

11-14-2016

Enhancing Developing Relationships with Skin-to-Skin Contact

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Enhancing Developing Relationships with Skin-to-Skin Contact

Dorothy Jean Vittner, PhD

University of Connecticut, 2016

Over 15 million premature infants are born annually around the world. It has been optimistically yet incorrectly proposed that healthy preterm infants without major complications eventually catch-up developmentally to full-term infants. Maternal touch, especially during skin to-skin contact (SSC) has the potential to reduce adverse consequences of prematurity. The aim of this dissertation is to increase understanding of mechanisms that link parent infant contact to bio-behavioral responses for parents and their healthy preterm infants. This is an important step in exploring oxytocin as a potential moderator to improve infant developmental outcomes and the effects of SSC on the mother, father, infant and their developing relationships. SSC activates oxytocin release in mothers, fathers and healthy preterm infants. Infant oxytocin responses were similar whether the infant was held by their mother or father. SSC decreases salivary cortisol levels for infants that are held by their mother and father. SSC also decreases parental stress and anxiety. Parents and infants who have higher oxytocin levels have more synchronous and responsive interactions. Nurses can use SSC as a strategy to decrease stress in the Neonatal Intensive Care Unit for parents as well as premature infants to provide an opportunity to enhance developing relationships and support parent engagement. Another important concept to consider is utilizing these findings to influence policy change at a systemic level in regards to education for health care professionals, and the integration of skin-to-skin contact into clinical practice of the NICU along with community awareness and the influence of using SSC to improve health outcomes.

Enhancing Developing Relationships with Skin-to-Skin Contact

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B.S., Western Connecticut State University, 1990

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A Dissertation

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Doctor of Philosophy

at the

University of Connecticut

2016

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2016

APPROVAL PAGE

Doctor of Philosophy Dissertation

Enhancing Developing Relationships with Skin-to-Skin Contact

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Acknowledgements

"What is now proved was once only imagined"

William Blake

I would like to express my heartfelt appreciation to my dissertation committee; Dr. Jacqueline McGrath, Dr. Xiaomei Cong, Dr. JoAnn Robinson, Dr. Regina Cusson and Dr. gretchen Lawhon. I would like to further acknowledge with sincere gratitude my dissertation chair, Dr. Jacqueline McGrath, for being an incredible mentor, generous and responsive, understanding the delicate balance that action is the foundation to success, encouraging me to walk my own path, and many hours of insightful discussions about infants and families. Dr. Xiaomei Cong has provided her mentorship and guidance with the research process, validating my beliefs and helping me to learn valuable lessons along the way. I appreciate Dr. JoAnn Robinson for sharing her vast experience, diverse perspectives, and academic rigor. To Dr. gretchen Lawhon for her continuous co-regulatory supports, her willingness to grapple and figure out the best next step, always building on strengths, with passion and enthusiasm to enhance the lives of infants and their families and to Dr. Regina Cusson for creating opportunities and believing in my success.

With my deepest gratitude I would also like to acknowledge Charlotte for listening with an open heart, sharing her kindness, believing in me along with her countless hours of reflective process. In heartfelt appreciation to Dan Micari; a man who has been the pinnacle teacher, always willing to share his wisdom with optimism, provide reflective supervision embedded in a strong faith and support for me to pursue my goals. I would like to acknowledge with heartfelt appreciation, those who influenced my early professional path, Dr. Heidelise Als, for opening

my eyes to the infant's experience, sharing her incredible knowledge, supporting me past my thresholds to become the person I am today. To Cathy Daguio, for your compassion, co-regulation and friendship, I miss you dearly. To Dr. Jim Helm, for sharing your comprehensive understanding of infant behavior and being a true collaborator. To Dr. Melissa Johnson, for your authentic perspectives on parenting, your enthusiasm and vigor to create learning opportunities and willingness to listen.

I also have sincere appreciation for all of the infants and families who have generously shared their experiences, and allowed me to walk alongside them in their journey for a short while to enhance the care to infants and improve neurobehavioral outcomes.

To my incredible children, who inspire me to be a better person with their unconditional love, who have taught me about the power of parenting and developing relationships. To Chelsea for your strong will and determination, always willing to help those in need, to Patrick for your sensitivity and thoughtfulness and to Christine, my love bug, who showed me the significance of skin-to skin, who is absolutely amazing. To Nick for all of his love and support throughout this process, believing in me from the beginning, creating opportunities of mindfulness and innovative thinking.

Finally I would like to add, my research was supported with funding from the American Nurses Foundation (Eastern Nursing Research Society), National Association of Neonatal Nurses, Sigma Theta Tau International (Mu Chapter) and the University of Connecticut, School of Nursing (Toner funds).

Enhancing developing relationships with skin-to-skin contact

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Dissertation Chapter 1

Dorothy Vittner

University of Connecticut

Dissertation Chapter 1

Introduction

Over 15 million premature infants are born annually around the world. One million children die from related complications (Howson, Kinney, & Lawn, 2012). It has been optimistically yet incorrectly proposed that healthy preterm infants without major complications will eventually catch up developmentally to full-term infants. Research suggests as preterm infants mature, many remain increasingly disadvantaged on many neurodevelopmental outcomes (Hack et al., 2009; Marlow, Hennessy, Bracewell, Wolke, & Group, 2007). Parental touch, especially during skin-to-skin contact (SSC) has the potential to reduce the adverse consequences of prematurity. Skin to skin contact is an evidenced based holding strategy that increases parental proximity and provides a continuous interactive environment known to enhance infant physiologic stability and affective closeness between parents and their infants (Feldman & Eidelman, 2003; Moore, Anderson, & Bergman, 2007; Ludington-Hoe, Anderson, Swinth, Thompson, & Hadeed, 2004). A recent study by Cong et al, with 30 minutes of maternal and paternal skin-to-skin contact (M-SSC; P-SSC) with preterm infants, identified significant correlations with biologic mechanisms via oxytocin, (OT). Salivary OT levels increased during SSC and remained elevated for fathers post SSC yet mothers' oxytocin levels decreased post SSC (Cong et al., 2015). Moreover, the American Academy of Pediatrics (AAP) has recently endorsed SSC immediately after birth with healthy infants (Baley, 2015).

Animal studies demonstrate that parent-infant proximity and touch can activate the oxytocinergic system. Another key role that the oxytocinergic system plays is in bond formation and parenting (Feldman, 2015; Moore, Anderson, & Bergman, 2007). In turn, OT neuropeptide release stimulates bonding and parenting behaviors by a bio-behavioral feedback loop (Mancini,

Carlson, & Albers, 2007; Parker, Kenna, Zeiter, & Et al, 2010; Groer & Morgan, 2007). In limited human studies, parental plasma oxytocin concentrations were positively related to mother-infant affectionate contact and father-infant stimulatory contact at 6 months postpartum (Ross & Young, 2009; Lee, Macbeth, Pagani, & Young, 2009). Demonstrated differences in behavioral responses such as state regulation and improved motor system modulation even after short interventions of SSC have been reported (Ferber & Makhoul, 2004). Biobehavioral responses of cortisol and improved maternal infant co-regulation have also been reported (Neu, Laudenslager, & Robinson, 2009 Neu & Robinson, 2010).

Recently published long term outcomes demonstrated that infants held SSC have improved physiology, executive functioning and mother-child reciprocity at 10 years (Feldman, 2015). A critical gap or next step is to examine the linkages of oxytocin and the developing mother-father-infant relationships. Fathers practicing SSC although less studied, also have beneficial effects. However, the biobehavioral mechanisms of SSC have rarely been studied. Investigating the mother-father-infant is geared toward assessing parental stress in relationship to infant outcomes. M-SSC has shown beneficial effects on the physiology and behavior of premature infants and their mothers. Limited results have shown beneficial effects of P-SSC (Cong, et al., 2015).

The NICU is a technology-driven environment where nurses have many tasks to accomplish throughout the day. Within the NICU, SSC needs to be considered a process rather than a task. It is essential that parents have a calm, soothing atmosphere while holding their infant to support bonding and reciprocity to occur, ensuring the experience is positive for both participants (Blomqvist, Frolund, Rubertsson, & Nyqvist, 2012). This modified environment enhances the parents experience and allows the parent infant dyad to relax and spend quality

time together. Skin-to-skin contact supports the infant and parent to develop reciprocity or co-regulation through their interactions. Another important concept explored within this dissertation is enhancing parent engagement which is a new research concept in neonatal care. It is dynamic and complex in its significance to preterm infant care. Engagement can be described as the process of parent experience that focuses on the acquisition of skills to problem solve and properly care for their infant based on their specific needs at that time. Through a parent's ambition to set goals and gain knowledge about the unique care necessary for their child, they can increase their engagement and improve the overall progression of their preterm infant's health. Skin-to-skin provides an opportunity or strategy to enhance parent engagement. This manuscript style dissertation addresses these concepts through three different avenues outlined below.

Manuscript One (Chapter 2)

Particularly within the United States (US), the practice of SSC remains inconsistent despite a plethora of evidence (Ludington-Hoe, 2011; Conde-Agudelo, Belizan, & Rosello-Diaz, 2011; Mori, Khanna, Pledge, & Nakayama, 2010). While nurses' knowledge about SSC has improved, a serious gap remains regarding nurses' sense of safety with SSC and appropriateness (such as for which infant and when), which continues to impede widespread use of SSC as standard of practice in the postpartum period (Flynn & Leahy-Warren, 2010). In Scandinavia and Europe, the implementation of programs such as the Newborn Individualized Developmental Care and Assessment Program (NIDCAP), have positively influenced care practices that incorporate consistent practices of SSC with parents and infants in special care settings (Kymre & Bondas, 2013). However, facilitation of SSC among the 112,000 perinatal nurseries across the United States continues to progress slowly; impeded by the lack of education for SSC (Hardy,

2011). Nursing education around SSC in the US has also been a great focus in the special care settings with high-risk infants and parents. Perinatal nurses were chosen as the focus of study for the second manuscript of my dissertation due to the influx of evidence to support SSC in the early postpartum period and the ability of perinatal nurses to influence provision of SSC during this critical period. Promoting SSC in the mother-infant dyad decreases potential mother-infant and enhances maternal infant attachment (Moore et al., 2007).

Understanding perinatal nurse's attitudes and beliefs about SSC, serves as a predecessor to understanding nurse behaviors that directly impact the facilitation of SSC. The evaluation of the attribute that contributes to the individual's attitude is in proportion to the strength of the individual's beliefs (Fishbein & Ajzen, 1975). The purpose of this research study was to examine the knowledge, beliefs, attitudes and reported practices of perinatal nurses regarding implementation of SSC with the parent/infant dyad in the early postpartum period (Vittner, Cong, Ludington-Hoe, & McGrath., 2016). Nurse age, years of experience, primary work setting and education levels were also examined in relationship to nurses' SSC perceptions and reported behaviors. The results from this manuscript have the potential to provide a better foundation for understanding perinatal nurses' perceptions that influence their use of SSC.

Manuscript Two (Chapter 3)

Although the existing qualitative literature primarily focuses on parent's experiences; it is crucial to describe the essence of the professional caregiver's experiences to enhance facilitation and implementation of SSC. Most studies surrounding the caregiver's perspective and SSC, have focused on barriers that impede implementation or examined the experience from the organizational perspective and general group experiences rather than individual personal experiences with SSC. Thus the first manuscript of my dissertation was a meta-ethnography that

integrated the findings from several discrete studies into a salient interpretative perspective, creating a more relevant understanding of the process of SSC as a means of enhancing facilitation and implementation of SSC with hospitalized infants.

Often the purpose of these qualitative inquiries has been to increase understanding of the multifaceted advantages of SSC on maternal attachment and confidence (Johnson, 2007). Participants in these studies have identified communication and information provided by the nurse as strongly influencing their experiences while participating in SSC with their infant (Lemmen, Frustedt, & Lundqvist, 2013). SSC can also help fathers of preterm infants gain confidence in their parental role, coping with the unexpected stress of preterm birth and extended hospitalizations (Blomqvist et al., 2011).

This qualitative synthesis of nurses' experiences surrounding implementation of SSC revealed four key themes that influenced nurse SSC implementation decision making: 1) varying thresholds for getting started; 2) difficulty identifying adequate resources; 3) infant complexity; and, 4) balanced with parental readiness (Vittner, Casavant, & McGrath, 2015). Additionally these researchers noted wide variations in SSC practices despite the majority of studies noting that nurses had the needed theoretical knowledge for SSC provision. Safety during SSC was often a nursing concern. Flynn and Leahy-Warren identified that some nurses believed that SSC should be ordered by a physician, even though any other type of maternal holding is considered within the realm of nursing judgment and does not require a direct physician's order (Tessier, Cristo, & Velez, 1998). Persistent yet invalid barriers to SSC implementation include: fear of infant physiologic instability; decreases in infant temperature; and challenges with meeting the complexity of the infant's care needs within the provision of SSC (Vittner et al., 2015; Chia,

Sellick, & Gan, 2006; Engler et al., 2002). It is important to note, that none of the persistent barriers are supported by evidence.

Manuscript Three (Chapter 4)

Skin-to-skin contact provides a strategy for improved autonomic regulation as seen with a steadier heart rate, improved respiratory status and temperature regulation as compared to routine caregiving and traditional holding (Bergman, Linley, & Fawcus, 2004; Cong, Ludington-Hoe, McCain, & Fu, 2009). The infant's respiratory and heart rate variability are sensitive indicators of autonomic function and can be used as a non-invasive measure of parasympathetic and sympathetic reactivity (Feldman & Eidelman, 2003; Ludington-Hoe, 2011; Mori, Khanna, Pledge, & Nakayama, 2010). Additional benefits of SSC include improved brain development as well as better motor and mental development (Feldman & Eidelman, 2003; Ferber & Makhoul, 2004). Demonstrated differences in behavioral responses such as state regulation and improved motor modulation even after short periods of SSC have been reported (Ferber & Makhoul, 2004). Biobehavioral responses of cortisol and improved maternal infant co-regulation have also been reported (Neu et al., 2011; Neu & Robinson, 2010). However, the biological mechanisms affected by SSC, including the oxytocin system, have rarely been studied.

This dissertation study aims to address the critical gap and increase understanding of the mechanisms that link parent-infant contact to bio-behavioral responses. This is an important step in exploring OT as a potential moderator to improve the infant's developmental outcome and the effects of SSC on the mother, father, and infant and their developing relationships. These study results have the potential to lead to new interventions to increase endogenous oxytocin release and to evaluate the efficacy of exogenous oxytocin in order to improve infants' and parents' well-being during the vulnerable neonatal period. Therefore, the hypothesis guiding this work is

that infants' and parental oxytocinergic systems are activated during SSC, where increasing OT levels are associated with bio-behavioral responses to enhance synchrony and responsiveness in parent-infant interactions as well as improving infant behavioral competence.

Conclusion

Despite advances in neonatal care, premature infants remain at risk for adverse neurodevelopmental outcomes (Hack et al., 2009; Marlow, Hennessy, Bracewell, Wolke, & Group, 2007). A Cochrane meta-analysis identified a significant reduction in infant mortality if infants <2500 g participated in continuous SSC prior to 10 post-natal days old (Conde-Agudelo, Belizan, & Rosello-Diaz, 2011). Nurses can use SSC as a strategy to decrease stress in the NICU for parents as well as premature infants as well as to provide an opportunity to enhance parent engagement. This dissertation asserts in conjunction with the views of the AAP, supporting the value that all preterm infants and their parents should have the opportunity for SSC every day.

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Chapter 2

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A survey of skin-to-skin contact with perinatal nurses

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Manuscript was accepted for publication in the Journal of Applied Nursing Research enclosed in dissertation with permission. The manuscript is still in press; PDF of manuscript will be updated for final dissertation submission.

Vittner, D., Cong, X., Ludington-Hoe, S., McGrath, J., A survey of skin-to-skin contact with perinatal nurses. *Applied Nursing Research*. doi:10.1016/j.apnr.2016.09.006



A survey of skin-to-skin contact with perinatal nurses[☆]

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ARTICLE INFO

Article history:

Received 29 March 2016

Revised 22 September 2016

Accepted 22 September 2016

Available online xxxx

ABSTRACT

Objective: This study explored perinatal nurses' knowledge, attitudes and practices of SSC, to identify knowledge-practice gaps.

Study design: A descriptive cross-sectional survey design was completed by 101 perinatal nurses. Descriptive statistics and ordered logistical regression were used to describe and compare nurses' responses.

Results: The participants strongly agreed that it is nurses' responsibility to advocate for SSC. Significant differences ($p < 0.01$) were reported in provision of SSC with eligible infants between nurses within and between practice settings, education levels, year experience and age differences. Education levels significantly influenced attitudes and implementation of SSC. Perinatal nurses' responses about how difficult it is to initiate SSC changes were affected by years of nursing practice ($p < 0.04$).

Conclusions: Perinatal nurses strongly believe in SSC practices, yet additional training regarding SSC implementation is needed. Education levels, primary practice settings and years of practice appear to influence nurses' implementation of SSC.

