

12-2-2015

# Relationships of Parent-Infant Contacts and Postpartum Depressive Symptoms in Mothers of Preterm Infants in the NICU: A Mixed Methods Approach

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Relationships of Parent-Infant Contacts and Postpartum Depression Symptoms in Mothers of  
Preterm Infants in the NICU: A Mixed Methods Approach

Victoria Vazquez, PhD

University of Connecticut, 2015

Background: Postpartum depressive symptoms in mothers of preterm infants in the neonatal intensive care unit (NICU) are a health crisis for mothers and infants. Mothers are at risk for mental suffering and infants are at risk for negative developmental outcomes.

Research Purpose: To investigate the relationship between a NICU mother's postpartum depressive symptoms and NICU parent – infant contact. Design: Mixed- methods, sequential, explanatory design Methods: Convenience sample of 26 mothers of preterm NICU infants 28 – 32 6/7 weeks gestation participated. Maternal postpartum depressive symptoms were measured using the Postpartum Depression Screening Scale (PDSS). The PDSS was administered at 14 (PDSS\_14) and 28 (PDSS\_28) postnatal days of life. Parent – infant contact was recorded. A qualitative interview was conducted with the mother on day of life 28. Descriptive analysis was used for demographic and contact data; correlation analysis was used for maternal demographic and characteristics data, parental – infant contact data, maternal data with PDSS data and parental contact data with PDSS data; content analysis was used for qualitative interviews.

Results: The majority of mothers: 25-39 years old, married, Caucasian, educated; mean infant gestational age: 30.6 weeks. Seventy percent of mothers had elevated PDSS\_14 scores and 60% of mothers had elevated PDSS\_28 scores. High Cronbach alpha reliabilities existed for all PDSS dimensions. There were significant correlations between: maternal demographics and PDSS subscales, maternal - infant and paternal - infant contact, and between parent – infant contact and PDSS subscale and total scores. Content analysis revealed six themes: *the all*

Victoria Vazquez – University of Connecticut, 2015

*important mother-infant connection, under the maternal watchful eye, NICU staff: make or break a mother's experience, the cycle of mental and physical exertion and recovery, somebody to lean on, and a place of unending stimuli.* Discussion: NICU mothers are suffering from elevated postpartum depressive symptoms. Maternal – paternal – infant contact relationships indicate high potential for decreasing PDD symptoms. Addressing the results from the qualitative thematic analysis could be highly beneficial for NICU mothers.

Conclusion: NICU maternal postpartum depressive symptoms need to be addressed and parental – infant contacts need to be encouraged.

*Keywords:* postpartum depression, preterm, NICU, mother, father, infant, contact, postpartum depression screening scale, PDSS

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Preterm Infants in the NICU: A Mixed Methods Approach

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B.S., University of Connecticut, 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

2015

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Victoria Vazquez

2015

APPROVAL PAGE

Doctor of Philosophy Dissertation

Relationships of Parent-Infant Contacts and Postpartum Depression Symptoms in Mothers of  
Preterm Infants in the NICU: A Mixed Methods Approach

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2015

## Acknowledgements

First and foremost I would like to thank my main advisor Dr. Xiaomei Cong for her unending support, relentless encouragement, considered guidance and unfathomable patience. Second, I would like to thank Dr. Cheryl Beck for her ceaseless support and advice and for her continued love and concern for the welfare of new mothers. Next I would like to thank Dr. Jacqueline McGrath for her directions and suggestions as to how to conduct and improve upon my study and dissertation. Lastly, I would like to thank Dr. Marilyn Sanders and Dr. Naveed Hussain for their time, expertise and kind hearted feedback for this dissertation from its inception to completion.

I am enormously grateful to my friends and family who supported me on this long and at times difficult journey. My father, who providing me with an education, instilled in me from a young age the curiosity and love of science and the expectation of completing a college education and my mother who was such a wonderful, consistent, loving, primary attachment figure for me. My long suffering best friends Trudy, Elizabeth and Colleen who, never more than a short phone call away, provided a frequent, non-judgmental, encouraging ear for my many anxious and uncertain moments during this process.

I would also like to thank Elise Bennett, the best graduate assistant boss ever and more and my work friends and colleagues for their support.

I greatly appreciate the parents who agreed to take part in this study.

I am grateful every day to God for providing me with a career as a neonatal intensive care nurse that I love as much 15 years later as the first day I started.

## Table of Contents

	Topic	Page
Chapter 1	Background and Significance	
	Background	1
	Significance	5
	Statement of Problem	5
	Theoretical Framework	9
	Purpose Statement	11
	Research Questions and Hypotheses	11
Chapter 2	Literature Review	
	Postpartum Depression in the General Population	14
	Postpartum Depression in the Neonatal Intensive Care Unit	18
	Postpartum Depression Screening Tools	25
	Effects of Maternal Depression	26
Chapter 3	Methodology	
	Design	35
	Sampling and Participants	35
	Instruments	36
	Data Collection Procedure	42
	Data Analysis and Management	44
	Protection of Human Subjects	46



## Table of Contents (Continued)

Chapter 4	Results	
	Recruitment and Participants	49
	Descriptive Statistics on Maternal and Paternal-Infant Contact	53
	Correlations Among Demographics and Maternal and Paternal-Infant Contact	57
	Statistical Analyses of PDSS Scores	59
	Correlations Between Maternal Demographics and PDSS Scores	67
	Correlations Between Individual Maternal and Paternal-Infant Contact and PDSS Scores	69
	Correlations Between Combined Maternal and Paternal-Infant Contact and PDSS Scores	71
	Qualitative and Mixed Methods Results	74
	Themes	75
Chapter 5	Discussion	
	Quantitative Findings: PDSS and Parent-Infant Contact	91
	Qualitative Findings: Themes	104
	Mixed Methods Findings	107
	Feasibility	107
	Strengths and Limitations	109
	Future Research	109

Implications for Nursing Practice	110
References	112

## Table of Contents (Continued)

Appendix A	Theoretical Framework	137
Appendix B	Mixed Methods Procedural Diagram	138
Appendix C	Maternal Demographics and Characteristics Sheet	139
Appendix D	Infant Demographics and Characteristics Sheet	140
Appendix E	Mother's Self Report of Contact with infant Log	141
Appendix F	NICU Mother-Infant <i>Plus</i> Contact Sheet	142
Appendix G	Postpartum Depression Screening Scale	143
Appendix H	SNAPPE-II	144
Appendix I	NTISS: Neonatal Therapeutic Scoring System	145
Appendix J	Data Collection Procedure Timetable	146
Appendix K	Copyright Permission for use of Postpartum Depression Screening Scale	147

## List of Tables

Table	Title	Page
Table 1	Maternal Demographics	51
Table 2	Maternal Characteristics	52
Table 3	Infant Demographics and Severity of Illness	53
Table 4	Maternal and Paternal Contact Hours for Different Types of Contact	56
Table 5	Correlations Between Types of Maternal and Paternal Contact	58
Table 6	Correlations Between Hours of Maternal and Paternal Contact	59
Table 7	Scores from PDSS administered at 14 days (PDSS_14)	61
Table 8	Scores from PDSS administered at 28 days (PDSS_28)	63
Table 9	Correlations Between PDSS_14 and PDSS_28 Scores	66
Table 10	Correlation Between Maternal Demographic and Characteristics and PDSS_14 and PDSS_28 Scores	68
Table 11	Correlation Between Maternal and Paternal Contact with PDSS_14 and PDSS_28 Scores	70

## List of Figures

Figure	Title	Page
Figure 1	Participant Flow Diagram	50
Figure 2	Correlations Between Weeks 1 & 2 and 3 & 4 Combined Maternal and Paternal Contact with PDSS Scores	73
Figure 3	Dendogram for Development of Themes	75

## **CHAPTER ONE**

### **BACKGROUND and SIGNIFICANCE**

Chapter one will introduce a brief background of maternal postpartum depression (PPD) both as it relates to the general population and as it pertains to the neonatal intensive care unit specifically. The significance of this research will be explained followed by a statement of the problem regarding the current state of the science. For the sake of time and space, a very abbreviated description of attachment theory and pragmatism as theoretical frameworks for this study will be discussed. Last will be the purpose statement, research questions and hypotheses for this study.

#### **Background**

Elevated postpartum depression (PPD) symptoms affect up to 50% or approximately 50,000-200,000 of U.S. neonatal intensive care unit (NICU) mothers annually (Center for Disease Control (CDC), 2013; McCabe et al., 2012; O'Hara & McCabe, 2013; Rogers, Kidokoro, Wallendorf & Inder, 2013; Vasa et al., 2014). However NICUs do not routinely screen for PPD symptoms, therefore these mothers may not be identified, assessed or treated. Infants of depressed mothers, in addition to and independent of being preterm, are at significant risk for impaired psychosocial development (Guedeney, Guedeney, Wendland & Burtchen, 2013). Postpartum depression is linked to altered parenting and safety practices (Field, 2010) and a portion of postpartum depressed mothers have thoughts of suicide, homicide or infanticide (Barr & Beck, 2008; Clare & Yeh, 2012; Howard, Flach, Mehay, Sharp & Tylee, 2011; Spinelli, 2004; Tabb et al., 2013). The paucity of research highlighting potential risk factors for postpartum depression in the NICU contributes to this crisis. This research investigated three potential contributing factors for elevated maternal PPD symptoms in the NICU: 1) the

frequencies, durations and types of contact the mother has with her NICU infant, 2) the frequencies, durations and types of contact the father has with the NICU infant and 3) the mother's experience of contact with her preterm NICU infant.

New mothers may experience what is termed the 'baby blues'. The 'baby blues' occur after delivery and typically last one to two weeks and are self-limiting. 'Baby blues' symptoms may include insomnia, crying episodes, mood swings and anxiety (Mayoclinic, 2012). Postpartum depression is different. Postpartum depression symptoms typically present later at 3 to 4 months and may last for up to a year or more (Mayoclinic, 2012). Postpartum depression symptoms include severe mood swings, anger, irritability, anxiety, pronounced sadness, anhedonia, feelings of hopelessness, withdrawal, and for a small but not insignificant percentage of mothers, psychosis, thoughts of suicide, homicide and infanticide (Barr & Beck, 2008; Beck, 2003, 2006; Guille, Newman, Fryml, Lifton & Epperson, 2013, Rosinger & Kautz, 2012).

For NICU mothers, infant characteristics play a potential role in the development and severity of postpartum depression. The highest rates of PPD in NICU mothers are seen in the mothers of very preterm ( $28 < 32$  weeks) and preterm infants ( $32 < 37$  weeks) (WHO, 2014) and in mothers of infants with a high severity of illness such as necrotizing enterocolitis and/or respiratory distress syndrome (Northrup, Evans & Stotts, 2013; Rogers, Kidokoro, Wallendorf, Inder, 2013; Vanderbilt, Bushley, Young & Frank, 2009; Vigod, Villegas, Dennis & Ross, 2010). The complications and uncertain outcomes of preterm delivery increase stress, fear and depression among NICU mothers. Also, physical barriers between the mother and her NICU infant including isolettes, respiratory equipment and intravenous equipment make contact between a mother and her neonate challenging. This restrictive access to and resultant decrease in contact with her infant contributes to existing heightened anxiety, fear and depression for the

NICU mother (Cervantes, Feeley & Lariviere, 2011; Flacking et al., 2012; Lee, Long & Boore, 2009).

NICU providers have a rich opportunity to see mothers early on in their experiencing of PPD symptoms. However lack of routine PPD screening of NICU mothers eliminates the advantage of early identification and assessment. While treatment options such as psychotherapy and antidepressant medication can be effective in treating postpartum depression, many patients do not respond to antidepressant medication or may not wish to take medications due to side effects or contraindications. In addition, mothers suffering from PPD symptoms may not feel symptom relief from either treatment method for several weeks (Bernard et al., 2011; Davanzo, Copertino, De Cunto, Minen & Amaddeo, 2011; Hirst & Moutier, 2010; Mayo Clinic, 2011; Papakostas, Perlis, Scalia, Petersen & Fava, 2006; Sie et al., 2012; Wisner et al., 2009). This delay in identification and thus potentially treatment, places the mother at risk for undo suffering including possibly psychosis or death (Cristescu, Behrman, Jones, Chouliaras & Ebmeier, 2015). A delay in PPD symptom relief also places the mother – infant relationship at significant risk for dysregulated and dysfunctional relational patterns potentially contributing to significantly negatively altered infant and child development (Ostler, 2015).

Few have studied the potential contact between a NICU mother and her infant has to influence maternal depressive symptoms. Yet evolving research indicates that as a mother engages in activities with her infant her symptoms of postpartum depression decrease (Bigelow, Power, MacLellan-Peters, Alex & McDonald, 2012; Dombrowski, Anderson, Santori & Burkhammer, 2001; Feldman, Eidelman, Sirota & Weller, 2002). For instance, participating in kangaroo care and infant massage has been shown to decrease maternal stress, anxiety and postpartum depression symptoms (de Alecar, Arraes, de Albuquerque & Alves, 2009; Feijo et



al., 2006; O'Higgins, St. James Roberts & Glover, 2008).

While the results from previous studies showing a decrease in PPD symptoms with maternal – infant contact are valid and helpful, much PPD symptomatology may be being missed due to the instruments chosen to assess PPD. PPD screening has typically been conducted using the Center for Epidemiologic Study – Depression (CES-D) (Radloff, 1977) or the Edinburgh Postnatal Depression Scale (EPDS) (Cox, Holden & Sagovsky, 1987). The CES – D however is designed to assess general depression in the general population (Radloff, 1977). The EPDS while being more PPD specific is still reflective of general depression and is very brief (Cox, Holden & Sagovsky, 1987). The brevity of the EPDS is both positive and negative; positive because it may be completed very quickly but negative because there is much to PPD symptomatology that is not adequately reflected in its 10 items. The Postpartum Depression Screening Scale (PDSS) however is solely PDD specific and captures a wider range of PPD symptomatology (Beck & Gable, 2002).

To date, no research has focused on analyzing the patterns of various frequencies, durations and types of contact between the NICU mother and father with the preterm NICU infant for the first 28 days and how these contact patterns relate to maternal PPD symptoms. Second, no research to date has utilized a mixed methods approach to investigate the relationship between maternal contact patterns with her preterm infant and PPD symptoms. Investigation of the patterns of contact between a NICU mother experiencing PPD symptoms and her NICU infant potentially offers the following benefits: 1) early assessment thus enhancing the potential for successful early intervention, management and treatment of postpartum depression and 2) improved maternal mood enhancing maternal-infant interaction and contact thus contributing positively to an infant's psychosocial development.

### **Significance**

The potential beneficiaries of this research are several -fold. First, the depressed NICU mother may benefit through earlier identification of PPD symptoms. Second, the NICU infant may benefit from this study with improved psychosocial outcomes secondary to reduced maternal PPD symptoms. Third, interventions aimed at increasing the frequency and quality of maternal-infant interactions that occur between a NICU mother experiencing PPD symptoms and her NICU infant can then be developed and incorporated into NICU practice. It is widely known that preterm infants are at greater risk for suboptimal developmental outcomes (Bardin, Piuze & Papageorgious, 2004; Moore et al., 2012; Serenius et al., 2013; Taylor, Minich, Klein & Hack, 2004) and early loss of maternal contact contributes to increased risk of psychosocial disorders for the infant later in life (Hennessy, Deak & Schiml-Webb, 2010). Improving and/or enhancing the quality of engagement between NICU mother and NICU infant may enhance the potential for optimal infant development. Finally, the community may benefit from this research because optimizing the mother-infant relationship may positively influence the trajectory for both infant and mother to becoming healthy, contributing members of society.

### **Statement of Problem**

It is estimated that 10-20% of new mothers in the general population suffer from postpartum depression (CDC, 2013; Mental Health America, 2015). However, NICU mothers' postpartum depressive symptom rates are higher. In U.S. NICUs, up to 50% of mothers screen positive for elevated postpartum depressive symptoms (McCabe et al., 2012). There has been inadequate research on PPD symptoms in the maternal NICU population and the means to detect PPD has varied significantly. While research has investigated the potential link between certain types of physical maternal-infant contact and PPD (Feldman, Eidelman, Sirota & Weller, 2002;

Holdtich-Davis et al., 2014), the specific frequencies, durations and additional types of contact in connection with postpartum depressive symptoms has not been explored fully. In addition, the effect of partner support in relation to PPD is also not well understood. No study to date has explored the impact of paternal – NICU infant contact on maternal PPD symptoms. This study is unique in its use of a mixed methods research approach to investigate mothers' subjective experiences of contact with her infant in light of postpartum depression symptoms. In conclusion, lack of early, appropriate, accurate and effective postpartum depression screening places NICU mothers at high risk for unidentified and thus untreated mental suffering with potentially serious consequences for both mother and infant. There is a significant gap in research investigating the effectiveness and necessity of early NICU maternal postpartum depression screening and the potentially modifiable maternal and infant contributing factors of PPD in the NICU.

Addressing the statement of the problem in greater depth, it is deleterious that more research is not conducted to investigate the phenomenon of PPD in NICU mothers including the need for PPD screening and intervention from NICU admission to discharge (Beck, 2003; Vasa et al., 2014). Typically, research on maternal depression as it pertains to maternal-infant interaction outcomes has occurred, with a minuetia of exceptions, several weeks or months after discharge (Horowitz et al., 2001). For instance, research has investigated risk factors for and predictors of PPD in the NICU (Poehlmann, Swichtenberg, Bolt & Dilworth-Bart, 2009; Rogers, Kidokoro, Wallendorf & Inder, 2013), but only three studies screened mothers for PPD within the NICU admission to discharge period (McCabe et al., 2012; Shaw et al., 2013; Vasa et al., 2014) or as in the case of Hatters Friedman et al. (2013) and Shaw et al. (2013), provided an intervention within the NICU stay period. If an outcome evaluation on maternal depressive

symptoms can be reliably done prior to discharge, all the more quickly a mother –infant dyad can be evaluated and a potentially depressed mother be offered referral and treatment.

Second, much of the previous research investigating PPD has used instruments not specific to postpartum depression. For instance, many studies have used the Center for Epidemiologic Studies Depression (CES-D) (Bigelow, Power, MacLellan-Peters, Alex & McDonald, 2012; Poehlman, Schwichtenberg, Bolt & Dilworth-Bart, 2009) or the Beck Depression Inventory (BDI) (Feldman, Eidelman, Sirota & Weller, 2002). Both of these instruments have been widely used and validated for research on depression in the general population. However, neither were designed nor intended to detect postpartum depression symptomatology. Several studies have used the more postpartum depression specific Edinburgh Postnatal Depression Scale (EPDS) (Bigelow, Power, MacLellan-Peters, Alex & McDonald, 2012), yet the content covered in this instrument is still more reflective of general depression as opposed to postpartum depression and asks about potential symptoms from the last 7 days. On the other hand, The Postpartum Depression Screening Scale (PDSS) (Beck & Gable 2000, 2001) was crafted from extensive qualitative and quantitative research and asks about potential PPD symptoms from the last 14 days resulting in a more thorough postpartum depression specific assessment and screening. It is also the most recently validated tool for assessing PPD in the NICU (McCabe et al., 2012).

Third, very little research has been conducted investigating the contact patterns between a post-partally depressed mother and her preterm NICU infant, particularly how specific frequencies, durations and types of contact may influence postpartum depression as measured by the PDSS or visa versa. For instance, research investigating contact between a depressed mother and her NICU infant has looked primarily at kangaroo care and PPD symptoms (Bigelow,

Power, MacLellan-Peters, Alex & McDonald, 2012; Feldman, Eidelman, Sirota & Weller, 2002).

This is to the exclusion of several additional types of contact that potentially occur between a NICU mother and her preterm infant.

Fourth, much research investigating the relationship between maternal depression and her contact patterns with her infant has focused on maternal self-efficacy as a factor in maternal depression outcomes (Høivik, Burkeland, Linaker & Berg-Neilsen, 2013; Zubaran & Forseti, 2013). Yet, this research is conflicting as to the potential impact maternal self-efficacy has on postpartum depression (Høivik, Burkeland, Linaker & Berg-Neilsen, 2013; Zubaran & Forseti, 2013). Therefore, using self-efficacy as a measurement or alleviator of postpartum depression may be disadvantageous. Mothers of very preterm, low birth weight or ill infants may not be able to participate early on in the usual activities that mothers of healthier and bigger infants do, such as bottle or breastfeeding that typically aid in developing maternal self-efficacy.

Fifth, research has indicated that social support has both positive and negative influences on postpartum depression based on the level and source of support (Fahey & Shenassa, 2013). Being married and extended family involvement for instance, has been shown to be a risk factor for increased PPD symptoms (Mohammad, Gamble & Creedy, 2011; Rogers, Kidokoro, Wallendorf & Inder, 2013). There has been no research investigating how a NICU father's contact with the mother's preterm infant potentially impacts her postpartum depressive symptoms.

Lastly, there have been no studies utilizing a mixed methods approach to investigate the phenomenon of postpartum depression in the NICU. There have been qualitative studies investigating the maternal NICU experience (Cervantes, Feeley & Lariviere, 2011; Cleveland, 2009; Fenwick, Barclay & Schmeid, 2008). There have been studies on the maternal experiences

of engaging in kangaroo care in light of reducing maternal depression (Bigelow, Power, MacLellan-Peters, Alex and McDonald, 2012). There have been quantitative studies on the assessment of PPD in the NICU (McCabe et al, 2012; Vasa et al., 2014). But there have been no studies combining both qualitative and quantitative methods in one study to investigate the phenomenon of PPD in the NICU.

## **Theoretical Framework**

### **Attachment Theory**

Humans are hard wired for interaction. While we come into the world helpless and defenseless, evolution has equipped us with tactics to ensure social interaction and thus survival. Crying, laughing, cooing and additional infant behaviors almost always guarantee a connection with an ‘other’ who will provide nourishment and protection from predators. Psychoanalyst John Bowlby (Bowlby, 1978) believed that there was more purpose to these outward infant behaviors than simply to receive nutrition and protection. Bowlby believed a driving force behind these infant behaviors also indicated attempts at securing human interaction. More specifically that infants need to become attached to a primary caregiver, usually mother, for optimal growth and development. This secure attachment figure must be safe, secure, close in proximity, reliable and predictable. Through the mother-infant connection, the infant learns that the mother will respond to its distress. To the degree that the infant gets its distress responded to in a comforting, timely and reliable manner, is the degree to which it will develop trust. This early trust in the primary attachment figure then forms the base from which subsequent relationships will be gauged and formed. Conversely, maternal responses that are absent, severely diminished, dismissive, harsh, intrusive, or otherwise disruptive to the infant, some or all of which may be present in and expressed by the depressed NICU mother, undoubtedly contribute to negatively altered cognitive

and psychosocial development of the infant that may persist into later childhood and adulthood (Turney, 2012).

### **Pragmatism**

The merging of the results from both the qualitative and quantitative data at the end of the study, hence the term mixed – methods, comes from a pragmatic perspective. Pragmatism states that the importance and validity in the research comes from the relevance and usefulness of the models and solutions that were applied to a specific target (Aragona, 2013; Leech, Dellinger, Brannagan & Tanaka, 2010; Polifroni & Welch, 1999). The focus of pragmatism is not on validating a theory, but rather concerns itself with: Does the applied model and/or resultant observations and interventions have utility regardless of whether the ‘theory’ is correct or accurate? Do the results from the investigation help in a practical way? Do the results help a broader population than just those involved in the study (Aragona, 2013; Leech, Dellinger, Brannagan & Tanaka, 2010; Polifroni & Welch, 1999)? Put another way, what are the consequences of the application of certain models, of observations, of interventions, of results? Did these help or hurt the target population? What are the consequences of doing a study investigating the contact patterns between a mother with elevated postpartum depressive symptoms and her preterm NICU infant? For this research study, incorporating the pragmatic perspective means the 1<sup>st</sup> and 2<sup>nd</sup> PDSS scores along with the contact information are all the more valuable when explained in light of the qualitative interviews. Were the contact patterns reflective of the mother’s postpartum depressive symptoms? Did the mother feel particular types of contact interaction with her preterm infant impacted her postpartum depressive symptoms? Second, the qualitative responses allow us to assess the generalizability of the findings to a broader population, ie., is the proposed method of evaluating the contact patterns between a

mother with elevated postpartum depressive symptoms and her preterm NICU infant easy to use and relevant to the mother and therefore would it be similarly easy and relevant for mothers with elevated postpartum depression symptoms in other NICUs outside of this study? See Appendix A (Figure 1.) for theoretical framework diagram.

### **Purpose Statement**

The primary purpose of this mixed- methods, sequential, explanatory study was to investigate the relationship between a NICU mother's postpartum depression symptoms and the frequencies, durations and types of parent – infant contact in the NICU. First, longitudinal quantitative data on maternal and paternal contacts with infant and PDSS scores were collected and analyzed to investigate the relationships between the frequencies, durations and types of parental-infant contact and the scores from the mother's 1<sup>st</sup> and 2<sup>nd</sup> PDSS screens. Second, qualitative data from in depth, one- on -one interviews were collected and analyzed to explore in greater detail the relationship between the NICU mother's subjective experience of having contact with her infant and her postpartum depression symptoms. Third, at the end of the 28 days, qualitative data were analyzed in light of PDSS data to more greatly elaborate on results from the PDSS data. Finally, this study was also designed as a feasibility study to investigate the feasibility of the current methodology for this targeted population.

