intervention time frame, indicating that more nurses were at least offering KC to parents as an option (see Table 5).

Table 5

KC Offered but Declined

	Time Period					
	Preintervention		Postintervention		Total	
KC Performed						
0	17	53.10%	9	25.00%	26	38.20%
1	10	31.20%	12	33.30%	22	32.40%
2	2	6.20%	5	13.90%	7	10.30%
3	2	6.20%	5	13.90%	7	10.30%
4	1	3.10%	4	11.10%	5	7.40%
6	0	0.00%	1	2.80%	1	1.50%
Total	32	100.00%	36	100.00%	68	100.00%
KC Declined						
0	30	93.80%	23	63.90%	53	77.90%
1	2	6.20%	9	25.00%	11	16.20%
2	0	0.00%	2	5.60%	2	2.90%
missing	0	0.00%	2	5.60%	2	2.90%
Total	32	100.00%	36	100.00%	68	100.00%

Note. This table shows the number of kangaroo care (KC) episodes and the number of times that KC was offered but declined during each weekly interval before and after the intervention.

The nursing staff were receptive to the highly influential champion's presence and motive to humanize the high-tech NICU environment. After implementing a multifaceted champion-based simulated education program, an increased percentage of nurses reported having somewhat adequate staffing to support KC (51.2% from 36.0%). Additionally, the pre-survey showed that 11.5% of nurses mostly waited for parents to request KC before initiation, which decreased to 7.5% of nurse respondents on the post-survey (see Table 4).

Implications

Ongoing evaluation and monitoring were essential to change the current practice of KC in the local NICU. To actively translate evidence into clinical practice, residual

concerns from staff and parents were identified and addressed throughout this study. For example, practice changes during KC included tube feeding and suctioning as indicated. Additionally, parents in the local NICU perused KC practice more than once a day. Sharing the responsibility of KC with families not only improved parent-staff relationships, but fulfilled the need for professional satisfaction. Even, the duration of KC and father participation appeared to increase.

The KC pathway allowed patients in the local NICU to receive the additional time and supportive measures required for safe transfer and physiologic adaptability. Infants in humidity were now encouraged to partake in KC, including neonates under the neuroprotective bundle. Consequently, KC practice was encouraged sooner after admission for vulnerable hospitalized neonates. As the NICU staff grew more confident and comfortable with the evidence, more intubated patients were offered KC. Furthermore, vulnerable neonates on high frequency JET ventilation safely received KC in the NICU under study after study implementation.

The NICU nurses in the study accepted the evidence after proudly recognizing and owning their unique powerful role in providing safety during KC. For example, some staff members inquired about expanding inclusion criteria for patients with umbilical arterial catheters. Most importantly, a critically ill neonate on high frequency ventilation with chest tubes received KC during the study. Despite staff ambivalence, the patient's oxygen saturations markedly increased during KC practice. The mother felt instrumental with her infant's care and the staff took pride in making KC a meaningful experience for the family.

Implications for this doctoral project provide recognition that the existing policy and procedure on KC requires updated revisions. Based on current evidence, the new revised policy will address the two-person transfer method recommended for intubated patient with multiple lines. Additionally, inclusion criteria will be broadened to include patients in humidity, under the neuroprotective bundle, or with an intact peripheral or umbilical arterial catheter. All ventilation modes will meet criteria for routine KC practice depending upon the discretion of each individualized care provider.

To decrease the gap between evidence and practice, potential implications for positive social change must fully encompass the umbrella of maternal child care. Parent education about the benefits and feasibility of KC needs to start with prenatal care and continue through postpartum care. The practice should be offered to every stable neonate immediately following vaginal or caesarean deliveries. This practice change requires ongoing educational training and reinforcement with maternity, newborn nursery, lactation specialists, and pediatricians. In return, early infant parent bonding will promote healthy development and family dynamics.

Recommendations

The evidence-based KC pathway can potentially improve nurses' knowledge and comfort with KC practice in NICUs nationwide. Not only does the pathway adequately depict incremental steps required for safe KC practice, it anticipates the needs of the neonate and provider. This DNP project recommends the KC pathway as an operationalized avenue to translate evidence into practice. Ultimately, the KC pathway serves as an evidence-based standard of care for NICUs to follow (See Figure 1).