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1. Introduction

Parent-infant relationships are difficult to establish when infants and parents confront challenges during the early postpartum period. One challenge that has the potential to disrupt parenting is hospital routines that increase maternal-infant separation. Nurses are highly influential during the emotionally charged time just after birth and have the opportunity to enhance the developing relationships between parents and infants (Lawhon, 2002; Johnson, 2008). Parent holding of the newborn is a powerful strategy to enhance these developing relationships. Parent holding with skin-to-skin contact (SSC) may be even more likely to enhance developing parent-infant relationships. SSC is described as a diaper clad infant who is placed on a parent's bare chest ideally over their breast to establish ventral contact. Parents have identified that nurses strongly influence their experiences of SSC by the type of information and communication that the nurses provide (Lemmen, Frustedt, & Lundqvist, 2013). Parents also have reported that if a nurse was knowledgeable and encouraging about SSC, parents were more motivated and likely to practice SSC (Lemmen et al., 2013).

The effects of SSC on parents and infants have been well established by reported studies. Immediate and long term benefits include physiologic stability for infants held in SSC (Bergman, Linley, & Fawcus, 2004; Feldman & Eidelman, 2003; Ludington-Hoe, Anderson, Swinth, Thompson, & Hadeed, 2004), more stable temperatures, and increased weight gain over time (Marin-Gabriel et al., 2010). Improved brain development (Kaffashi, Scher, Ludington-Hoe, & Loparo, 2013), as well as better motor (Bera et al., 2014; Miranda, Cabral Filho, Diniz, Souza Lima, & Vasconcelos, 2014) and mental development (Feldman, Rosenthal, & Eidelman, 2014), are also documented for infants held in SSC (Martin & Ludington-Hoe, 2010). There are also many positive effects for the parents during SSC, including reduced maternal stress and postpartum depression (Lemmen et al., 2013). One of the more immediate benefits of SSC is an enhanced mother-infant relationship because mothers report feelings of closeness, increased maternal confidence, and improved breastfeeding success, as well as stress reduction (Bigelow, Power, MacLellan-Peters, Alex, & McDonald, 2012; Johnson, 2007). Facilitating SSC is an effective strategy nurses can use to enhance the mother-infant relationship. The majority of the existing literature examining nurses' experiences with facilitating SSC use quantitative methodologies describing nurses' attitudes, barriers to implementation and nurses' knowledge of SSC (Engler et al., 2002; Chia, Sellick, & Gan, 2006; Flynn & Leahy-Warren, 2010; Stikes & Barbier, 2013).

[☆] The authors have no conflict of interests to report. No funding was received to complete this research.

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Particularly in the United States (US), the practice of SSC remains inconsistent despite a plethora of evidence (Ludington-Hoe, 2011; Mori, Khanna, Pledge, & Nakayama, 2010; Conde-Agudelo, Diaz-Rossello, & Belizen, 2000). While nurses' knowledge about SSC has improved, a serious gap remains regarding nurses' sense of safety with SSC and appropriateness (such as for which infant and when), which continues to impede widespread use of SSC as standard of practice in the postpartum period (Flynn & Leahy-Warren, 2010). In Scandinavia and Europe, the implementation of programs like the Newborn Individualized Developmental Care and Assessment Program (NIDCAP) has positively influenced care practices that incorporate consistent SSC with parents and infants in special care settings (Kymre & Bondas, 2013). However, facilitation of SSC among the 112,000 perinatal nurses across the United States continues to progress slowly, impeded by the lack of education in SSC (Hardy, 2011). US nursing education about SSC has also been a great focus in the special care settings with high-risk infants and parents. Therefore, perinatal nurses were chosen for the focus of this study because of the extensive evidence supporting SSC in the early postpartum period and the ability of perinatal nurses to influence provision of SSC in this critical period of time. Promoting SSC in the mother-infant dyad enhances maternal infant attachment (Moore, Anderson, Begman, & Dowswell, 2012). A recent qualitative synthesis of nurses' experiences surrounding implementation of SSC revealed four key themes that influenced nurse SSC implementation decision making: 1) varying thresholds for getting started; 2) difficulty identifying adequate resources; 3) infant complexity; and 4) balanced with parental readiness (Vittner, Casavant, & McGrath, 2015). Additionally these researchers noted wide variations in SSC practices despite the majority of studies noting that nurses had the needed theoretical knowledge for SSC provision. Safety during SSC was often a nursing concern. Flynn and Leahy-Warren identified that some nurses believed that SSC should be ordered by a physician, even though any other type of maternal holding is considered within the realm of nursing judgment and does not require a physician's direct order (Flynn & Leahy-Warren, 2010). Persistent yet invalid barriers to SSC implementation include: fear of infant physiologic instability; decreases in infant temperature; and challenges with meeting the complexity of the infant's care needs within the provision of SSC (Ludington-Hoe, 2011; Mori et al., 2010; Moore et al., 2012). It is important to note, that none of the persistent barriers are supported by evidence.

Understanding perinatal nurse's attitudes and beliefs about SSC serves as a predisposition to understanding nurse behaviors that directly affect the facilitation of SSC. The evaluation of the attribute that contributes to the individual's attitude is in proportion to the strength of the individual's beliefs (Fishbein & Ajze, 1975). The purpose of this research study was to examine the knowledge, beliefs, attitudes and reported practices of perinatal nurses regarding implementation of SSC with the parent/infant dyad in the early postpartum period. Nurse age, years of experience, primary work setting and education levels were also examined in relationship to nurses' SSC perceptions and reported behaviors. The results from this survey may provide a better foundation for understanding perinatal nurses' perceptions that influence their use of SSC.

2. Method

2.1. Design and sample

A descriptive cross-sectional survey design using convenience sampling methodology was used. The participant population was perinatal nurses who were members of the Connecticut Perinatal Association (CPA) or associated with the organization.

2.2. Instruments

The unpublished survey was initially created by a leading SSC researcher, S. Ludington-Hoe, and consists of 35 questions related to

nurses' knowledge, attitudes and beliefs regarding SSC. Additionally, perceptions of SSC guidelines and protocols are included among the survey questions. Items are scored by participants with a five-point Likert-type scale ranging from *Strongly Disagree* to *Strongly Agree*. Examples of the survey items are *My unit uses skin-to-skin holding regularly* and *Skin-to-skin holding changes brain growth in neonates*. Content validity was supported by a cross-disciplinary review of the literature conducted using CINAHL, PsycInfo, PubMed, and the Cochrane Library, as well as Scopus databases. Construct validity was established using Principal Component Analysis with alpha reliability of 0.79–0.90. The survey contained four constructs or dimensions: SSC implementation, SSC knowledge, SSC attitudes and beliefs, and SSC education and training. Data were also collected for six additional demographic questions to identify participants' race, gender, age, education level, years of experience, and primary practice setting.

2.3. Procedures

The study was reviewed and approved by a research university's Institutional Review Board. An email was sent by a CPA representative to potential participants, specifically perinatal nurses within the Northeast US. The email contained an information sheet describing the study with a link to a secure anonymous online survey established through the Qualtrics Website (www.qualtrics.com). No identifiable information was collected from participants. Consent was implied if respondents connected to the website link to access the survey. One reminder email was sent to all participants two weeks after the initial email invitation. The questionnaire was available to participants for a total of 4 weeks.

2.4. Data analysis

The SPSS Statistics version 22 was used for data analysis. Descriptive statistical analyses were conducted for demographic and survey data. Responses were further analyzed using one-way analysis of variance (ANOVA), with nurses' demographic and background data as between-subject factors to compare perinatal nurses' attitudes, beliefs, knowledge and practices in facilitating SSC. Relationships between

Table 1
Perinatal skin-to-skin contact survey demographic characteristics of sample (N = 79).

Characteristics	Frequency (n)	%
Gender		
Female	79	100
Race		
Black	2	3
Hispanic	1	1
White	76	96
Age		
Age group 1: 18–34 years	4	5
Age group 2: 35–52 years	36	46
Age group 3: 53–75 years	39	49
Years of experience		
Exp group 1: 0–11 years	10	13
Exp group 2: 12–25 years	35	45
Exp group 3: 25+ years	34	42
Education level		
Ed group 1: associate degree & diploma program	24	30
Ed group 2: bachelor's degree	39	49
Ed group 3: master's & doctoral degree	16	21
Practice setting		
Setting group 1: post-partum & level 1 nursery	19	23
Setting group 2: level II, III, IV nursery	24	29
Setting group 3: labor & delivery	38	48

groups are provided in Table 1. The findings were linear and appear to have correlations as described below.

3. Results

An email inviting participation in this study was sent to 298 perinatal nurses in the Northeast. A total of 101 surveys were completed, with a response rate of 34%. Upon cleaning the data, 79 complete data sets were available for analysis. Because twenty-two participants answered fewer than half of the items on the survey, their responses were not included in the final analysis. The majority of the respondents were White females over 35 years old with a bachelor's degree, and had practiced longer than 12 years in their primary practice setting. Population demographics are identified in Table 1, which highlights groupings of participants within the characteristics of age, years of experience, practice setting and education levels. Table 2 depicts the significant responses between group comparisons, frequencies and mean scores of identified items. Fig. 1 depicts the participants' education levels grouped by each practice setting. Fig. 2 illustrates the participants' ages grouped by each practice setting.

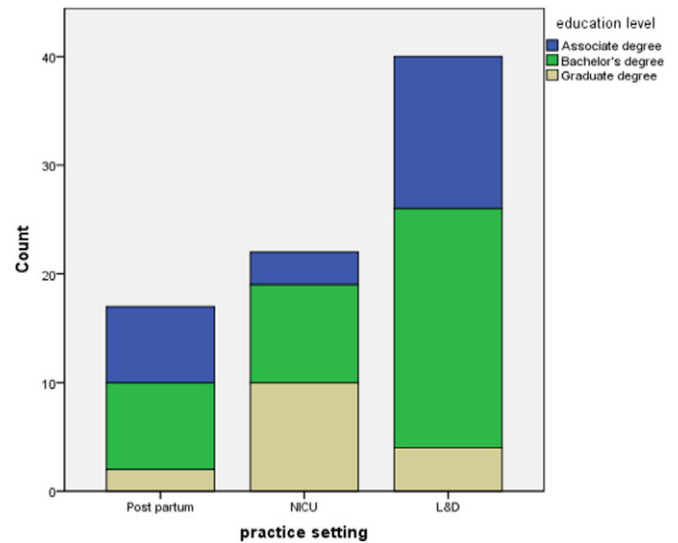


Fig. 1. Respondents practice settings and education levels.

3.1. Perinatal nurses' perceptions on SSC implementation

Although 62% of the participants agreed that SSC was well managed in their facility, nurses with higher levels of education ($p < 0.001$)

responded differently and reported that SSC was not managed well on their unit. There were also significant differences ($p < 0.05$) in the responses between nurses working in the NICU compared with nurses

Table 2

ANOVA summary for skin-to-skin care survey – perinatal nurses (N = 79).

Nurses responses grouped by practice setting	Neonatal (n = 24)		L & D (n = 39)		Post-partum (n = 16)		F	p	Summary of significant differences
	M	SD	M	SD	M	SD			
Dimension (item)									
SSC implementation									
The health care providers on my unit practice adequate skin to skin holding with eligible neonates (18)	1.75	1.03	2.23	1.18	3.00	1.54	5.03	0.009	Education Grp 3 > Grp 1
I feel that the provision of skin to skin holding on my unit is well managed (16)	1.79	0.658	2.33	1.11	3.19	1.37	8.36	0.001	Education Grp 1 > Grp 3
My unit uses skin to skin holding regularly (9)	1.43	0.728	1.74	0.993	2.63	1.45	6.49	0.003	Education Grp 1 > Grp 3
Physicians are willing to use new evidence based application of skin to skin holding on my unit (29)	2.04	0.999	2.36	0.811	2.94	1.34	3.93	0.024	Education Grp 1 > Grp 3 Education Grp 1 > Grp 2
The SSC guidelines/protocols are clear, comprehensive and based on current research (28)	2.04	0.806	2.15	1.01	3.06	1.48	5.13	0.008	Education Grp 3 > Grp 1 Education Grp 2 > Grp 1
I feel that it is difficult to initiate skin to skin changes on my unit (30)	4.25	0.737	3.85	1.01	2.53	1.19	14.97	0.000	Education Grp 3 > Grp 1 Education Grp 2 > Grp 1
SSC education and training									
My unit regularly uses an assessment tool for skin to skin holding responses (12)	3.30	0.949	3.97	1.17	3.23	1.12	3.96	0.023	Yrs exp. Grp 3 > Grp1
I have received adequate education or training regarding SSC when I was oriented to my unit (7)	2.00	1.63	2.46	1.33	3.38	1.58	5.29	0.007	Education Grp1 > Grp 3
My unit provides continuing education regarding SSC (8)	2.75	1.44	2.05	1.12	1.50	1.00	6.64	0.002	Education Grp 1 > Grp 3 Education Grp 1 > Grp 2
SSC knowledge									
SSC changes brain growth in the neonate (33)	1.86	0.77	2.03	0.84	2.50	0.58	6.83	0.002	Education Grp 3 > Grp 1
Skin to skin holding can reduce the risk of impaired brain development in neonates (24)	2.00	0.76	2.18	0.99	2.50	0.58	4.70	0.012	Education Grp 1 > Grp 3 Education Grp 1 > Grp 2
SSC attitudes									
I agree with skin to skin holding orders provided by physicians on my unit (19)	2.54	0.977	2.49	0.997	1.69	0.793	4.74	0.011	Education Grp 3 > Grp 1
Provision of SSC is an expectation of parents (32)	2.18	1.01	2.91	0.921	2.30	1.13	3.05	0.05	PS Grp 3 > Grp 2 PS Grp 3 > Grp 1
SSC is effective in reducing risks associated with physical separation of the neonate and their mother (22)	1.29	0.470	2.09	0.971	1.59	0.549	7.06	0.002	PS Grp 1 > Grp 3
I am confident with my skills recognizing and assessing physiologic/behavioral responses of infants during SSC (10)	1.18	0.529	1.41	0.503	1.68	0.859	3.14	0.049	PS Grp 1 > Grp 2 PS Grp 1 > Grp 3
Discomfort from minor procedures, such as gavage tube placement & oral suctioning can be minimized with SSC (4)	1.24	0.437	1.91	1.02	1.55	0.639	4.14	0.020	PS Grp 1 > Grp 3
The way we measure responses to SSC on my unit is an accurate measurement of infant responses (13)	3.46	0.779	3.00	1.10	3.75	1.29	3.28	0.043	Education Grp 2 > Grp 3

Post-hoc Scheffé mean difference is significant at the $p = 0.05$ level.

Education Grp1 = associate degree, Grp 2 = bachelor degree, Grp 3 = graduate degree.

Yrs Exp = years of experience Grp 1 = 0–11 years, Grp 2 = 12–25 years, Grp 3 = 25+ years.

PS = practice setting Grp 1 = neonatal, Grp 2 = postpartum Grp 3 = labor and delivery.

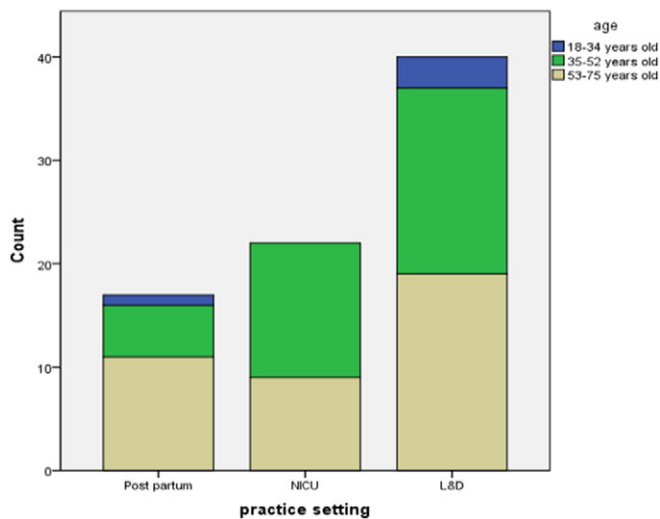


Fig. 2. Respondents practice setting and age.

working on the postpartum floor and well-baby nursery, related to perceptions about whether SSC holding was well managed. Nurses who responded that SSC was practiced with eligible infants ($p < 0.05$) differed across practice settings, nurse age groups, as well as numbers of years of experience. Moreover, perceptions about provision of SSC differed by nurse respondent education levels. Nurses with higher education levels responded that health care providers were less likely to practice adequate SSC with eligible infants ($p < 0.01$) as compared with nurses with less education, who responded that health care providers were more likely to practice SSC.

3.2. Perinatal nurses' knowledge regarding SSC

There were significant differences ($p < 0.02$) among responses regarding nurses' knowledge about the influence of SSC on infant brain development and infants' risk of neurodevelopmental delays and whether SSC changes brain growth in infants. Nurses with more education strongly agreed that SSC influences infant brain development and believed that infants who are not held with SSC are at greater risk for developmental delays. The majority of nurses, about 90%, were aware of SSC guidelines and protocols on their units. There were significant differences among participants' responses that SSC is effective in reducing risks associated with physical separation of the infant and their mother, which corresponded to the nurses' practice settings ($p < 0.002$). Nurses who practiced in the level I nurseries or on postpartum floors have significantly different responses compared to nurses in a NICU or labor and delivery unit. Differences were also noted for the item *Physicians are willing to use new evidence based application of SSC on their units* ($p < 0.024$), as seen between the nurses with an education level of a diploma or associate degree, compared with nurses with a master's or doctoral degree. The items regarding the perceptions that *SSC changes the neonate's brain growth* and *SSC can reduce the risk of impaired brain development* demonstrated differences ($p < 0.002$) between nurses with an associate degree or diploma compared to nurses with a graduate degree. The nurses with advanced education were more likely to strongly agree that SSC changes infant brain growth.