### **Research Questions and Hypotheses**

#### **Quantitative Research questions**

1. What are the frequencies, durations and types of contact between the mother, father and their preterm NICU infant during the first 28 days of life (DOL)?
2. What is the relationship between maternal demographic data and contact patterns and between maternal – infant contact and infant demographic and severity of illness data?



3. What is the relationship between maternal contact patterns and breast-feeding?
4. What is the relationship between maternal – infant and paternal –infant contact with NICU infant during the first 28 days?
5. What are PDSS results of NICU mothers on infant's days of life 14 and 28?
6. What is the relationship between maternal demographic and characteristics data and infant demographic and severity of illness data and PDSS scores?
7. What is the relationship between individual maternal– infant and paternal – infant contact and scores from the PDSS administered at 14 days (PDSS\_14) and scores from the PDSS administered at 28 days (PDSS\_28) ?
8. What is the relationship between combined maternal – paternal infant contact and scores from the PDSS\_14 and PDSS\_28?

### **Qualitative Research Question**

9. What are the specific and global NICU experiences and the maternal – infant contact for mothers of preterm infants?

### **Mixed methods research question**

10. In what ways do the qualitative data on the maternal NICU experience help explain the quantitative data from the PDSS scores?

### **Hypotheses**

The NICU mother's PDSS scores will be inversely correlated with:

1. the frequencies, durations and types of contact she has with her preterm NICU infant during their first 28 days of life.
2. the frequencies, duration and types of contact the father has with the preterm NICU infant during their first 28 days of life.

### **Summary**

To summarize chapter one, a significant number of mothers of preterm NICU infants suffer from elevated postpartum depressive symptoms. This is a health crisis for both mother and infant. This mixed- methods, sequential, explanatory study was conducted to further investigate maternal postpartum depressive symptoms using the PDSS as the measurement for PPD symptoms. It was also conducted to study the maternal and paternal contact patterns between each parent and their preterm, NICU infant and to investigate the relationship between these parental – NICU infant contacts and PPD symptoms. Lastly, this study was conducted to better understand the maternal NICU experience as it may have related to postpartum depressive symptoms.

Chapter two will address the literature review. The literature review will present research pertaining to PPD in the general and NICU population. In addition, the negative effects of maternal depression on infants, including the harmful effects of maternal emotional and physical separation will be discussed. Last, the beneficial effects of maternal – infant intimacy and closeness for both mother and infant will be highlighted.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

Chapter two will review research literature pertinent to postpartum depression. First, the prevalence and predictors of PPD in the general population will be examined. Second, the prevalence and predictors of PPD in the NICU population will be discussed. Third, the harmful effects of maternal physical and emotional separation, as potentially in the case of maternal depression, for the infant will be discussed. Lastly, in contrast, the beneficial effects of maternal - infant closeness for both mother and infant, as it especially relates to PPD symptoms, will be highlighted.

#### **PPD in General Population: Prevalence and Predictors**

##### **Prevalence**

Postpartum depression rates in the general U.S. population are between 10 – 20% (APA, 2015; Craig & Howard, 2009) and close to 45% in U.S. Armed Forces mothers (Chu, Emasealu, Hu, O'Donnell & Clark, 2015). There is yet consensus as to clearly definitive causative factors of PPD. Contributing factors for PPD include: 1) a genetic predisposition, 2) a history of premenstrual dysphoric disorder, perinatal depression/anxiety, posttraumatic stress disorder (PTSD), major depression, a major depressive episode or postpartum depressive episode with previous births, 3) being of lower socio-economic and educational status, 4) being married and 5) lack of social support, having a history of abuse, particularly an abusive relationship with a significant other or intimate partner and additional psychosocial stressors during the pregnancy (Beck, 2003; Beydoun, Al-Sahab, Beydoun & Tamim, 2010; Buttner et al., 2013; El-Ibiary et al, 2013; Fahey & Shenassa, 2013; Haagen, Moerbeek, Olde, van der Hart & Kleber, 2015; Janssen,

Heaman, Urquia, O'Campo & Theissen, 2012; Hirst & Moutlier, 2010; LaCoursiere, Hirst & Barrett-Connor, 2012; Logsdon, Tomasulo, Eckert, Beck & Dennis, 2012; Meltzer- Brody, 2011; Mohammad, Gamble & Creedy, 2011; Norhayati, Hazlina, Asrenee, & Emilin, 2015; Oppo et al, 2009; Panthangi, West, Savoy-Moore, Geeta & Reickert 2009; Plaza et al., 2012; Sylvan, Ekselius, Sundstrom, Poromaa & Skalkidou, 2013).

### **Predictors**

A meta-analysis by Beck (1996) of 44 studies revealed 8 predictors for PPD. Using Cohen's (1988) definition for effect size (ES): small ( $r = .10$ ), medium ( $r = .30$ ) and large ( $r = .50$ ), the resultant predictors with medium to strong effect sizes were: a history of previous depression (.27 to .29), marital dissatisfaction (.29 to .37), maternity blues (.35 to .37), prenatal anxiety (.30 to .36), lack of social support (.37 to .39), life stress (.36 to .40), child care stress (.48 to .49) and prenatal depression (.49 to .51). In a second meta-analysis of 84 studies, Beck (2001) found 13 predictors for PPD. The resultant predictors from smallest to largest ES were: an unplanned or unwanted pregnancy (.14 to .17), lower socioeconomic status (.19 to .22), marital status (unmarried) (.21 to .35), maternity blues (.25 to .31), infant temperament (.33 to .34), history of depression (.38 to .39), poor marital relationship (.38 to .39), lack of social support (.36 to .41), life stress (.38 to .40), prenatal anxiety (.41 to .45), child care stress (.45 to .46), prenatal depression (.44 to .46) and low self-esteem (.45 to .47).

Similarly, in a systematic review of 150 psychosocial articles relevant to PPD risk factors, Yim, Tanner Stapleton, Guardino, Hahn-Holbrook and Dunkel Schetter (2015) found the strongest social predictors for PPD to be: lower socioeconomic status, unmarried, no relationship

with infant's father, poor marital/partner relationship including experiencing intimate partner violence and perceived and actual lack of social support.

In a meta-analysis including 43 studies investigating associations between paternal and maternal postpartum depression, results indicated a moderately strong association ( $r = .308$ ) between paternal postpartum depression and maternal postpartum depression at 3-6 months (Paulson & Bazemore, 2010). Similarly, in a study of 200 couples, prenatal depression, lack of social support and paternal depressive symptoms were all significantly correlated ( $p < .01$ ) with maternal postpartum depressive symptoms at 6 months (Ngai & Ngu 2015). In a study with 1,423 mothers, Katon, Russo and Gavin (2014) found the women with postpartum depressive symptoms as opposed to those who did not, were more likely to be younger, single, less than college educated, unemployed and have had depressive symptoms during pregnancy (all  $p < .0001$ ), have comorbid conditions such as diabetes and migraines, experienced intimate partner violence ( $p < .05$ ) and have had a preterm birth or very low birth weight infant ( $p < .01$ ). In their regression model Katon, Russo and Gavin (2014) found being younger, unemployed, having comorbid pregnancy conditions, taking antidepressants, and smoking and drinking during pregnancy were all significant ( $p < .05 - p < .000$ ) predictors of postpartum depressive symptoms.

### **Depression and anxiety**

Having a history of general depression, perinatal or previous postpartum depression is one of the strongest predictors for PPD. Lynch and Prasad (2014) found an almost twice - elevated odds/risk (OR 1.93) for postpartum depression if the mother had perinatal depression symptoms and Nielsen Forman, Videbech, Hedegaard, Dalby Salvig & Secher, (2000) found a

twice elevated risk (OR 2.1) of PPD with a history of perinatal depression. Contributors for perinatal depression are childhood and adulthood abuse (Alvarez-Segura et al., 2014; Choi & Sikkema, 2015). Choi, Bishai and Minkovitz (2009) found mothers with a previous hospitalization for mental health and drugs or alcohol had an 84% elevated risk (OR 1.87) and an almost 2.7 times (OR 2.67) higher risk respectively, for PPD symptoms at 9 months. Sit et al. (2015) found a history of childhood trauma to be a contributing risk factor for PPD. Specifically, for depressed mothers who indicated positively to suicidal thoughts or ideations on a postpartum depression-screening item, those with childhood abuse had almost 1.7 times increased odds for self-harm thoughts (OR 1.68). Wosu, Gelaye and Williams (2015) found childhood trauma including sexual abuse was associated with previous depression ( $p < .01$ ) and perinatal depression ( $p < .01$ ; OR 1.20) but not postpartum depression directly. De Venter et al. (2015) found childhood trauma was associated with previous depression ( $p < .01$ ) and perinatal depression ( $p < .01$ ) and that a history of depression was positively associated ( $p < .05 - .001$ ) with postpartum depression at 3, 12 and 24 months postpartum.

### **Marital/Partner Status**

Choi, Bishai and Minkovitz (2009) in a retrospective study of more than 8,000 mothers found being married was negatively associated with, and increased the risk of, PPD symptoms (OR 0.57). In a retrospective study of 5,395 Massachusetts' mothers between 2007 -2010 investigating associations between pre-pregnancy pre-birth stressors, PPD and help seeking behaviors, Stone et al. (2015) used the PRAMS (Pregnancy Risk Assessment Monitoring System) to investigate stressors and PPD risk. The PRAMS yes/no questions specific to partner issues 12 months prior to birth included: arguing with partner, partner not wanting pregnancy,

separation/divorce, partner/mother went to jail, someone close to mother had drinking/drug problem. They found grouped partner stress (all partner items grouped together) to have the strongest (Prevalence Ratio (PR) = 1.90) (almost 2 times) association with increased PPD at 3 -4 months postpartum.

### **Suicidality**

Suicidal ideation is one of the most critical maternal postpartum depression complications. In a retrospective study Kim et al. (2015) found 3.4% of postpartum respondents reporting suicidal ideation with 1.1% having an active suicide plan, although 13.1% of the suicidal ideation group reported not understanding the question fully. Among the significant risk factors for suicidal ideation were being of race other than Caucasian, Hispanic or African American ( $p < .001$ ), single ( $p < .01$ ), on public assistance ( $p < .001$ ) and having a 'pre-existing mental health diagnosis' ( $p < .001$ ). Sit et al. (2015) found at 4-6 weeks postpartum, 5.4% of mothers responded 'sometimes' or 'quite often' to item #10 from the EPDS (Cox, Holden and Sagovsky, 1987) which states, "the thought of harming myself has occurred to me". In this group a history of childhood physical and sexual abuse increased the risk of self-harm ( $OR = 1.677, p < .05$ ).

### **Socioeconomic/educational status/maternal age**

Among 40,337 women from 16 states enrolled in a CDC infertility and follow-up study, Prevention's Pregnancy Risk Assessment Monitoring System (PRAMS), from 2009 – 2010, Lynch and Prasad (2014) found younger maternal age mothers (ages 20 – 24) had the most postpartum depressive symptoms and the mothers with less than college education had an increased risk ( $OR 0.87$ ) of postpartum depressive symptoms. Choi, Bashai and Minkovitz

(2009) found lower socioeconomic status increased risk of postpartum depressive symptoms at 9 months by 58% (OR 1.58).

### **PPD in the NICU: Prevalence and Predictors**

#### **Prevalence**

PPD rates in mothers of NICU infants are higher than in the general population, ranging from roughly 20% to slightly more than 60%. In a study by Hatters Friedman et al., (2013) investigating short- term psychiatric service in the NICU, psychiatrist interviews revealed 40% of mothers had depression, 31% had anxiety and 5% had PTSD. Mothers more likely to be referred for psychiatric services had a very low-birth-weight infant. Timing of the psychiatric interviews was not mentioned. In a sample of low -income mothers of very low- birth -weight premature infants, Garfield et al. (2015) screened NICU mothers within the first 3 months of admission and found 42% of mothers suffered from elevated PPD symptoms as measured by the CES-D. Vasa et al. (2014) found 19.1% of mothers had elevated PPD scores on the EPDS at 2 weeks. In a study investigating the impact of depressive symptoms and smoking habits on breastfeeding practices with mothers of high respiratory-risk infants, Northrup, Wooten, Evans and Stotts (2013) found close to 38% of mothers had elevated depression- screening scores on the CES-D. These mothers were approached within the first 12 hours of their infant being on a ventilator and asked to complete a packet which included the CES-D questionnaire. In a study investigating depression and anxiety symptoms in NICU mothers, Segre, McCabe, Chuffo - Siewert and O'Hara (2014) found > 25 % of NICU mothers had elevated depression scores on the EPDS which was completed on average 8 days into the infant's hospitalization. In a study to assess risk of depression after discharge in mothers with very preterm infants, Rogers, Kidokoro,



Wallendorf and Inder (2013) found 20% of mothers had elevated depression scores as measured by the EPDS at discharge. Average timing of discharge was not specified. In a study to investigate maternal depression in mothers of preterm infants from hospitalization up to 27 months, Miles, Holditch – Davis, Schwartz and Scher (2007) found 63% of mothers had elevated scores while in the NICU and greater than 20% of these mothers still had elevated PPD scores at 22 months as measured by the CES-D. In their first of two studies investigating the factor structure of the PDSS, Blucker et al. (2014) found 35.6% of mothers had a positive screen and 30.4% had highly elevated PPD symptoms at 2 weeks postpartum as measured by the PDSS. In their second study, Blucker et al. (2014) found 52% screened positive for PPD symptoms and 30% were at risk for postpartum depression at 2 weeks postpartum as measured by the PDSS. Similarly, investigating the reliability of the PDSS for the NICU, McCabe et al. (2012) found 52% of mothers screened positive for PPD symptoms and an additional 30% of mothers screened at risk for elevated PPD symptoms at 2 weeks postpartum.

## **Predictors**

### **History depression/anxiety/PTSD**

Garfield et al. (2015) found significant predictors of elevated PPD symptoms to be elevated posttraumatic symptoms ( $p < .01$ ) and increased state anxiety ( $p < .01$ ). Vasa et al. (2014) found significant predictors for PPD to be mothers with a reported history of substance abuse ( $p < .05$ ) and depression with a previous pregnancy and current pregnancy ( $p < .000$ ). Segre, McCabe, Chuffo - Siewert and O'Hara (2014) found a history of perinatal depression in 41% of the 25.5% of mothers who had elevated EPDS scores.

Acute Stress Disorder (ASD) is a risk factor for PTSD and PTSD is a risk factor for postpartum depression in NICU parents (Lefkowitz, Baxt and Evan, 2010; Shaw, Bernard,

Storfer-Isser, Rhine & Horwitz, 2013). A percentage of NICU parents experience either ASD or PTSD symptoms during the NICU stay and within the first 6 months post discharge (Holditch-Davis, Bartlett, Blickman & Miles, 2003, Vanderbilt, Bushley, Young & Frank, 2009). At one week, Mehler et al. (2014) found parents of preterm NICU infants had significantly higher ( $p < .05$ ) depression and PTSD scores than parents of healthier full term NICU counterparts. Lefkowitz, Baxt and Evans (2010) found at  $\geq 30$  days post- NICU discharge, 15% of mothers qualified for PTSD and of those mothers, 39% screened positive for elevated postpartum depressive symptoms and close to 17% had subsyndromal PPD. PTSD was significantly correlated with PPD and a history of depression (both  $p \leq .001$ ).

High maternal stress and anxiety from an altered parental role and increased anxiety and worry over their infant has been suggested as a potential risk factor for postpartum depression in the NICU (Davis, Edwards, Mohay & Wollin, 2003). In the qualitative research, Cervantes, Feeley and Lariviere (2011) found mothers to be highly worried regarding long term effects of NICU treatment regimes and potential pain and discomfort their infant may be experiencing. Fegran, Helseth and Fagermoen (2008) found mothers very much wanted close proximity to and to hold their infant, but were at the same time highly fearful. In Fenwick, Barclay and Schmied (2008) mothers reported not being able to feed their infant was highly distressing and distancing, contributing significantly to the feeling of loss in the maternal role. Lee, Long and Boore (2009) found mothers were very anxious and distracted over the small size and acuity of their infant.

### **Social support/ Socioeconomic/Educational status/Maternal age**

Lack of social support, lower socioeconomic and lower educational status has consistently been shown to be a risk factor for PPD in NICU mothers. In a population of low-income mothers, Garfield et al. (2015) found mothers not living with the father of the infant and

increased maternal age to be significant predictors (both  $p < .02$ ) of elevated PPD symptoms. Tahirkheli, Cherry, Tackett, McCaffree and Gillaspay (2014) found lack of social support to be a significant predictor for PPD especially for young, lower-income, single mothers. Helle et al., (2015) found lack of social support to be a significant predictor of PPD in all the regression models ( $p < .01 - p < .001$ ). Nielsen Forman, Videbech, Hedegaard, Dalby Salvig and Secher (2000) found perceived lack of social support increased the risk of elevated postpartum depression symptoms by more than 3 ½ times (OR 3.6). Parfitt and Ayers (2014) found poor partner support was significantly associated with elevated postpartum mental health problems (OR 8.0,  $p < .01$ ).

Conversely, the presence of supportive extended family, biological family, church family or partner mitigates NICU PPD symptoms (Lee, Long & Boore, 2009; Poehlmann, Schwichtenberg, Bolt & Dilworth-Bart, 2009; Schenk & Kelley, 2010; Tahirkheli, Cherry, Tackett, McCaffree & Gillaspay, 2014). Social support is also a buffer against PTSD symptoms in the case of emergent cesarean section as compared with vaginal delivery ( $p < .05$ ) (Noyman – Veksler, Herishanu-Gilutz, Kofman, Holchberg & Shahar, 2015). NICU staff support is also effective at mitigating postpartum depressive symptoms while encouraging maternal -infant contact (Blomqvist, Frölund, Rubertsson & Nyqvist, 2013; Hane et al., 2015; Seidman et al., 2015).

### **Marital/Partner status**

Marital status has been inconsistently linked with PPD in NICU mothers. An explanation for this may be that if the marriage/partner relationship is strong and supportive, it may not become a predictor. But obviously, if the marital/partner relationship is contentious, unhealthy or becomes so because of the stress of the situation, it could become a significant predictor for PPD.

Rogers, Kidokoro, Wallendorf and Inder (2013) found being married to be a predictor for PPD ( $p < .001$ ). Alkozei, McMahon and Lahav (2014) found being married was associated with maternal stress ( $p < .05$ ) and maternal stress was correlated with elevated PPD symptoms ( $p = .001$ ).

### **Assisted Reproductive Technology (ART)/ Multiple Births**

It is not definitive as to whether mode of conception or parity increases the risk of postpartum depression. What is known is that assisted reproduction technology (ART) may increase the risk of multiple births, low birth weight infants, delivery complications and NICU admissions (Fumagalli et al., 2012; Qin et al., 2015) thus increasing maternal fear, anxiety and depression. For instance Lee, Liu, Kuo and Lee (2011) found frequency of IVF treatments ( $> 3$  cycles) and cesarean birth were significantly correlated ( $p < .05$  and  $p < .01$  respectively) with postpartum depression but having multiple births or a preterm birth was not. Lynch and Prasad (2014) found an increased, though not statistically significant, risk of postpartum depressive symptoms in mothers of multiples, but they, as well as McMahon et al. (2011) did not find statistically significant relationships between ART and PPD. Conversely, Choi, Bishai and Minivitz (2009) found mothers of multiples as opposed to singletons had an 43% elevated risk (OR 1.43) of having PPD symptoms 9 months after birth. Comparing mental health symptoms at 18 -20 weeks gestation (T1), 2 months postpartum (T2) and 1 year postpartum (T3), in parents of twins and singletons using ART versus parents of twins and singletons who did not (control), Vilska et al. (2009) found at T1 mothers of ART twins had less depressive symptoms than control mothers ( $p < .001$ ); at T2 both ART and non-ART mothers of twins had greater depression and anxiety symptoms than mothers of singletons ( $p < .05$ ) and at T3 ART and control mothers of twins had significantly more depressive symptoms than mothers of singletons ( $p < .01$ ) While specific associations between ART, NICU admissions and PPD have not been

exhaustively studied, it is conceivable how unexpected complications of ART may significantly contribute to maternal fear, anxiety and depression (Agostini et al., 2009; Csatordai et al., 2007; Fisher, Hammarberg & Baker, 2005; Hyrapetian, Loucaides, Sutcliffe, 2014; Nielsen Forman, Videbech, Hedegaard, Dalby Salvig & Secher, 2000; Pados et al., 2012).

### **Infant Severity of Illness**

Infant severity of illness, including lower gestational age and birth weight, has and has not been associated with greater risk of PPD symptoms (Howe, Sheu, Wang & Hsu, 2014). Segre, McCabe, Chuffo - Siewert and O'Hara (2014) found infant severity of illness, and infant prematurity (gestational age and weight) was associated ( $p < .05$ ) with greater 'negative emotionality' which included depression symptoms. Choi, Bishai and Minkovitz (2009) found having a cesarean birth increased the risk of PPD symptoms at 9 months, as did delivery complications (OR 1.12) and having a moderately preterm birth (gestational age (GA) 33-36 weeks) (OR 0.91 to 1.04) or very preterm birth (GA < 33 weeks) (OR 1.21 to 1.42). Grigoriadis et al. (2013) in their meta-analysis found a preterm delivery increased the odds of postpartum depression 37% (OR 1.37,  $p < .05$ ). Rogers, Kidokoro, Wallendorf and Inder (2013) found days the infant was on ventilator was a significant factor ( $p < .001$ ) for elevated PPD symptoms. In a study investigating risk factors for PPD in parents of preterm infants versus term infants, Helle et al. (2015) found being a mother of a preterm versus term infant carried a 5 – 18 times greater risk of PPD ( $p < .001$ ) and in the regression modeling, being a mother of a very low birth weight (< 1500 grams) infant was the most significant predictor of PPD ( $p < .001$ ).

In a systematic review of 26 studies conducted between 1990 – 2005 of 2,392 mothers with preterm (GA < 38 weeks) and low birth weight (< 2500 grams) and very preterm (GA < 33 weeks) and very low birth weight (<1500 grams) infants, Vigod, Villegas, Dennis and Ross

(2010) found mothers of these infants to be at greater risk of PPD. PPD screening was done with several different instrument including the CES-D, Beck Depression Inventory (BDI), EPDS and the Structured Clinical Interview (SCID). Screenings took place between 1 to 60 weeks postpartum. PPD rates in individual studies ranged from as low as 0% at 60 weeks postpartum (Kersting et al., 2004) to as high as 40% at 4 weeks postpartum (Davis et al., 2003) and 28 weeks postpartum (Segal et al., 1995).

Simply having an infant in the NICU poses risk of elevated PPD symptoms. In a retrospective study of 2,391 U.S. mothers, Farr, Denk, Dahms and Dietz (2014) found that of the 13% of mothers with postpartum depressive symptoms, up to 32% had had infants in the neonatal intensive care unit. Lynch and Prasad (2014) found in mothers who had received IVF, having their infant admitted to the NICU increased her odds (OR 1.29) of postpartum depressive symptoms. Hoedjes et al. (2011) found of mothers with preeclampsia, a NICU admission increased the risk of PPD by 3 fold (OR 3.19).

### **Postpartum Depression Screening Tools**

Screening instruments and timing of screening has varied significantly. The most common screening instruments have included the: Edinburgh Postpartum Depression Scale (EPDS), Center for Epidemiologic Studies – Depression (CES-D), Patient Health Questionnaire (PHQ-9), Beck Depression Inventory (BDI), Structured Clinical Interview for DSM-IV (SCID) and the Postpartum Depression Screening Scale (PDSS). Timing of screenings has ranged from 1 week to 60 weeks postpartum (Vigod, Villegas, Dennis & Ross, 2010). Important to note is that timing of PPD screening is important because if the screening is done within the first 2 weeks the results may be indicative of the ‘baby blues’ which are common, self-limiting and self resolving postpartum symptoms (Mayoclinic, 2012).

The BDI (Beck, 1978), CES-D (Radloff, 1977) and PHQ-9 (Kroenke, Spitzer & Williams, 2001) were designed to assess general depression in the general population. The EPDS was designed to assess general depressive symptoms within the last 7 days post birth (Cox, Holden & Sagovsky, 1987). The PDSS was designed to assess a range of postpartum specific symptoms within the last 14 days post birth (Beck & Gable, 2000). The PDSS Short Form (the first 7 items) has been found to be more accurate ( $p < .05$ ) in screening postpartum mothers at 6-8 weeks post-birth than the PHQ-9 (Hanusa, Scholle, Haskett, Spadaro & Wisner, 2008). The PDSS Long Form (all 35 items) has the highest sensitivity and specificity rates (ability to detect postpartum depression) as compared to the EPDS and the Beck Depression Inventory –II (BDI-II) (Beck & Gable, 2001). For postpartum depression screening in the NICU specifically, Blucker et al. (2014) found certain PDSS subscales too highly correlated and as such felt the instrument would benefit from alteration and further testing to more highly reflect the maternal NICU experience. Conversely, McCabe et al. (2012) found the PDSS valid and reliable for NICU use with alpha coefficient for the total instrument .95 and the subscale coefficients ranging from .72 to .89. Cross culturally, including use in Canada, Brazil and Thailand, the PDSS had 96-98% specificity meaning of those mothers who screened negative, there was a 96 – 98% chance they did not have PPD (truly negative) and 72% - 94% sensitivity meaning the instrument correctly identifies PPD 72% - 94% of the time (Zubaran, Schumacher, Roxo & Foresti, 2010).