Benefits discovered through research in developing or underdeveloped countries should not automatically apply to resource rich countries (Conde-Agudelo, & Diaz-Rossello, 2016). However, there are limited studies investigating the effect of KC on mortality, infection, and serious illness in developed countries where advanced support is readily available. More methodologically rigorous studies are needed to better understand and maximize the clinical benefits of KC in the high-tech NICU environment. Randomized controlled studies could determine the optimal duration and time to initiate KC in developed countries (Conde-Agudelo, & Diaz-Rossello, 2016). Replication of this doctoral project with groups controlled for day of life since admission could determine if integrating the KC pathway within a multifaceted champion-based simulated training program promotes earlier practice. Additionally, researchers need to conduct dose response studies to predict the best outcomes for the least cost. Investigators must take advantage of available advanced brain imaging to further explore both short and long-term neurodevelopmental changes associated with KC (Campbell-Yeo et al., 2015).

Although many neonates may not receive KC soon after admission while critically ill, it is important to continually reevaluate the cost-benefit ratio. Since vulnerable infants often become more stable during KC, patient outcomes and cost-benefit ratios must be included in further institutional documentation and clinical reports (Hardy, 2011). For example, hospital bench marking records should address the number of infants who received KC holding and the frequency of practice. Furthermore, patient satisfaction scores and hospital surveys need to incorporate KC as a mechanism to endorse family-centered care.

Literature suggested that KC become a nurse competency training skill to improve confidence with practice (McGowan et al., 2017). Nurses also require knowledge about available continuing education courses which provide KC certification. Another recommended approach to facilitate KC practice is to assign patients with paired nurses of varying skill sets and experiences. However, a consistent clinical method for assessing parent, infant, and environmental readiness is essential to measure success and guide interventions to increase KC practice in the NICU (Almutairi & Ludington-Hoe, 2016).

NICU nurses are drawn to the highly specialized neonatal patient population and technological care required for their survival. Despite being some of the strongest and most talented intensive care nurses, their nontechnical aspects of caregiving require constructive attention to improve family-centered care (Griffin, 2006). For example, NICU nurses rarely implement KC as a non-pharmacologic comfort measure during routinely endured minor painful bedside procedures. To increase parent participation with patient care, behavior modification requires communication and relationship building with self, peers, and families (Griffin, 2006). Therefore, nurse managers in the NICU must prioritize family-centered care during annual nursing evaluations. Offering KC should not be considered a nice gesture, but rather an expected unit standard of care.

Study Limitations and Strengths

This doctoral project encountered various study limitations resulting in lessons learned. Although the convenient sample was conducive for study purposes, it limited the sample to one institution. Findings may not be generalizable since the study was

influenced by the culture and personal interactions shared within the local NICU. Additionally, extraneous confounding variables occurred during the study. For example, nurse lead rounds were recently implemented prior to study implementation. This forum served as an unintentional avenue to reinforce KC among the NICU staff. Additionally, many new nursing graduates were hired during the study, allowing for additional training and reinforcement regarding neonatal KC. Finally, nursing documentation in the EMR was not always reflective of each KC episode that occurred during the study. Although the medical record provided designated space for recording KC practice, inconsistent nursing documentation made it difficult to capture each true encounter.

Lessons gained from this doctoral project stemmed from the importance of clear communication and patience during project planning. Feelings of internal stress and anxiety to distribute the pre-survey within a given time frame overshadowed the importance of double checking the list of intended nurse recipients. Consequently, the electronic pre-survey was inadvertently delivered to a sister hospital in Florida. Many of the responses from the pre-survey were not from the intended study sample. This problem was resolved by compiling a list of the Internet Protocol (IP) addresses from each computer used for entering survey responses. Determining the general proximity of each respondent's IP address allowed pre-survey responses to be removed from the unintended study district. Subsequently, the electronic post-survey was only administered to the nurses who completed the pre-survey from the NICU under study.

Another study weakness was that the pre- and post-survey lacked identifiers to link individual responses to study participants. Although anonymity was protected, it was

impossible to statistically analyze each nurse's response against them self. However, this study was able to descriptively compare group responses since the surveys were administered to the same sample of nurses before and after the study.

An equal number of KC observations before and after the study intervention allowed for statistical significance regarding the overall frequency of KC practice in the NICU. However, time constraints prohibited groups from being equally matched on the number of individual patients, their day of life since admission, and their mode of respiratory support. Unequal patient sample sizes and group characteristics made it difficult to statistically determine if the study intervention increased KC practice for patients requiring invasive and noninvasive ventilation, despite the reassuring descriptive study results. Unfortunately, this study was unable to determine statistical significance for earlier KC practice because the groups were not controlled for day of life since admission.

Numerous strengths of this doctoral project culminated in program success. Conducting the study within an academic university hospital ensured a large patient sample size for enhanced statistical power. Patients were easily available with varying levels of acuity and modes of respiratory support. Additionally, the large convenient sample of staff nurses potentially increased response rates for the pre- and post-survey. Most importantly, this project facilitated family-centered care in the NICU by prioritizing a multidisciplinary team approach to KC.