Perinatal nurses attitudes and beliefs related to SSC

The majority of nurses surveyed (70%) strongly agree that *It is the nurse's responsibility to advocate for SSC for infants in their care*, yet there were significant differences ($p < 0.009$) associated with nurses' education levels and age that *Health care providers practice adequate SSC with eligible infants*. Although the majority of participants (70%) agree with the item *SSC orders provided by physicians*, the responses appear to be influenced based on the nurses' practice settings ($p < 0.05$),

with nurses in the delivery room agreeing strongly that physicians ordered SSC in contrast to nurses on the postpartum floor. Although most of the respondents (93%) believe that *SSC can minimize discomfort from minor procedures such as gavage tube placement and oral suctioning*, there were significant response differences ($p < 0.01$) between the nurses in level I nurseries and postpartum units in contrast to nurses in NICUs. The nurses identified as working in a level 1 nursery or postpartum unit predominately responded with *Strongly Agree*, whereas NICU nurses tended to respond with *Agree* or *Neither Disagree or Agree*. These data suggest some skepticism or lack of knowledge about how SSC might minimize discomfort.

The majority of respondents (96%) felt confident in their own use of SSC holding. However, there were differences between responses ($p < 0.05$) for nurses working in a labor and delivery unit in contrast to nurses on the postpartum floor and level 1 nursery, regarding their confidence in recognizing and assessing infants' physiologic and behavioral responses. The nurses in level 1 nurseries or postpartum units felt more confident in their infant assessment skills than nurses working in labor and delivery units.

3.3. Perinatal nurses' education and training regarding SSC

Nurses with graduate level education responded that they received less education when oriented to their units ($p < 0.002$) than did nurses with an associate degree or diploma in nursing. Years in practice also made a difference: nurses who had been practicing 0–11 years as well as nurses with an associate degree or diploma responded that it was *Difficult to initiate SSC changes on their unit* ($p < 0.000$), compared to nurses who had been practicing for longer than 25 years or who had a graduate degree. There were significant differences ($p < 0.006$) about whether continuing education in SSC was provided on the respondents' units. The nurses working in labor and delivery were most likely to receive education within their practice setting compared to nurses on the postpartum floor or NICU. Respondents also demonstrated differences ($p < 0.05$), that the *SSC guidelines or protocols within their practice setting were clear, comprehensive and based on current research*. Over 40% of the nurses who participated in this survey were unsure or disagreed with this statement. Nurses with higher levels of education responded that the SSC guidelines and protocols were neither clear, comprehensive nor based on current research.

4. Discussion

The instrument's construct validity and reliability of the data provide meaningful insights into perinatal nurses' knowledge, beliefs and practices of SSC. The population demographics of participants in this study are similar to national distributions of the RN workforce across the US (Department of Health and Human Services, 2013). Engler and colleagues in 2002 found similar results as this survey regarding nursing knowledge of SSC and suggested that nurses need education and skills to safely implement SSC (Engler et al., 2002). That study was a national survey completed with primarily neonatal nurses. Chia also identified that nurses strongly support SSC but acknowledged that additional education and knowledge were necessary to practice SSC safely and effectively (Chia et al., 2006). That study utilized a two-phase research design, which included a descriptive survey followed by in-depth qualitative interviews with Australian neonatal nurses.

Our survey is the first to examine perinatal nurses as a group regarding SSC. Our respondents' education levels appear to have a considerable effect on the perceptions of perinatal nurses, indicating that education does influence practice and nurses' critical thinking abilities. We draw this conclusion because nurses with a graduate degree responded that they were less likely to receive adequate education or training when they were oriented to their units as compared to responses from nurses with an associate degree or diploma in nursing.

4.1. Clinical implications

Given our findings, there continues to be a knowledge-practice gap surrounding SSC despite the array of education efforts over the past twenty years related to various aspects of SSC implementation. Perinatal nurses continue to have educational gaps related to: the positive physiologic effects of SSC on infants; safe and effective transfer techniques; and best strategies to support the parent/infant dyad with appropriate use of SSC. In addition, a perinatal nurse's years of experience and practice setting appear to be associated with their level of SSC knowledge. Nurses' highest level of education also appears to be associated with SSC implementation. Younger nurses with less experience and less education report increased difficulty in initiating SSC changes on their units, indicating a greater need for collaboration and mentorship from more experienced and educated nurses.

We also found that nurses' attitudes both inform their practice and influence policy development. Positive attitudes or favorable beliefs about SSC appear to have a relationship with nurses' perceptions related to SSC implementation, which may translate into opportunities for practice change. In addition, we found that nurses with less experience perceive parents as having greater expectations for SSC holding of their infants. Nurses with higher education levels are more apprehensive about the lack of appropriate SSC assessments and interpretation of infant responses. Interpreting accurate infant behavioral responses is imperative in creating an appropriate plan of care for the infant and family within all perinatal settings. Perinatal nurses have many opportunities to influence safe and effective SSC practices.

4.2. Limitations

A limitation of this study is the relatively small convenience sample size collected from only the Northeastern US. Caution is warranted when generalizing the findings to larger groups or to other geographical regions. Our response rate of 34% is a modest return rate; moreover, participants may have had self-report biases that could have influenced the results. Perinatal nurses' age and education levels may also provide confounding effects on survey results. Further research is needed with a larger sample to fully examine the effects on the survey results. For this study we used an investigator designed questionnaire that shows encouraging initial reliability, yet additional studies with larger diverse samples are necessary to strengthen the instrument's validity and reliability.

5. Conclusion

This study confirms that perinatal nurses believe strongly in the provision of SSC practices, and they perceive infants as capable of having reciprocal responses during SSC. Respondents also agreed that parents were emotionally affected by the stress their infants may be experiencing, and nurses may use SSC as a strategy to decrease the infants' and parents' stress. Because education levels, primary practice settings and years practicing appear to influence nurses' implementation of SSC, these variables may need to be considered when providing continuing education or support for the implementation of SSC on a unit. This study confirms the need for continued education across perinatal settings with accurate information for nurses regarding the benefits and importance of SSC to augment non-separation of the infant-mother dyad to enhance the infants' developmental trajectory. Nurses must design strategies to ensure that each infant is supported to participate in daily SSC. These findings may be used to influence change to assure

that each perinatal nurse is supported with appropriate SSC guidelines and assessment skills to ensure safe and effective use of SSC.

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Dissertation Chapter 3

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A meta-ethnography: Skin to skin holding from the caregiver's perspective

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Manuscript was published in the journal *Advanced in Neonatal Care* enclosed in this dissertation with permission:

Vittner, D., Casavant, S., McGrath, JM., A meta-ethnography: Skin to skin holding from the caregiver's perspective, *Advances in Neonatal Care*, 15(3): 191-200.

A Meta-ethnography

Skin-to-Skin Holding From the Caregiver's Perspective

Dorothy Vittner, MSN, RN; Sharon Casavant, University Scholar, BS Candidate;
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ABSTRACT

Background: Although the benefits of skin-to-skin care (SSC) are well documented in the literature, practices in the clinical setting remain inconsistent. Although nurses' reported knowledge about SSC has improved, confusion still exists regarding safety and appropriateness. Existing qualitative literature primarily focuses on parents' experiences; yet it is crucial to describe the essence of professional caregivers' experiences to enhance facilitation and implementation of SSC. Most studies surrounding the caregiver's perspective and SSC have focused on barriers that impede implementation or examined the experience from the organizational perspective and general group experiences rather than individual personal experiences with SSC.

Purpose: This meta-ethnography integrated the findings from several discrete studies into a salient interpretative perspective, creating a relevant understanding of the process of SSC as a means of enhancing facilitation and implementation of SSC with hospitalized infants.

Methods: An ethnographic meta-synthesis of qualitative literature was completed.

Results: As a result of this synthesis, the caregivers' experiences were separated into themes to articulate the phenomena juxtaposed from the 8 original studies that influence facilitation of SSC for the parent–infant dyad. Qualitative data analysis uncovered 4 overarching themes: (1) varying thresholds of getting started; (2) defining adequate resources; (3) navigating the demands and complexity of the infant; and (4) balancing parental readiness with infant needs.

Implications for Practice: This ethnographic meta-synthesis confirms nurses have good intentions in supporting SSC practices, yet struggle to meet competing demands in their daily practice.

Implications for Research: Innovative and practical translations of SSC are needed to normalize SSC as the daily standard for premature infants.

Key Words: ethnography, kangaroo mother care, meta-synthesis, premature infants, qualitative, skin-to-skin care

Skin-to-skin care (SSC) is the holding of a diaper-clad infant on the parent's bare chest. A warmed blanket is often placed over the infant to maintain body temperature while the infant is held. Holding can be for minutes to hours, but should last as long as it is physiologically supportive to both the infant and the parent. However, SSC for less than 30 minutes has not yielded physiologic benefits for preterm infants possibly because of the time needed for infants to adapt to position changes with enough recovery time.¹⁻³ Neu and colleagues⁴ reported that the recovery time for the infant's

physiologic stability was within 15 minutes. The effects of SSC on parents and infants are well documented in the literature. Immediate and long-term benefits include physiologic stability for infants during and after SSC.^{3,5-10} Other benefits to the infant include more stable thermoregulation and weight gain.^{3,11,12} Improved brain development, as well as better motor and mental development, is also documented findings for infants held in SSC.^{3,13,14}

Parents also benefit from SSC including reduced maternal stress and decreased postpartum depression.^{15,16} There also appears to be benefits with SSC with regard to parent–infant bonding; SSC has been found to enhance the developing relationship; mothers report feelings of closeness; increased maternal confidence; improved breastfeeding success; as well as reduced stress levels.¹⁷⁻²² Skin-to-skin care is an effective strategy nurses may use to enhance the parent–infant relationship. The majority of literature related to the nurse's experience is quantitative, examining nurses' attitudes, barriers to implementing SSC, and nurses' knowledge of SSC.²³⁻²⁶ Fewer studies have provided a qualitative understanding of this practice from the nurse's perspective.

Although there are benefits for both infants and parents; the newborn intensive care unit (NICU) is a

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Jacqueline M. McGrath, who is the co-editor of *Advances in Neonatal Care*, was not involved in the editorial review or decision to publish this article. The entire process from submission, referee assignment, and editorial decisions was handled by another member of the editorial team for the journal.

The authors declare no conflicts of interest.

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DOI: 10.1097/ANC.0000000000000169

technology-driven environment where nurses have many tasks to accomplish throughout the day. Within the NICU, SSC needs to be considered a process rather than a task and demands a modified sensory environment with decreased lighting, sounds, and activity. This modified environment enhances the parents' experience and allows the parent-infant dyad to relax and spend quality time together. Skin-to-skin care supports the infant and parent to develop reciprocity or coregulation through interaction. It is essential that parents have a calm, soothing atmosphere while holding their infant to support bonding and reciprocity to occur, ensuring the experience is positive for both participants.²⁷ Nurses often attend to the demands of the environment at the infant's bedside and are aware of how the atmosphere influences SSC experiences for both parents and infants, making them the ideal health professional to facilitate the process.

Overall, qualitative literature on the subject of SSC primarily focuses on the parents' experiences. Often the purpose of these inquiries has been to increase understanding of the multifaceted advantages of SSC on maternal attachment and confidence.²⁰ Participants in these studies have identified communication and information provided by the nurse as strongly influencing their experiences while participating in SSC with their infant.¹⁶ Skin-to-skin care can also help fathers of preterm infants gain confidence in their parental role, coping with the unexpected stress of preterm birth and extended hospitalizations.²⁸

Although the benefits of SSC for parents, as well as infants, are well documented in the literature, the practice of SSC remains inconsistent.^{23,24} Ludington-Hoe documents that adoption of SSC by nurses in the United States continues to be slow despite strong evidence that support its use.²⁹ Nurses report that although knowledge about SSC has improved, confusion still exists among them with regard to safety and appropriate use of SSC.²⁵ In addition, nurses have reported that the support from leadership, education on SSC, and adequate staffing levels are all factors that influence their decision to facilitate SSC.^{23,30} The aim of this meta-synthesis is to describe the essence of healthcare providers' experiences in facilitating SSC, with the overall goal of increasing understanding of the process, thus enhancing the facilitation and implementation of SSC.

This synthesis of the literature adds to the discourse regarding the meaning of caregivers' experiences in facilitating SSC by blending the findings of several individual qualitative studies. The purpose of this meta-synthesis is to integrate the findings from several discrete studies into a more salient interpretative perspective that will lead to more targeted understanding that can be used to support implementation and facilitation of skin-to-skin holding experiences for critically ill or hospitalized infants.

What This Study Adds

- Description of 4 key themes that influence the caregiver's facilitation of SSC.
- Deeper understanding of the caregiver's experiences with SSC, highlighting the complexity of SSC experiences as nurses and health professionals navigate competing demands, which influence when or if SSC is initiated.
- Identifies knowledge practice gaps with regard to SSC.

METHODS

Noblit and Hare's³¹ method for meta-ethnography has been used by many nursing scholars to combine the findings of multiple qualitative studies, translating or "juxtaposing" the findings, to create a figurative meaning of the identified themes resulting in a new understanding of the caregiver's experiences when facilitating SSC with parents and their hospitalized infants. This method was selected because it maintains the richness, essence, and integrity of the original studies while integrating the context into a newly defined whole. These interpretive findings serve as units of analysis. Table 1 outlines the methodological process. For the meta-ethnography, a constant comparative procedure grounded in the hermeneutic process was used with analysis. Data were extrapolated from the individual studies themselves and were examined in relation to each other, which brought forth 4 overarching themes elicited by metaphors. This synthesis generated a new understanding of the caregiver's experiences when facilitating SSC. Table 2 identifies overarching metaphors that were extrapolated as specific phrases, ideas, and concepts that were extrapolated from each individual study. Table 2 also provides an audit trail to enhance the credibility of the analysis. Synthesizing the translations through this method of analysis creates a new product, which serves as something more than the individuality of its parts.

TABLE 1. Meta-ethnography Method^a

Phase 1	Identify a topic
Phase 2	Deciding what is relevant to initial topic
Phase 3	Reading the studies
Phase 4	Determining how studies are related
Phase 5	Translating the studies into one another
Phase 6	Synthesizing translations
Phase 7	Expressing the synthesis

^aThis method is adapted from Noblit and Hare.³¹



TABLE 2. Individual Study Metaphors as Related to Overarching Themes

Study	<i>A Fork in the Road: Varying Thresholds of Getting Started</i>	<i>Spectrum of Possibilities: Defining Adequate Resources</i>	<i>Continuing to Grapple: Navigating Demands/Complexity of the Infant</i>	<i>Dancing the Waltz: Balancing Parental Readiness With Infant Needs</i>
Wallin et al ³²	"Considerable attention was devoted to preparing information ... focusing on developing unit-based guidelines" for KMC	"Perceptions about contextual conditions" manager influenced adequate staffing resources and demonstrated respect for nursing	"You notice it both in infants & on the monitors. The monitors don't alarm, the oxygen is reduced and the baby does well"	"wide perception that care procedures changed and parents and infants well being was enhanced"
Chia et al ²⁴	Education was essential for staff knowledge and skill to facilitate SSC	"All respondents expressed strong frustration with increased workload & low staffing levels" making SSC difficult	"Condition of the infant area of concern, with consensus that infant's tolerance level was deciding factor to encourage parent to practice" SSC	"Understanding kangaroo care" ... "explaining what it actually means and how they can go about doing it"
de Hollanda Parisi et al ³³	"Decision making and awareness of process of health-care team" was pivotal to successful implementation	"Need for adequate physical space, chairs etc" "When adequate resources and staff available advantages of SSC obvious"	"The mother is more of a partner of ours than of the medical team"	
Lee et al ³⁴	"Lack of adequate staff education about importance of" SSC... "not all staff believed in benefits of SSC"	"Creative opportunities to increase motivation for staff" participation. "Physician and leadership support critical"	Impression of "infants' clinical stability" was variable, thus influenced SSC practices	"increasing maternal motivation for STSC can be difficult in light of cultural traditions"
Gontijo et al ³⁵	Ministry of Health defined proposal for implementation. "Importance of method of newborn care"	Lack of "institutional support" most hindering to SSC constraints with physical space limitations	Lack of "institutional support" most hindering to SSC constraints with physical space limitations	"We can help facilitate this bond between mother and baby, decrease anguish that his is a terror"
Kymre and Bondas ³⁶	Realizing urgency in transferring and limited valuable time for "being with" infant before death	"Dignity for the dying newborn was raised as challenging in regard to simultaneous urgency of the situation"	Persuaded parents to hold their dying newborn skin to skin; "common experience ... was that parents were thankful for being helped to cross threshold of getting close to child they were about to lose"	
Kymre and Bondas ³⁷	"Shared experience of changing focus in the history of NICU care." "Initiating SSC as soon and much as possible"	Nurses perceived SSC as responsibility, "giving up SSC by transferring back to incubator was seen as failure in nursing care"	"The sicker the newborn, the more important SSC is" Signs of well-being and harmony are motivating for SSC	"Encouraging parents to dare to hold their newborn skin to skin"
Ferrarello and Hatfield ³⁸	"All nurses indicated SSC was important" yet "would involve complete change in the way we do care" for staff	Logistics of not enough time to complete all that needs to be done within shift. "There's so much to do. Where can you fit it in?"	Many visitors in mother's room considered barrier. Wanting to share infant with visitors inhibited SSC	SSC removes barriers between mother and infant enhancing interactions and promotes calm

Abbreviations: KMC, kangaroo mother care; SSC, skin-to-skin contact; STSC, skin to skin care.