### **Effects of Maternal Depression**

#### **Behavior Towards Infant**

Depressed and anxious mothers have altered neural responses to infant behavior in the deep areas of the brain which regulate affect, motivation, reward, attention and fear responses (Barrett & Fleming, 2011; Moses-Kolko, Horner, Phillips, Hipwell & Swain, 2014) thus

potentially contributing to altered maternal-infant relating. Depressed and anxious mother interact less frequently with their infants (Field, 2010; Muzik et al., 2013; Tietz, Zietlow & Reck, 2014; Wan & Green, 2009; Zauderer, 2008) and when they do interact with their infant they typically have less positive or even detrimental engagement and contact patterns with their infant. For instance, maternal depression has been linked with intrusive, hostile and otherwise mentally disruptive behaviors towards the infant (Field, 2010; Field, Diego & Hernandez - Reif, 2009; Weinberg & Tronick, 1998). A secondary result from Korja et al. (2008) indicated that maternal depression was associated with previous history of depression and that these depressed mothers at all measurement time points had less interactions with their infants, were less responsive to their infants and had a more depressed affect when they did interact with their infant. In a meta-analysis by Lovejoy, Graczyk, O'Hare and Neuman (2000) investigating the relationship between maternal depression and maternal-infant interaction, researchers found that depressed mothers interacted less with their infant, played less with their infant, were more negative, disruptive and hostile in their interaction with their infant and had overall significantly decreased synchronous interactions with their infants. A greater negative affect during mother-infant contact was seen in mothers with current depression as opposed to mothers with lifelong or remittent depression, though similar detrimental relational patterns were seen in the latter but with a smaller effect. Similarly, in a secondary data analysis by Cho, Holditch-Davis and Miles (2008), mothers of more medically fragile infants were found to have more depressive symptoms and the depressed mothers of these medically fragile and premature infants had less interactions with, were less attentive to and had more depressed affect during interactions with their infant than mothers of healthier, older preterm infants.



### **Effects of NICU mother – infant separation for mother**

Loss of maternal role as the mother is prevented from engaging in typical maternal behavior such as touching, diaper changing, holding or feeding her infant is a contributing factor for PPD symptoms (Howe, Sheu, Wang & Hsu, 2014). Barriers to maternal-infant contact serve to foster anger, depression, anxiety, loss of maternal role and loss of engagement by mother in maternal care giving behaviors. Barriers can be physical and psychological, the majority of both can be corrected by NICU nurses. Physical barriers include but are not limited to, the isolettes, respiratory equipment (endotracheal tubes, CPAP, nasal cannula tubing) and lack of personal/private space. Psychological barriers include lack of education for mothers on the benefits of maternal-infant contact and resistance or lack of support from nursing staff to encourage and provide for maternal-infant contact opportunities (Anderzén Carlsson, Lamy & Eriksson, 2014; Blomqvist, Frölund, Rubertsson and Nyqvist, 2013; Seidman et al., 2015)

### **Effects of NICU mother-infant separation on infant**

Infants who have experienced significant maternal emotional and physical separation and neglect suffer from numerous adverse psychosocial and developmental responses and outcomes (Field et al., 1988; Field, 1994; (Beck, 1995; Conroy et al., 2012; Feldman et al., 2009; Guedeney, Guedeney, Wendland & Burtchen, 2013; Nulman et al., 2012; Reck, Muller, Tietz & Mohler, 2013; Schmid et al., 2011; Strathearn, 2011; Tronick & Reck 2009). Infants of depressed mothers have increased rates of anxiety, depression and additional behavioral disorders from childhood through adulthood (Kersten-Alvarez et al., 2012; Turney, 2012). Infants of depressed mothers have more gaze aversion than infants of non-depressed mothers and have in general, a less synchronus and beneficially responsive relationship with mother (Beebe et al., 2008; Field, 1994). One year olds who had depressed mothers since infancy had negatively

altered developmental outcomes as compared to their one- year old counterparts of non-depressed mothers (Hart, Jones, Field & Lundy, 1999). Newborn infants of depressed mothers have negatively altered responses to themselves, others and the environment (Field, Diego & Hernandez-Reif, 2009). Maternal-infant separation results in louder and more intense infant cry from infant (Christensson, Cabrera, Christensson, Unvas-Moberg & Winberg, 1995; Michelson, Christensson, Rothganger & Winberg, 1996) and the longer the separation the greater activation of the infant's stress response system (Elverson, Wilson, Hertzog & French, 2012). Animal and human research has shown that maternal –infant separation as an example of early life stress, alters hypothalamic-pituitary-adrenal (HPA) axis response by inducing genetic modifications in the infant offspring that contribute to later life depression (Coplan et al., 2010; Francis, Diorio, Plotsky & Meaney, 2002; Goodman, Stroh & Valdez, 2012; Juruena, 2013; Kember et al., 2012; Martisova et al., 2012; Plotsky & Meaney, 1993; Zhang et al., 2013) and other additional psychiatric disorders (Carlyle et al., 2012; Goodman, Stroh & Valdez, 2012). Research with primates has shown that maternal separation negatively impacts immune and antibody responses in the offspring (Coe, Rosenberg & Levine, 1988; Laudenslager, Reite & Harbeck, 1982).

### **Maternal-Infant Contact in the NICU**

#### **Benefits for mother**

Contact between a mother and her NICU infant is beneficial for the mother. Intimate maternal-infant contact as what occurs during skin-to-skin contact is an activity that can enhance and restore the mother's sense of her maternal role, decreasing her anxiety (Anderzén-Carlsson, Lamy and Eriksson; 2014; Dombrowski, Anderson, Santori and Burkhammer (2001). The main type of contact researched showing a positive relationship between maternal-infant contact and a reduction in PPD symptoms has been via kangaroo care or skin – to –skin contact (Anderzén-

Carlsson, Lamy and Eriksson; 2014; de Macedo, Cruvinel, Lukasova & D'Antino; 2007, Dombrowski, Anderson, Santori and Burkhammer, 2001; Feldman, Eidelman, Sirota and Weller, 2002). For this contact, if medically stable, the naked, diapered infant is placed on the mother's bare chest and covered with her shirt or blanket for varying periods of time. In several studies, skin-to-skin contact has been shown to benefit mother with a reduction of PPD symptoms.

Anderzén-Carlsson, Lamy and Eriksson (2014) found in their meta-synthesis of 27 qualitative articles on the maternal experience of skin-to-skin that mothers found the experience empowering and facilitated her bond with her infant. Bigelow, Power, MacLellan-Peters, Alex and McDonald (2012) revealed mothers who engaged in skin-to-skin contact showed a significant decrease ( $p < .05 - p < .01$ ) in PPD screening posttest scores compared to mothers who had not. In Dombrowski, Anderson, Santori and Burkhammer (2001) the mother stated skin-to-skin contact was a useful method in decreasing her feelings of fear, anxiety and depression and that skin-to-skin contact helped her develop maternal self-efficacy and confidence and encouraged bonding between herself and her daughter. de Macedo, Cruvinel, Lukasova and D'Antino (2007) found improved mood, increased calm, decreased anxiety, decreased sadness, increased happiness and increased contentedness with mothers who did skin-to-skin contact with their infant as compared with the mothers whose infant remained in the isolette during maternal visitation ( $p < .05 - p < .01$ ). Feldman, Eidelman, Sirota and Weller (2002) found that mothers of higher risk, more medically fragile and sicker infants had higher initial depressive scores. At the prior to discharge assessment, mothers in the skin-to-skin contact group had an overall decrease in depressive scores as compared with mothers who did not do skin-to-skin contact ( $p < .001$ ). The skin-to-skin contact mothers also viewed their infants more

positively, vocalized more with, looked more at and touched their infants more than the mothers in the control group ( $p < .01$ ).

Even maternal- infant contact that includes basic eye and touch contact can result in improvement in maternal mood. Holditch-Davis et al. (2014) found mothers who performed ATVV (auditory, tactile, visual, vestibular) stimulation during periods of infant message with their infant during and after the NICU admission versus usual kangaroo care, at the 12 – month time point had a greater longitudinal decline in and leveling off of depressive symptoms than did the mothers in the kangaroo care only group ( $p < .05$ ). Also, infants in the ATVV group were more awake and alert than infants in the kangaroo care only group ( $p < .001$ ) during the NICU stay. At discharge, infants in the ATVV group were more responsive than the infants in the KC only group ( $p < .001$ ).

### **Breastfeeding**

Breastfeeding may have potential positive effects on maternal postpartum depressive symptoms and a lack of breastfeeding in the NICU is associated with elevated PPD symptoms (Grigoradis et al., 2013). The potential positive antidepressant and anxiolytic effects may stem from increasing oxytocin, the ‘bonding hormone’, additional pro-lactation hormones and decreasing cortisol through restored hypothalamic-pituitary-adrenal (HPA) axis functioning (Heinrichs et al., 2001; Glynn, Davis and Sandman, 2013; Okabe, Yoshida, Yakayanagi & Onaka, 2015; O’Keane et al., 2011; Sibolboro Mezzacappa & Endicott, 2007). In addition, breastfeeding increases the mother’s familiarity with her infant through increased touching and visual interactions. As mother and infant gain breastfeeding competency, the mother’s sense of her maternal role, confidence and mastery increase reducing maternal anxiety and depression (Figueiredo, Dias, Brandão, Canário & Nunes-Costa, 2013).

## **Benefits for infant**

Research is clear that contact with mother, especially intimate contact such as in the case of skin-to-skin contact, is highly physiologically beneficial and comforting to the infant (Karlsson, 1996; Karlsson, Heinemann, Sjörs, Nykvist & Agren, 2012; Park et al., 2013). For infants, intimate contact results in heart and respiratory rate stabilization (Bergman, Linley & Fawcus, 2004), a decrease in the number of oxygenation desaturation episodes (Mitchell, Yates, Williams & Hall, 2013), improved thermoregulation (Fransson, Karlsson & Nilsson, 2005; Karlsson, Heinemann, Sjörs, Nykvist & Agren, 2012), a decrease in crying and pain response (Ludington-Hoe, Hosseini & Torowicz, 2005; Kostandy et al., 2008;), an initiation and enhancement of vocalization between infant and mother (Velandia, Matthissen, Unväs-Moberg & Nissen, 2010), a strengthening of bonding (Neu & Robinson, 2010; Tuoni, Scaramuzzo, Ghirri, Boldrini & Bartalena, 2012) and an improved mother-infant dyadic relating pattern (Bystrova et al., 2009). Daily maternal NICU visitation (though specific maternal-infant contact was not analyzed) decreases the risk ( $p < .05$ ) of later childhood psychosocial developmental problems (Latva, Lehtonen, Salmelin & Tamminen, 2004).

## **Holding**

In a study evaluating the relationship between crying, holding patterns and quality of maternal-infant interactions at 6 and 12 months of preterm infants < 32 weeks gestation and <1501 grams and their full term counterparts, Korja et al. (2008) found the preterm infants especially benefitted from increased holding by mother. While higher frequency of crying was found with the preterm infants ( $p = .01$ ), perhaps indicating a greater need for external modulation for their immature internal modulatory capabilities, their overall affect and interactive behaviors were significantly improved by increased maternal holding at 6 months

( $p < .05$ ). This greater holding of the preterm infants was also associated with a better quality of maternal-infant relationship compared to infants held less as exhibited in better responsiveness from mother and greater synchronous interactions between mother and her preterm infant ( $p < .05$ ).

### **Kangaroo Care**

Kangaroo care or skin-to-skin contact between mother and infant is highly beneficial for infant (Nyqvist et al., 2010). A meta-analysis of 2518 low birth-weight infants showed that kangaroo care infants as compared to usual care infants, showed improved growth, decreased morbidity and mortality from complications such as sepsis and were discharged from the hospital sooner (Conde-Agudelo, Belizan, Diaz-Rossello, 2011). Bigelow and Power (2012) found full term infants who participated in skin-to-skin contact showed greater visualization, smiling and vocalization responses to changes in maternal behavior at 1 month (all  $p < .05$  respectively); at 2 months for visual and smiling (both  $p < .001$  respectively) and at 3 months ( $p < .001$  for visual and smiling and  $p < .05$  for vocalization) compared to full term, non –skin-to-skin contact infants.

### **Kangaroo care and infant autonomic response**

When investigating the effect of kangaroo care on a preterm infant's heart rate variability (HRV) during a painful procedure (heel stick), Cong, Ludington-Hoe, McCain & Fu (2009) found that preterm infants in the kangaroo care group, as opposed to an incubator care group, had significantly better regulated sympathetic/parasympathetic response, as measured by HRV, before, during and after the painful procedure ( $p < .05 - .001$ ). Collados-Gomez, Aragonés-Corral, Contreras-Olivares, García-Feced and Vila-Piqueras (2011), found kangaroo care to have a significant positive effect on improving a preterm infant's autonomic responsiveness and

regulation as evidenced by a decrease in arching, finger splaying, frowning, apnea and tachycardia while increasing oxygenation saturations ( $p < .05$ ). Feldman & Eidelman (2003) found that preterm infants who participated in kangaroo care for little more than an hour a day over the course of 14 days had better vagal tone maturation ( $p < .05$ ) as measured by HRV as well as additional psychomotor and behavioral markers ( $p < .05 - .01$ ) at the 37 week assessment than did their counterparts who did not participate in the kangaroo care intervention.

### **Summary**

In summary, it is clear from the literature that a significant percentage of NICU mothers suffer from PPD symptoms. Mothers suffering from postpartum depression may experience severe anxiety, loss of interest in herself and others including her infant, loss of identity, mental confusion and even perhaps psychotic thoughts, suicidal thoughts and thoughts about harming or killing her infant. Risk factors for PPD most typically include having a history of general or perinatal depression, perceived lack of social support, lower socioeconomic and educational status, being in a negative marital/partnered relationship and having a medically fragile, low-birth weight, premature infant. Additional potential risk factors for PPD may include maternal age and the use of assisted reproductive technology.

Maternal depression has negative effects on the infant. Depressed mothers relate and interact less and differently with their infants than non-depressed mothers. These altered relating patterns between depressed mothers and their infants can be highly detrimental and life altering to their infant's psychosocial development. However, intimate contact between mother and infant is highly beneficial to both mother and infant by reducing PPD symptoms and encouraging infant physiological and psychosocial stabilization.

Chapter three will discuss the research methods for this study including a description of

the research design, sample, instruments and procedure. Also included in chapter three will be the research questions and data analysis. The data analysis will be divided into quantitative data analysis, qualitative data analysis and mixed – methods data analysis.



## **CHAPTER THREE**

### **METHODOLOGY**

Chapter three will discuss the research methods for this study including a description of: the research design, sample, instruments and procedure. Also included in this chapter are the research questions and data analysis. The data analysis will be divided into quantitative data analysis, qualitative data analysis and mixed – methods data analysis.

#### **Design**

A mixed- methods, sequential, explanatory design was used and the feasibility of this design was tested in this study. Quantitative data were collected on parental – infant contact and PDSS scores. The quantitative data were analyzed using descriptive and correlational statistics. Then qualitative data were collected in the form of private, semi-structured, tape -recorded interviews on the maternal NICU experience. The qualitative data were analyzed using Krippendorff's (2004) content analysis method. Finally, using mixed – methods (Creswell & Plano Clarke, 2011), results from the qualitative interview data were analyzed in light of the quantitative findings. See Appendix B (Figure 2) for mixed methods procedural diagram.

#### **Sampling and Participants**

A convenience sample of NICU mothers was enrolled in the study

#### **Sample Inclusion and Exclusion Criteria**

1. NICU mothers of preterm infants born 28 – 32 + 6/7 weeks gestational age and 7 – 10 days of life
2. English speaking
3.  $\geq 18$  years of age

4. without easily observable cognitive/developmental/psychological impairments (mothers with positive toxicology screens were eligible as long as they did not exhibit the afore mentioned impairments)
5. physically able to interact with their infant including viewing, speaking, touching, holding and participating in skin-to-skin contact with their infant.
6. Not being currently treated for general depression or postpartum depression

### **Sample Size**

Based on previous research which reported that mothers who did skin – to – skin contact with their preterm infant had less depressive symptoms as compared to controls (Feldman, Eidelman, Sirota & Weller, 2002), a medium effect size (ES)  $r = .40$ , an alpha ( $\alpha$ ) at .05 and a power of 80%, the sample size for this study was estimated to require and  $N = 46$  participants. Since this was a feasibility study designed to establish the likelihood of success with this methodology, an  $N = 26$  of eligible NICU mothers was recruited for this study.

### **Setting**

The study was conducted in 2 level IV NICUs in the Northeast US. One NICU is 72 beds and the other with 56 beds. The PDSS screenings and one –on-one interviews with mother took place either in the private family rooms immediately off the NICU or at the infant's bedside with privacy screens per mother's preference. The actual location of mother's interview based on her choosing was documented.

### **Instruments (Quantitative)**

1. The Maternal Demographic and Information Sheet: This data collection tool consisted of age, marital status, race/ethnicity, employment, education, past and current mental health history, obstetric, labor and delivery history, intimate partner support, number of children,

current medical status, medications, transportation and additional social support. See Appendix C for maternal demographic and information sheet.

2. The Infant Demographic and Information Sheet: This data collection tool consisted of gestational age at birth, post-natal days, race/ethnicity, gender, use of assisted reproductive techniques, delivery method, respiratory/chest tube/mechanical ventilation history, surfactant history, phototherapy history, intravenous nutrition history, neurologic history, Score for Neonatal Acute Physiology Perinatal Extension- II (SNAPPE-II) and Neonatal Therapeutic Intervention Scoring System (NTISS) score. See Appendix D for infant demographic and information sheet.

3. Parent's Self-Report of Contact with Infant Log. A researcher designed log that was given to the mother at time of consent. A PhD prepared nurse researcher validated the log composition. Mother and father were instructed to independently record the date, who had contact with infant (mother or father), the duration of the contact in minutes and the comfort level on a scale of 1-5 of how comfortable mother and father perceived the infant to be in during the contact period. See Appendix E for the 'Mother's Self-Report of Contact with Infant Log'.

4. The NICU Parent-Infant *Plus* Contact Interview Tool: A researcher developed instrument consisting of the days of the week (Sunday-Saturday) and date the contact occurred, who engaged in contact with infant (mother, father), what type of contact occurred (eye, touch, verbal, holding, skin-to-skin), and for how long. The mother and father's perception of the infant's level of comfort during the contact was also included. A PhD prepared nurse researcher validated the composition of the interview tool. The researcher used this instrument during the weekly check-in interviews. See Appendix F for the 'NICU Parent-Infant *Plus* Contact Interview Tool'.

5. The Postpartum Depression Screening Scale (PDSS) (Beck & Gable, 2002): The PDSS is a Likert scaled, 35 item instrument that consists of seven domains: sleeping/eating disturbances, anxiety/insecurity, emotional lability, cognitive impairment, loss of self, guilt/shame and contemplation of harming oneself. Initial content development of the PDSS was done through the use of multiple previous qualitative studies' data, focus group data and opinions of panel experts in the field under investigation, thus establishing content validity (Beck & Gable, 2001). Further development of the instrument was done as its developers administered the PDSS to 525 new mothers. Results indicated alpha reliabilities from 0.83 to 0.94 and Goodness of Fit indices of 0.87 further supporting the construct validity of this instrument (Beck & Gable, 2000). Reliability for use in NICU was found in a study conducted by McCabe et al. (2012) with N=111 NICU mothers where reliability coefficients (alpha ( $\alpha$ )) ranged from .72 to .89 for subscales (.72 anxiety/insecurity; .81 emotional lability; .83 guilt/shame; .84 sleep/eating disturbances; .87 loss of self; .87 mental confusion; .89 suicidal ideation/thoughts) and .95 for overall summative PDSS score.

The Inconsistent Responding Index (INC) is tabulated from 10 pairs of items within the long form PDSS. Each pair of items is similar in content therefore responses within each pair should be similar. If the responses within each pair are dissimilar, completion of the questionnaire may not be accurate. If the response ratings with the pair differ by more than one point, that equals one count in the INC index. A count or score of 4 or greater on the INC index indicates the participant may not have understood the item or there was an error in response. A cut – off score of 4 means there is an 85% chance that the PDSS was completed incorrectly. The reason for the item response discrepancies should be investigated as it may reflect a misunderstanding of an item due to a language or cognitive/concentration barrier or simply a

response error. If there is concern for maternal cognitive functioning, a more thorough evaluation is required (Beck & Gable 2002).

The categories for the PDSS are: sleep/eating disturbances (SLP), anxiety/insecurity (ANX), emotional lability (ELB), mental confusion (MNT), loss of self (LOS), guilt/shame (GLT), suicidal thought (SUI), inconsistent responding index (INC). Cut-off scores for the SLP, ANX, ELB, MNT, LOS and GLT subscales were established as being one standard deviation greater than the raw score used in the instrument development sample. A mother scoring above the cut-off score in any of these sub-categories is reporting more symptomatology in that area than approximately 84% of the women in the instrument development sample. Due to the significance of having elevated scores on the suicidal thought (SUI) index, the cut-off score was established to be just above the minimum possible score of 5 and thus if above, should be immediately further evaluated for level of suicidality.

A score above the cut-off for: SLP indicates a disturbance in sleep and/or eating; ANX indicates a high level of anxiety including possible psychomotor agitation, feeling overwhelmed and/or isolated; ELB indicates emotional instability; MNT indicates problems with thought process, attention and/or mental confusion; LOS indicates alterations in personal identity/perceiving herself as strange/abnormal as compared with prior to giving birth; GLT indicates significant guilt/shame with respect to being a mother; SUI indicates thoughts of harming herself. A score above the INC cut-off may indicate a respondent did not understand the items. A mother scoring on the PDSS total: 1)  $< 60$ , no referral is needed; 2) 60-79 needs to be referred for further evaluation and 3)  $\geq 80$  indicates a positive screen for postpartum depression and a definite need for social work/psychiatric referral (Beck & Gable, 2002). See Appendix G for Postpartum Depression Screening Scale (The first 5 items).

6. The Score for Neonatal Acute Physiology Perinatal Extension- II (SNAPPE-II): A nine - item instrument used to assess infant illness severity and mortality risk (Dammann et al., 2009; Gagliardi et al., 2004). Assessment is done within the first 12-24 hours either in person or by chart records on all gestational and weight infants and is based on a cumulative score from physiologic variables: birth weight, small for gestational age (SGA), 5- minute Apgar scores, urine output, lowest mean blood pressure, oxygenation (PaO<sub>2</sub>/FiO<sub>2</sub>) ratio, serum pH, presence of seizures and temperature. Researchers have applied the instrument to more than 14,000 infants in the US and Canada and found it to be a valid and reliable instrument for use in the neonatal intensive care unit (Richardson, Corcoran, Escobar & Lee, 2001). Infant severity of illness as indicated by lower birth weight and extent of respiratory support may be factors in elevated PPD symptoms in NICU mothers (Rogers, Kidokoro, Wallendorf & Inder, 2013; Vigod, Villegas, Dennis & Ross, 2010). See Appendix H for SNAPPE-II score sheet.

7. The Neonatal Therapeutic Intervention Scoring System (NTISS): A 63 item index used to assess severity of illness based on required therapy. The instrument is divided into 8 groupings: respiratory, cardiovascular, drug therapy, vascular access, monitoring, metabolic/nutrition, transfusion, and procedures including 3-10 subvariables. Infants receive a score from 1- 4 based on the technology or therapy used (subvariable) in their treatment regimen. If an infant has undergone or received more than one intervention per group, the intervention with the highest score is used. Scoring can be done as a sub or total score (Georgieff, Mills & Bhatt, 1989). This instrument was initially devised as the ‘Therapeutic Intervention Scoring System’ (TISS) for use with adults in intensive care units to determine severity of illness and patient staff/nursing ratios (Keene & Cullen, 1983), however as many of the grouping and indexes within those groupings did not include or were not relevant to the neonatal population,

the NTISS was developed and tested. Gray, Richardson, McCormick, Workman-Daniels and Goldman (1992) conducted a study with 1643 NICU infants. The infants' birth weights ranged from < 750 grams to > 2500 grams, their gestational ages ranged from < 26 weeks to > 37 weeks, both genders and Apgars at 1 and 5 minutes were included. Results for internal consistency indicated an overall alpha coefficient of 0.84. There was little correlation between NTISS scores and birth weight ( $r = -.11$ ) or gestational age ( $r = -.17$ ). However NTISS scores were highly correlated with physician assessment of mortality risk ( $r = .70, p < .0001$ ), in-hospital mortality rates ( $p < .0001$ ), hospital charges ( $r = .68, p < .001$ ), admission day Medicus scores (scores tabulated to determine patient-nurse ratios ( $r = .59, p < .0001$ ) and length of stay (LOS) ( $r = .37, p < .0001$ ). Correlations between NTISS scores and LOS, hospital charges and Medicus scores were all higher with the extremely low birth weight (ELBW), very low birth weight (VLBW) and > 2499 gram weight infants.