Multidisciplinary clinical champions were invaluable for the success of this doctoral project. Not only did they empower staff's willingness to comply with the study,

but they also overcame nursing resistance by compensating for the limited staff and perceived interrupted work flow from KC practice. Creating a contest among champions served as a healthy competitive incentive for unit recognition, enhanced moral, and professional satisfaction. Catchy slogans, professional incentives, and ongoing communication with the champions facilitated study momentum to sustain KC practice. In congruence with Wallin et al. (2004), the overall process of effective practice change appeared to be a social phenomenon impacted by people's interactions.

Section 5: Dissemination Plan

Introduction

Dissemination of knowledge was crucial to successfully integrate the KC pathway within a champion-based simulated educational training program in the NICU under study. Effective dissemination required communication strategies tailored toward the target audience. Therefore, specific communication styles and catchy slogans were intentionally used to deliver a shared vision of family-centered care. The unit-based electronic news-paper was most frequently used to spread knowledge and enthusiasm regarding routine KC practice in the NICU. This modality was chosen because it easily captured the entire NICU staff in a non-threatening manner.

Champions were provided multiple opportunities to replicate KC via hands-on training within a simulated NICU environment. Clinical staff and families gained shared knowledge from viewing a simulated educational video on KC. Finally, the feasibility of KC was relayed through a PowerPoint presentation during a nursing journal club. This method facilitated questions with rational supporting the strongest evidence to date.

Sharing implications of an evidence-based project is critical for improving health outcomes. To sustain routine KC practice in the local NICU, the DNP study findings and recommendations were relayed to staff via the electronic news-paper. The goal is to publish these findings in a peer-reviewed nursing journal for multiple viewers with shared interests. Serving as the gold standard for global dissemination, publication captures data and statistics needed to translate evidence into practice. Disseminating the

evidence-based KC pathway can potentially improve nurses' knowledge and comfort with KC practice in NICUs nationwide.

Analysis of Self

Professional growth and inner confidence were evident as the doctoral project evolved from the planning phase into final dissemination. Theoretical frameworks guiding leadership provided the knowledge and tools necessary to lead change. Additionally, I developed strong social skills to spread enthusiasm and solve disagreements with self-control. Rather than trying to be a heroic leader, I created a culture of change by building collaborative trust and mutual respect. No single individual or group has full authority, resources, or expertise to lead change within a system. Clearly, people will not initiate change if it holds no value to them. The practicum experience demonstrated the importance of empowering the target population by recognizing and acknowledging their special attributes needed for program success.

Lessons gained from the DNP not only focused on planning, implementing, and evaluating an evidence-based project, but the broader social impact of translating evidence into clinical practice. The program emphasized that performance and outcome measures shape health care delivery by promoting quality improvement. Therefore, nurses can no longer rely on tradition and task orientation to acquire knowledge. Recognizing that health care policy and law uniformly affects providers, consumers, and executive branch agencies, nurses today must disseminate evidence of their value in health care delivery and patient outcomes. Subsequently, population research indirectly

affects individual outcomes by providing insight into variations observed on a global level (Joshi, Ranson, Nash, & Ranson, 2014).

Summary

A substantial and compelling body of literature has supported earlier and more frequent KC practice in the NICU (Nvqvist et al., 2010). Despite proven physiologic and neurodevelopmental benefits of providing KC to vulnerable neonates and their families, practice barriers continue to exist. This DNP project confirmed that translating evidence-based research into clinical practice requires intensive planning, implementation, and ongoing evaluation of change.

This doctoral study exemplified how new evidence-based programs are incorporated for practical implementation based on clinical expertise and patient values. Integrating the KC pathway within a champion-based simulated educational training program did improve nurses' knowledge and ability to provide safe KC practice in the NICU under study. Project success was attributed to the influential multidisciplinary KC champions.

In conclusion, this study supported the hypothesis that integrating an evidence-based KC pathway within a multifaceted champion-based simulated educational training program can promote routine KC practice in the NICU. Overall, the number of KC episodes increased for patients requiring both invasive and noninvasive modes of respiratory support. The increased knowledge and comfort level with KC enabled staff and parents to advocate earlier and more frequent practice. Study replication controlled with equal patient sample size, day of life, and respiratory support mode could determine

if integrating the KC pathway within a multifaceted educational training program leads to earlier practice soon after admission. Disseminating the findings, implications, and recommendations of this doctoral project can humanize the NICU environment by cultivating a family-centered approach to neonatal health care delivery.

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