SAMPLE

A cross-disciplinary review of the literature was completed using CINAHL, PsycInfo, PubMed, and the Cochrane Library as well as Scopus Databases. Anthropological and humanities literature as well as the sociological abstracts was also searched. The key words for the searches included the following: *kangaroo care, kangaroo mother care, skin-to-skin holding, neonatal intensive care, qualitative, grounded theory, phenomenology, mixed methods, nursing care, nursing knowledge, nursing attitudes, premature, systematic reviews, meta-analysis, and meta-synthesis*. Inclusion criteria included qualitative studies that identified the caregiver's perspective when facilitating skin-to-skin holding experiences. There were no quantifiers on the type of qualitative design used for inclusion of the studies. Peer review articles in English were utilized to integrate knowledge on SSC into this ethnography. The final sample was selected to maximize heterogeneity in terms of the healthcare provider's experiences and perceptions in facilitating SSC. Of the 62 articles that were read and screened for eligibility, 8 met the inclusion criteria and were included in this synthesis. Eleven studies did not pertain to skin-to-skin holding with infants; 28 studies focused on parental perspectives; 4 articles were duplicates; and, the remaining 11 articles did not attend to staff experiences or used quantitative methodologies.

In a meta-synthesis, each of the research studies is examined both as a unit and as part of the whole. Table 3 identifies demographic characteristics of study participants. Many of the qualitative study reports did not identify extensive, distinct characteristics of the individual study participants. There were 343 participants overall

within the 8 qualitative studies. Five of the studies were published from the nursing discipline, whereas the remaining 3 were published from the discipline of medicine, yet these studies primarily utilized nurses as participants. One article utilized multidisciplinary participants from nursing, lactation, occupational therapy, physical therapy, dieticians, and physicians. Many of the studies utilized either convenience or purposive sampling with thematic analysis methods. See Table 4 for explicit methodological characteristics of the sample.

FINDINGS

Below is a summary of overarching themes related to the various aspects of this meta-ethnography. An elucidation of key metaphors that correspond to the overarching themes emerged from the individual studies and contributed to the synthesis. A metaphor is used as a figure of speech to highlight an implied comparison for a word or phrase that is ordinarily used with other meaning. Metaphors are often exaggerated expressions that elicit a profound statement. Individual study metaphors and participant quotations that contributed to the reciprocal translation of this synthesis are highlighted. Sample memos and examples are meant to demonstrate the constant comparative method encompassed within the hermeneutic process, to analyze and articulate the caregiver's experiences. Most studies surrounding the caregiver's perspective and SSC have focused on barriers impeding implementation or examined the experience from the organizational perspective and general group experiences, rather than individual personal experiences with SSC. In contrast, a few studies have attended to the unique perspectives of the individual nurse, which provided a rich cadre of experiences to explain the phenomenon of facilitating SSC.

TABLE 3. Demographic Characteristics of the Participants of Individual Studies Included in Metasynthesis

Study	Discipline	Sex	Country	Age, y	
				Mean (Range)	Practicing RN, y
Wallin et al ³²	Nursing	Not specified	Sweden	39 (23-63)	Range, 1-37; mean, 15
Chia et al ²⁴	Nursing	Female	Australia	39.7 (25-56)	Range, not specified; mean, 9.9
de Hollanda Parisi et al ³²	Medicine	Not specified	Brazil	Not specified	Not specified
Lee et al ³⁴	Medicine	Not specified	United States	Not specified	Not specified
Gontijo et al ³⁵	Medicine	Not specified	Brazil	Not specified	Not specified
Kymre and Bondas ³⁶	Nursing	Female	Sweden Denmark Norway	Not specified	Swedish RN, 3-24; median, 13 Danish RN, 7-22; median, 12 Norwegian RN, 4-22; median, 11
Kymre and Bondas ³⁷	Nursing	Female	Sweden Denmark Norway	Not specified	Swedish RN, 3-24; median, 13 Danish RN, 7-22; median, 12 Norwegian RN, 4-22; median, 11
Ferrarello and Hatfield ³⁸	Nursing	Not specified	United States	Not specified	Not specified

TABLE 4. Methodological Characteristics of Individual Studies Included in Metasynthesis

Study	Sample Size	Setting	Sampling	Qualitative Research Design	Data Collection	Data Analysis
Wallin et al ³²	45	(4) NICUs	Convenience	Descriptive qualitative	Focus group interviews, Morgan and Krueger, 1998	Transcript-based analysis
Chia et al ²⁴	4	(1) NICU	16 self-identified then randomized sample	Mixed methods, descriptive qualitative	Interviews	Thematic analysis
de Hollanda Parisi et al ³³	5	(1) NICU	Not specified	Exploratory descriptive qualitative	Semistructured interviews	Narrative, categories and core themes
Lee et al ³⁴	128	(11) NICUs	Not specified	Descriptive qualitative	Focus groups	Thematic analysis Atlas Ti Software
Gontijo et al ³⁵	135	(10) Maternity hospitals	Purposive	Grounded theory, Strauss and Corbin, 1990	Semistructured interviews, observations	Structural analysis of narration
Kymre and Bondas ³⁶	18	(3) NICUs	Purposive	Phenomenology, Dahlberg, Dahlberg, and Nystrom, 2008	Interviews	Essence, identify constituents to create meanings of new whole
Kymre and Bondas ³⁷	18	(3) NICUs	Purposive	Not specified Phenomenology, Dahlberg, Dahlberg, and Nystrom, 2008	Interviews	Essence, identify constituents to create meanings of new whole
Ferrarello and Hatfield ³⁸	8	(1) Postpartum	Purposive	Mixed methods, descriptive qualitative	Focus group interviews	Thematic analysis

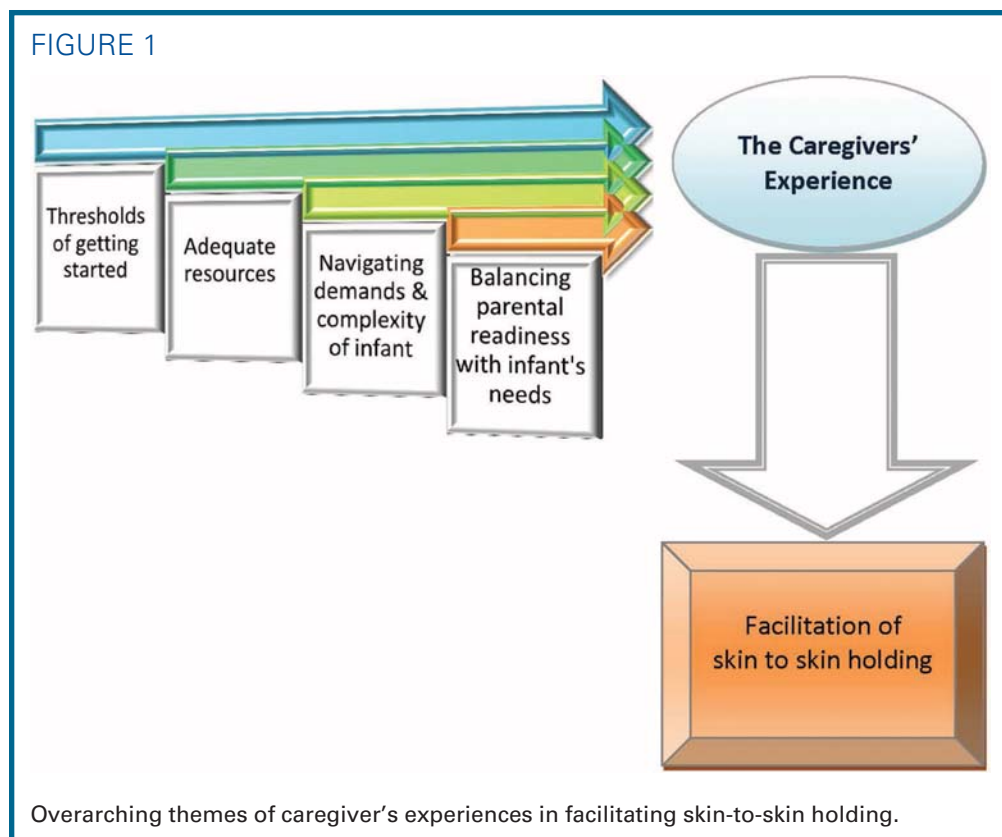
Total participants: 343.

The reciprocal translations necessary in this metasynthesis yielded 4 metaphors that were further defined by the identified overarching themes: (1) *a fork in the road*: varying thresholds of getting started; (2) *spectrum of possibilities*: defining adequate resources; (3) *continuing to grapple*: navigating the demands or complexity of the infant; and (4) *dancing the waltz*: balancing parental readiness with the infant's needs. These themes comprise the health professional's experience and influence the facilitation of SSC. As illustrated in Figure 1, caregivers' perceptions and experiences are separated into 4 categories to articulate the phenomena juxtaposed from the 8 original studies that influence facilitation of SSC for the parent–infant dyad. Following is an in-depth description of each metaphor with the corresponding theme that emerged from the meta-synthesis.

A Fork in the Road: Varying Thresholds of Getting Started

The metaphor of *a fork in the road* emerged through the synthesis as described with the first overarching theme of the *varying thresholds of getting started*, as evidenced with the premise that despite the theoretical knowledge about humane care that includes SSC, the practice of SSC was not fully incorporated into clinical settings.³⁵ The Ministry of Health in Brazil developed a proposal for implementation of SSC to help uncover the gaps between knowledge and application because of inconsistent practices of SSC within the NICU.³⁵

In one study from Scandinavia; SSC has been fully integrated into the nurse's role. Participants describe this change as stemming from a NICU cultural practice shift when they began using NIDCAP (Newborn Individualized Developmental Care and



Assessment Program). These strategies incorporate infant development into the healthcare process and views parental attachment as a priority within traditional medical care of the infant.^{36,37} The nurses' self-awareness of these changed attitudes described a completely different path to reaching a higher threshold of SSC implementation than found in other studies in the synthesis. These nurses perceived the approach to caring for an infant to be defined as individualized developmentally supportive care intertwined with empowering parenting as their utmost responsibility and priority. Supporting the infant's experiences was considered a central component of the nurses' daily work, which included SSC. This cohort articulated "initiating SSC as soon and as much as possible" and described it as a critical threshold to achieve harmonic SSC, which enhanced the nurses' functioning.^{37 (p.4)} Another participant from the Kymre and Bondas study stated "the sicker the newborn is, the more important it is to get started to have SSC."^{37 (p.4)} If the infant was dying or decisions were made to stop life-supporting treatments, the nurses in this study perceived "urgency in transferring, and limited, valuable time for being with" was expressed as the notion of "should" with a participant stating, "the newborn 'should' have the opportunity to be with (their) parents before passing away."^{36 (p.671)} In contrast, another study with postpartum nurses in the United

States identified that although "all nurses indicated SSC was important," practicing SSC on a regular basis "would involve complete change in the way we do care" and respondents focused on perceived barriers to implementation of SSC, which was not a part of their daily nursing practice.^{38 (p.58)}

Many studies identified education or training as essential to providing staff with knowledge and skills to facilitate SSC. Considerable attention was devoted to preparing information for colleagues focused on developing appropriate guidelines and unit protocols for SSC. "We know staff is going to need support because it (SSC) hasn't always been an expectation and it hasn't always been positively promoted."^{34 (p.81)} The theme of staff buy-in, motivation, and interdepartmental communication also influenced the perception of, or if and when, SSC was utilized. However, despite the perceived need for knowledge about SSC, the priority within that study was in regard to how the staff were supported "through role-plays we captured a lot of situations that were difficult to express" to help diffuse the perceived burden or negativity associated with SSC.^{32 (p.65)}

In many of the studies, there were nurses who expressed positive personal emotions when implementing SSC.^{24,32,36,37}

For example, "respondents said they were knowledgeable about the use of KC (SSC) and expressed a sense of excitement and enthusiasm about facilitating

SSC^{24(p.24)}; thus, these mixed findings contribute to the overarching theme of varying thresholds of getting started with SSC.

Spectrum of Possibilities: Defining Adequate Resources

The metaphor of the spectrum of possibilities corresponding with the theme of defining adequate resources was pervasive throughout all the studies. Chia and colleagues documented “all respondents expressed a strong sense of frustration with increased workloads and low staffing levels, making it difficult for them to find time to facilitate KC (SSC) effectively.”^{24(p.24)} An organization’s leadership was described as pivotal to success for implementing SSC, with the nursing manager influencing adequate staffing levels and respect for nursing.³² One respondent from Wallin and colleagues stated: “We have a good nurse manager ... she trusts us and supports us in what we are doing. It is important that you have someone trustworthy to talk things over with”; yet others within the same study stated, “KMC had not been prioritized because of heavy workloads and many ongoing projects.”^{32(p.69)}

A participant from another study identified the lack of adequate staffing resources, which was portrayed as a challenge to facilitate SSC, “We are kind of stumbling a little bit because of our lack of manpower to ... move forward with a lot of our things. I think the intent (for SSC) and will is there, just we require more staff members.”^{34(p.81)}

A few studies identified inadequate resources limiting physical space as constraints associated with inadequate institutional support hindering SSC.³³⁻³⁵ When there were adequate infrastructures and sufficient human resources within a nursery as well as ample physical space for chairs, the staff acknowledged the advantages of SSC are obvious.³³

Besides material resources, there is still the human resources factor that is a limiter for the execution of the healthcare proposal (SSC), we have few professionals to supervise the actions provided to the mother-child binomial adequately, especially on weekends when we work with a reduced staff, and still have the managerial activities that take up a large share of our time.^{33(p.578)}

The logistics of not enough time to complete all that needs to be done within a shift were expressed as “there’s so much to do where do you fit it all in.”^{38(p.58)} The postpartum nurses participating in this study were focused on the multitude of tasks that need to be done with new mothers and infants such as hearing screenings, as well as environmental and dietary considerations.³⁸ These nurse respondents perceived SSC as one more task.

Yet, nurse participants from the Scandinavian studies articulated a very different perspective.^{36,37} If SSC was not practiced, it was perceived as unacceptable. One participant described, “Giving up SSC by transferring an uncomfortable newborn back into the incubator was seen as failure in nursing care and could possibly make the parents more anxious.”^{37(p.5)}

Thus, adequate resources were considered in the context of balancing challenges of shared responsibilities within themselves as nurses, as well as with what the parents brought to the interaction and how the nurse perceived what they, as expert nurse, would need to do to facilitate SSC. For these Scandinavian nurses, it was the personal resource of emotional competence found within themselves to attend to the complexity and challenge these sick infants required rather than physical resources as expressed in the findings of other studies.

Continuing to Grapple: Navigating the Demands and Complexity of the Infant

The metaphor of *continuing to grapple* elicited by the overarching theme of *navigating the demands and complexity of the infant* was threaded throughout all of the studies in the synthesis. The professional caregivers needs to trust their interpretation of the infant’s physiologic complexity and whether they feel comfortable with their perceptions of the infant’s condition. The Scandinavian nurses stated, “I have seen them (infants) get more stable and since studies have found the brain develops better, I understand the importance.”^{37(p.5)} The condition of the infant was an area of concern and consensus among the nurses who responded within the study conducted by Kymre and Bondas in Scandinavia.³⁷ The infant’s physiologic status and tolerance of care interactions often dictated whether SSC was encouraged with parents or not. The respondents’ were also concerned with dislodging infusion lines and equipment when transferring an infant for SSC, yet also stated asking a second staff nurse for assistance was helpful.²⁴ A respondent commented that “kangaroo care supported the physiological and behavioral status of the infant, keeping the infant warm, maintained the infant’s heart and respiration rate and promoted sleep.”^{24(p.24)}

There was general agreement that infants needed to be clinically stable to be eligible for SSC, yet there was also recognition that there was significant variability and sometimes disagreement over the definition of clinical stability among providers.^{24,34} Another factor that posed a barrier to SSC was the type of technology and equipment being used to care for the infant, which meant that at times, extra assistance by additional personnel was needed. Some of the participants were focused on the infant’s experience attempting to navigate the complexity of the care needs as illustrated by the comment, “Because

he was very ill, I am uncertain of what he was sensing. I think it depends on the various physical condition and medications. If they are conscious or in a doze, (asleep) but I believe the skin to skin contact is good for the newborn.”^{36(p.672)}

Another participant from the same study stated “dignity of the dying newborn was raised as challenging in regard to the simultaneous urgency of the situation.”^{36(p.672)}

The nurse participants felt a responsibility to get the infant onto the mother’s chest before the infant’s death to preserve the infant’s dignity, yet the challenge of the simultaneous demands of urgency paired with the complexity of the critically ill infant to facilitate SSC within this critical window was difficult for the caregiver.