Oygur, Ongun and Saka (2012) conducted a study evaluating the accuracy of the NTISS to predict severity of illness for ELBW and VLBW infants. A total of 364 infants were enrolled in the study. The infants were divided into three groups according to birth weight: 1) 500-1499 grams, 2) 1000-1499 grams and 3) 500-999 grams. Results from area under the curve analyses (AUC) indicated that the NTISS in total was an accurate measure of severity of illness for the infants born < 1500 g. (0.851) and those born between 1000 g. to 1499 g. (0.834) but less so for infants born < 1000 g. (0.749). The reason for the decreased discriminatory power and therefore accuracy of the NTISS in the group born < 1000 g. was felt by the authors to be due to treatment that were typically given to a birth weight class does not necessarily indicate severity of illness but may so in a different birth weight class. For instance, using a gavage tube for enteral feeding may not indicate increased mortality risk in an infant born < 1000 g., as that is routine intervention, but

may indicate increase severity of illness if used to feed an infant born closer to term and of higher birth weight. Infant severity of illness as indicated by lower birth weight and extent of respiratory support may be factors in elevated PPD symptoms in NICU mothers (Rogers, Kidokoro, Wallendorf & Inder, 2013; Vigod, Villegas, Dennis & Ross, 2010). See Appendix I for NTISS.

### **Instruments (Qualitative)**

Private, tape-recorded, transcribed, one-to-one interviews. Potential questions asked by this researcher to the mother were:

1. 'How have you felt for the last four weeks?'
2. 'Is there anything you would like me to know your experience before we continue?'
3. 'How was your overall NICU experience for the last four weeks?'
4. 'How do you feel your contact with your infant specifically during the last first four weeks impacted your sense of well-being?'
5. 'How do you feel the contact the father's or significant other had with the infant during the last four weeks impacted your sense of well-being?'
6. 'Were there any barriers you felt prevented you from having contact with your infant and how did that impact your well-being?'

### **Data Collection Procedures**

Hospital and university Internal Review Boards (IRB) approved the study.

1. Recruitment of mothers was on infant's DOL 7-10. Eligible mothers identified by the researcher were asked if they would like to consider participating in the study. Once written consent was obtained, this researcher collected information on both mother and infant using the



‘Maternal Demographic & Information Sheet’ and the ‘Infant Demographic & Information Sheet’. Included in this data was information (scores) from the SNAPPE-II and NTISS. This researcher computed NTISS biweekly scores.

2. The mother was given the ‘Parent’s Self-Report of Contact with Infant Log’ journal and was instructed to keep a daily log of contact that occurred with her infant. She was instructed to include in her log: the type of contact she had with her infant, the duration of contact in minutes, how comfortable she perceived her infant to be during the period of contact and how she felt over all for the visit. The father of the infant was also instructed to record his contact with the infant in terms of the frequencies, durations and types and of contact and how comfortable he perceived the infant to be during periods of contact.

3. The researcher met with mother (and father if available) for weekly interviews. The researcher reviewed the mother’s log with her and recorded the contact information she and the father/significant other had with the infant as recorded in her ‘Parent’s Self- Report of Contact with Infant’ log onto the researcher’s ‘NICU Parent - Infant *Plus* Contact’ tool for this researcher’s reference. The ‘NICU Parent - Infant *Plus* Contact’ tool had the study ID number, the day of week and date, who had contact with the infant (mother and/or father), the type of contact that occurred (eye, touch, hold, STS, talk/sing/read) and duration of contact.

4. On infant’s day of life 14, the first PDSS (PDSS\_14) was administered to the mother and scored by the researcher. On infant’s day of life 28, the second PDSS (PDSS\_28) was administered to the mother and scored by the researcher. Mothers scoring  $\geq 60$  to  $\leq 80$  on the either the first or second PDSS were referred to social work services. Mothers scoring  $> 80$  or who indicated a response other than ‘strongly disagree’ individual items pertaining to suicidal

ideation or mental competency on either the first or second long form PDSS were immediately evaluated by social work services.

5. A private, in-depth, one-to-one interview pertaining to her experience of contact with her infant was conducted on infant's day of life 28. See Appendix J for data collection procedure timetable.

## **Data Analysis & Data Management**

### **Quantitative Data Analysis**

SPSS version 20 was used for data analysis and data management to answer research questions. First, descriptive statistics (means, frequencies, SDs) were run on all maternal and infant demographic data. Then, to answer:

Research question 1: Contact that occurred between mother and infant and father and infant was measured in hours and tabulated for each type of contact weekly and for all types of contact combined over the 28 day period.

Research question 2: Pearson's and Spearman's rho correlations were run between maternal demographic data and maternal – infant contacts and between maternal – infant contact and infant demographics and severity of illness indicators (SNAPPE-II and NTISS scores).

Research question 3: Pearson's and Spearman's rho correlations were run between maternal contacts and breast – feeding.

Research question 4: Pearson's correlations were run between the maternal-infant and paternal – infant contact.

Research question 5: Descriptive statistics, paired samples t-test, correlations and alpha reliabilities were run on all PDSS\_14 and PDSS\_28 data.

Research question 6: Pearson's and Spearman's rho correlations were run between maternal

demographic data and PDSS\_14 and PDSS\_28 data and between infant demographic and severity of illness data (SNAPPE-II and NTISS scores) and PDSS\_14 and PDSS\_28 data .

Research question 7: Pearson's correlations were run between individual maternal – infant and paternal – infant contacts and PDSS\_14 and PDSS\_28 data.

Research question 8: Pearson's correlations were run between combined maternal – paternal infant contacts and PDSS\_14 and PDSS\_28 data.

To test Hypothesis: Pearson's correlations were run between PDSS\_14 and PDSS\_28 scores and the durations, frequencies and types of contact the mother and father had with the preterm infant during the first 28 days of life

Research questions 9 and 10:

### **Qualitative data analysis**

1. One-on-one interviews were conducted with all mothers who completed study participation and were available on infant's DOL 28. These recorded interviews were transcribed line by line. Content from the one-on-one interviews was organized according to Krippendorff's (2004) thematic content analysis method using dendograms. According to Krippendorff, dendograms are used as a means of clustering, thus organizing, thematic content. A dendogram is a tree-like, branching diagram that maps or illustrates the analysts' thematic clustering process using significant similarities within the units under analysis. For this study specifically, similar thematic content based on the maternal experiences of the durations and types of maternal-infant contact and the impact of the durations and types of contact on her postpartum depressive symptoms, were clustered or grouped together. This process of clustering like themes occurred until all pertinent narrative content was placed in one of the like-content groups. Once all the thematic groups were determined, descriptive statements

were applied to the different grouped themes in order to illuminate and conceptually capture the mothers' specific experiences of contact with her NICU infant and her global NICU experience.

### **Mixed Methods Data Analysis**

A method of quantifying qualitative data whereby counts and frequencies of repeated meaningful words and/or word units and phrases from the qualitative interview were originally intended to be statistically correlated with PDSS\_28 scores. This was not possible due to low frequency counts of individual meaningful words or word units. Therefore, the qualitative data were manually evaluated in light of PDSS\_28 scores whereby individual participant interviews were coded as to thematic content. The participants with their coded thematic content were then arranged according to low to high PDSS scores. Thematic results were then analyzed according to low – high PDSS scoring.

### **Protection of Human Subjects**

#### **Ensuring Confidentiality**

Maternal and infant demographic data were kept in one locked cabinet. PDSS results were kept in another locked cabinet and the taped interviews were kept in a third locked cabinet. Maternal and infant information was coded, deidentified and entered into a password protected SPSS file to prevent a link to identifiable demographic information. All information in password protected files were available only to this researcher and Dr. Xiaomei Cong. Mothers were provided the options if they would prefer to be interviewed in a private room immediately off the unit or if they would like privacy screens around themselves and their infant's bedside. Tape recorders were used to ensure accuracy of transcription of interview.

## **Ethical Considerations**

Mothers were told in the consenting phase that should they express feelings or otherwise indicate thoughts or intentions to harm themselves, others or their infant, this researcher was obligated to make a referral to social work services.

## **Informed Consent**

Eligible mothers were asked if they would like to consider participating in this study. Mothers were informed that they had the right to withdraw from the study at any time without risk of damaging their relationship with their infant's physician or treatment team now or any time in the future. It was explained on the consent that should a mother screen positive for postpartum depression a referral will be made to social services and if a mother indicated a significant risk to herself or her infant, she would need to be emergently evaluated by social work services. After the study was explained, written consent was obtained. Written consent was necessary as mothers needed to be identifiable. The necessity of this was discussed with and explained to the mother. In the consent, there was a request to interview all mothers. A statement pertaining to this was, "After completion of the second PDSS, you may be asked if you would like to participate in a confidential interview about your general NICU experience as well as your specific experience of contact with your infant."

## **Summary**

Chapter three discussed the mixed methods research method of first collecting quantitative data and analyzing the quantitative data; second, collecting then analyzing the qualitative data; and third, analyzing and interpreting the qualitative data in light of the quantitative data. How confidentiality was ensured, ethical considerations and informed consent was also addressed.

Chapter four will discuss the results of this study. The results will be discussed in five sections: 1) descriptive analysis for the demographic data and additional characteristics of the mothers and infants, 2) descriptive analysis of maternal and paternal contact patterns, 3) descriptive analysis, paired samples t-test analysis, correlation analysis and alpha reliabilities of the PDSS administered at 14 days (PDSS\_14) and the PDSS administered at 28 days (PDSS\_28), 4) correlations between maternal-paternal-infant contact and PDSS\_14 and PDSS\_28 variables and 5) content analysis of maternal interviews.

## **CHAPTER FOUR**

### **RESULTS**

Chapter four will reveal the results of the study. The results are reported in five sections:

1) descriptive analysis for the demographic data and additional characteristics of the mothers and infants, 2) descriptive analysis of maternal and paternal contact patterns, 3) descriptive analysis, paired samples t-test analysis, correlations and alpha reliabilities of the PDSS\_14 and PDSS\_28, 4) correlations between maternal-paternal-infant contact and PDSS variables and 5) content analysis of maternal interviews.

#### **Recruitment and Participants**

Twenty-nine mothers of preterm infants who met inclusion criteria were approached during the 10 month period from June, 2014 to March, 2015, in 2 level IV NICUs in the NorthEast. Twenty-six mothers consented. Twenty-four mothers completed the PDSS\_14 and 20 mothers completed the PDSS\_28. Nineteen mothers completed the entire study protocol. See Fig. 1 for flow diagram of maternal participation through 28- day study protocol. Data obtained after consent but prior to withdrawal were all used in statistical analysis. Data obtained prior to infant early discharge or transfer were also retained and used in statistical analysis.

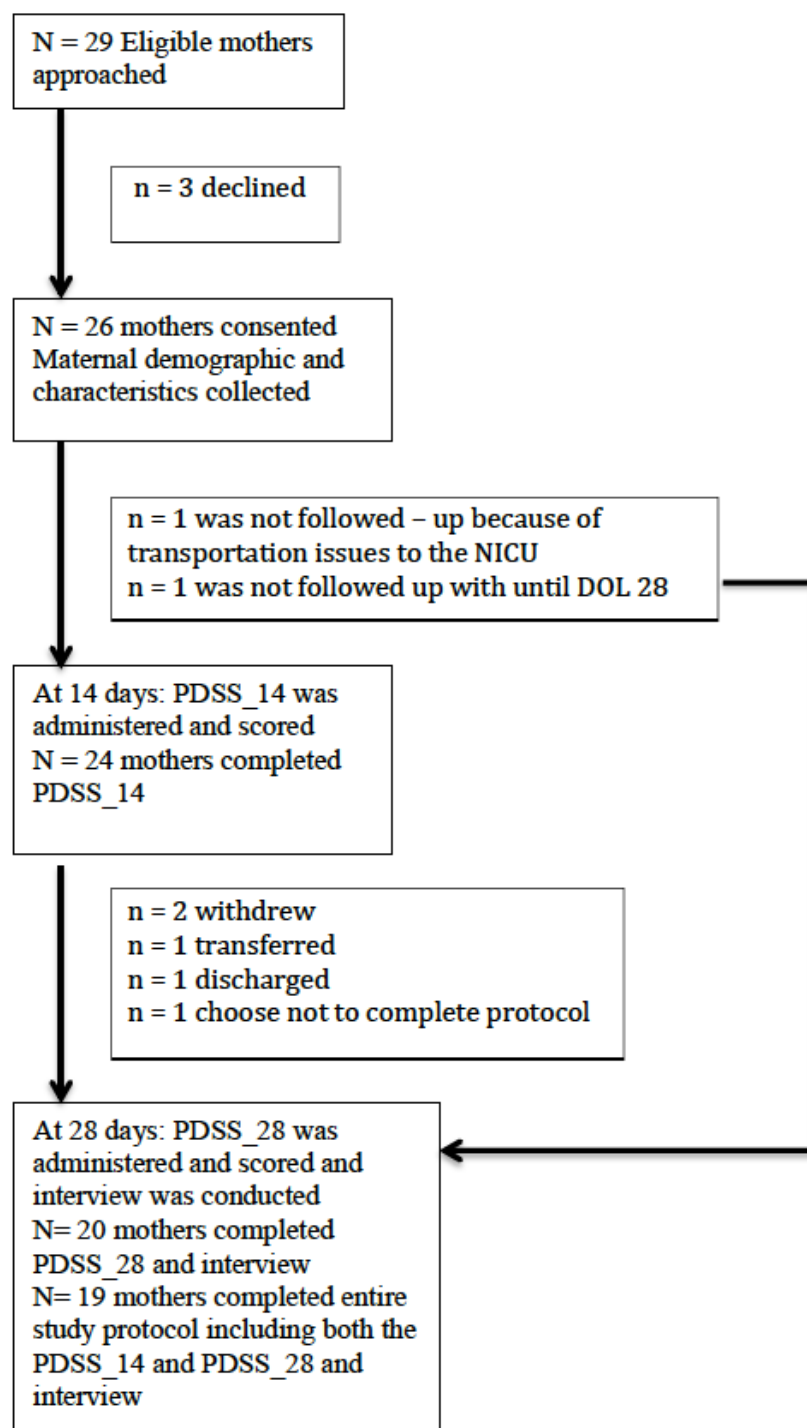


Figure 1. Flow diagram showing number of participants approached and number of participants who did and did not complete study protocol.



## Maternal and Infant Demographics

The majority of mothers was 25 to 39 years old (72.8%), Caucasian (61.5%), married (65.4%), at least partially college educated (57.7%) and currently working (53.9%). See Table 1.

**Table 1**  
**Maternal Demographics (N=26)**

	n	%
<b>Age</b>		
18-24	4	15.3
25-29	6	23.0
30-34	7	26.8
35-39	6	23.0
40-42	3	11.4
<b>Race</b>		
Caucasian	16	61.5
African American	4	15.4
Hispanic	6	23.1
<b>Marital Status</b>		
Single	4	15.4
Married	17	65.4
Divorced	1	3.8
Cohabiting	4	15.4
<b>Education</b>		
Trade School	1	3.8
High School	7	26.9
Some College	10	38.5
Bachelor's	5	19.2
Master's	2	7.7
Post Master's	1	3.8
<b>Current Employment</b>		
Unemployed	5	19.2
Part time	2	7.7
Full time	12	46.2
Maternity Leave	7	26.9

Additional maternal characteristics included: self-reported history of depression (30.8%), history of miscarriages (23.1%), use of assisted reproductive technology (ART) with this

pregnancy (23.1%), cesarean section delivery with current infant(s) (73.1%) and multiple birth delivery (twin 15.4%, triplet 7.7%). See Table 2.

**Table 2**  
**Maternal Characteristics (N=26)**

	n	%
Depression*		
Yes	8	30.8
Abortions		
Elective	3	11.5
Spontaneous	6	23.1
ART**		
Yes	6	23.1
Mode of Delivery		
Vaginal	7	26.9
Cesarean-section	19	73.1
Unplanned	17	89.5
Multiple Births		
Twin	4	15.4
Triplet	2	7.7

*Note.* \*Self - report as a period of sadness lasting  
> 2 weeks anytime prior to study participation;  
\* \*\*ART = Assisted Reproductive Technology

The majority of infants were male (56%) and Caucasian (64%) with a mean gestational age of 30.6 weeks. The mean SNAPPE-II score was 19.5 (SD 20.5). The average NTISS score for week 1 was 17.2 (SD 6.3), week 2; 10.9 (SD 5.1), week 3; 8.4 (SD 5.1) and week 4; 7.2 (3.9). See Table 3. When statistical analysis required infant information and the infant was a twin or triplet, the infant with the highest severity of illness was used.

Table 3  
Infant Demographics and Severity of Illness  
(N=25)

	n	%	M/SD
Gestational age (weeks)			30.6/1.6
28-28+6	7	28	
29-29+6	1	4	
30-30+6	5	20	
31-31+6	7	28	
32-32+6	5	20	
Gender			
Male	14	56	
Female	11	44	
Race/ethnicity			
Caucasian	16	64	
African American	4	16	
Hispanic	5	20	
SNAPPE-II scores			19.5/20.5
0-20	17	68	
21-40	4	16	
41-60	2	8	
61-80	2	8	
NTISS average score			
Week 1			17.2/6.3
Week 2			10.9/5.1
Week 3			8.4/5.1
Week 4			7.2/3.9

*Note.* M = mean; SD = standard deviation  
SNAPPE-II = Score for Neonatal Acute Physiology and Perinatal Extension;  
NTISS = Neonatal Therapeutic Index Scoring System

### Descriptive Statistics on Maternal and Paternal-Infant Contact

#### To answer research question # 1: Parental Contact

Types of contact that occurred in the NICU were originally to include eye contact, touch, swaddle holding, skin – to – skin contact and talking/singing/reading. Based upon early responses, the researcher revised the types of parent – infant contact to include: swaddle holding,

skin-to-skin (STS) contact, direct breast - feeding, bottle feeding, diaper changing and bathing. Types, frequencies and durations of contact were recorded and analyzed.

### **Maternal – infant Contact**

Twenty-six of the NICU mothers described the type of contact they had with their infants immediately after delivery (defined as within 1 hour). Forty – two percent saw their infant, 34.6% had no physical contact at all, 15.4% touched their infant and 7.7% held their infant.

Maternal contact included swaddle holding, skin-to-skin contact, breastfeeding, bottle-feeding, diaper changing and bathing. Hours of maternal contact for each type of contact were calculated for each week. Then the mean hours and range of hours for each type of maternal contact was calculated for each week. Last, the mean of the maternal contact hours for all types of contact combined was then calculated for weeks 1 & 2 combined, weeks 3 & 4 combined and for all 4 weeks combined.

During the first week postpartum: 16 (67.0%) held their infant, 8 (33.5%) provided skin-to-skin contact. During the second week: 17 (70.8%) mothers held their infant, 16 (66.7%) provided skin-to-skin contact, 3 (12.5%) breastfed, 8 (33.3%) changed their infant's diaper. During the third week: 17 (73.9%) mothers held, 16 (69.6%) provided skin-to-skin contact, 6 (26.1%) breastfed and 9 (39.1%) changed their infant's diaper. During the fourth week: 14 (66.7%) mothers held, 11 (52.4%) provided skin-to-skin contact, 9 (42.9%) breastfed and 8 (38.1%) changed their infant's diaper.

The mean of all maternal contacts for week one was 16.2 hours (SD 20.4), for week two (n=24), 23.8 hours (SD 21.4); for week three (n=23), 21.9 hours (SD 13.0) and for week four (n=21) 22.9 (hours SD 14.3). Mean maternal contact hours for all types of contact for weeks 1 and 2 combined was 40.1 hours (SD 40.4). Mean maternal contact hours for all types of contact for

weeks 3 and 4 combined were 44.3 hours (SD 25.9). Mean maternal contact hours for all types of contact combined for all 4 weeks combined was 83.9 hours (SD 63.3). See Table 4.

### **Paternal – infant Contact**

Paternal contact included swaddle holding, skin-to-skin contact, bottle-feeding, diaper changing and bathing. Hours of paternal contact for each type of contact were calculated for each week. Then the mean hours and range of hours of each types of paternal contact was calculated for each week. Last, the mean hours of all types of paternal contact was calculated for weeks 1 & 2 combined, weeks 3 & 4 combined and for all 4 weeks combined.

During the first week postpartum, 14 (58.3%) fathers held and 3 (12.5%) provided skin-to-skin contact with their infant. During the second week, 15 (62.5%) held and 4 (16.6%) provided skin-to-skin contact with their infant. During the third week, 18 (78.3%) held, 6 (26.1%) provided skin-to-skin contact, 4 (17.4%) bottle fed and 7 (30.4%) changed their infant's diaper. During the fourth week, 15 (68.2%) held, 6 (27.3%) provided skin-to-skin contact, 2 (9.1%) bottle fed, 5 (22.7%) changed their infant's diaper and 3 (13.6%) bathed their infant.

Total mean paternal contact hours for all types of contact combined for  $n = 23$  fathers for week one were 5.8 hours (SD 9.2), week two ( $n = 23$ ) were 6.0 hours (SD 5.8), for week three ( $n = 23$ ) were 9.0 hours (SD 7.8), and for week four ( $n = 22$ ) were 9.8 hours (SD 8.7). Total mean paternal contact hours for all types of contact for weeks 1 and 2 combined were 11.7 hours (SD 14.3) and for weeks 3 and 4 combined were 18.3 hours (SD 15.0). Total mean paternal contact hours for all 4 weeks combined for all types of contact combined were 29.5 hours (SD 24.1). See Table 4.

Table 4  
Maternal and Paternal Contact Hours for Different Types of Contact

	n	%	Maternal M/SD	Range		n	%	Paternal M/SD	Range
Week 1:									
Hold	16	67.0	12.6/17.7	0.0 – 84.0		14	58.3	5.2/9.1	0.0 – 42.0
STS	8	33.5	3.6/8.8	0.0 – 42.0		3	12.5	0.60/1.8	0.0 – 7.0
Breastfeed	1	4.2	0.04/.20	0.0 – 1.0		0	0.0	0.0/0.0	0.0 – 0.0
Bottle Feed	0	0	0.0/0.0	0.0 – 0.0		0	0.0	0.0/0.0	0.0 – 0.0
DC	1	4.2	0.03/.15	0.0 – 0.7		0	0.0	0.0/0.0	0.0 – 0.0
Total	24		16.2/20.4			23		5.8/9.2	
Week 2:									
Hold	17	70.8	12.5/12.6	0.0 – 42.0		15	62.5	4.9/5.7	0.0 – 21.0
STS	16	66.7	10.6/13.1	0.0 – 42.0		4	16.6	0.97/2.4	0.0 – 8.0
Breastfeed	3	12.5	0.38/1.4	0.0 – 7.0		0	0.0	0.0/0.0	0.0 – 0.0
Bottle feed	0	0	0.0/0.0	0.0 – 0.0		0	0.0	0.0/0.0	0.0 – 0.0
DC	8	33.3	0.24/0.40	0.0 – 1.5		2	0.08	0.03/0.11	0.0 – 0.50
Bath	3	12.5	0.08/0.24	0.0 – 1.0		1	0.04	0.04/0.20	0.0 – 1.0
Total	24		23.8/21.4			23		6.0/5.8	
Weeks 1 & 2 Combined			40.1/40.4					11.7/14.3	
Week 3:									
Hold	17	73.9	10.9/12.4	0.0 – 42.0		18	78.3	6.2/6.5	0.0 – 21.0
STS	16	69.6	8.0/7.9	0.0 – 21.0		6	26.1	1.7/3.6	0.0 – 14.0
Breastfeed	6	26.1	1.8/4.2	0.0 – 14.0		0	0.0	0.0/0.0	0.0 – 0.0
Bottle feed	3	13.0	0.72/2.2	0.0 – 9.5		4	17.4	0.83/2.0	0.0 – 8.0
Bath	9	39.1	0.41/0.72	0.0 – 3.0		7	30.4	0.23/0.38	0.0 – 1.0
DC	3	13.0	0.15/0.41	0.0 – 1.5		1	0.04	0.04/0.21	0.0 – 1.0
Total	23		21.9/13.1			23		9.0/7.8	
Week 4:									
Hold	14	66.7	11.12/12.1	0.0 – 42.0		15	68.2	7.4/8.3	0.0 – 24.0
STS	11	52.4	6.3/7.4	0.0 – 21.0		6	27.3	1.6/3.4	0.0 – 14.0
Breastfeed	9	42.9	3.9/6.7	0.0 – 21.0		0	0.0	0.0/0.0	0.0 – 0.0
Bottle Feed	2	9.5	1.2/4.6	0.0 – 21.0		2	9.1	0.52/1.8	0.0 – 8.0
DC	8	38.1	0.29/0.41	0.0 – 1.25		5	22.7	0.19/0.38	0.0 – 1.0
Bath	4	19.0	0.14/0.32	0.0 – 1.0		3	13.6	0.09/0.25	0.0 – 1.0
Total	21		22.9/14.3			22		9.8/8.7	
Weeks 3 & 4 Combined			44.3/26.0					18.3/15.0	
All 4 weeks Combined			83.9/63.3					29.5/24.1	

\*Hold = swaddle holding; STS= skin-to-skin contact; DC = diaper change  
Means/Standard Deviations (M/SD) and Ranges are measured in hours

### **Correlations Among Demographics and Maternal and Paternal-Infant Contact**

#### **To answer research question #2:**

**Correlation Between Maternal Demographics and Types of Maternal Contact:** There was a significant positive correlation between maternal age and the provision of maternal skin-to-skin contact ( $r = .441, p = .046$ ); older mothers participated in more skin-to-skin contact.

#### **Correlation Between Maternal Contact and Infant Demographics and Severity of Illness:**

There was a positive correlation between maternal diaper changing for week 1 and the infant's average NTISS score for week 1 ( $r = .525, p = .008$ ). There was a significant negative correlation between maternal holding for week 1 and the infant's average NTISS score for week 1 ( $r = -.420, p = .041$ ). There were no correlations between GA or SNAPPE-II scores with maternal contact.

#### **To answer research question #3:**

**Correlation Between Types of Maternal Contact and Breastfeeding:** There was a significant positive correlation between maternal swaddle holding and breast-feeding ( $r = .746, p = .000$ ); the more maternal swaddle holding the more breast-feeding was provided. There was a significant correlation between skin-to-skin contact and breast-feeding ( $r = .608, p = .003$ ); the more maternal skin-to-skin contact was provided, the more breast feeding was provided.

#### **To answer research question # 4:**

#### **Correlations of Maternal (alone) and Paternal (alone) Contact for First 28 days**

There was a significant positive correlation between the hours of maternal contact provided for weeks 1 & 2 combined with the hours of maternal contact provided for weeks 3 & 4 combined ( $r = .666, p = .001$ ). Mothers who provided more contact in weeks 1 & 2 provided more contact in weeks 3 & 4. However, there were no correlations between the amount of paternal contact provided during weeks 1 & 2 with the amount of paternal contact provided during weeks 3 & 4.

### Correlations Between Types of Maternal and Paternal Contact

There were significant positive correlations between maternal and paternal types of contact with a range of  $r = (.499 - .658)$  and a range  $p = (.001 - .021)$ . These results indicate that as one parent had more contact among different types of contact with their infant so did the other parent. See Table 5.

**Table 5**  
**Correlations Between Types of Maternal and Paternal Contact**

Paternal Contact	Maternal Contact			
		Hold (swaddle)	Diaper Change	Skin-to-skin Breast Feed
	Hold (swaddle)	.592** .005		.499* .021 .658** .001
	Diaper Change		.539* .012	.400 .072

Note. Types of contact measured in total hours for 4 weeks

\*  $p < 0.05$ ; \*\*  $p < 0.01$

**Correlation Between Hours of Maternal and Paternal Contact:** There were significant positive correlations between total maternal contact hours for weeks 1 and 2 combined, 3 and 4 combined and all 4 weeks combined with total paternal contact hours for weeks 1 and 2 combined, 3 and 4 combined and all 4 weeks combined with a range  $r = (.424 - .810)$  and a range of  $p = (.038 - .000)$ . Greater maternal and paternal contact during weeks one



and two were associated with greater maternal and paternal contact during weeks three and four.

See Table 6.

**Table 6**  
**Correlations Between Hours of Maternal and Paternal Contact**

		Maternal Contact		
Paternal Contact		Weeks 1 & 2	Weeks 3 & 4	Total for All 4 Weeks
	Weeks 1 & 2	.810*** .000	.424* .044	.680*** .000
	Weeks 3 & 4		.445* .038	
	Total for All 4 Weeks	.623** .002	.524* .012	.624** .002

Note. \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

### **Correlations Between Combined Types of Maternal and Paternal Contact**

There was a significant positive correlation between combined maternal holding, skin-to-skin contact and breast-feeding for weeks 1 and 2 with combined paternal holding and skin-to-skin contact for weeks 1 and 2 ( $r = .682, p = .000$ ). There was a positive correlation between combined maternal holding, skin-to-skin contact and breast-feeding for weeks 3 and 4 with combined paternal holding and skin-to-skin contact for weeks 3 and 4 ( $r = .547, p = .010$ ).

### **Statistical Analyses of PDSS Scores**

#### **To answer research question #5:**

Cronbach alpha reliabilities for the PDSS administered at 14 days (PDSS\_14) were as follows: subscales: SLP = .744, ANX = .695, ELB = .710, MNT = .811, LOS = .853, GLT = .857, SUI = .909; total (all 35 items) = .935. Cronbach alpha reliabilities for the PDSS administered at 28 days (PDSS\_28) were as follows: subscales: SLP = .897, ANX = .802,

ELB = .699, MNT = .836, LOS = .830, GLT = .868; total (all 35 items) = .928. The alpha reliability for the SUI subscale on the PDSS\_28 could not be run as there was not enough variability in the scores.

Twenty-four mothers completed the PDSS administered at 14 days (PDSS\_14): six (25.0%) scored above the cutoff on the SLP\_14 subscale; five (20.8%) scored above the cutoff on the ANX\_14 subscale; six (25.0%) scored above the cutoff on the ELB\_14 subscale; seven (29.2%) scored above the cutoff on the MNT\_14 subscale; two (8.3%) scored above the cutoff on the LOS\_14 subscale; three (12.5%) scored above the cutoff on the GLT\_14 subscale; four (16.7%) scored above the cutoff on the SUI\_14 subscale; three (12.5%) scored above the cutoff on the INC\_14 subscale and seventeen (70.8%) scored above the lower cutoff of 59 with 5 (21.0%) of those scoring above or equal to the upper cutoff of 80 on the total (all 35 items) PDSS\_14. (Highlighted rows indicate the ranges, numbers and percentages of responses above the cutoff scores.) See Table 7.

Table 7  
Scores from PDSS administered at 14 days (PDSS\_14) (N = 24)

PDSS Subscale	M/SD	Cutoff	Range	n	%
SLP_14	11.9/4.6	≥ 14	5 - 13	18	75.0
			14 - 24	6	25.0
ANX_14	11.8/3.7	≥ 15	5 - 14	19	79.2
			15 - 22	5	20.8
ELB_14	12.5/3.7	≥ 15	5 - 14	18	75.0
			15 - 20	6	25.0
MNT_14	11.5/4.4	≥ 14	5 - 13	17	70.8
			14 - 20	7	29.2
LOS_14	8.4/3.5	≥ 13	5 - 12	22	91.7
			13 - 20	2	8.3
GLT_14	8.5/4.2	≥ 13	5 - 12	21	87.5
			13 - 20	3	12.5
SUI_14	5.7/1.8	≥ 6	5	20	83.3
			6 - 13	4	16.7
INC_14	1.6/1.7	≥ 4	0 - 3	21	87.5
			4 - 5	3	12.5
PDSS_14	70.3/20.3	≤ 59	38 - 59	7	29.2
		60 - 79	60 - 79	12	49.8
		≥ 80	80 - 130	5	21.0

*Note.* PDSS = Postpartum Depression Screening Scale; SLP= Sleeping/Eating Disturbance; ANX= Anxiety/Insecurity, ELB= Emotional Lability; MNT= Mental Confusion; LOS= Loss of Self; GLT= Guilt/Shame; SUI= Suicidal Thoughts; INC= INC Raw Score; PDSS = Total PDSS score  
A score above the cut-off for any subscale indicates increased symptomatology in that area(Beck & Gable, 2002).

Twenty mothers completed the second PDSS administered at 28 days (PDSS\_28): five (25.0%) scored above the cutoff on the SLP\_28 subscale; six (30.0%) scored above the cutoff on the ANX\_28 subscale; six (30.0%) scored above the cutoff on the ELB\_28 subscale; six (30.0%) scored above the cutoff on the MNT\_28 subscale; one (5.0%) scored above the cutoff on the LOS\_28 subscale; one (5.0%) mother scored above the cutoff on the GLT\_28 subscale; one (5.0%) scored above the cutoff on the SUI\_28 subscale; one (5.0%) scored above the cutoff for the INC\_28 subscale and twelve (60.0%) scored above the lower cutoff of 59 with 5 (25.0%) of those mothers scoring above or equal to the upper cutoff of 80 on the total PDSS\_28. (Highlighted rows indicate the ranges, numbers and percentages of responses above the cutoff scores.) See Table 8.

Table 8  
Scores from PDSS administered at 28 days (PDSS\_28)(N = 20)

PDSS Subscale	M/SD	Cutoff	Range	n	%
SLP_28	11.2/5.4	≥ 14	5 - 13	15	75.0
			14 - 21	5	25.0
ANX_28	11.4/4.3	≥ 15	5 - 14	14	70.0
			15 - 19	6	30.0
ELB_28	11.9/3.3	≥ 15	5 - 14	14	70.0
			15 - 19	6	30.0
MNT_28	11.3/4.5	≥ 14	5 - 13	14	70.0
			14 - 20	6	30.0
LOS_28	7.5/2.9	≥ 13	5 - 12	19	95.0
			13 - 16	1	5.0
GLT_28	7.5/3.2	≥ 13	5 - 12	19	95.0
			13 - 17	1	5.0
SUI_28	5.0/0.22	≥ 6	5	19	95.0
			6	1	5.0
INC_28	1.3/1.3	≥ 4	0 - 3	19	95.0
			4	1	5.0
PDSS_28	65.7/18.1	≤ 59	35 - 59	8	40.0
		60 - 79	60 - 79	7	35.0
		≥ 80	80 - 102	5	25.0

*Note.* PDSS = Postpartum Depression Screening Scale; SLP= Sleeping/Eating Disturbance; ANX= Anxiety/Insecurity, ELB= Emotional Lability; MNT= Mental Confusion; LOS= Loss of Self; GLT= Guilt/Shame; SUI= Suicidal Thoughts; INC= INC Raw Score; PDSS= Total PDSS score  
A score above the cut-off for any subscale indicates increased symptomatology in that area(Beck & Gable, 2002).

### **Comparisons Between Means on the PDSS administered at 14 days (PDSS\_14) and at 28 days (PDSS\_28) Postpartum**

Paired t-test revealed that for each individual subscale, INC and total score, there were no significant differences in mean scores between the PDSS administered at 14 days and the PDSS administered at 28 days.

### **Correlations Between the PDSS administered at 14 days (PDSS\_14) and at 28 days (PDSS\_28) Postpartum**

There were significant positive correlations between the subscales and total scores from the PDSS\_14 and PDSS\_28 with a range of  $r = (.480 - .943)$  and a range of  $p = (.000 - .059)$ . There were no correlations between the INC subscale and any other PDSS subscale or total scores. There was a significant correlation between the SLP\_14 subscales and the SLP\_28 subscale ( $r = .743, p = .000$ ).

There were significant correlations between the ANX\_14 subscale and the SLP\_28, ANX\_28, ELB\_28, MNT\_28, GLT\_28 subscales and PDSS\_28 total scores. Specifically, the ANX\_14 subscale was significantly correlated with the SLP\_28 subscale ( $r = .759, p = .000$ ); the ANX\_28 subscale ( $r = .733, p = .000$ ); the ELB\_28 subscale ( $r = .736, p = .000$ ), the MNT\_28 subscale ( $r = .552, p = .014$ ); the GLT\_28 subscale ( $r = .542, p = .016$ ) and the PDSS\_28 total score ( $r = .799, p = .000$ ).

There were significant correlations between the ELB\_14 subscale and the ANX\_28, ELB\_28, MNT\_28, LOS\_28, GLT\_28 subscales and PDSS\_28 total scores. Specifically, the ELB\_14 was significantly correlated with the ANX\_28 subscale ( $r = .478, p = .038$ ), the ELB\_28 subscale ( $r = .559, p = .013$ ), the MNT\_28 subscale ( $r = .647, p = .003$ ), the LOS\_28 subscale ( $r = .495, p = .031$ ), the GLT\_28 subscale ( $r = .493, p = .032$ ), and the total PDSS\_28 score

( $r = .662, p = .002$ ).

There were significant correlations between the MNT\_14 subscales and the ANX\_28, MNT\_28, LOS\_28, GLT\_28 subscales and PDSS\_28 total scores. Specifically, the MNT\_14 subscale was significantly correlated with the ANX\_28 subscale ( $r = .509, p = .026$ ), the MNT\_28 subscales ( $r = .943, p = .000$ ), the LOS\_28 subscale ( $r = .633, p = .004$ ), the GLT\_28 subscales ( $r = .626, p = .004$ ), and the PDSS\_28 total score ( $r = .751, p = .000$ ).

There were significant correlations between the LOS\_14 subscale and the ANX\_28, MNT\_28, LOS\_28, GLT\_28 and PDSS\_28 total scores. Specifically, the LOS\_14 subscale was significantly correlated with the ANX\_14 subscale ( $r = .496, p = .031$ ), the MNT\_28 subscale ( $r = .677, p = .001$ ), the LOS\_28 subscale ( $r = .727, p = .000$ ), the GLT\_28 subscale ( $r = .788, p = .000$ ) and the PDSS\_28 total score ( $r = .739, p = .000$ ).

There were significant correlations between the GLT\_14 subscale and the MNT\_28, LOS\_28, GLT\_28 subscales and PDSS\_28 total scores. Specifically the GLT\_14 subscale was significantly correlated with the MNT\_28 subscale ( $r = .625, p = .004$ ), the LOS\_28 subscale ( $r = .594, p = .007$ ), the GLT\_28 subscale ( $r = .810, p = .000$ ) and the PDSS\_28 total score ( $r = .649, p = .003$ ).

There were significant correlations between the SUI\_14 subscale and the MNT\_28, LOS\_28, SUI\_28 subscales. Specifically, the SUI\_14 subscale was significantly correlated with the MNT\_28 subscale ( $r = .468, p = .043$ ), the LOS\_28 subscale ( $r = .690, p = .001$ ) and the SUI\_28 subscale ( $r = .614, p = .005$ ).

There were significant correlations between the PDSS\_14 total score and the SLP\_28, ANX\_28, ELB\_28, MNT\_28, LOS\_28, GLT\_28 and PDSS\_28 total scores. Specifically the PDSS\_14 total scores were significantly correlated with the SLP\_14 subscale score

( $r = .617, p = .005$ ), the ANX\_28 subscale score ( $r = .626, p = .004$ ), the ELB\_28 subscale score ( $r = .472, p = .041$ ), the MNT\_28 subscale score ( $r = .826, p = .000$ ), the LOS\_28 subscale score ( $r = .595, p = .007$ ), the GLT\_28 ( $r = .734, p = .000$ ) and the PDSS\_28 total score ( $r = .868, p = .000$ ). See Table 9.

Table 9  
Correlations Between PDSS\_14 and PDSS\_28 Scores (N = 19 pairs)

		SLP_28	ANX_28	ELB_28	MNT_28	LOS_28	GLT_28	SUI_28	PDSS_28
SLP_14	r	.743***							
	p	.000							
ANX_14	r	.759***	.733***	.736***	.552*		.542*		.799***
	p	.000	.000	.000	.014		.016		.000
ELB_14	r		.478*	.559*	.647**	.495*	.493*		.662**
	p		.038	.013	.003	.031	.032		.002
MNT_14	r		.509*		.943***	.633**	.626**		.751***
	p		.026		.000	.004	.004		.000
LOS_14	r		.496*		.677*	.727**	.788***		.739***
	p		.031		.001	.000	.000		.000
GLT_14	r				.625**	.594**	.810***		.649**
	p				.004	.007	.000		.003
SUI_14	r				.468*	.690**		.614**	
	p				.043	.001		.005	
PDSS_14	r	.617**	.626**	.472*	.826***	.595**	.734***		.868***
	p	.005	.004	.041	.000	.007	.000		.000

Note. PDSS = Postpartum Depression Screening Scale; PDSS\_14 = PDSS administered at 14 days; PDSS\_28 = PDSS administered at 28 days; SLP\_14 = SLP subscale from PDSS\_14, ANX\_14 = ANX subscale score from PDSS\_14, ELB\_14 = ELB subscale score from PDSS\_14, MNT\_14 = MNT subscale score from PDSS\_14, LOS\_14 = LOS subscale score from PDSS\_14, GLT\_14 = GLT subscale score from PDSS\_14, SUI\_14 = SUI subscale score from PDSS\_14, PDSS\_14 = total score from PDSS\_14. SLP\_28 = SLP subscale score from PDSS\_28, ANX\_28 = ANX subscale score from PDSS\_28, ELB\_28 = ELB subscale score from PDSS\_28, MNT\_28 = MNT subscale score from PDSS\_28, LOS\_28 = LOS subscale score from PDSS\_28, GLT\_28 = GLT subscale score from PDSS\_28, SUI\_28 = SUI subscale score from PDSS\_28, PDSS\_28 = total score from PDSS\_28.

r = strength of correlation; p = significance of correlation

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

To answer research question # 6:

### Correlations Between Maternal Demographics and Characteristics and PDSS Scores

There was a significant negative correlation between maternal age and SLP\_14 subscale



from the PDSS \_14 ( $r = -.485, p < .05$ ), the younger the age the worse or higher the sleep scores. There was a significant negative correlation between education and the ANX\_14 subscale from the PDSS \_14 ( $r = -.473, p < .05$ ) indicating the less education the worse or higher the anxiety scores. There was a significant negative correlation between marital status and SLP\_28 subscale from the PDSS \_28 ( $r = -.484, p < .05$ ) indicating married mothers had worse or higher sleep scores. See Table 10.

Table 10  
Correlation Between Maternal Demographic and Characteristics and  
PDSS\_14 and PDSS\_28 scores

		Age	Marital♦ Status	Education	Depression♦♦
PDSS_14					
ANX_14	<i>r</i>			-.473*	
	<i>p</i>			.020	
SLP_14	<i>r</i>	-.485*			
	<i>p</i>	.016			
PDSS_28					
SLP_28	<i>r</i>		-.484*		
	<i>p</i>		.031		
ELB_28	<i>r</i>		-.438		
	<i>p</i>		.053		
TPDSS	<i>r</i>		-.407		.407
	<i>p</i>		.075		.075

Note. PDSS\_14 = PDSS administered at 14 days;

PDSS\_28 = PDSS administered at 28 days;

ANX = Anxiety/Insecurity subscale;

SLP=Sleep/Eating Disturbances subscale;

ELB= Emotional Lability subscale;

TPDSS = total PDSS score

♦Spearman's rho for dichotomous variable correlations

• Self-report history of sadness lasting > 2 weeks anytime prior to study participation.

*r* = strength of correlation; *p* = significance

\* *p* < .05

**To answer research questions #7:**

**Correlations Between Individual Maternal and Paternal Contact and the PDSS\_14 and PDSS\_28 scores**

There were several significant positive and negative correlations between individual maternal and paternal contact types and the subscale and total scores from the PDSS administered at 14 days (PDSS\_14) and at 28 days (PDSS\_28). See Table 11.

Table 11  
Correlations Between Maternal and Paternal Contact with PDSS\_14 and PDSS\_28 Scores

		Mother				Father		
PDSS_14		Diaper	Hold	STS	BF	Diaper	Hold	STS
SLP_14	r						-.413*	
	p						.050	
ANX_14	r							
	p							
MNT_14	r	.442*						
	p	.035						
GLT_14	r							.422*
	p							.045
SUI_14	r							.614**
	p							.002
TPDSS	r							
	p							
PDSS_28		Diaper	Hold	STS	BF	Diaper	Hold	STS
SLP_28	r			-.401	-.404		-.442	
	p			.080	.077		.051	
ANX_28	r						-.408	
	p						.074	
MNT_28	r	.659**						
	p	.002						
LOS_28	r	.574**						
	p	.008						
GLT_28	r	.438						
	p	.053						
SUI_28	r					.442		
	p					.051		
TPDSS	r	.492*					-.401	
	p	.028					.080	

Note. PDSS\_14 = PDSS administered at 14 days; PDSS\_28 = PDSS administered at 28 days; Diaper = Diaper Changing; Hold = swaddle holding; STS = Skin-to-skin; BF = breastfeeding; SLP= Sleeping/Eating Disturbance subscale score from PDSS; ANX= Anxiety/Insecurity subscale score from PDSS; ELB= Emotional Lability subscale score from PDSS; MNT= Mental Confusion subscale score from PDSS; LOS= Loss of Self subscale score from PDSS; GLT= Guilt/Shame subscale score from PDSS; SUI= Suicidal Thoughts subscale score from PDSS; TPDSS = total PDSS scores

r = strength of correlation, p = significance of correlation

\*  $p \leq .05$ , \*\*  $p < .01$ ,

The significant positive correlations between maternal diaper change and the MNT subscales from both the PDSS administered at 14 days (PDSS\_14) and the PDSS administered at 28 days (PDSS\_28) indicates a relationship between the mother's MNT score at 2 and 4 weeks and the amount of diaper changing she engaged in during the first and second weeks and third

and fourth weeks. The significant positive correlation between maternal diaper changing and LOS subscale of the PDSS\_28 indicates a relationship between the mother's LOS scores at 4 weeks and the amount of the diaper changing she engaged in over the previous 4 weeks. Similarly, the significant positive correlations between maternal diaper changing and the total scores from the PDSS\_28 indicate a relationship between higher maternal total scores and the amount of diaper changing she had engaged in during the previous 4 weeks.

The significant negative correlations between paternal holding and maternal SLP subscale score from the PDSS\_14 indicate a relationship between worse maternal sleep scores and the amount of holding father engaged in for the first two weeks. The significant positive correlation between paternal skin-to-skin contact and maternal GLT subscale score from the PDSS\_14 indicates a relationship between greater maternal guilt symptomatology and the amount of paternal skin-to-skin contact. Of special interest is the relationship between the maternal suicide index score and paternal contact. The significant positive correlation between paternal skin-to-skin contact and maternal SUI subscale score PDSS\_14 indicates a relationship between the mothers SUI score and the amount of paternal skin-to-skin contact for the first 2 weeks.

#### **To answer research question #8:**

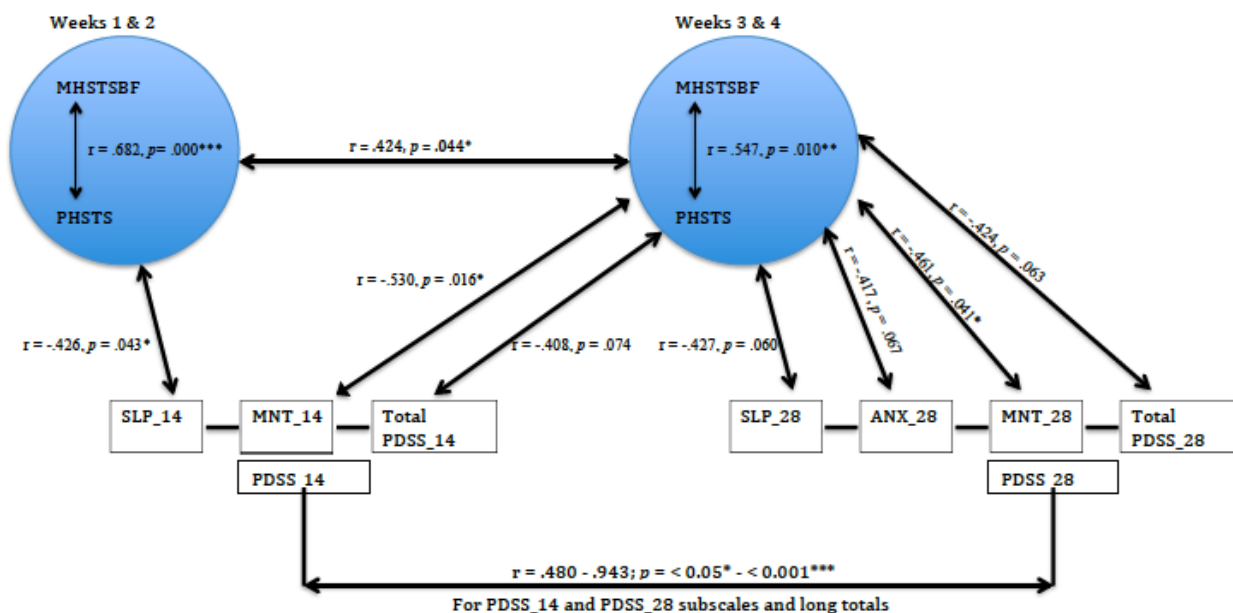
#### **Correlations Between Combined Maternal and Paternal Contact Types and with the PDSS\_14 and PDSS\_28**

The most intimate types of maternal- infant and paternal – infant contacts that had occurred over the 28 days were calculated and combined into one maternal – infant contact variable and one paternal– infant contact variable. The most intimate maternal contacts were swaddle holding, skin-to-skin contact and breastfeeding. These contacts were then combined into

one 'MHSTSBF' variable. The most intimate paternal-infant contacts were swaddle holding and skin-to-skin contacts. These contact were then combined into one 'FHSTS' variable. Next, combined maternal holding, skin-to-skin contact and breast-feeding (MHSTSBF) was correlated with combined paternal holding and skin-to-skin contact (PHSTS) and correlated with PDSS\_14 and PDSS\_28 scores.

There were significant positive correlations within combined maternal-paternal contact for weeks 1 & 2 ( $r = .682, p = .000$ ) and weeks 3 & 4 ( $r = .547, p = .010$ ). Second, combined maternal-paternal contacts for weeks 1 & 2 were correlated with combined maternal-paternal contacts for weeks 3 & 4. There was a significant correlation between weeks 1 & 2 combined maternal-paternal contact and weeks 3 & 4 combined maternal - paternal contact ( $r = .424, p = .044$ ). Third, combined maternal-paternal contacts were correlated with PDSS scores. There was a negative significant correlation between combined maternal – paternal contact for weeks 1 and 2 and the SLP subscale from the PDSS\_14 ( $r = -.426, p = .043$ ) indicating a relationship between a higher or worse maternal sleep score at two weeks and a less combined maternal and paternal contact during weeks 1 and 2. The significant negative correlation between weeks 3 & 4 combined maternal – paternal contact and the MNT subscale from the PDSS\_14 ( $r = -.530, p = .016$ ) indicates a relationship between a worse maternal MNT score at 14 days and less parental – infant contact during weeks 3 & 4. The significant negative correlation between weeks 3 & 4 combined maternal – paternal contact and the MNT subscale from the PDSS\_28 ( $r = -.461, p = .041$ ) indicates a relationship between a worse maternal MNT score at 28 days and less parental – infant contact during weeks 3 and 4. See Figure 2. There was also a significant correlation between MHSTSBF and FHSTS for all 4 weeks combined and the SLP subscale from the PDSS\_28 ( $r = -.467, p = .038$ ) not included in following figure.