Dancing the Waltz: Balancing Parental Readiness With the Infant’s Needs

The overarching theme of balancing parental readiness with the infant’s needs was first identified by Kymre and Bondas in their phenomenological study of the facilitation of SSC with premature infants that were dying.³⁷ Many nurses consider it important to be sensitive to the parent’s perspective and not impose on parents to feel guilty for not being continuously present in the NICU.^{24,34,36,37} Some parents decline a nurse’s suggestion to hold SSC and need to be encouraged or persuaded to stay with their infant. The participants in Kymre and Bondas’ study felt a responsibility to talk with parents about the efficacy of SSC:

Sometimes we persuade parents to hold their baby skin to skin, especially the smallest, who they don’t dare to touch. We cannot push too hard, but we may sometimes be impatient in getting started with SSC. This outcome is normally good, though we have to go step by step to get there.^{37(p.5)}

Supporting parents in the delicate dance of beginning the parenting process was expressed as follows:

The mother is more like a partner of ours than the medical team, surely this doesn’t mean all the doctors. The impression I have is that the doctors give the orders and we have to accomplish it, when everybody should actually be inserted in the situation. It is necessary to decide together the best form and the best moment to perform the technique, (SSC) as to not do it carelessly.^{33(p.578)}

In another study, a participant, identified that it is important to carefully approach parents when broaching SSC, “We cannot push them too hard. The very first SSC is sometimes a threshold to cope with, especially if the infant is critically ill”. One

nurse said, “I will not push them if they won’t, but I always try to persuade them to hold the child close.”^{36(p.673)} Skin-to-skin care should be a mutually cohesive experience for both the parent and the infant supporting their developing relationship. It is imperative to consider the infant’s needs as well as parental readiness when facilitating SSC. Parental support in the form of SSC education was illuminated by one respondent:

It’s a parent education thing too ... explaining to them what it actually means and how they can go about doing it and how often and how long it does actually take ... you need to explain to parents what to wear.^{24(p.25)}

Increasing maternal motivation can be difficult for nurses to navigate in light of diverse cultural traditions and language barriers; one participant reflected, “I’ve often found that sometimes the nurses think the mother is understanding everything and when I try and get into some detail with them, she doesn’t even understand enough English to really know what I’m talking about.”^{34(p.82)}

Lee and colleagues highlighted that the participants within their study felt the use of interpreters or staff who speak the same language as the parent may influence parents’ participation with SSC. Clinical practice was an important source of feedback in how staff interacted with families, “wide perceptions that care procedures (SSC) changed and parents and infants well being was enhanced,” which gave the staff incentive to strive for further improvement and increased facilitation of SSC.^{32(p.65)} To clarify, the participant’s perception was that the infants’ and parents’ well-being was enhanced when they participated in SSC practices, which then further drove the participant’s desire to facilitate SSC.³²

CLINICAL IMPLICATIONS

The results of this meta-synthesis provide implications for clinical practice, highlighting the complexity of SSC experienced by nurses and health professionals as they navigate the competing demands in the NICU, which influence when or if SSC is initiated. Nurses and health professionals at the bedside need to plan accordingly, using critical thinking skills for various components of how best to support and facilitate SSC. It is not only the physical resources of comfortable reclining chairs or adequate staffing that influence SSC practices but also the nurse’s emotional competence and wherewithal to prioritize caregiving tasks that also affect the process.

A priority of most healthcare professionals is for safe implementation of SSC to ensure a positive experience for the parent and infant. Examining the findings within this meta-synthesis also provides an

opportunity for professional caregivers to enhance their awareness through reflection about their own practices of SSC. This new understanding may augment an increased understanding of the caregiver's experiences to encourage SSC implementation on a regular basis.

LIMITATIONS

A limitation of this study is in generalizing findings, given the vastly different practice approaches to healthcare from various countries such as Scandinavia and the United States. Another consideration is noted with the lack of identified demographic characteristics of the participants in several of the studies, which warrants generalizing the findings with caution. Six of the 8 studies identified the staff as working in the NICU, yet the authors did not differentiate the acuity of the infants as primarily preterm or very preterm within the NICU setting. Further research is needed to better understand the phenomenon of nurses' experiences when facilitating SSC to increase participation for all hospitalized infants and their families.

CONCLUSIONS

This meta-synthesis provides insight that many nurses have good intentions in supporting SSC

practices, yet struggle to meet the multiple demands of daily practice of SSC. Education for staff nurses and health professionals as well as parents is essential to create positive SSC experiences in this critical window of development for young infants. Clearly, a paradigm shift or culture change is necessary to provide individualized developmentally supportive care practices, focusing on the infant's developmental trajectory. The overall human experience must be seen as pivotal to collaborative care practices of nonseparation between the parent and infant and thus, essentially integrated to enhance implementation of SSC practices. The 4 key themes identified and articulated within this ethnography that influence caregivers' experiences to facilitate SSC: varying thresholds to getting started, defining adequate resources, navigating the complexity of the infant and balancing parental readiness provide an increased awareness to enhance the professional caregiver's understanding of the complexity of SSC practices.

Acknowledgments

The authors express appreciation to Dr Cheryl Beck for her guidance and expertise in qualitative methodology and to Valori Banfi for her library and searching assistance and her patience throughout the process.

Summary of Recommendations for Practice and Research

What we know:

- Despite the plethora of evidence to support SSC, practices remain inconsistent.
- This study reinforces that nurses have good intentions to facilitate SSC, yet struggle to meet the multiple demands of daily practice.
- Skin-to-skin care is the recommended method of care for the parent–infant dyad.
- Although education on SSC knowledge is necessary, organizations that have undergone a paradigm shift in care, such as NIDCAP, are more successful in implementing SSC.

What needs to be studied:

- Core factors that contribute to inconsistent practices of SSC.
- Innovative and practical translations of this evidence-based practice strategy, to enhance the parent–infant dyad, normalizing SSC as the standard of daily practice.
- Practical applications that support nonseparation of the mother–infant dyad.

What can we do today:

- Enhance the critical thinking skills of the healthcare team to facilitate their ability to plan accordingly, as they navigate the complexities of how best to implement SSC.
- Acknowledge the complexity of delivering SSC holding and provide opportunities for teams to work together to support each other in greater implementation of this practice.
- Provide strategies such as reflection that highlight the professional caregiver's experiences and intentions to practice SSC, yet struggle to implement on a daily basis.

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Dissertation Chapter 4

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Oxytocin enhances developing relationships with skin-to-skin contact

Abstract

Objective: To examine bio-behavioral mechanisms associated with maternal and paternal skin-to-skin contact (M-SSC and P-SSC) with premature infants. Specifically, to examine changes that occur in infant-parental salivary oxytocin and cortisol levels during SSC and whether the process of SSC alleviates parental stress and anxiety also supporting the developing mother-father-infant relationships.

Methods: This randomized cross-over design study used a 3-day timeframe conducted in the Neonatal Intensive Care Unit (NICU). The sample consists of 28 stable preterm infants (30 0/7 – 34 6/7 weeks gestational age between 3 -10 days old) and their mothers/fathers. After informed consent, each triad was randomly assigned to one of two sequences: M-SSC on day 1 and P-SSC on day 2; or P-SSC on day 1 and M-SSC on day 2. Infants' and parents' saliva samples for oxytocin and cortisol were collected pre-SSC, 60-min during-SSC, and 45-min post-SSC. Parental anxiety was measured at the same three time points. Parent-infant interaction was examined during a parent-infant video collected prior to discharge.

Results: Salivary oxytocin levels increased significantly during SSC for mothers ($p<0.001$), fathers ($p<0.002$) and infants ($p<0.002$). Infant salivary cortisol levels decreased significantly ($p<0.001$) during SSC as compared to before and after SCC. Parent anxiety scores also had a significant relationship with parent OT and SC levels. Parents with higher OT levels had more synchrony and responsiveness ($p<0.001$) in their interactions.

Conclusion: This study addresses the gap in understanding the mechanisms that links parent-infant contact to bio-behavioral responses, which is an important step in exploring oxytocin as a potential moderator to improve responsive and synchronous interactions between mother-infant

and father-infant.

Implications for practice: SSC provides an opportunity to active oxytocin release as well as to decrease mother-father-infant salivary cortisol levels. The nursing intervention of facilitating SSC implementation should be used to reduce parent and infant stress in the NICU.

Keywords: skin-to-skin care, oxytocin, premature infant, kangaroo care

Oxytocin enhances developing relationship with skin-to-skin contact

Introduction

The Neonatal Intensive Care Unit (NICU) environment is often a stark contrast to expectations for the developing infant and can induce parents' stress and anxiety that have lifelong effects. Fundamental to the infant's developmental trajectory is early parent-infant contact. Maternal touch, especially during skin-to-skin contact (SSC) has the potential to mitigate some of the adverse consequences of prematurity. Skin-to-skin contact is an evidenced based holding strategy that increases parental proximity and provides a continuous interactive environment known to enhance infant physiologic stability and affective closeness with the parent-infant dyad (Bergman, Linley, & Fawcus, 2004; Moore, Anderson, & Bergman, 2007; Ludington-Hoe, Anderson, Swinth, Thompson, & Hadeed, 2004).

Skin-to-skin contact provides a strategy for improved autonomic regulation as seen with a steadier heart rate, improved respiratory status and temperature regulation as compared to routine caregiving and traditional holding (Bergman, Linley, & Fawcus, 2004; Cong, Ludington-Hoe, McCain, & Fu, 2009). The infant's respiratory and heart rate variability (HRV) are sensitive indicators of autonomic function and can be used as a non-invasive measure of parasympathetic and sympathetic reactivity (Feldman & Eidelman, 2003; Ludington-Hoe, 2011; Mori, Khanna, Pledge, & Nakayama, 2010). Additional benefits of SSC include improved brain development as well as better motor and mental development (Feldman & Eidelman, 2003; Ferber & Makhoul, 2004). Demonstrated differences in behavioral responses such as state regulation and improved motor modulation even after short periods of SSC have been reported immediately following SSC (Ferber & Makhoul, 2004). Biobehavioral responses of cortisol and improved maternal infant co-regulation have also been reported (Neu, Laudenslager, & Robinson, 2009; Nue &

Laudenslager, 2011; Neu & Robinson, 2010). However, the biological mechanisms affected by SSC, including the oxytocin system, have rarely been studied.

Oxytocin is produced primarily in the supraoptic nucleus and paraventricular nucleus of the hypothalamus (Gordon et al., 2010). OT was originally identified as a female hormone because of its important roles in birth and lactation (Ross & Young, 2009; Lee et al., 2009; Erlandsson et al., 2007). Another key role that the oxytocinergic system plays is in bond formation and parenting (Parker et al, 2010). In limited human studies, parental plasma OT concentrations were positively related to mother-infant affectionate contact and father-infant stimulatory contact at 6 months postpartum (Groer & Morgan, 2007; Ross & Young, 2009). Oxytocin is reported to be involved in the control of stress, anxiety, and autonomic functions, such as heart rate, high oxytocinergic activity is stress relieving and anxiolytic in animals and humans (Uvnas-Moberg et al., 2005). Mothers of preterm infants are more likely to have difficulty with attachment than mothers of full term infants (Lee et al., 2009; Poehlmann & Fiese, 2001). This difference can be attributed to decreased synchrony or responsiveness with parent-infant interactions as well as the subtle behavioral cues among premature infants that are difficult to interpret (Poehlmann & Fiese, 2001; Lester, Hoffman, & Brazelton, 1985). Evidence suggests that early dysfunctional contacts due to the infant's disorganized behavioral patterns between the infant and parent lead to poorer attachment and behavioral problems in childhood (Lester et al., 1985; Feldman, 2006).

Conversely, early responsive and synchronous contact may positively influence cognitive and developmental outcomes for the child (Gordon et al., 2010). Feldman defines sensitive periods as opportunities to identify “essential biobehavioral experiences that trigger specific neurological or endocrine systems impacting on gene expression, brain development, and social

fittedness that exist in early environments for reparation to be possible” (Feldman, 2015, p.370). Cong and colleagues have reported increased OT levels during SSC yet responses after SSC appear to differ for mothers and fathers, the father’s salivary OT levels remained elevated after SSC ended as compared to mother’s OT levels, which dropped after the episode of SSC ended (Cong et al., 2015). This study is modeled after Cong’s original work yet provides a more inclusive look at the mechanisms of OT and SC for mothers, fathers and infants with a longer episode of SSC along with examining the interaction between preterm infants and their parent to support these developing relationships. Only a few studies have reported on fathers and SSC (Cong, et al., 2015; Gloppestad, 1998; Poehlmann & Fiese, 2001). Fathers are included in the study in an effort to examine the OT mechanism associated with SSC, as well as to engage fathers in the practice of SSC.

The purpose of this study was to examine bio-behavioral mechanisms associated with maternal and paternal skin-to-skin contact (M-SSC and P-SSC) with premature infants. Specifically, we examined whether changes that occur in infant and parental (mother and/or father) salivary oxytocin levels during SSC would be associated with simultaneous reductions in anxiety and with later outcomes reflecting improvements in the synchrony and responsiveness with parental-infant interactions. Salivary cortisol and parental (mother and father) stress and anxiety were also measured to examine parental stress and anxiety and whether the process of SSC alleviates that stress and anxiety. Our long term goal was to identify new interventions to increase endogenous OT release for parents and infants to decrease stress in the NICU. Uncovering the bio-behavioral basis of early parent-infant interaction is an important step in developing therapeutic modalities to improve health outcomes.

Methods

Study design, setting and participants

A randomized cross-over design was used over a 3-day study period. The mother-father-infant participants were assigned to one of the two study sequences: 1) M-SSC on Day 1 and P-SSC on Day 2; 2) P-SSC on Day 1 and M-SSC on Day 2. The order of the sequences was determined randomly by a computer-program that uses simple random assignment. The study was conducted in three nurseries (a level II, III, and IV NICU) in central Connecticut. Mother-father-infant triads were recruited using a convenience sampling approach. Inclusion criteria included: infants who are 1) 30 0/7–34 6/7 weeks gestational age, 3-10 days old; and 2) either nothing per oral (NPO) or on bolus feeds to control for feeding effects on heart rate variability (HRV) (Klug, Dressendorfe, Strasburger, & Et al, 2000). Exclusion criteria included: infants who: 1) are intubated and receiving mechanical ventilation; 2) have known congenital anomalies; 3) have severe periventricular/ intraventricular hemorrhage (\geq Grade III); 4) have undergone minor or major surgery; 5) are receiving sedation or vasopressors or analgesics to control for the effect of sedative medication on behavioral states; or 6) have positive drug exposure history to control for drug effects on behavioral states and autonomic responses. Parental eligibility criteria were: 1) $>$ 18 years old; 2) English speaking; and, 3) without history of depression. A maternal history of the diagnosis of depression is a known significant predictor of postpartum depression and may influence OT levels (Chang, Anderson, & Wood, 1995; Parker et al., 2010). Parent history of depression was based on parental self report during the consent process and review of infant medical records. To address our primary aim of contrasting mean changes in infants' and parental salivary OT/SC levels pre-, during-, and post-SSC, the sample size objective was to enroll 28 mother-father-infants. Based on limited data that were collected from previous triads,

mean changes in salivary oxytocin levels provided a standardized effect size (Cohen's *d*) of 0.50, an effect of precisely medium magnitude (Cong, et. al., 2015). A sample size of 28 mother, father, infant triads were recruited to provide 80% levels of power for M-SSC/P-SSC with one-sided tests at the 5% level of statistical significance.

Biobehavioral Measures and Instruments

Parent saliva was collected using the unstimulated passive drool method (Grewen, Davenport, & Light, 2010). Infant saliva samples were obtained using infant swab (Salimetrics LLC, State College, PA) methods. The swab was placed along the infant's cheek for 5-10 minutes can obtain at least 120 μ L of saliva, whereas the minimum saliva needed for testing OT is (70 μ L). The swab is 5 x 90 mm, which was an appropriate size for the mouth of preterm infants. The infants were found not to be disturbed by the sampling process. The saturated oral swabs are then placed in a small insert tube; the small tube is then placed in a large outer tube with a snap cap. Samples from infants and parents were immediately placed in a cooler to freeze them at -20°C and then transferred to -80°C freezer for long term storage until assay was completed. Salivary OT Assay was completed via an enzyme immunoassay (Enzo Life Sciences, Plymouth Meeting, PA). This method is similar to that specifically developed and validated for salivary OT analysis (Carter, Pournajafi-Nazarloo, Kramer, & Et al, 2007). The sensitivity limit without correcting for the concentration is 15 pg/mL and the lower limit of sensitivity is at 12.0 pg/mL with correction for the extraction. The salivary cortisol was completed via an enzyme immunoassay (Salimetrics LLC, State College, PA). The lower limit of detection is measured at $< 0.007 \mu\text{g/dL}$. The intra- and inter-assay coefficients of variation are 4.6% and 6%, respectively.

Parental anxiety responses were measured using a validated 8-item visual analogue scale

(Cox, Connor, Henderson, McGuire, & Kendell, 1983; Cong, et. al., 2015). Each item represented an emotion such as “*I am very worried and anxious*” and was scored using a 100 mm line rating the emotion from “*not at all*” to “*worse than I have ever before*”. There are two primary constructs or dimensions associated with the scale determined using principle component analysis. The alpha reliability of the data was calculated at 0.93. Each parent was asked to rate their perspectives on whether the statement or item was true, the scale was completed by mothers and fathers before SSC, during SSC and after SSC.

The synchrony and responsiveness of the parent infant interaction was measured using Dyadic Mutuality Code (DMC). Just prior to hospital discharge typically when the infant was approximately 36-37 weeks post-menstrual age, a 5 minute parent-infant video obtained measure levels of contingency and responsiveness in the infant-adult interaction (Censullo, Bowler, & Lester, 1987). Parents were asked to position the infant facing them, typically on their lap and to play with their child as they normally would without using a pacifier (Censullo, 1991). All parents were provided with the same instructions. DMC reliability, construct, and concurrent validity have been estimated with healthy term, preterm, as well as high risk infants (Censullo et al., 1987; Censullo, Lester, & Hoffman, 1985). All of the mother-infant and father-infant interactions were coded independently by two researchers with inter-rater reliability >90%. For the few videos that the researchers had different scores, the score was within 1 point and remained within the same category thus the each reviewer was in complete agreement with scored categories. Each researcher was blinded to OT/SC results prior to watching and scoring videos. The video interaction is scored using 6 categories; mutual attention, positive affect, turn-taking, maternal pauses, infant cues to continue or cease, and maternal sensitive responsiveness, each category is rated 1 or 2 for a total score between 6-12.

Study Procedures

Sampling time is an important consideration in assessing OT and SC levels for adults who display diurnal patterns (White-Traut et al., 2009). Studies suggest establishing consistency in sampling is desirable (White-Traut et al., 2009). Based on the infant's feeding schedule, the daytime interval of 1 to 3pm is ideal for data collection. The selection of this time can control for diurnal changes and feeding/eating influences on OT and cortisol responses (Feldman et al., 2010; White-Traut et al., 2009).

Pre-SSC phase (15 min): Infant saliva samples for OT/SC assays were collected during the last 10 minutes of this phase, then, parent saliva samples were collected and, next, the parent completed the visual analogue scale (VAS) anxiety measurement.

During-SSC phase (60 min): The mother or father held the infant SSC for 60-minutes.

1) M-SSC condition: The infant was transferred from the incubator into SSC position using a standard transfer technique (Ludington-Hoe, Ferreira, Swinth, & Ceccardi, 2003). During the last 10 minutes of M-SSC, the infant's saliva sample was collected first. Then, maternal saliva was collected, and, next, the mother completed the VAS. 2) P-SSC condition: The data collection procedure during P-SSC condition is the same as during M-SSC, except that the father is holding the infant. Instructions for mothers and fathers were the same.

Post-SSC phase (45 min): The infant was transferred back to the incubator and left undisturbed for 45 minutes to measure post-SSC responses. After 45 minutes post-SSC, the infant's saliva sample was collected, then parental saliva was collected, last the parental anxiety level via VAS was obtained from parent (mother and/or father).

Data Analysis

Data were analyzed using IBM SPSS version 22; descriptive statistics were used to

describe demographic characteristic variables. Repeated measures analysis of variance (RM-ANOVA) was used to describe salivary oxytocin and cortisol differences before, during and after SSC as a repeated factor in a two-tailed test with 5% of statistical significance. Parametric testing was utilized as normality of data was accounted for in differences of salivary oxytocin and cortisol measures. This method was also used for parental VAS measures and standardized the effect of SSC over time for each participant serving as their own control. Bonferroni correction was applied thus significance is identified at $p \leq .01$ to attend to outliers at the individual level. Paired t-tests were used to examine mother, father and infant salivary oxytocin levels and the DMC of the mother-infant and father-infant interactions.

Results

There were 112 infant medical charts screened for study participation; 54 triads did not meet eligibility criteria, thus 58 parents were approached for recruitment, of these 18 parents declined participation. Thirty-two mother, father, infant triads consented for study participation, yet four were discharged quickly prior to data collection, ultimately 28 triads participated in this study and their data was used for this analysis. Table one describes the parental demographic characteristics and Table two depicts the infants' demographic characteristics. Fifteen participants were randomized to sequence one (M-SSC on day 1 with P-SSC on day 2) and thirteen triads completed sequence two (P-SSC on day 1 with M-SSC on day 2). The majority of participants were white (68%), college educated (61% of mothers) and (46% of fathers) with the mothers mean age of 32 years while the fathers' mean age was 33 years old. The infants were relatively healthy with a mean SNAPPE II score of 3.93, born at a mean gestational age of 33 weeks post-menstrual age, Caucasian (61%) males (68%). Most mothers (89%) had held their infants skin-to-skin while only some of the fathers (27%) had participated in skin to skin holding

with their infants prior to study participation. Only a small percentage of parents (mothers 32% and fathers 21%) had previous SSC experience with another infant.

Salivary Oxytocin Levels: In the maternal SSC condition: pre, during and post-SSC with mother-infant; the maternal OT levels significantly increased from pre-SSC ($M= 161.97$, $SD = \pm 104.91$ pg/mL) to during-SSC ($M= 275.09$, $SD = \pm 173.54$ pg/mL) and then dropped post-SSC ($M= 202.25$, $SD = \pm 104.91$ pg/mL). A similar response was seen with the infant OT levels, pre-SSC (134.71 ± 104.69 pg/mL) significantly increased during-SSC ($M= 306.72$, $SD = \pm 275.48$) and decreased post-SSC ($M= 223.44$, $SD = \pm 214.02$ pg/mL). Table 3 describes mother, father and infant salivary OT and SC levels pre, during and post-SSC. Figure one identifies mean salivary oxytocin levels for mothers, fathers and infants. Repeated-measures ANOVA analyses showed that salivary oxytocin levels increased significantly during SSC for mothers ($F(1, 27) = 23.19$, $p < 0.001$), and infants ($F(2, 54) = 8.05$, $p < 0.002$) as compared to before and after SSC.

In the paternal SSC condition: pre, during and after SSC fathers and infants' OT levels, paternal OT levels increased from pre-SSC ($M= 142.99$, $SD= \pm 112.69$ pg/mL) to during-SSC ($M= 211.86$, $SD= \pm 159.87$ pg/mL) and then dropped post-SSC ($M= 153.85$, $SD= \pm 88.32$ pg/mL). During the infant-father SSC condition the infants' OT levels increased from pre-SSC ($M= 130.71$, $SD= \pm 143.67$ pg/mL) significantly increased during-SSC ($M= 346.87$, $SD= \pm 291.63$) and decreased post-SSC (260.98 ± 232.08 pg/mL). Repeated-measures ANOVA analyses showed that salivary oxytocin levels increased significantly during SSC for fathers ($F(2, 52) = 8.21$, $p < 0.001$) and infants ($F(2, 52) = 21.88$, $p < 0.001$) as compared to before and after SSC. There were no differences for the infant data pre, during and post-SSC between maternal and paternal SSC for the infants' salivary oxytocin responses.

Salivary Cortisol Levels: In the maternal SSC condition: pre, during and after SSC –

mothers' and infant cortisol levels are described in Table 3 and Figure 2. In the paternal-SSC condition: pre, during and post-SSC with the fathers' and infants' cortisol levels – (Table 3, Figure 2). Infant salivary cortisol levels decreased during M-SSC condition from the pre-SSC (M= .09, SD= \pm .132 ug/dL) to during (M= .024, SD= \pm .033 ug/dL) and then increased again post-SSC (M=.055, SD= \pm .071 ug/dL). Using repeated-measures ANOVA infant SC levels significantly ($F(1, 26) = 5.85, p < 0.001$) decreased during SSC with their mother as compared to pre and post-SSC. Figure 2 depicts mother, father and infant salivary cortisol responses.

Infants had similar responses when held SSC with their fathers; the infants' SC pre-SSC (M= .81, SD= \pm .064 ug/dL) decreased during-SSC (M= .019, SD \pm .024 ug/dL) and then slightly increased post-SSC (M= .051, SD= \pm .058 ug/dL). Infant SC levels significantly dropped when infants were held in P-SSC condition during-SSC ($F(2, 52)=11.48, p < .001$) compared to pre and post-SSC. The infant's salivary cortisol levels significantly decreased when the infant was held SSC by the mother as well as when held by the father. Although SC levels decreased for both mothers and fathers during SSC there were no significant differences identified.

Parental Anxiety Levels: Table 3 also describes maternal and paternal anxiety scores pre, during and post-SSC. Maternal anxiety levels pre-SSC (M= 72.00, SD= \pm 77.84) dropped during-SSC (M= 28.54, SD= \pm 54.72) and post-SSC (M= 32.14, SD= \pm 61.06). Paternal anxiety levels pre-SSC (M= 43.59, SD= \pm 58.10) also decreased during-SSC (M= 15.57, SD= \pm 19.57) increasing slightly post-SSC (M= 24.41, SD= \pm 36.08). Using repeated-measures ANOVA maternal anxiety scores significantly decreased ($F(1, 26)= 9.69, p < .001$) during SSC compared to pre and post-SSC. Paternal anxiety levels also significantly decreased ($F(1, 26)= 8.86, p < .003$) compared to pre and post-SSC. There were no significant correlations between maternal and paternal anxiety levels and their respective salivary SC or OT levels.

Parent-infant Interaction: The video scoring was categorized into 3 groups. A score between 6-8 was considered low responsiveness, a score of 9 was considered moderate responsiveness and a score of 10-12 was considered highly responsive or a synchronous interaction. Twenty-eight mothers and twenty-six fathers completed the videos interactions. The majority of mothers 67% (n=19) scored as moderately responsive, with only 7% (n=2) scoring in the low responsive group and 26% (n=7) scoring highly responsive category. The fathers also scored predominately moderately responsive 58% (n=15), with 16% (n=4) scoring in the low responsiveness group and 26% (n=7) scoring highly responsive. Parents and infants with higher OT levels demonstrated had more synchronicity and responsiveness ($p < 0.001$) in their interactions. Paternal oxytocin levels were strongly correlated ($r = .49, p < .01$) with the synchronous and responsive father-infant interactions. Maternal oxytocin levels were also strongly correlated ($r = .53, p < .005$) with synchronous and responsive mother-infant interactions. There were no significant correlations with maternal SC and mother-infant interactions. There were no significant correlations with paternal SC and father-infant interactions. There was a significant negative correlations ($r = -.60, p < .001$) between father OT and SC levels yet there was not a correlations identified with maternal OT and SC levels. The maternal OT and paternal OT as a couple had strongly correlated ($r = .45, p < 0.018$ (using Spearman's correlation) oxytocin levels meaning the mothers with higher OT levels had fathers with higher OT levels.

Discussion

This study's results are consistent with Cong's previous finding indicating that SSC activates oxytocin release in mothers and fathers (Cong, et. al., 2015). The results of current study indicated similar effects with salivary OT and SC for mothers and fathers after SSC which was different than what Cong reported. This difference may be related to the extended timing of

during and post-SSC which extended the episode of salivary oxytocin collection. In this study we extended the length of during-SSC to 60 minutes and the post-SSC to 45 minutes thus the mechanisms of oxytocin release may have been influenced by the constraints of not collecting samples at 30 minutes after the initiation of SSC as Cong had reported. Cong reported on salivary oxytocin responses for 26 mothers and 19 fathers at three time intervals of pre SSC, during 30 minutes of SSC and 30 minutes after SSC (Cong, et. al., 2015).

SSC may be used as a strategy to support developing relationships with premature infants and their parents. Our study indicated salivary oxytocin levels increased for infants held SSC and that infants with higher oxytocin levels had more responsive and synchronous interactions. During sensitive periods of bond formation between the parent and preterm infant, the infant's brain is sensitized to reciprocal occurrences of physiological systems and behavioral patterns with these interactions (Feldman, Rosenthal, & Eidelman, 2014; Feldman, Gordon, Influss, Gutbir, & Ebstein, 2013). The literature defines these sensitive periods in early infancy as critical to support the developing relationships between infants and their parents (Feldman 2013; Feldman, 2015). Conversely, early responsive and synchronous contact may positively influence cognitive and developmental outcomes for the child (Gordon et al., 2010).

A recently published study which examined biobehavioral factors in child health outcomes identified maternal stress and maternal-child engagement, play a significant role in the regulation of the infant's stress responses (Clowtis, Kang, Padhye, Rozmus, & Barratt, 2016). These researchers found that mothers with lower levels of maternal-child engagement had elevated salivary cortisol levels. Our results indicated similar findings that mothers with higher salivary cortisol levels and lower levels of salivary oxytocin had less synchronous and responsive interactions with their premature infants.

Animal studies have revealed bio-behavioral provisions embedded within the mother-infant dyad help to organize the infant's physiological systems, stress response and social orientation (Champagne, Diorio, Sharma, & Meaney, 2001; Hofer, 1995). Feldman describes the sensitive period of parent-infant interactions as the opportunity for bond formation, where the infant's brain is sensitized to mutual influences; physiologically, behaviorally and with interactions to create a synchronous process (Feldman, 2013). The intervention of SSC increases endogenous OT release for parents and infants to decrease stress in the NICU and facilitate synchronous interactions. Our findings were consistent with this earlier work and have implications within the clinical setting that SSC can be used to decrease stress and anxiety in mothers, fathers and infants in the NICU. Infant salivary cortisol levels decreased during SSC whether the infant was held by the mother or the father indicating that SSC is an important strategy to decrease stress with both parents. This study validates the need to encourage fathers to participate in SSC as well. Interestingly, mother and father salivary levels decreased during SSC yet these differences did not reach statistical significance.

Maternal responses that are adaptive and sensitive to the infant's behavioral repertoire support the infant to use regulatory strategies to enhance calm alert states and facilitate learning (Kalinauskiene et al., 2009). Consistent with the results of our study, the biobehavioral responses of decrease in salivary cortisol during SSC and improvement in infant co-regulatory responses have previously been reported in the literature (Neu & Robinson, 2010). The premature infant is at risk for less synchronous interactions due to the infant's developing nervous system and diffuse behavioral cues (Forcada-Guex, Pierrehumbert, Borghini, Moessinger, & Muller-Nix, 2006). Our study confirms SSC may be used as a strategy to support these developing relationships with more synchronous interactions between parents and their premature infant.

Implications for practice

The oxytocinergic system was activated for the infant whether the infant was held by the mother or the father. Engaging fathers in SSC with their premature infants is a priority to enhance their developing relationships. Additional research is needed to understand the mechanisms salivary oxytocin plays in father-infant interactions with preterm infants. This study validates that SSC can and should be used to decrease parent and infant stress in the NICU. In addition SSC activates endogenous OT release as well as a decrease in salivary cortisol in mothers, fathers and infants indicating this is consistent with the theory that early infancy is a sensitive period in the development of the HPA axis regulation. This provides significant implications for the intervention of SSC to improve child health outcomes via bio-behavioral mechanisms to facilitate synchronous interactions between parents and their premature infants.

To identify effect size we converted the calculations from partial eta-squared, which provided the percent of variation of the dependent measures (OT, SC, VAS) that is explained by the manipulation of the experimental condition (SSC). Eta-squared identifies a small effect equals .02, a medium effect is identified at .13 and a large effect is .26 (Pierce, Block, & Aguinis, 2004). Based on calculations of eta-squared with our data a medium-effect was seen, see Table 3 for specific results.

Limitations

Despite the small sample size the findings demonstrated statistically significant findings with robust effects that SSC activates oxytocin release in mothers, fathers and infants, in addition to decreasing salivary cortisol levels and parental anxiety, yet further research with a larger sample size is needed to generalize findings. Our sample demographics also were primarily Caucasian participants with parents having a college education which may have influenced the

findings. Another limitation was the cross-over study design which does not allow us to define clear causality.

Conclusion

This study addresses the gap in understanding the mechanisms that links parent-infant contact to bio-behavioral responses, which is an important step in exploring oxytocin as a potential moderator to improve infant developmental outcomes and the effect on responsive interactions between mother-infant and father-infant. Skin-to-skin holding provides an opportunity to active oxytocin release for mothers, fathers and infants. In addition SSC decreases mother-father-infant salivary cortisol levels and parental anxiety. The nursing intervention of facilitating SSC implementation should be used to reduce parent and infant stress in the NICU.

Acknowledgements

This study was supported with funding from the American Nurses Foundation (Eastern Nursing Research Society), National Association of Neonatal Nurses, Sigma Theta Tau International (Mu Chapter) and the University of Connecticut, School of Nursing (Toner funds).