Figure 2. Correlations Between Weeks 1 &amp; 2 and 3 &amp; 4 Combined Maternal and Paternal Contact with PDSS scores



## Qualitative and Mixed Methods Results

### To answer research questions #9 and #10:

Twenty mothers participated in the qualitative interviews. Eighteen of these interviews were tape recorded then transcribed verbatim. The final two interviews were hand written due to recording equipment failure. When direct quotes were used from the last two interviews, they

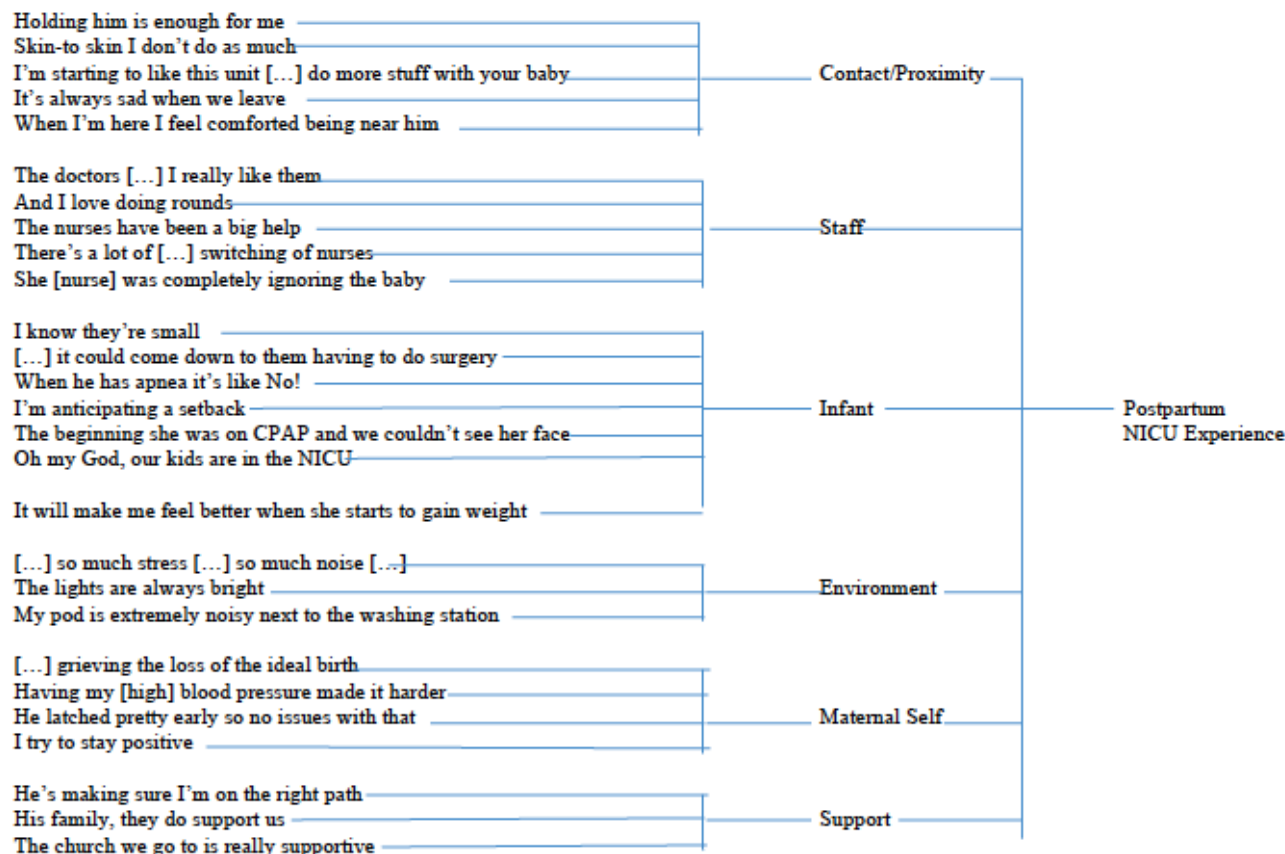
were read back to the participant for reliability of data collection. All of the narratives were analyzed first for word units or phrases describing a particular aspect of the mother's general NICU experience and her experience of maternal-infant contact. The word units/phrases were then clustered or grouped, together into themes. Statistical correlational relationships between these word units or themes and PDSS scores could not be determined as originally anticipated using available statistical software because the counts or frequencies of meaningful words or units of words were too low.

Manual evaluation and analysis of the interview data with PDSS scores revealed that there were no differences in meaningful word units or resultant themes between mothers who scored low on any PDSS\_14 or PDSS\_28 subscales, INC, or total scores versus mothers who scored high on PDSS\_14 or PDSS\_28 subscales, INC, or total scores. For example, of the N= 20 mothers with varying PDSS scoring, 19 mentioned in one unit form or another what was to become the theme of contact with her infant and its impact on her postpartum mood. Second, the direction in which mothers spoke regarding meaningful units or phrases was both positive and negative regardless of PDSS scoring. For example, a mother with very high PDSS subscale or total scores may have spoken positively of how often she had contact with her infant and how rewarding that was for her whilst another mother with similar PDSS scoring may have discussed the theme 'contact' as negatively impacting her postpartum mood. For these reasons, interviews from all the mothers were included and analyzed. The analysis of the qualitative data resulted in thematic extraction. Themes were determined by analyzing how many mothers mentioned a similar idea, similar words or similar word units. These word units were then grouped into themes. See Figure 3. for example of dendogramic formation of themes.



Figure 3. Dendrogram for Development of Themes

Quotes:



The following resultant six themes are in descending order of most to least prevalent.

## Themes

### Theme 1. *The all important mother-infant connection*

Nineteen mothers described how having or not having contact with their infant impacted their postpartum mood. Mothers described sadness and a sense of loss at not being able to see, touch or hold their infant after delivery. One mother described,

*We're here every day. Our priority is her, whatever time we have. When we get to hold her every day, that was a big step. The first three or four days was a little tough because we weren't able to hold her [...]. [Before], we didn't feel any connection. [...] But I wish I saw her at that moment [after delivery],*

*that was a loss to me a lot. I don't know, is it our baby? How does she look?*

*I just wanted to see her. That connection was a little off.*

Mothers described fear of holding their infant because of equipment such as intravenous lines or respiratory equipment. Mothers discussed sadness and anxiety at not being able to see their infant's face because of Continuous Positive Airway Pressure (CPAP); a system designed to deliver pressure and oxygen as a means of respiratory assistance requiring the infant to wear either a nasal mask or nasal prongs fastened to the face with tubing then extending from the infant's face to the bedside machine; partially obstructing the face from view. One mother stated, *"She was on CPAP [...] the very beginning she had the mask and CPAP and we couldn't see her and that was really nerve wracking."* Another mother stated, *"I didn't want to hold them when they had the CPAP because it was always getting bumped and then they'd have spells, things would happen. I felt um, that they were just safer in the isolette."*

Many mothers discussed tremendous sadness when it was time for them to leave for the night. One mother stated, *"It's always sad always sad when we leave him at night. We always try to make sure he's asleep. It's almost like putting him to bed at home. See him asleep before we leave like it would be at home."* Another mother stated, *"The first three weeks I would say were not fun. Leaving here I just felt terrible leaving him. Then when I was home thinking about him anxious to get back in the morning."* A third mother stated, *"It was really hard to leave her when she was awake. That was the hardest time when we had to get somewhere that was just really hard to leave her; to walk away, that was awful."* A fourth mother stated,

*First week you don't even understand it [the NICU]. You're still in the hospital and the baby is here [in NICU]. Once you go home your belly is no longer there, no one is kicking and the baby is not there and then it just sinks into you. The first*

*few minutes is very tough in the car [leaving].*

Conversely, having intimate contact with her infant was beneficial for the mother. One mother discussed holding her infant as having a reconstituting effect. *“Any time I get to hold her makes it better, much, much better. When I hold her I feel like I’m put back together... she’s supposed to still be in me [...]”* Holding meant different things for different mothers. One mother preferred holding her infant in a swaddled en face position, as opposed to skin-to-skin which she had also done, as it afforded her more time to see her daughter’s face and thus facilitated her bonding with her infant. She stated,

*When we’re holding the babies I noticed that when we did kangaroo care in the beginning it was great because you’re feeling close to the baby.*

*But after the first week I noticed I didn’t even remember what they looked like.*

*I didn’t feel I knew them. [...] I prefer swaddling so I can see their faces and I generally talk to them more when I can see their face.*

One mother described she felt very insecure doing skin-to-skin care on the unit because of lack of privacy.

*The skin-to-skin I don’t do it as much as I should even though I kind of feel bad about it but like I said I don’t feel comfortable even though we have these guards [privacy screens]. You know taking off my clothes, I’m a really shy person [...].*

Other mothers reported doing skin-to-skin was helpful in enhancing their well-being stating, *“[...] then the attention focused on the kangaroo care and it was a more relaxing state for me as a parent and I’m sure for them too [...]”*. Another mother stated, *“Kangaroo care makes you feel much better.”* Participating in hands on cares was very helpful for mothers. One

mother stated, *“What helped my moods? [...] to actually do the care, like diaper changes and the bathing [...] and another mother, “what helped too is the nurses... we got to do a lot like taking them out of the isolette and doing things on our own.” NICUs that have family friendly policies that permit 24 hour visiting was very important to one mother’s well-being. “What’s helpful [...] um, getting to hold him and stay here as long as I would like [...] I can stay as long as I like and hold him until I can’t hold him anymore.” Another mother stated, “What helped my moods? [...] um, the visiting hours allowing you to come in whenever you want [...].*

## **Theme 2. Under the maternal watchful eye**

Eighteen mothers made references regarding her infant as vital to influencing her mood. Several mothers made reference to the small size of their infant as a source of anxiety, frustration and concern.

*“... your initial reaction is oh my God, our kids are in the NICU and but they’re so small and everyone’s like ‘they’re so little and I’m like, ah I know they’re little. Stop telling me my kids are little! I know they’re little!*

A second mother stated,

*He [father] had shown me a picture [...] and oh she looked big in the picture and when I came in [to the NICU] I was like whoa you’re so little, tiny. I didn’t know what was going on. Is she healthy?”*

A third mother,

*I think people forget how old she is because she’s so little. She’ll be 36 weeks on Sunday. She’s 3 pounds 3.9 ounces. When she was born she was 31 weeks and 6 days and she was 2 pounds 5.6 ounces, so she was definitely smaller, IUGR [intrauterine growth*

*restricted]. I'm more anxious for, I do ask every night when I call what does she weigh. It will make me feel better that she continues to gain weight.*

A fourth mother stated,

*"[...] I think you know a smaller baby you get a little more anxious about keeping or holding him and changing his diaper. That was the hardest thing. I kind of got scared about cause he was real little and I felt like I don't want to hurt him and you think that you might hurt him [...]"*

Infant acuity was a significant difficult aspect of the NICU experience and one frequent cause of maternal and paternal anxiety.

*The beginning was real hard because she was having breathing problems. She was hooked up to all this and she was having digestive issues and they said it could come down to them having to do surgery and they wanted to give her antibiotics and the PICC line. I had so many questions about that. You're going to stick a line in my baby's arm all the way up to her chest? She's just a little baby.*

Perceived setbacks such as going back on CPAP from being on nasal cannula, having either continual or recurrent apnea/bradycardia (respiratory and/or heart rate drops) was very frustrating and disheartening for mothers. One mother stated,

*Its four weeks later and you know, um, I don't want to get too excited about anything though just because, I don't want, I'm anticipating a setback. Not that I should but I always have in the back of my mind that could happen.*

Another mother explained,

*She did have some apnea. They took her off the CPAP and put her on the nasal*

*cannula then she went back on the CPAP machine because the cannula wasn't doing the job [...]. There were a few setbacks and those were disheartening [...]*

Two mothers echoing similar sentiments, “*Last week they took a few dips, um in particular he was on the CPAP to cannula then he had to go back on the CPAP which was hard to take [...]*” and the second mother,

*A couple of days ago she had issues with her belly, um and they were thinking we don't think its NEC [necrotizing enterocolitis] but we...so that was really scary for us, and they did take her off, they stopped feeding her for twenty-four hours and took x-rays in the morning, night and next morning to kind of check on it. She had air in her belly and it [emotionally] was hard so that was really scary to have that setback.*

*We weren't expecting to have any more setbacks.*

Conversely, when the infant made improvements or reached milestones this subjectively improved the mother's mood as one mother stated,

*Last week they took a few dips, um in particular he was on the CPAP to cannula then he had to go back on the CPAP which was hard to take but then he went from being on CPAP to not needing the cannula at all [...] They're getting there, so its great.”*

Another mother stated,

*The difference from the beginning until now is they are getting a little bit older and they are starting to do things on their own which is encouraging to watch the progress that they are making and knowing that they are going to get better and that they are going to come home and that, knock on wood, they are going to be normal, healthy, happy babies, which obviously puts a smile on my face.*

Another stated,

*We call at night, when we can't come at night we call at night and its good to hear she had some weight gain or whatever it is, she didn't spit up, no spit ups, all those things, poo'd in her diaper. It's all good to hear.*

A fourth mother stated, *"Catching on to the bottle, not spitting, things like that are always good."*

### **Theme 3. NICU staff: make or break a mother's experience**

Sixteen mothers mentioned the NICU staff, physicians and nurses, as undeniably impactful to her mood and overall positive or negative NICU experience. *"The nursing staff and doctors have been amazing."* A second mother stated, *"The nurses here, they're so, they're comforting and very helpful. [...] The staff here are beautiful. I love every single last nurse that has taken care of him because they let me know a lot of things."* A third mother reflected,

*The doctors, they are really, um, really welcoming. They made me feel comfortable, like they're not just strangers. "Your baby is fine." "We'll figure it out." kind of thing. So I feel like I'm becoming more closer to them, a lot. I really like them; they're loving. They love him and they do whatever they have to do and they tell me what's wrong, keep me updated.*

Several mothers mentioned specifically the beneficial and highly validating effect of being included in rounds especially when they felt their opinion positively impacted their infant's treatment plan. One mother stated,

*And I love doing rounds. Just to hear what's going on and that they involve us especially when we were trying to figure out the HMF [human milk fortifier] with him. They were talking about formula feeds and breast milk. I veto'ed that and got a very, um, intense reaction that I would not put him on straight formula. But then [physician] was able to*

*work with us and that formula was just not the way to go. So its nice to be involved in the process and hear what everyone had to say and they checked with us several times to see if we were comfortable with the plan. Not a lot of doctors do that so that was very nice to see here.*

Another mother stated, *“Its nice to be involved and not in the corner and not know things.”*

When mothers had consistency in the nursing care of their infants, trusted staff, particularly nursing, they reported feeling better and less anxious when leaving. One mother stated, *“We were moved once and here we have a lot more consistency with who we have every day so that’s been nice to have that consistency especially overnight.”* Another mother, *“Having the same nurses was good. If I haven’t met them, we found that we have our favorites; makes me feel better to know she’s in good hands.”* Another mother stated, *“A select few of the nurses who gained our trust, we became closer to. They treated her like she was her own. Being able to leave here knowing she was in good hands made it easier.”*

When a mother did not trust her infant’s nurse, she felt more anxious when leaving. Distrust of nursing staff could come from unfamiliarity, a previous negative experience with a particular nurse or perceiving that a particular nurse did not have adequate time to care for her infant. One mother stated,

*There’s a lot of doctors and nurses and the switching of nurses is very stressful because I never know which nurse he’s going to get and if I’ll be ok with the person he’s going to get. There’s about two or three that I feel that I don’t want to leave his side all day because of the person he’s going to get. [...] Its only been that one instance with that nurse that I don’t know that I could leave him here and that he’d be ok. It was a nurse that we’ve been fine but she was busy doing other things. She was completely ignoring*



*the baby, the beeping and I understand if you are busy but if you are busy you should get someone else. That was that one incident where my husband and I were like maybe we should stay tonight.*

#### **Theme 4. *The cycle of mental and physical exertion and recovery***

Fifteen mothers mentioned aspects of themselves affecting their postpartum mood and NICU experience. Mothers discussed that having an infant in the NICU felt like a loss of a normal pregnancy and birth, a loss they had to grieve. As one mother stated,

*I think one of the hardest things about this is grieving the loss of the ideal birth. Like I have my baby shower which I'd been postponing and trying to find an outfit is really hard 'cause you know, so mourning that loss."*

And another stated,

*Eating for me and sleeping for me was really hard for me when he first got here. I had a lot of feelings like I felt like I was different kind of person like, I'd see a lot of girls that were still pregnant. I felt like that wasn't fair for me. I was kind of like angry mad cause I see someone pregnant and it's not, you know. I was supposed to stay pregnant till January.*

Pumping breast milk and breast-feeding had both positive and negative impacts on a mother's sense of well-being. When pumping and/or breast-feeding were going well, mothers felt encouraged that they were making a significant positive impact on their infant; that the effort and time was worth any discomfort. One mother stated, *"He latched on pretty early so he had no issues with that and I had no problems with supply."* When pumping and/or breast-feeding was more difficult or not going as anticipated, mothers reported feeling discouraged and exhausted.

One mother stated, “[...] and pumping every three hours, it’s hard for me. I can’t get to do anything else. I have to rush. I’m always rushing, but then you know she’s benefitting.”

Another mother stated,

*The only time my moods would get effected was, so because my body is producing for three babies, I have to pump every two hours and I think people generally pump every three to four hours and even if I don’t get a lot out after two hours, the babies only eat 50 milliliters. It’s enough that if I don’t do it my ducts get clogged and then I’ll really be in a very very bad mood. For me, pumping affects my mood swings, not really anything else.*

Several mothers described physical ailments such as recuperation from a cesarean section and high blood pressure as contributing to discouragement and negative mental states. One mother stated, “Having my blood pressure issues made it harder because I couldn’t come in as much, that was very upsetting.” Another mother, disappointed when unable to see her infant soon after delivery due to recuperation issues stated,

*I just wanted to see her [...]. I came that night. Six hours I came out of PACU and I went to the floor and they were making sure I was able to get up [...] They wanted to see how well you do so that took a lot of time. [...] I wanted to come [to NICU] so bad.*

Lastly, a few mothers mentioned how simply having a positive outlook was important to self - preservation. One mother stated,

*I mean inside, whatever you feel inside its nothing to do with the place. Its just kind of the way it happened. The biggest challenge would be to be good to your self, be friends with yourself. I’m scared most of the time but its gotten better. In the morning you’re always optimistic. You always wake up with, no matter what you’re going to make it.*

Another mother stated,

*I try to stay positive about it because the baby needs the positive. He don't need the I try to stay positive about it because the baby needs the positive. He don't need the negative and if you think positive it makes it a little easier. You stay stronger and it also makes you have a better day or you wake up in a better mood if you stay that way.*

### **Theme 5. Somebody to lean on**

Nine mothers discussed that having a husband/partner, family, friends and religious beliefs were forms of support. NICU mothers viewed their spouse/partner as either encouraging her sense of well-being or greatly hindering it. Mothers who's partners were supportive, physically and mentally present, active in hands on care or assistive in other ways greatly helped these mothers. One mother stated,

*We're always on the same page so its been easy. When he's noticed I'm only irritable at him. If I'm uncomfortable I can hide it from everyone else but for some reason I'm more comfortable snapping at him. So I'll tell him I've got clogged ducts and he knows I'm really uncomfortable. Then in term of everything else, we're on the same page.*

*Everything has just flowed very easily.*

Another mother stated,

*He is making sure I'm on the right path. I think that's the best way to put it. He's solid. I mean he's just making sure I don't over do myself. That's his job, taking care of all of us.*

A third mother stated,

*Having the support of my husband while I do the breast feeding and pumping is helpful. Just holding the snappies, just anything he can do to help. There's parts of it [breast feeing] he can't do but what he can do, he cleans the pump afterward that sort of thing, not every time certainly, but when he can he does. He also helps prepare dinner while I'm pumping. He'll start dinner which is helpful.*

Fathers of the infants who were not present were a source of sadness and discouragement. As one mother stated,

*What was hard, its still hard, that dad lives in Florida. Its really hard because he wants to be around. He was here when we had [infant's name] then he left like a week after. But that's pretty much what's really hard. That's the only thing like dragging me down a bit because I'd like be here and when I talk to [father of infant], he wants to talk to [infant's name] as well and be a family kind of thing.*

Extended family had dual effects on maternal well-being. One mother stated,

*My support at home too has been pretty good. Even though my mother-in-law has moved in with us, its been a big help and she's been taking care of stuff at home so I can be here for the eight plus hours.*

Another mother stated,

*Having family around to assist and take care of the organizational aspect, getting the nursery ready, helping me heal. My parents have been able to get up here. [...] so just a few times my mom [...] and my dad [...] assist for a couple of days here and they're leaving a lot of meals when they come so that's been hugely helpful.*

However, mothers also mentioned feeling burdened and anxious by increased unwelcomed extended family involvement and visitation to the NICU. One mother stated, “*Family pushing to visit, family that you're not close with before now they're here wanting to visit.*”

Several mothers mentioned their religious community and unit support specialists and parent groups as a source of support and encouragement. One mother stated, “*The church we go to is really very supportive. We don't have family here but our church is really, really*

*supportive. They've offered several times to help."* Another stated, *"I think God looks out for a lot of people too and he's here to support us [...]."* A third mother stated,

*A lot of people support you and they help you a lot and you know they tell you that when you go to the groups; the 'Parenting Hour'. So I went to one of those and it was interesting to hear about their baby being early; the different situations that it is for them. So I think that you learn from it too because you learn a lot of things about babies that a lot of people don't experience and some people have the same feelings as you and some have different feelings so you kind of learn what's the positive and that I'm not the only one that's feeling like that.*

Regarding the March of Dimes specialist on one unit, one mother stated, *"Michelle has been tremendous, really helpful."*

#### **Theme 6. A place of unending stimuli**

Three mothers mentioned aspects of the NICU environment as negatively impacting their mood and overall NICU experience. On the other hand, while some mothers agreed their infant was in a noisy location, it was a trade off. Mothers stated they felt less anxious, especially when leaving for the night, knowing someone, a nurse, was close by should their son or daughter require intervention.

One mother reported feeling very worried due to the location of her infant. She felt her daughter's location was a noisy spot in the NICU; her bedside cart and cabinets were very noisy as well as the nearby nurse's station and she worried this was affecting her daughter's current neurodevelopment and would impact negatively her daughter's future development.

*My pod is extremely noisy next to the washing sink and the nurse's station and the lights are always bright. I wish we were in a different pod but the trade off is that you're right*

*near the nurses' station. When they sleep or something happens there's always someone nearby and they get quicker attention than some of the other moms I've noticed. I just worry that developmentally that they are exposed to brighter lights and loud noises some times and so I feel bad for them because it bothers me, it has to bother them. I think they're more sensitive to loud noises and things startling them. So if I could request a different pod but again there's a trade off. I'd rather have nurses really close by. [...] and then especially [one of the triplets], she's closest to the opening [of the pod], she's the smallest and she gets probably terrible sleep because of the constant noise and light. That's just an observation. I've been told by the nurses I have definitely the very loudest area, but they wanted to keep all three together. I've noticed like their file cabinet behind [another of the triplets] is so loud. When they slam it shut it makes me jump. There's just things I wish were different. I didn't want her to be over stimulated. I almost observe that her personality where she seems like her eyes are really active. She seems over animated that concerns me for like down the road. Is she going to be an over stimulated child? Where I've heard of different diagnosis and things where I'm thinking oh my God, did that already affect how she reacts to things. I wish it were quieter than, that's just the way it is.*

A second mother echoed, *"Obviously there's just so much stress. I can't emphasize enough, there's just so much noise. [...] But its nice having all these people around who can come to your rescue."*

### **Summary**

Besides the descriptive analyses, this chapter revealed several key findings. First, maternal and paternal contact increases over times and was not related to gestational age or

infant severity of illness and is related to one another, as one partner had contact so did the other. Second, a considerable percentage of NICU mothers are suffering from elevated PPD symptoms. Seventy percent of mothers had elevated PPD symptoms at 2 weeks and at 4 weeks. Third, the maternal demographic related to elevated PPD symptoms were age, marital status and educational status. Fourth, there maternal diaper changing and paternal skin-to-skin contact were the primary parent – infant contacts correlated with elevated PPD symptoms at 2 and 4 weeks. Fifth, combined maternal and paternal – infant contacts had significant inverse correlations with most notably the MNT subscale from the PDSS at 2 and 4 weeks and were approaching significance on several additional PDSS scores. Last, NICU mothers regardless of PDSS scores, had similar qualitative experiences. Most mothers wanted close, intimate contact with their infant, were constantly observant of and worried for their infant, felt the NICU physicians and nurses were very important in the quality of their NICU stay, had concerns regarding their own physical recuperation, were impacted positively and negatively by social support or lack thereof and had increased stress and anxiety related to the NICU environment.

The next chapter will be a discussion on the results of this study. These results will be compared and contrasted to previous research on maternal depression in the NICU and the effect of paternal presence and paternal-infant contact. Last, implications for future research, strengths and limitations and feasibility will be addressed.

## **CHAPTER FIVE**

### **DISCUSSION**

Chapter five provides discussion on the main quantitative and qualitative results alone and as they relate to previous research results. In addition, the feasibility of conducting this study, the strengths and limitations of this study as well as potential future research and clinical implications are also addressed.



## **Quantitative Findings: PDSS and Parent-Infant Contact**

### **Prevalence of elevated PPD symptoms**

It is clear from this study that depressive symptoms are elevated in a significant portion of mothers with preterm infants in the NICU. Roughly 70% of mothers had elevated PDSS\_14 total scores with 21% of those mothers having scores greater than the upper cutoff of 80 indicating a positive screen for postpartum depression. Sixty percent of mothers had elevated PDSS\_28 total scores with 25% of those mothers having scores greater than the upper cutoff of 80 again, indicating a positive screen for postpartum depression. These percentages, particularly those mothers scoring greater than 80, are similar to results found by other authors. In a study investigating the impact of maternal depression on breastfeeding practices in the NICU, the authors noted that 37.5% of mothers had elevated PPD scores indicating considerable depressive symptoms (Northrop, Wootton, Evans & Stotts, 2013). In a study investigating risk factors for postpartum depression among low-income mothers of very preterm infants, Garfield et al. (2015) found 42% of mothers had elevated depressive scores. In a study investigating potential risk factors for postpartum depression in mothers of very preterm infant getting discharged from the NICU, Rogers Kidokoro, Wallendorf and Inder (2013) found that 20% of mothers screened positive for PPD. In a study investigating model for risk factors for postpartum depression in NICU mothers, Segre , McCabe, Chuffo-Siewert and O'Hara (2014) found > 25% mothers screened positive for postpartum depression. Blucker et al. (2014) found > 35% mothers screened positive for postpartum depression with close to 30% of those having significantly elevated scores on the PDSS. McCabe et al. (2012) found 52% NICU mothers screened positive for postpartum depressive symptoms (score  $\geq$  80) and 30% were at risk, meaning had elevated symptoms (scores  $\geq$  60 - 79) for PPD on the PDSS. Miles, Holditch-Davis, Schwartz and Scher

(2007) using the CES-D found an alarming 63% of mothers screened positive for elevated depressive symptoms.

While it is clear a significant portion of NICU mothers are experiencing elevated postpartum depressive symptoms, it must be noted that many studies do not clearly report when the screens are being administered. Great variance in scoring can occur if screens are being administered at 2 weeks versus 4 weeks versus 8 weeks and so on. Since 2 weeks is early in the postpartum period and the NICU is such a specialized environment an option to assess maternal well-being may be to use the Parental Stressor Scale: Neonatal Intensive Care Unit (PSS: NICU) at that same 2 week mark. The PSS: NICU is a well validated, self-report instrument used to evaluate parental stress and anxiety in response to: the sights and sounds of the NICU, the infant's appearance, the NICU staff and parent – infant interaction (Franck, Cox, Allen & Winter, 2004; Miles, Funk & Carlson, 1993).

In addition, there is great variance in instrument choice (Vigod, Villegas, Dennis & Ross, 2010). Some instruments such as the CES-D (Radloff, 1977) and BDI (Beck, 1978), while developed to assess for depression in the general population, were not developed to assess for postpartum depression (Radloff, 1977). However, it must also be taken into consideration that to examine postpartum depressive symptoms in NICU mothers, investigators are under time constraints as some mothers of preterm NICU infants, if at the upper preterm gestational age of  $\geq 34$  weeks and otherwise healthy, may be potentially discharged within two weeks. This is significantly prior to the typical window for PPD screening.

### **Maternal and Infant Characteristics and PDSS**

Regarding maternal characteristics, maternal age was negatively associated with only the sleep subscales on the PDSS\_14 and not associated with other PDSS\_14 or PDSS\_28 scores.

This is different from several studies that have found an association between young maternal age and elevated postpartum depressive symptoms especially among African American mothers and mothers in lower socioeconomic groups (Garfield et al., 2015; Northrup, Evans & Stotts, 2013). Similarly, marital status was only negatively associated with SLP on the PDSS\_28. These results, potentially due to small sample size, deserve further investigation as several studies have shown significant positive relationships between being married and elevated postpartum depressive symptoms (Alkozei, McMahon & Lahav, 2014; Rogers, Kidokoro, Wallendorf & Inder, 2013).

Additional risk factors for elevated postpartum depressive symptoms in NICU mothers are lack of social support and being of lower socioeconomic status (SES) (Northrup, Evans & Stotts, 2013; Tahirkheli, Cherry, Tackett, McCaffree & Gillaspy, 2014, Vigod, Villegas, Dennis & Ross, 2010). Increased anxiety felt by NICU mothers of less education and income may be due to perceived or actual reduced physical resources. It can be easily understood how young, less educated, perhaps socially isolated and financially challenged mothers could become emotionally overwhelmed when in addition to grappling with their infant's situation also must now consider the financial costs of hospitalization, transportation, parking, and basic infant needs.

This study however did not find a relationship between either a lack of social support or lower SES and elevated PPD symptoms. The majority of mothers in this study indicated feeling either "very" or "mostly" supported from their significant other, immediate and extended family and friends. In this study, many fathers engaged in contact with their infant and increasingly did so increasingly as the infant increased in GA.

In addition, this study did not assess income but rather highest level of education. It was found that the majority of this population of mothers had at least some college education indicating a greater potential for a higher standard of living. Maternal education was negatively associated with only the anxiety subscale from the PDSS\_14 but not with any of the other subscale or total scores of the PDSS\_14 or PDSS\_28. Perhaps regardless of formal schooling, as mothers spend more time in the NICU they become more familiar with and less intimidated by all that concerns their infant and the NICU. They become highly ‘schooled’ in the ways of the NICU; potentially increasing their confidence thus decreasing negative symptomatology.

Infant severity of illness has been both associated and not associated with elevated postpartum depressive symptoms. Lower gestational age, lower birth weight, more days on ventilation, more visible signs of sickness were not found to be a factor for elevated postpartum depressive symptoms in a studies conducted by Alkozei, McMahon and Lahav (2014) and Garfield et al. (2015) but were associated with elevated postpartum depressive symptoms in Northrop, Evans & Stotts, (2013); Rogers, Kidokoro, Wallendorf, & Inder, (2013); Segre, McCabe, Chuffo-Siewert & O’Hara, (2014) and Vigod, Villegas, Dennis & Ross, (2010).

In this study, only severity of illness as measured by an average NTISS score for week one was correlated with maternal contact. In week one the average NTISS score was significantly positively correlated with maternal diaper changing. As the infant may be more ill, perhaps the only activity permissible or tolerable for the infant was diaper changing. The average NTISS score was also significantly negatively correlated with maternal holding. As the infant improves or as the NTISS score decreases, the mother holds more and visa versa, as the infant’s severity of illness increases, the mother holds less. Neither infant GA nor severity of illness as measured by the SNAPPE-II and NTISS scores were correlated with any of the

subscale or total scores on either the PDSS\_14 or PDSS\_28. This is important to consider because if it is modifiable external factors such as barriers to maternal-infant contact or the NICU environment and not infant GA or severity of illness that are contributing to NICU maternal PPD symptoms, these external factors can be modified for maternal benefit. For instance, if the infant is intubated, on CPAP, in the isolette or even under photo-therapy, NICU physicians and nurses can still take action to encourage and allow for intimate maternal-infant contact. If the NICU environment is highly anxiety promoting, perhaps changing the infant's location to a quieter bed space would do much to alleviate maternal anxiety symptoms.

### **Maternal-Infant Contact, PPD symptoms and PDSS scores**

Physical contact between mother and her NICU infant is vital to the mother's sense of well-being. However the type of contact a mother has with her infant and its ability to reduce PPD symptoms has yet to be defined. For instance, tactile interaction such as infant massage between mother and NICU infant as well as between mother and older, non-NICU infant has been shown to reduce maternal depressive symptoms (Feijo, Hernandex- Reif, Field, Burns, Valley-Gray & Simco, 2006; Holditch-Davis, White-Trout, Levy, O'Shea, Geraldo & David, 2014; Onozawa, Glover, Adams, Modi & Kumar, 2001). Skin-to-skin contact has and has not been shown to reduce PPD symptoms (Athanasopoulou & Fox, 2014; Mörelius, Örténstrand, Theodorsson & Frostell, 2015). For instance in an intervention study by Feldman, Eidelman, Sirota and Weller (2002), mothers in the intervention group were instructed to provide skin-to-skin contact for their preterm infant for at least 1 hour per day for 14 days as compared to a usual care group. At 37 weeks postnatal, the mothers who provided skin-to-skin for the 14 days had less depressive symptoms as measured by the BDI than mothers in the usual care group

( $p < .001$ ). In a study by Bigelow, Power, MacLellan-Peters, Alex and McDonald (2012), mothers in the intervention group were instructed to provide skin-to-skin care to their full term infant for up to 6 hours per day for the first week then up to 2 hours per day until one month. At one week, PPD depressive symptoms as measured by the EPDS and CES-D were significantly less in the intervention group ( $p < .05$ ) and only slightly less and not significantly so, at the one month check and not different from the control group at 2-3 months. And while depressed mothers provide less breast-feeding (Northrop, Wootten, Evans & Stotts, 2013; Paul, Downs, Schaefer, Beiler & Weisman, 2013), exclusive breast -feeding may be protective against PPD symptoms (Figueredo, Canario & Field, 2014).

This study revealed that maternal diaper changing specifically was significantly positively correlated with several elevated PDSS\_14 and PDSS\_28 subscale scores as well as with the total PDSS\_28 scores, while other forms of maternal contact such as holding, skin-to-skin contact and breast-feeding individually, were not. Perhaps there are underlying mechanisms that occur during diaper changing that are more psychologically attractive to a NICU mother experiencing elevated PPD symptoms than other forms of maternal-infant contact such as holding, skin-to-skin contact or breastfeeding.

First, diaper changing is a time limited task or activity. As a mother has elevated mental confusion, loss of self or guilt perhaps diaper changing is the one activity she feels capable of engaging in. Second, diaper changing occurs in the isolette or crib. Perhaps NICU mothers with elevated PPD symptoms feel it is a safer or an otherwise less fearful activity than other mother-infant contact options. Third, diaper changing usually awakens the infant encouraging infant alertness thus promoting the opportunity for increased eye contact between mother and infant that may not occur during swaddle holding particularly if the infant is asleep or similarly during

skin-to-skin contact or breast-feeding. Perhaps it is these eye-to-eye contacts during diaper changing that emotionally reward mother aiding in reducing or relieving PPD symptoms.

There is much in the literature to support biological mechanisms involved in promoting psychological rewards for mother as she engages in pro-maternal-infant interactions (Rillings, 2013). This reward activation serves to foster maternal behaviors that would ensure mother-infant bonding and thus infant survival. One biologic mechanism closely linked with reward and affiliate behavior is via the neuroendocrine peptide Oxytocin (OT). OT both drives parental affiliate behavior and rises in response to mother-infant bonding interactions, including affectionate touch and mutual eye contact interactions (Feldman, Weller, Zagoory-Sharon & Levine, 2007). Mothers with higher levels OT have more responsive and affectionate behavior with their infants (Samuel et al., 2015) and in a small study with mothers who specifically had elevated PPD symptoms were given exogenous intranasal OT, pro- maternal-infant behaviors increased (Mah, Bakermans-Kranenburg, Van Ijzendoorn & Smith, 2015).

Oxytocin, has also been found to have anxiolytic and antidepressant effects (Amico, Mantella, Vollmer & Li, 2004; McQuaid, McInnis, Abizaid & Anisman, 2014; Okabe, Yoshida, Takayanagi & Onaka, 2015; Scantamburlo, Hanseene, Geenen, Legros & Ansseau, 2015; van den Burg, Stindl, Grund Neumann & Strauss, 2015; Yang et al., 2011) and lower perinatal OT levels are associated with postpartum depressive symptoms (Skrundz, Bolten, Nast, Hellhammer & Meinlschmidt, 2011). Affectionate touch and maternal-infant gaze are soothing for both mother and infant. In the case of NICU mothers suffering from elevated anxiety, OT levels may be driving maternal-infant situations such as diaper changing in attempts to gain the anxiolytic and antidepressant effects of OT.

Even though breastfeeding is associated with increased OT levels (White-Traut et al., 2009), perhaps the non-correlation between breast-feeding and PPD scores in this study is primarily due to the small number of mothers who were actually able to breast-feed their infant due to the reduced gestational age of the infant during the course of study participation. With so few mothers breast-feeding, significant statistical relationships would not be possible to find. In this study for example, if a mother was enrolled during her infant's 28<sup>th</sup> week of life, she would be done with the study participation during her infant's 32<sup>nd</sup> week of life, too early to initiate let alone sustain breast-feeding long enough to statistically impact PPD symptoms.

Knowing the enormous contribution breastfeeding makes to the health and development of the NICU infant, it is interesting to note that for those mothers who were able to breastfeed older infants preterm infants, this study did find a highly significant positive correlation between maternal holding and skin-to-skin contact with breastfeeding. While research is not definitive as to which maternal-preterm infant contact patterns encourage breastfeeding, research has shown that early maternal-infant contact such as skin-to-skin contact after delivery versus maternal-infant separation promotes mother-infant bonding behaviors (Bystrova et al., 2009) and skin-to-skin during the NICU hospitalization promotes milk supply and breastfeeding during hospitalization and after discharge (Bigelow, Power, Gillis, Maclellan-Peters, Alex, 2013, Briere, McGrath, Cong & Cusson, 2014; Renfrew et al., 2009). Therefore, if we wish to promote and encourage breast-feeding or if mother is already engaged in breast-feeding and wishes to increase breast-feeding, staff should also encourage mother to hold and engage in skin-to-skin contact as much as possible.

Additionally, the connection between breastfeeding and breastfeeding expectations and PPD symptoms in the NICU warrants closer investigation as there are potentially numerous



factors pertaining to breastfeeding that could potentially significantly negatively impact maternal sense of well being (Gregory, Butz, Ghazarian, Gross & Johnson, 2015). For a new first time, breast feeding mother regardless of age, breast feeding a premature or less than optimally healthy full-term NICU infant is an enormous challenge. There may be bothersome equipment to contend with to get the infant situated on mother. The infant may be much less mentally vigorous than a healthy term infant and have less suck strength than a healthy full term infant creating latching frustrations. Mother's milk supply may be low, frustrating the infant and the mother. Lack of privacy in the NICU may prove an obstacle to new, shy breast-feeding mothers. Add to these challenging circumstances other risk factors for PPD such as younger maternal age and lower social support and you potentially have a mother at heightened risk for elevated PPD symptoms in the NICU who needs to be evaluated and supported.

This study did show that a combination of intimate maternal contact was able to impact postpartum depressive symptoms in a beneficial way; perhaps this is a key finding. Mothers should be encouraged to participate in as much contact with their infant as possible. This includes utilizing a variety of types of contact that may be especially valuable to mothers given perhaps visitation time limitations or personal contact preferences. This also means not dismissing the small beginning contacts, such as diaper changing, that occur between mother and infant. A five or ten minute hands on diaper change either alone or in combination with a brief skin-to-skin contact or breast-feeding trial or even touching through the incubator may be not only the extent to which the mother can emotionally tolerate contact at said given time but also may prove highly valuable in both encouraging greater maternal-interaction in the following weeks and also impacting PPD symptoms in ways we may not initially perceive as being significantly positively influential long term.

### **Paternal - Infant Contact, PPD Symptoms and PDSS scores**

This study is the first to investigate the patterns of various contacts between fathers and their preterm NICU infants alone and as it relates to maternal postpartum depressive symptoms in the NICU. This research showed that early paternal-infant contact resulted in greater paternal-infant contact for the subsequent weeks of NICU hospitalization. This result is well supported in qualitative literature investigating fathers' experiences of having an infant in the NICU (Fegran, Helseth & Fagermoen, 2008; Lindberg, Axelsson & Öhrling, 2007, 2008, Lundqvist, Hellström Westas & Hallström, 2007). NICU fathers may be physically present visiting but have less actual contact in the initial weeks because they perceive their preterm infant as fragile and they fear 'breaking' their infant and/or dislodging lifesaving equipment attached to their infant. However, in this study, infant's GA or severity of illness were not correlated with paternal contact patterns. Over the course of hospitalization as fathers become more familiar with the situation and feel a greater sense of control, they may increase in the amount and types of contact they have with their NICU infant. Close proximity to and contact with their infant, though not specifically investigated in this study, is a prominent desire for fathers of preterm infants as well as mothers (Sisson, Jones, Williams & Lachanudis, 2015).

In line with Garten, Maass, Schmalisch & Bühner (2011) who investigated parental NICU visitation patterns during the first 28 days of life in preterm infants, this study found that:

1) paternal visitation was significantly less than maternal visitation in frequencies and 2) there were no correlations between infant characteristics and severity of illness and parental visitation frequency and duration. This study's maternal and paternal visitation patterns differed from Garten, Maass, Schmalisch & Bühner's (2011) in that their study revealed that the frequency of visitation declined for both parents in subsequent weeks of NICU hospitalization but duration of visit remained consistent, where as in this study, both parent's visitation durations increased over

the first four weeks. Interestingly and though follow-up evaluations after discharge on paternal-infant contacts were not conducted in this study, Levy Shiff, Hoffman, Mogilner, Levinger and Mogilner (1990) found paternal NICU visitation resulted in increased paternal-infant interaction quantity and quality during NICU stay ( $p < .001 - < .05$ ) and at 8 and 18 months post discharge ( $p < .001 - < .05$ ) and decreases paternal perception of infant difficultness at 18 months post discharge ( $p < .05$ ). They also found paternal NICU visitation resulted in improved infant physical and psychosocial growth at 8 and 18 months ( $p < .05$ ).

Second, this study showed the significant relationship between paternal-infant contact and maternal postpartum depressive symptoms which has not been previously studied. For instance, when analyzed alone, there was a significant positive relationships between paternal contacts and the SUI subscale of the PDSS\_14 and paternal skin-to-skin. As scores on the SUI subscale at both time points elevate, the more paternal diaper changing and skin-to-skin activity occurred. In addition, there were several positive and negative correlational relationships approaching significance between paternal contact and PDSS\_28 subscale and total scores. The reasoning for these results is unclear and similar results to these have not been examined, found or discussed in previous research. Perhaps as mother choose not to partake in certain activities for unknown reasons, the father takes over that parental task for again unknown reasons. Or, conversely, perhaps certain elevated maternal PPD symptoms encourage the mother to partake in these activities to the extent then that father is unable to.

### **Combined Maternal-Infant and Paternal-Infant Contact and PDSS scores**

Though causality cannot be determined through correlation analysis, the most important results of this study indicate that combined maternal-paternal contact with their infant had several significant, moderately strong, positive and negative correlations with PDSS scores. The

significant negative correlation between maternal-paternal contact for weeks 1 & 2 and SLP-14; the significant negative correlations between combined maternal-paternal contact for weeks 3 & 4 and the MNT\_14 and MNT\_28 subscale scores indicate a combined parent-to-parent infant contact influence on maternal PPD scores.

The interrelatedness of maternal-paternal behavior or the influence one NICU parent had on the other NICU parent's interaction with their infant is not completely surprising. Research has shown interrelatedness between maternal and paternal biological responses during or after interactions with their infant. For instance, research investigating maternal and paternal OT and cortisol in response to kangaroo care with their NICU infant, Cong et al. (2015) found correlations between maternal and paternal OT and between maternal and paternal anxiety and stress response as measured by cortisol. In a study investigating maternal and paternal oxytocin in response to affectionate and stimulatory interactions with their non-NICU infants, Feldman, Gordon, Schneiderman, Weisman & Zagoory-Sharon (2010) found baseline maternal and paternal OT levels were initially similar but then diverged, increasing in mothers after affectionate interactions and in fathers after stimulatory (active play) interactions. In a study investigating maternal-paternal biobehavioral responses to their own infant, Atzil, Hendler, Zagoory-Sharon, Winetraub and Feldman (2012) conducted brain scans and measured hormone levels in parents after interaction with their 4-6 month old infant. Though the sample size was small, preliminary results indicated that mothers and fathers have similar brain responses in several anatomic regions at the same time points to their interactions with their infants. In a study investigating associations between maternal and paternal OT and Cortisol levels during interactions with their child at 2 and 6 months, Gordon, Zagoory-Sharon, Leckman and Feldman (2010) found that OT was positively related to positive parental-infant interactions and that

mothers and fathers showed synchronous behaviors including affectionate touch and mutual gaze between each other and toward their infant when maternal-paternal-infant triad was in close proximity.

Regardless of unknown causality, any parental behavior that encourages positive contact with the infant is invaluable. As previously mentioned, infants, especially NICU infants who by virtue of being in the NICU are at significant risk of suboptimal neuro and social development, benefit greatly from positive parental engagement. Parents are the NICU infant's buffer against its harsh NICU world, mediating negative consequences of the NICU environment. With so many positive and negative opportunities the NICU infant has for learning about relationships in its current surroundings, NICU parents have numerous opportunities by appropriately responding to and comforting a distressed infant, to help that NICU infant develop interpersonal trust in an untrustworthy environment.

Second, any parental behaviors and practices that decrease maternal PPD and increase maternal wellbeing, are enormously helpful. Post-partally depressed mothers suffer from numerous negative psychological symptoms. NICU mothers may suffer greatly with increased psychological symptoms. Combine a NICU mother who also has heightened PPD symptoms and you have a mother in great distress, pain and suffering. If contact with her infant, especially in conjunction with a partner who is actively engaged in the care of their infant, has the potential of relieving PPD symptoms, as health care providers we are responsible to promote such behaviors.

### **Qualitative Findings: Themes**

While correlational analysis could not be run between quantitative and qualitative results as originally intended, it is clear that the NICU experience subjectively impacts maternal

postpartum mood on several levels. These mothers were able to speak to a multitude of issues that they felt negatively and positively affected their sense of wellbeing.

**1<sup>st</sup> theme: *The all important mother-infant connection***

As for the thematic results, this study's results were similar to previous qualitative research investigating the parent's NICU experience. This study revealed the number one issue mothers stated impacted their postpartum mood was contact with their infant. Lack of contact with or proximity to, such as in the case when remaining impatient on postpartum floor, having to drive to the unit from far away, or encountering barriers such as the physical environmental or resistive staff, increased maternal stress and anxiety. Conversely, mothers stated being able to hold, participate in skin-to-skin contact, breastfeed and additional basic hands on cares was instrumental in improving their postpartum mood and encouraged an increased sense of motherhood. These results are similar to previous research (Alkozei, McMahon & Lahav, 2014; Fegran, Helseth & Fagermoen, 2008; Fenwick, Barclay & Schmeid, 2008; Lupton & Fenwick, 2001; Schenk & Kelley, 2010; Wigert, Johansson, Berg & Hellström, 2006).

**2<sup>nd</sup> theme: *Under the maternal watchful eye***

Research has consistently shown that mothers are acutely aware of the presentation of their infant and the progress their infant does or does not make over the course of their NICU admission. For instance, the vigilant watching over of their infant, not uncommon in previous research, was not uncommon in this study as well. Mothers being keenly aware as to the small size of their infant and any setbacks their infant experienced was also not new. The back and forth between respiratory support means and the subsequent disappointment revealed in this study was also very similar to previous research (Cervantes, Feeley & Lariviere, 2011; Lee,

Long & Boore, 2009). These infant focused maternal concerns then can be seen as considerable global factors to increased maternal stress, anxiety, disappointment, uncertainty and depression.

**3<sup>rd</sup> theme: *NICU staff: make or break a mother's experience***

The third theme, staff, has also been expressed in previous qualitative research (Cleveland, 2009; Fenwick, Barclay & Schmeid, 2008). Mothers, in agreement with previous research (Fenwick, Barclay & Schmied, 2008; Heerman, Wilson & Wilhelm, 2005; Hurst, 2001), report much encouragement and improvement in mood when they are able to form positive relationships with their infant's nurses but much maternal dissatisfaction and angst with negative mother-nurse relationships or with a change in staff due to assignment changes or infant location changes. Parents want information from medical staff and typically have a high level of trust in the physicians and nurses taking care of their child. Receiving information from those with whom they developed strong positive relationships was of great comfort to the mothers from this study. The positive impact of being present for rounds and feeling that their opinions during rounds mattered on maternal mood cannot be underestimated or overstated.

**4<sup>th</sup> theme: *The cycle of mental and physical exertion and recovery***

The fourth theme was also similar to previous research (Carr Swift & Scholten, 2009; Lee, Long & Boore, 2009; Wigert, Johansson, Berg & Hellström, 2006). These mothers reported being highly fatigued from: a lack of sleep, pumping, breast-feeding, taking care of older children, recuperation from a cesarean section or residual hypertension, having their infant in the NICU, and grief from the loss of a normal pregnancy, birth and post-birth experience. All of these 'self' experiences had significant negative impacts on their postpartum sense of wellbeing.

**5<sup>th</sup> theme: *Somebody to lean on***

Several qualitative and quantitative studies have discussed the positive and negative impacts of both social support and marital status on the maternal postpartum NICU experience (Schenk & Kelley, 2010; Rogers, Kidokoro, Wallendorf & Inder, 2013; Vigood, Villegas, Dennis & Ross, 2010). Similar to those results, mothers in this study reported a positive psychological impact from having a strong social network and interestingly, increased and decreased stress and anxiety from their marital relationship.