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Table 1
Parental Demographic Characteristics

Characteristics	Mother		Father		M	SD	Frequency (n)	%	M	SD
	Frequency (n)	%	Frequency (n)	%						
Gender										
Female	28	100								
Male			28	100						
Race										
Asian	1	3	1	3						
Black	3	11	4	14						
Hispanic	5	18	4	14						
White	19	68	19	68						
Age					32	±1.13			33	±1.38
20-24 years old	4	14	3	11						
25-29 years old	6	22	9	32						
30-34 years old	8	29	4	14						
35-39 years old	8	29	7	25						
40-44 years old	1	3	3	11						
45-52 years old	1	3	2	7						
Employment status										
Employed Full-time	19	69	24	88						
Employed part-time	4	14	1	3						
Full-time homemaker	2	7	1	3						
Student	1	3	1	3						
Unemployed	2	7	1	3						
Education level										
Completed High School	2	7	3	11						
Completed Some College (1-3 yrs)	9	32	12	43						
Completed 4 years College	8	29	10	35						
Completed Graduate School	9	32	3	11						
Marital Status										
Married	23	82	23	82						
Single	5	18	5	18						

Table 2

Infant Demographic Characteristics

Characteristics	Frequency (n)	Mean	SD	%
Gender				
Female	9			32
Male	19			68
Race				
Asian	2			7
Black	4			14
Hispanic	5			18
White	17			61
Gestational age at birth		33	± 1.57	
30-30 6/7	4			14
31-31 6/7	5			18
32-32 6/7	1			3
33-33 6/7	3			11
34-34 6/7	15			54
Weight (grams)		1882	± 416.66	
900-1300	3			7
1301-1700	5			18
1701-2100	12			43
2101-2500	5			18
2501-2900	3			3
Snappe II		3.93	± 7.78	
0	21			75
7-10	3			11
18-21	3			11
22-27	1			3
Apgar Score (1 minute)		7.11	± 2.04	
0-4	4			14
5-7	7			25
8-10	17			61
Apgar Score (5 minutes)		8.29	± 1.27	
0-4	1			3
5-7	4			14
8-10	23			87
Mode of Delivery				
Vaginal	11			39
Cesarean	17			61

Table 3

RM-ANOVA Salivary Oxytocin and Cortisol Responses to SSC

Sequence of SSC:	Before SSC		During SSC		After SSC		<i>F</i>	<i>p</i>	η^2	Summary of Significant Differences
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
Oxytocin pg/mL										
Mother (n=28)	161.97	±104.91	275.09	±173.54	202.25	±104.91	23.19	.001	.094	
Infant/mother M-SSC (n=28)	134.71	±104.69	306.72	±275.48	223.44	±214.02	8.05	.002	.052	
Father (n=27)	142.99	±112.69	211.86	±159.87	153.85	±88.32	8.21	.001	.066	
Infant/father P-SSC (n=27)	130.71	±143.67	346.87	±291.63	260.98	±232.08	21.88	.001	.137	
Cortisol ug/dL										
Mother (n=28)	.152	±.140	.147	±.138	.109	±.085	1.94	.153	.011	NSD
Infant/mother M-SSC (n=28)	.090	±.132	.024	±.033	.055	±.071	5.85	.005	.063	
Father (n=27)	.167	±.223	.111	±.111	.097	±.093	2.81	.070	.020	NSD
Infant/father P-SSC (n=27)	.081	±.064	.019	±.024	.051	±.058	11.48	.001	.011	
Anxiety levels										
Mother (n=28)	72.00	±77.84	28.54	±54.72	32.14	±61.06	9.69	.001	.060	
Father (n=27)	43.59	±58.10	15.57	±19.57	24.41	±36.08	8.86	.003	.053	
NSD- No statistical significance										
** Using the Bonferroni adjustment required significance at the $p < .01$ level.										
* Effect size guidelines indicate .02 = small effect; .13 = medium effect; .26 = large effect										
Salivary oxytocin pg/mL; Salivary cortisol ug/dL										
VAS- Visual analogue scale measurement of parental stress and anxiety										

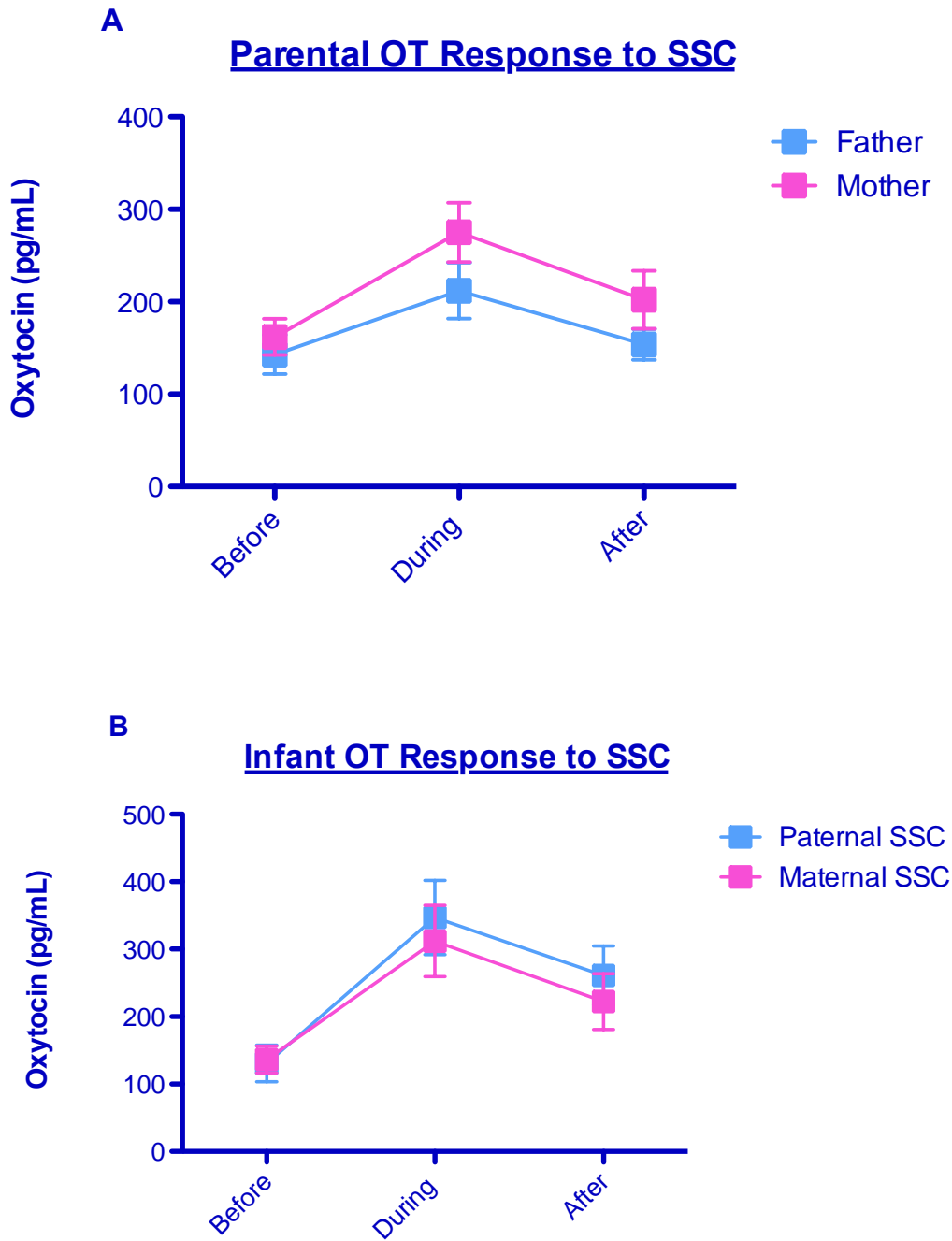


Figure 1
Salivary oxytocin responses to SSC
(Mean and SEM)

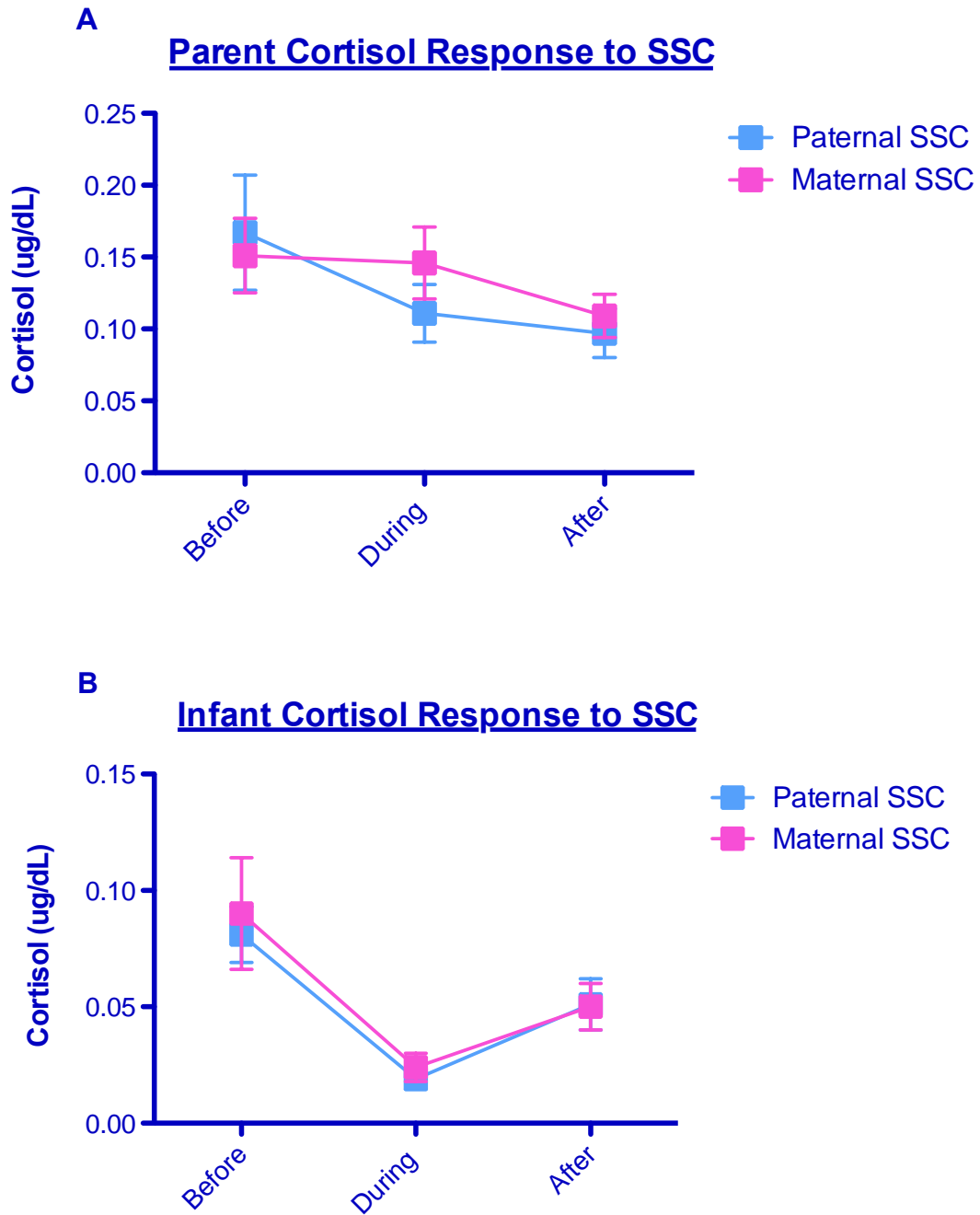


Figure 2
Salivary cortisol responses to SSC
(Mean and SEM)

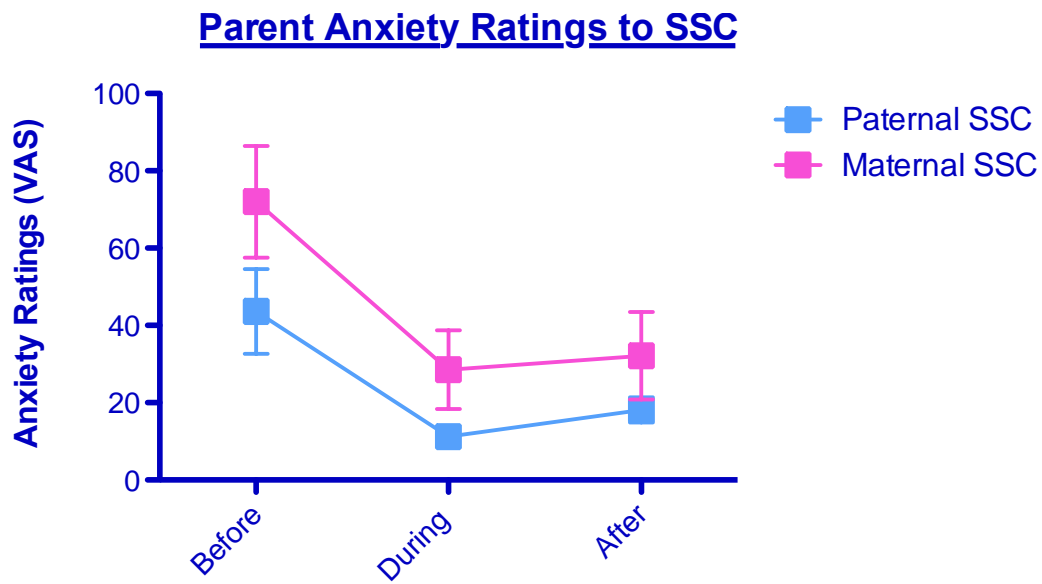


Figure 3
Parent anxiety measures to SSC
(Mean and SEM)

Dissertation Chapter 5

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Introduction

Advances in the Neonatal Intensive Care Unit (NICU) in terms of medical, technical and psychological care have improved significantly over the past several years influencing infant survival rates (EXPRESS Group, 2009). Yet the NICU is also considered a stressful environment and the preterm infant's care exposes them to several stressful interventions each day (Stevens, Abbott, Harrison, Stinson, & Taddio, 2011). Mothers describe the separation from their preterm infant in the NICU as a major stressor that influences their developing relationship (Lindberg & Ohrling, 2008). Parental touch, especially during skin-to-skin contact (SSC) can support the developing relationships between preterm the infant and their mother and father. Skin-to-skin contact is an evidenced based holding strategy that increases parental proximity and provides a continuous interactive environment known to enhance infant physiologic stability and affective closeness between parents and their infants (Feldman & Eidelman, 2003; Moore, Anderson, & Bergman, 2007; Conde-Agudelo, Belizan, & Rosello-Diaz, 2014). Yet there are several gaps where integration of research findings has not occurred and thus, evidence-based practice changes have not been made. The evidence that supports the integration of these strategies is not truly getting to the nurse at the bedside. Parenting is a transformational process with many complexities. In this chapter we will outline how each of the studies within this dissertation provides a better understanding of these gaps from different vantage points, with implications for practice and recommendations for the next steps in this research trajectory.

Implications for Practice

Parent-infant relationships are difficult to establish when infants and parents confront challenges during the early postpartum period. Early parent-infant contact is the cornerstone of

an infant's health through-out life. One challenge that has the potential to disrupt parenting is hospital routines that increase maternal-infant separation. In Chapter 2 we explored perinatal nurses' attitudes, knowledge and practices of SSC with hospitalized infants. Understanding perinatal nurse's attitudes and beliefs about SSC, serve as a predisposition to understanding nurse behaviors that directly impact the facilitation of SSC.

Nurses are highly influential during the emotionally charged time just after birth and have the opportunity to enhance the developing relationships between parents and infants (Lawhon, 2002; Johnson, 2008). Parent holding of the newborn is a powerful strategy to enhance these developing relationships. Parent holding during SSC may even be more likely to enhance developing parent-infant relationships particularly if the infant is high risk or requiring care in the NICU. Skin-to-skin is described as a diaper clad infant that is placed on the parent's bare chest ideally over their breast to establish ventral contact. Parents have identified that nurses strongly influence their experiences of SSC, by the type of information and communication that is provided by the nurse (Lemmen, Frustedt, & Lundqvist, 2013). Parents also have reported that if a nurse was knowledgeable and encouraging about SSC, parents were more motivated and likely to practice SSC (Lemmen et al., 2013).

The respondents' education levels appear to have a considerable effect on the perceptions of these perinatal nurse respondents indicating that education does influence practice and nurses' critically thinking abilities. This was evidenced as nurses with a graduate degree responded that they were less likely *to receive adequate education or training when they were oriented to their units* as compared to nurses with an associate degree or diploma in nursing (Vittner, Cong, Ludington-Hoe, & McGrath, 2016).

There continues to be a knowledge-practice gap regarding SSC, despite the array of

educational efforts over the past twenty years related to various aspects of SSC. Perinatal nurses continue to have educational needs related to the physiologic effects of SSC on the infant; safe and effective transfer techniques; and best strategies to support the mother-father-infant triad with appropriate use of SSC. A perinatal nurse's years of experience and primary practice setting appear to be associated with their level of SSC knowledge. Nurses' highest level of education also appears to be associated with SSC implementation (Vittner et al., 2016). Younger nurses with less experience and less education report increased difficulty in initiating SSC changes on their units indicating a greater need for collaboration and mentorship from more experienced and educated nurses.

The participant's responses indicated that nurses' attitudes inform their practice and influence policy development. Positive attitudes or favorable beliefs about SSC appear to have a relationship with nurses' perceptions related to SSC implementation and may translate into opportunities for practice change. In addition we found that nurses with less experience perceive parents as having greater expectations for SSC holding of their infants. Nurses with higher education levels are more apprehensive about the lack of appropriate SSC assessments and interpretation of infant responses. Interpreting accurate infant behavioral responses is imperative to creating an appropriate plan of care for the infant and family within all perinatal settings. Opportunities for next steps must include acknowledgement that education levels, practice settings and years practicing influence nurses' decision making regarding implementation of SSC. Perinatal nurses have many opportunities to influence safe and effective SSC practices. It would be beneficial to develop peer mentoring strategies within the clinical settings to support apprehensive nurses who have not developed the skills necessary to manage the complexities of SSC. This study validates the need for SSC education across perinatal settings.

In Chapter 3 we examined the qualitative literature regarding caregiver's experiences facilitating SSC to provide a synthesis of several individual studies. The majority of literature related to the nurse's experience of SSC is quantitative, examining nurses' attitudes; barriers to implementing SSC and, nurses' knowledge of SSC (Engler et al., 2002; Chia, Sellick, & Gan, 2006; Flynn & Leahy-Warren, 2010; Stikes & Barbier, 2013). The NICU is often a technology-driven environment where nurses have many tasks to accomplish throughout the day. The purpose of this meta-synthesis was to integrate the findings from several discrete studies into a more salient interpretative perspective that will lead to more targeted understanding that can be used to support implementation and facilitation of skin-to-skin holding experiences for critically ill or hospitalized infants. The reciprocal translations yielded four metaphors that were further defined by the identified overarching themes: 1) *A fork in the road*: varying thresholds of getting started; 2) *Spectrum of possibilities*: defining adequate resources; 3) *Continuing to grapple*: navigating the demands or complexity of the infant; and 4) *Dancing the waltz*: balancing parental readiness with the infant's needs (Vittner, Casavant, & McGrath, 2015). These themes comprise the health professional's experiences and influence the facilitation of SSC. The results of this meta-synthesis provided implications for clinical practice, highlighting the complexity of SSC experienced by nurses and health professionals as they navigate the competing demands in the NICU which influence when or if SSC is initiated. This manuscript also identified a knowledge-practice gap regarding SSC.

Despite the plethora of evidence to support SSC, implementation remains inconsistent. The AAP recommends SSC as a method of care for the parent-infant dyad (Baley, 2015). Core factors that contribute to inconsistent practices of SSC need further investigation. Innovative practical translations of evidence-based practice strategies of SSC to normalize SSC as the

standard of daily practice need to also be studied. Health care providers would also benefit from further research regarding the practical applications of SSC in the clinical setting that supports non-separation of the mother-father-infant triad.

Moving forward, a priority must be to enhance the critical thinking skills of the health care team to facilitate their ability to plan accordingly, as they navigate the complexities of how best to implement SSC. This could be operationalized through peer mentoring with more experienced nurses collaborating and partnering with younger less experienced nurses. Another key concept is to acknowledge the complexity of delivering SSC holding and provide opportunities for teams to work together to support each other in greater implementation of this practice. For example, advocating for nurses to articulate the complexity of the skills needed to appropriately maneuver the necessary equipment. Perhaps the bedside nurse can partner with another nurse or health professional to attend to the infant's physiologic needs to facilitate safe SSC transfers while supporting parental readiness. A final consideration is to provide strategies such as reflection that highlight the professional caregiver's experiences and intentions to practice SSC yet struggle to implement on a daily basis. Reflective strategies provide necessary opportunities for nurses to increase their awareness of their own experiences and challenges while also considering another's experience (the infant, or parent or another health professional) (Vittner, 2009). Reflection is an essential component to enhance critical thinking skills: Reflection is a process of creating meaning from interpreting experiences through purposeful thought that guides decision-making (Vittner, 2009).

In chapter 4 we more fully explore the bio-behavioral processes that are the foundation for parental touch. The NICU environment is a stark contrast to the neurodevelopmental expectations of developing infants and can induce parental stress and anxiety that have lifelong

effects. Fundamental to the infant's developmental trajectory is early parent-infant contact. Parental touch, especially during SSC reduces many of the adverse consequences of prematurity. This study addressed the gap in understanding the mechanisms that link parent-infant contact to bio-behavioral responses, which is an important step in exploring oxytocin as a potential moderator to improve infant developmental outcomes and the effect on responsive interactions between mother-infant and father-infant.

Skin-to-skin holding provides an opportunity to activate oxytocin release for mothers, fathers and infants. In addition SSC decreases mother-father-infant salivary cortisol levels and parental anxiety. The nursing intervention of facilitating SSC implementation should be used to reduce parent and infant stress in the NICU and may be used as a strategy to support developing relationships with premature infants and their parents. Our study indicated salivary oxytocin levels increased for infants held SSC and that infants with higher oxytocin levels had more responsive synchronous interactions. During sensitive periods of bond formation between the parent and preterm infant, the infant's brain is sensitized to mutual influences between physiological systems, behavioral indicators with their interactions (Feldman, Rosenthal, & Eidelman, 2014; Feldman, Gordon, Influx, Gutbir, & Ebstein, 2013). Feldman defines these sensitive periods in early infancy as critical to support the developing relationship (Feldman, 2015). Conversely, early responsive and synchronous contact may positively influence cognitive and developmental outcomes for the child (Gordon et al., 2010).

Implications for further research

Skin-to-skin contact provides an intimate connection between parents and their premature infant that has lasting effects (Chiu & Cranston Anderson, 2009). The impact of this dissertation research to enhance the developing relationships with premature infants and their parents has the

potential to decrease stress associated with the NICU experience as well as improve health outcomes for premature infants. The premature infant's neurobiological expectation to have the comfort and security of their parent's body and breast during the vulnerable NICU experience is essential to health outcomes. Another priority is to engage systems with organizational change that influence systemic use of daily SSC for all infants focusing on federal, state and organizational policy change.

Limitations

A key concept regarding the limitation of the research regarding SSC is despite the plethora of evidence to support SSC from an array of perspectives; practices remain inconsistent for mother-father-infant triads. Further research is needed to address the complexity of implementation of SSC to examine what is at the core of the resistance of daily practice for parents and infants. Engaging fathers in SSC with their premature infants is a priority to enhance their developing relationships. Additional research is needed to understand the mechanisms salivary oxytocin plays in father-infant interactions with preterm infants.

Conclusion

The infant's salivary oxytocin responses were similar whether held by the mother or father during SSC indicating a need to facilitate SSC for both parents in the NICU. The concordance for the infant's salivary cortisol responses was also similar whether the infant was held SSC by the mother or father. These results suggest the potential importance of parent-infant interactions on developing relationships to facilitate strategies to decrease stress in the NICU and create opportunities for neurobehavioral competence. The hypothalamic pituitary adrenal (HPA) axis responds to environmental and emotional stress which produces the hormone cortisol from such as SSC can affect the development of the HPA axis to support the infant's co-regulatory

competence (Clowtis, Kang, Padhye, Rozmus, & Barratt, 2016). This trajectory of research will contribute to science by increasing health care providers understanding of biobehavioral mechanisms associated with SSC. The human capacity to form enduring social relationships is essential to an individual's overall health and well being (Swain et al., 2012). These relationships manifest into fulfilling emotional experiences where parenting quality modulates the underlying emotion and stress regulation in infants (Clowtis et al., 2016). Next steps in this trajectory are to explore parent engagement in the context of the developing parent-infant relationships as well as consider both short and long term effects of parent engagement for developing self-management strategies. Parent engagement is a new concept in the literature and research in the NICU. Parent engagement can be described as active participation and decision making in their infant's care that is driven by the parents' desires, needs, skills, knowledge and values (AHRQ, 2013). Another important concept to consider is utilizing these findings to influence policy change at a systemic level in regards to education for health care professionals, integration of SSC into clinical practice of the NICU and community awareness of the influence on improving health outcomes.

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Appendix 1

Recruitment Screening – Chart Review

Data collector Initial _____

Date _____

1. Infant's Name: _____

2. Infant's Birth Date: _____ (dd/mm/yyyy)

3. Infant's Gestational Age: _____ (weeks/days)

4. Infant's Postnatal Age: _____ (days)

5. Infant's Severity of Illness (SNAPII) score: _____

6. Does the infant receive sedation or analgesics? _____ Yes _____ No

7. Does the parent have a history of Depression? _____ Yes _____ No

8. Is the infant eligible for the study? _____ Yes _____ No

9. If Yes for question 7, then the

Mother's name _____

Father's name _____

Mother's phone number: _____

Father's phone number: _____

Modified from Cong et al

Recruitment Tool
A Study of
Oxytocin and Skin-to-skin Contact

Hi, I am Dorothy Vittner, a doctoral student from the University of Connecticut School, School of Nursing. I am working on a research study to identify responses during maternal and paternal skin-to-skin contact. This method of holding is also called Kangaroo Care. We will teach you to hold your baby skin-to-skin on your bare chest over your breast. We want to see how helpful this method of holding is for improving your baby's bio-behavioral responses and reducing parents' stress and anxiety.



The first part of the study will be conducted on 3 different days (2 afternoons) – one Mother Kangaroo Care day and one Father Kangaroo Care day. You (the mother or father) will hold your baby in a Kangaroo Care day for about 60 minutes. Your baby will be observed by researchers 15 min before Kangaroo Care, 60 min during- Kangaroo Care, and 45 min post-Kangaroo Care. Your baby has heart rate electrodes attached to his/her chest as the regular NICU care connecting to a heart monitor, this cable will be connected to a laptop that will print out the baby's heart rate pattern. Salivary sample of yours and your baby's will be collected pre-, during-, and post- Kangaroo Care. You will also be asked to rate your anxiety levels. Just before your baby goes home from the hospital, a behavioral assessment will be completed on your baby as well as a 5 minute video interaction of each parent with their baby will be completed. This will be completed at a convenient time for you before your baby goes home from the hospital. We will use only study ID number on the salivary samples, and other study records as identification method, and both your baby's name and your name will be not identified.

The physical risk of the study is minimal for you and your baby. You may learn about your baby's behavior during the study. Bonding and attachment between you and your baby may be enhanced by Kangaroo Care. Everything will be kept confidential. You and your baby do not have to be in the study and you can stop being in it if you wish. There is no cost to you. You will receive \$40 for our appreciation when you complete the 2-days of kangaroo holding as well as the infant developmental assessment and 5-minute video interaction with each parent as part of this study.

Does this sound like something you would like to help us with? If you are interested in participating in the study, please contact Dorothy Vittner at 860 306 0414 for further information.

Thank you!

Modified from Cong et al

Appendix 3

Phone Script for Potential Subjects Calling the Study Team Oxytocin and Skin-to-Skin Contact

- Hi, thank you for calling. I am glad to know that you are interested in our study.
- My name is Dorothy Vittner, a doctoral student in School of Nursing at UConn. I am working on a research study of mother and father skin-to-skin contact (also called Kangaroo Care) with their preterm infants. Therefore, both the mother and father will be recruited in the study.
- We will teach you to hold your baby skin-to-skin. We want to see the basic mechanism of this method and how helpful it is for improving your baby's bio-behavioral responses and reducing parents' stress and anxiety.
- The first component of the study will be conducted on 2 days (2 afternoons) – one Mother Kangaroo Care day and one Father Kangaroo Care day. You (the mother or father) will hold your baby in a Kangaroo Care day for about 60 minutes.
- Your baby will be observed by researchers 15 min pre-, 60 min during-, and 45 min post-Kangaroo Care. Your baby has heart rate electrodes attached to his/her chest as the regular NICU care connecting to a vital monitor and a laptop that will print out the heart rate pattern. Salivary sample of yours and your baby's will collected pre-, during-, and post- Kangaroo Care. You will also be asked to rate your anxiety levels.
- Prior to your baby's discharge at approximately 36-37 weeks corrected gestational-age an infant behavioral assessment will be completed. The assessment will be done in the NICU at your baby's bed space and will take about 20-30 minutes. You are welcome to be present for exam.
- A five-minute video interaction between you and your infant will also be completed after the behavioral assessment
- We will use only study ID number on the salivary samples, and other study records as identification method, and both your baby's name and your name will be not identified.
- The physical risk of the study is minimal for you and your baby. You may learn about your baby's behavior during the study. Bonding and attachment between you and your baby may be enhanced by Kangaroo Care.
- Everything will be kept confidential. You and your baby do not have to be in the study and you can stop being in it if you wish.
- There is no cost to you. You will receive \$40 for our appreciation when you complete the 2-day kangaroo care holding as well as the infant behavioral exam and 5-minute video interaction as part of this study.
- Are you still interested in the study?
- Do you have any questions?
- If you are still interested in participating the study, we will do chart review to see if you and your baby are met the criteria of the study. If you and your baby are qualified to our study, we can meet in the NICU and further discuss the study procedures.
- Again, my name is Dorothy Vittner. My telephone number is: 860 306 0414. Please contact me if you need further information.
- Thank you.

Modified from Cong et al

Appendix 4

Enhancing developing relationships with skin-to-skin contact

Demographic Data and Medical Data Information: Mother

Study ID _____ Data collector initial _____ Date: _____ Time: _____

1. What is mother's age at birth of this child: _____
2. Gender: (1) male (2) female _____
3. Race: _____
(1) White (5) Hawaiian or Pacific Islander
(2) Black or African American (6) 2 or more selected
(3) Asian (7) Do not know
(4) Indian or Native American (8) Refused
4. Is ethnic background Hispanic? (1) yes (2) no _____
5. Employment situation before delivery: _____
(1) Employed full time (5) Part time student
(2) Employed part time (6) Disabled
(3) Full time homemaker (7) Unemployed
(4) Full time student (8) Refused
6. Education level: _____
(1) Completed graduate school (5) Some high school (10th – 11th grade)
(2) Completed 4 years college (6) Some junior high (7th – 9th grade)
(3) Some college (1-3 years) (7) Less than 7th grade
(4) Completed high school (8) Refused
7. Marital status: _____
(1) Married (4) Divorced
(2) Single (never married) (5) Widowed
(3) Divorced (6) Refused
8. Do you have history of depression: (1) yes (2) no _____
9. Pre-study SSC with this infant: (1) yes (2) no _____
10. Pre-study SSC with other infant: (1) yes (2) no _____
11. Currently smokes cigarettes: (1) yes Mother (2) no Mother _____
12. History of smoking cigarettes: (1) yes Mother (2) no Mother _____
13. Maternal parity: Gravida _____ Para _____

Modified from Cong et al

Appendix 5

Enhancing developing relationships with skin-to-skin contact

Demographic Data and Medical Data Information: Father

Study ID _____ Data collector initial _____ Date: _____ Time: _____

1. What is father's age at birth of this child: _____
2. Gender: (1) male (2) female _____
3. Race: _____

(1) White	(5) Hawaiian or Pacific Islander
(2) Black or African American	(6) 2 or more selected
(3) Asian	(7) Do not know
(4) Indian or Native American	(8) Refused
4. Is ethnic background Hispanic? (1) yes (2) no _____
5. Employment situation before delivery: _____

(1) Employed full time	(5) Part time student
(2) Employed part time	(6) Disabled
(3) Full time homemaker	(7) Unemployed
(4) Full time student	(8) Refused
6. Education level: _____

(1) Completed graduate school	(5) Some high school (10 th – 11 th grade)
(2) Completed 4 years college	(6) Some junior high (7 th – 9 th grade)
(3) Some college (1-3 years)	(7) Less than 7 th grade
(4) Completed high school	(8) Refused
7. Marital status: _____

(1) Married	(4) Divorced
(2) Single (never married)	(5) Widowed
(3) Divorced	(6) Refused
8. Do you have history of depression: (1) yes (2) no _____
9. Pre-study SSC with this infant: (1) yes (2) no _____
10. Pre-study SSC with other infant: (1) yes (2) no _____
11. Currently smokes cigarettes: (3) yes Father (4) no Father _____
12. History of smoking cigarettes: (3) yes Father (4) no Father _____

Modified from Cong et al

Appendix 6

Enhancing developing relationships with skin-to-skin contact

Demographic Data and Medical Data Information: Preterm Infants

Study ID _____ Data collector initial _____ Date: _____ Time: _____

13. Date of Birth: _____ Time: _____

14. Post-conceptual age: _____ Post natal age: _____ Corrected gestational age: _____

15. Gender: (1) male (2) female _____

16. Race: _____

- (1) White
- (2) Black or African American
- (3) Asian
- (4) Indian or Native American
- (5) Hawaiian or Pacific Islander
- (6) 2 or more selected
- (7) Do not know
- (8) Refused

17. Is ethnic background Hispanic? (1) yes (2) no _____

18. Type of birth: (1) vaginal (2) cesarean _____

19. Birth weight: _____ Current weight: _____

20. Infant birth HC: _____ Infant birth length: _____

21. Current infant HC: _____ Current infant length: _____

22. APGAR scores: (1 minute) _____ (5 minute) _____

23. Feeding: (1) yes (2) no _____

24. If #9 is yes, type of feeding? (1) oral (2) gavage (3) mixed _____

25. If #9 is yes, type of milk? (1) breastmilk (2) formula (3) donor human milk _____

26. Severity of illness (SNAPPE II) score: _____

*The Score for Neonatal Acute Physiology (SNAPPE II) is used to measure the severity of infants clinical condition. The score will be obtained from the medical chart.

27. Pre-study SSC experience with this infant: (1) yes (2) no _____

28. Pre-study SSC experience with other infant: (1) yes (2) no _____

29. Length of stay: _____

Modified from Cong et al

Visual Anxiety Scale

1. I am very worried and anxious:

Not at all		Worse than I have ever been before
------------	--	------------------------------------

2. I am very irritable and quick tempered:

Not at all		Worse than I have ever been before
------------	--	------------------------------------

3. I am feeling miserable and depressed:

Not at all		Worse than I have ever felt before
------------	--	------------------------------------

4. I am feeling useless and unavailable:

Not at all		Worse than I have ever felt before
------------	--	------------------------------------

5. I am relaxed and calm:

Better than I have ever been before		Not at all
-------------------------------------	--	------------

6. I am happy and satisfied:

Better than I have ever been before		Not at all
-------------------------------------	--	------------

7. I am feeling certain and self confident:

Better than I have ever felt before		Not at all
-------------------------------------	--	------------

8. I am feeling close and loving:

Better than I have ever felt before		Not at all
-------------------------------------	--	------------

Modified from Cong et al