#### **6<sup>th</sup> theme: *A place of unending stimuli***

In line with previous research, the NICU environment was highly anxiety producing for this population of mothers (Alkozei, McMahon & Lahav, 2014; Cervantes, Feeley & Laviere, 2011; Lee, Long & Boore, 2009). The high noise and light levels and the equipment surrounding their infant, such as isolettes, intravenous lines and ventilators, was at various times a source of fear, anxiety, sadness and discouragement. Interestingly, it was the mother's perception of these aspects of the NICU and how it relates to her infant's acuity that colored how the NICU environment impacted her postpartum state of mind. For instance, in this study there were mothers of very sick infants requiring a high level of intervention who scored in the lowest ranges on the sub-scale and total scores on both PDSS screenings and visa versa, very high PDSS scoring mothers had infants of much less acuity requiring much less medical intervention. These low PDSS scoring- higher infant acuity mothers seemed to still see their very sick infants as beautiful and as 'fighters'.

### **Mixed Methods Findings**

When the qualitative data from maternal interviews was analyzed in light of PDSS scores, there was no pattern or relationship between maternal PPD symptoms and what the mothers discussed. Several scenarios occurred. Either regardless of PDSS scoring and infant



severity of illness, mothers verbalized similar observations and worry about their infant or high PDSS scoring mothers voiced observations in a very positive tone and low PDSS scoring mothers voiced observations and concerns in a negative tone. How mothers spoke of their situations, observations and concerns were also not reflective of their infant's severity of illness. Mothers of high severity of illness infants spoke very positively regarding their infant similar to mothers of low severity of illness infants. These varied responses may also be a reflection of maternal premorbid psychological functioning. Some mothers may simply be predisposed to experiencing higher anxiety levels or other mental states that could contribute to elevated PPD symptoms, than other mothers irrespective of the situation.

### **Feasibility**

Lastly, the issue of the feasibility of conducting this study needs to be addressed. First, Tahirkheli et al. (p. 980, 2014) indicated that the PDSS was lengthy and time consuming for the mother to complete. This researcher did not find this to be the case. Mothers were able to complete the PDSS in approximately 10 minutes and there were no complaints from the mothers that the completion of this instrument was otherwise mentally or physically taxing. A second issue was participant retention. Several mothers, who had elevated scores either in the SUI subscale or total score, withdrew once they found out it was required per the study protocol that they needed to be evaluated by social work services. Mothers feared the consequences of having elevated PDSS scores and having to be evaluated by social work even though reassurance that high PDSS results and social work referral would not result in maternal-infant separation was reinforced. A third issue was mother-father self-report of contact. Only one mother used the log that was provided for her to record the types and durations of contact both she and father had with the infant. All the remaining participants relied on memory or recall when discussing their

types of durations of contact they had with their infant for the previous week. This could result in erroneous contact information. Last was the issue of coordinating meeting times with the mothers. At times this was difficult as it was not originally approved in the protocol to call the mothers to arrange meeting in the NICU. This researcher had to rely on meeting with the mother during a previously agreed upon time, which the mother may have forgotten about or during a time when the mother was otherwise typically in the NICU. Also, even if a meeting was previously arranged, the mother would for various reasons, typically after an infant setback, decline to meet.

To enhance feasibility in a subsequent study of the same or similar design, first the maternal log would not be introduced as the responsibility for filling out the log seemed burdensome for NICU mothers at this time under these circumstances. Second, the protocol to administer the PDSS only when social work support was available would be continued. Third, putting in the protocol and getting approval for phone contact between the researcher and participant for either arranging meeting times or for collecting parent – infant contact data may prove highly valuable. While there were occasional considerable obstacles, with patience, persistence and flexibility, the methodology of conducting a study of this type and the ability to find meaningful quantitative and qualitative results indicates feasibility.

## **Strengths and Limitations**

### **Strengths**

This study was the first to investigate the relationship between various maternal-infant contact types and the impact those had or did not have on PPD symptoms in the NICU as

evaluated by a PPD evaluation at two time points. Second, this study was the first to see the impact paternal-infant contact had on the maternal PPD symptoms. Lastly, it was clearly seen that several types of maternal-infant contact combined with paternal holding and skin-to-skin contact had a significant beneficial relationship to one another as well as with several PDSS scores and potentially with total PDSS scores.

### **Limitations**

This study's results cannot be generalized beyond the scope of this population. This study did not include non-English speaking or less than 18 years of age participants and thus could have missed valuable results and information regarding PPD symptoms in NICU mothers. This study relied on parental recall of duration and types of contact subjecting this study to biased data and thus biased results. This study did not follow mothers longer than 4 weeks, therefore valuable data such as breastfeeding patterns and its impact on PPD symptoms could not be analyzed. Additionally, given that typical onset for PPD is 3 to 6 months, by not following up with mothers beyond four weeks, this study may have missed participants that would qualify as having PPD.

### **Future Research**

This study revealed a number of aspects pertaining to PPD in the NICU that would be valuable to consider for future research. First, assessment of PPD in the NICU is still a challenge. Therefore research investigating the most valid and reliable PPD screening instrument and the most optimal time window to administer the screening is needed. Further research investigating the interaction between elevated PPD symptoms and paternal contact is very important especially at the intersection of elevated maternal SUI subscale scores and paternal-infant interaction. The results of investigating paternal-infant behavior on maternal PPD could

pave the way for potentially viewing and encouraging certain paternal NICU behaviors that could positively impact maternal PPD. Further analysis into how maternal-paternal contact with their infant influence each other may be very important to the health, safety and growth of the maternal-infant dyad, paternal-infant dyad and maternal-paternal-infant triad. Because of the massive impact breastfeeding makes to the health and well-being of the NICU infant, we cannot ignore the need for additional research investigating the relationship between elevated PPD symptoms and breastfeeding practices in the NICU as well as the connection between holding and skin-to-skin contact and subsequent breast-feeding practices. Lastly, biomarkers pertaining to maternal and paternal moods, the influence of contact with their preterm NICU infant on said biomarkers and the relationships between these variables and PPD could prove highly valuable in investigating more fully the prevalence and trajectory of elevated PPD symptoms in NICU mothers.

### **Implications for Nursing Practice**

Nursing staff need to be cognizant to the emotional well-being of mothers in the NICU and be prepared to either assess for PPD independently then make appropriate social work referral or invite social work services to actively assess and manage potential PPD. Nursing staff need to do more to provide for maternal-NICU infant contact. This includes assessing maternal anxiety surrounding infant contact concerns and working with mother to decrease her anxiety enough to then provide for maternal-infant contacts. Positive reinforcement after maternal-infant contact may do much to encourage further maternal-NICU infant contact especially in the case of breast-feeding. New NICU mothers are often discouraged and exhausted particularly in the beginning stages of pumping breast-milk and in attempts at providing direct breast-feeding.

Therefore encouragement from nursing staff and lactation is vital to a new NICU mother's breast-feeding success.

The importance of encouraging paternal participation in infant care practices cannot be over stated. Paternal participation in infant care and contact may take additional nursing attention and effort but the positive impact it will make on maternal and paternal well-being and infant development is well worth the effort.

Nursing is at the forefront and often the first line staff to have contact with parents and as such nursing is in a prime position to make positive impacts on the maternal-paternal-infant triad. Nursing is also at an advantage as to having one of the most consistent relationships with the parents as the medical team often rotates biweekly and between patient acuities. This nurse-parent relationship affords many opportunities for discussions, evaluations and education pertaining to PPD and the importance and value of maternal-infant and paternal-infant contact in the NICU for the betterment of the families we serve.

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## Appendix A

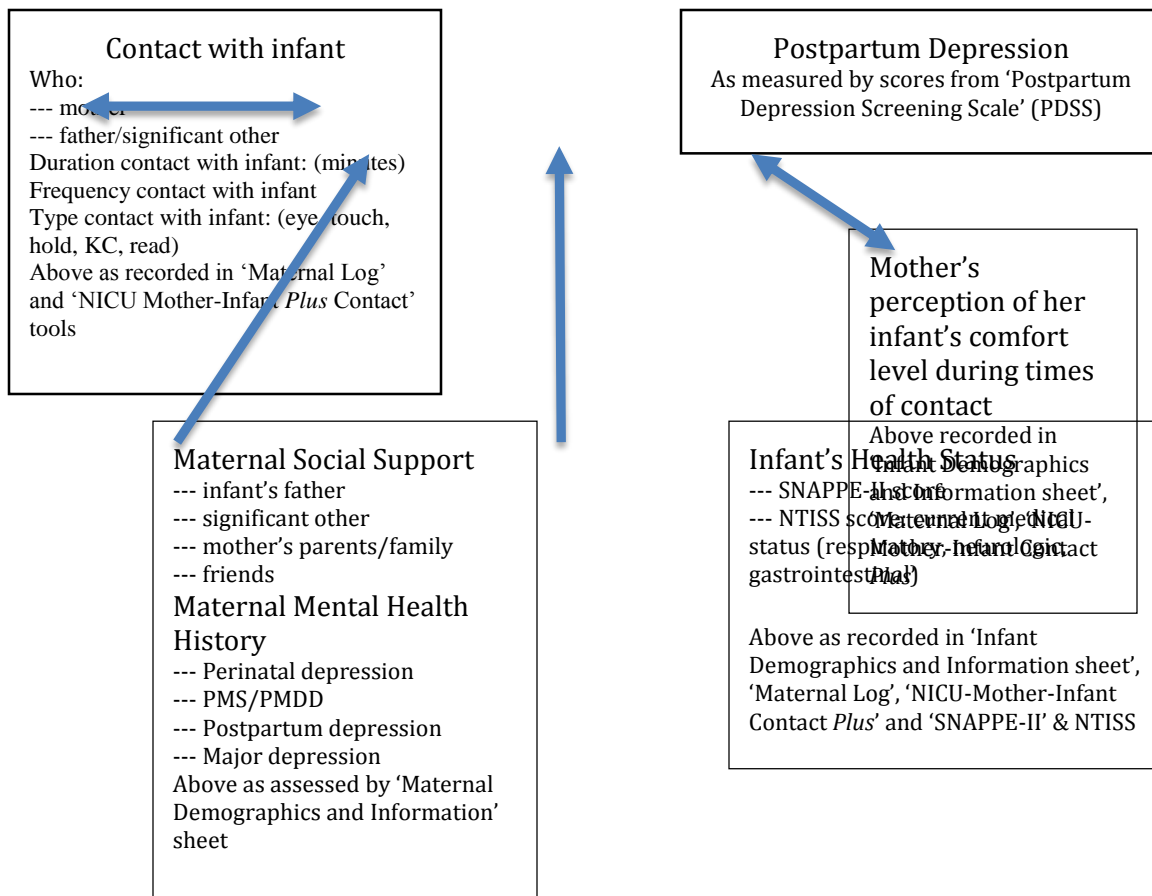
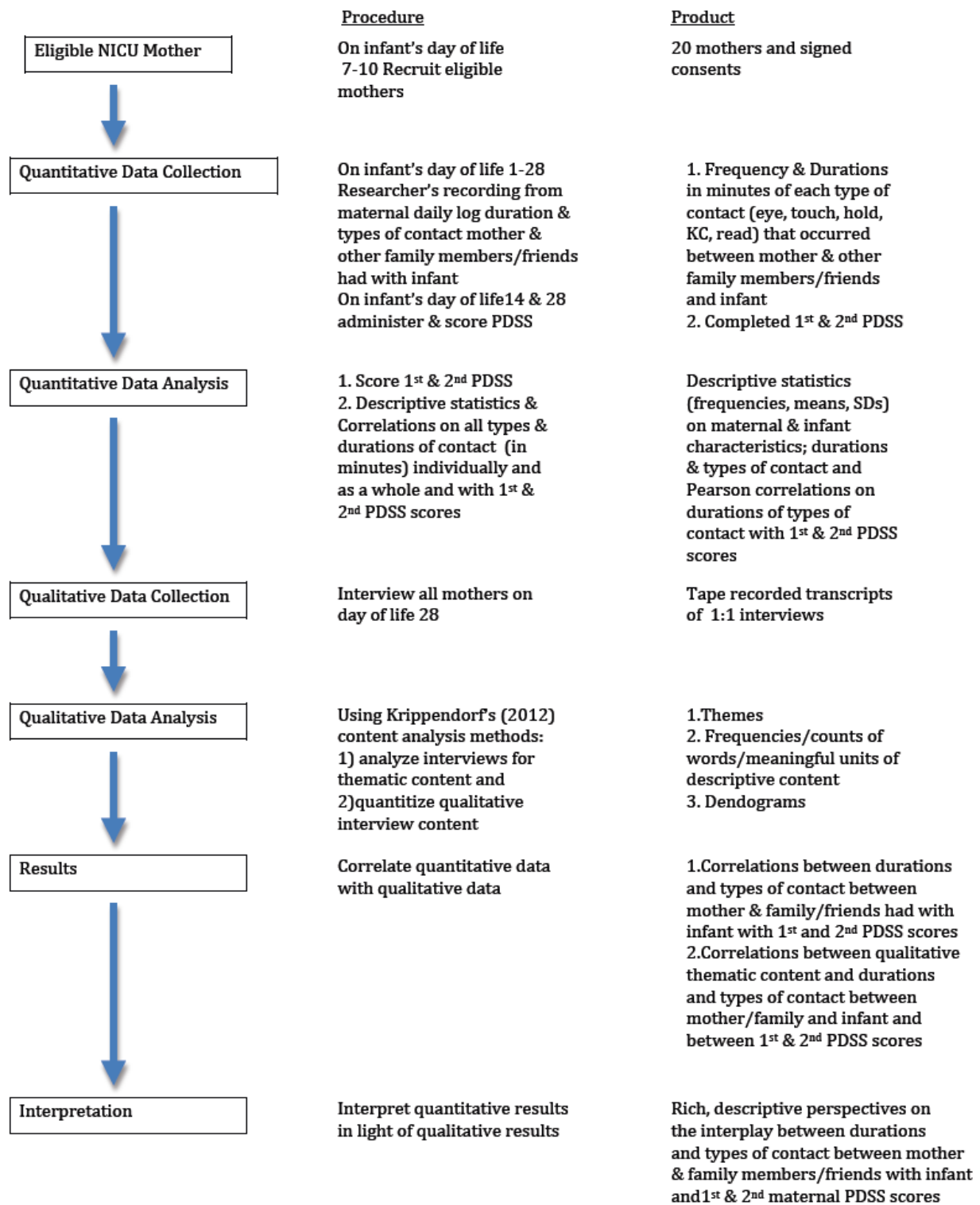


Figure 1. Theoretical Framework of the influences between Postpartum depression in the NICU and a mother's contact with her infant and additional contributing influences on NICU postpartum depression. The bidirectional influence between contact with infant and Postpartum Depression; the influence of maternal social support and maternal mental health history on postpartum depression; the influence of infant health status on postpartum depression; the influence of the mother's perception of the infant's comfort level during periods of contact on postpartum depression

## Appendix B

Figure 1. Mixed Methods Procedural Diagram



Appendix C  
Maternal Demographics & Information

<b>1. Maternal Age:</b>	<b>Study ID:</b>	<b>Date:</b>
<b>2. Race/Ethnicity:</b> White/Caucasian <input type="checkbox"/> African American <input type="checkbox"/> Hispanic <input type="checkbox"/> Pacific Islander <input type="checkbox"/> Native American <input type="checkbox"/> Other <input type="checkbox"/>	<b>10. Mental Health History:</b> Felt depressed during pregnancy <input type="checkbox"/> Felt depressed after birth of previous children <input type="checkbox"/> Felt depressed during your period <input type="checkbox"/> Felt depressed at other times <input type="checkbox"/> Other: Current medications:	
<b>3. Marital Status:</b> Single <input type="checkbox"/> Married <input type="checkbox"/> Divorced <input type="checkbox"/> Widowed <input type="checkbox"/> Living w/ partner <input type="checkbox"/>	<b>11. How safe do you feel in your home?</b> Very safe <input type="checkbox"/> Mostly safe <input type="checkbox"/> Somewhat safe <input type="checkbox"/> Not at all safe <input type="checkbox"/>	
<b>4. Highest Level Education:</b> < 8 <sup>th</sup> grade <input type="checkbox"/> Technical/trade school <input type="checkbox"/> High School <input type="checkbox"/> Bachelor Degree <input type="checkbox"/> Master's Degree <input type="checkbox"/> Post Masters/Doctoral <input type="checkbox"/>	<b>12. Does your significant other live in home?</b> Y <input type="checkbox"/> N <input type="checkbox"/>	
	<b>13. Is your significant other the father of baby?</b> Y <input type="checkbox"/> N <input type="checkbox"/>	
	<b>14. How supported do you feel by your significant other?:</b> Very supported <input type="checkbox"/> Mostly supported <input type="checkbox"/> Somewhat supported <input type="checkbox"/> Not at all supported <input type="checkbox"/>	
<b>5. Current Employment Status</b> Unemployed <input type="checkbox"/> Part-time <input type="checkbox"/> Full-time <input type="checkbox"/> On leave of absence <input type="checkbox"/>	<b>15. How supported do you feel by extended family:</b> Very supported <input type="checkbox"/> Mostly supported <input type="checkbox"/> Somewhat supported <input type="checkbox"/> Not at all supported <input type="checkbox"/>	
<b>6. Past &amp; Current substance abuse/methadone treatment: Y <input type="checkbox"/> N <input type="checkbox"/> Drugs:</b>	<b>16. How supported do you feel by friends?:</b> Very supported <input type="checkbox"/> Mostly supported <input type="checkbox"/> Somewhat supported <input type="checkbox"/> Not at all supported <input type="checkbox"/>	
<b>7. Transportation: Y <input type="checkbox"/> N <input type="checkbox"/></b>	<b>17. Obstetric &amp; Labor and Delivery History:</b> Abortions: elective <input type="checkbox"/> spontaneous <input type="checkbox"/> ART: Y <input type="checkbox"/> N <input type="checkbox"/> Vaginal <input type="checkbox"/> C- section <input type="checkbox"/> : planned <input type="checkbox"/> unplanned (emergent) <input type="checkbox"/> Induction <input type="checkbox"/> Precipitous delivery <input type="checkbox"/> Forceps <input type="checkbox"/> Vacuum <input type="checkbox"/> Shoulder dystocia <input type="checkbox"/> Unknown fetal anomalies <input type="checkbox"/> Infant resuscitation <input type="checkbox"/> Multiples: Twins <input type="checkbox"/> Triplets <input type="checkbox"/>	
<b>8. Medical conditions:</b>		
<b>9. Number and ages of children at home:</b>	<b>18. Immediately following birth, were you able to:</b> see infant <input type="checkbox"/> touch infant <input type="checkbox"/> hold infant <input type="checkbox"/> none <input type="checkbox"/>	



## Appendix D

### Infant Demographics & Information

<b>1. Infant's age at birth (weeks + days):</b> _____	<b>Study ID:</b> _____ <b>Date:</b> _____
<b>2. Infant's postnatal days:</b> _____	<b>8. Current respiratory support:</b> None/RA <input type="checkbox"/> Nasal Cannula <input type="checkbox"/> CPAP <input type="checkbox"/> Intubated: SIMV <input type="checkbox"/> HFOV <input type="checkbox"/>
<b>3. Infant's gender:</b> male <input type="checkbox"/> female <input type="checkbox"/>	<b>9. Chest tubes:</b> Historically <input type="checkbox"/> on PNDs: Current <input type="checkbox"/>
<b>4. Infant's Race/Ethnicity:</b> White/Caucasian <input type="checkbox"/> African American <input type="checkbox"/> Hispanic <input type="checkbox"/> Pacific Islander <input type="checkbox"/> Native American <input type="checkbox"/> Other <input type="checkbox"/>	<b>10. Intravenous therapy:</b> PCVC/PICC: Historically <input type="checkbox"/> on PNDs: Currently <input type="checkbox"/> UVC: Historically <input type="checkbox"/> on PNDs: Currently <input type="checkbox"/> UAC: Historically <input type="checkbox"/> on PNDs: Currently <input type="checkbox"/>
<b>5. Previous respiratory support:</b> None/RA <input type="checkbox"/> Nasal Cannula <input type="checkbox"/> on PNDs: CPAP <input type="checkbox"/> on PNDs: Intubated: SIMV <input type="checkbox"/> on PNDs: HFOV <input type="checkbox"/> on PNDs	<b>11. Phototherapy:</b> Historically <input type="checkbox"/> on PNDs: Currently <input type="checkbox"/>
<b>6. Surfactant: Doses:</b> _____ <b>on days:</b> _____	<b>12. SNAPPE – II Score:</b>
<b>7. IVH: Y</b> <input type="checkbox"/> <b>Grade:</b> _____ <b>R</b> <input type="checkbox"/> <b>L</b> <input type="checkbox"/> <b>Grade:</b> _____ <b>R</b> <input type="checkbox"/> <b>L</b> <input type="checkbox"/> <b>DOL IVH(s) occurred:</b> _____ <b>@GA:</b> _____	<b>13. NTISS Score: 1<sup>st</sup> week</b> _____ <b>2<sup>nd</sup> week</b> _____ <b>3<sup>rd</sup> week</b> _____ <b>4<sup>th</sup> week</b> _____
	<b>14. Congenital anomalies that could contribute to degree of contact: Y</b> <input type="checkbox"/> <b>N</b> <input type="checkbox"/> Anomalies:

# Appendix E Mother's Self Report of Contact with Infant Log

Study ID: \_\_\_\_\_ Date: \_\_\_\_\_

**Instructions:** Please write next to the type of contact that happened, how many minutes the contact was between the mother and baby or between the father/significant other and baby. Then **circle** the level of comfort you feel best matches the baby's level of comfort during the contact period using the **Baby's Comfort Level** key below.

**Baby's Comfort Level:** Very uncomfortable / uncomfortable / unsure / comfortable / very comfortable  
 1                      2                      3                      4                      5

Contact with my baby today:

**Baby's Comfort Level**

1. Eye Contact

Mother: \_\_\_\_\_ minutes

1 2 3 4 5



Father/Significant other:

\_\_\_\_\_ minutes

1 2 3 4 5

2. Touch

Mother: \_\_\_\_\_ minutes

1 2 3 4 5



Father/Significant other:

\_\_\_\_\_ minutes

1 2 3 4 5

3. Hold

Mother: \_\_\_\_\_ minutes

1 2 3 4 5



Father/Significant other:

\_\_\_\_\_ minutes

1 2 3 4 5

4. Kangaroo Care/  
Skin-to-skin

Mother: \_\_\_\_\_ minutes

1 2 3 4 5

Father/Significant other:

\_\_\_\_\_ minutes

1 2 3 4 5



5. Talk/sing/read

Mother: \_\_\_\_\_ minutes

1 2 3 4 5



Father/Significant other:

\_\_\_\_\_ minutes

1 2 3 4 5

## Appendix F

NICU Mother-Infant *Plus* Contact Sheet

Instructions for researcher: Please place check by who had what type of contact with infant, how many minutes contact lasted and what comfort level infant was in during contact. If more than one applies, please check off all that apply. See legend below						Study/Participant ID number: Dates (Week):	
	Sun/Date	Mon/Date	Tues/Date	Wed/Date	Thurs/Date	Fri/Date	Sat/Date
Who	Minutes Comfort	Minutes Comfort	Minutes Comfort	Minutes Comfort	Minutes Comfort	Minutes Comfort	Minutes Comfort
Mother	E	E	E	E	E	E	E
	T	T	T	T	T	T	T
	H	H	H	H	H	H	H
	KC	KC	KC	KC	KC	KC	KC
	T/S/R	T/S/R	T/S/R	T/S/R	T/S/R	T/S/R	T/S/R
Father/Significant other	E	E	E	E	E	E	E
	T	T	T	T	T	T	T
	H	H	H	H	H	H	H
	KC	KC	KC	KC	KC	KC	KC
	T/S/R	T/S/R	T/S/R	T/S/R	T/S/R	T/S/R	T/S/R

<b>Contact:</b> E= eye contact T= touch H= Hold KC= Kangaroo Care T/S/R= talk/sing/read	<b>Infant Perceived Comfort Level :</b> 1= very uncomfortable 2= uncomfortable 3= unsure 4= comfortable 5= very comfortable
-----------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------

## Appendix G

### Postpartum Depression Screening Scale (The first 5 Items)

Below is a list of statements describing how a mother may be feeling after the birth of her baby. Please indicate how much you agree or disagree with each statement. In completing the questionnaire, please circle the answer that best describes how you have felt over the past 2 weeks. Read each item carefully. Then circle the number that best fits your answer. Please give only one response for each statement, using the following scale:

	1	2	3	4	5	
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	
<div style="display: flex; justify-content: space-between; padding: 0 10px;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Strongly Disagree</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Disagree</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Neither Agree nor Disagree</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Agree</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Strongly Agree</div> </div>						
If you wish to change your response, completely mark through your first response with an "X." Then circle the response that best fits your new choice.						
<b>During the past 2 weeks,</b>						
1 .....2 .....3 .....4 .....5 .....	1. I had trouble sleeping even when my baby was asleep.					
1 .....2 .....3 .....4 .....5 .....	2. I got anxious over even the littlest things that concerned my baby.					
1 .....2 .....3 .....4 .....5 .....	3. I felt like my emotions were on a roller coaster.					
1 .....2 .....3 .....4 .....5 .....	4. I felt like I was losing my mind.					
1 .....2 .....3 .....4 .....5 .....	5. I was afraid that I would never be my normal self again.					

Appendix H  
SNAPPE-II

		Scores
Mean blood pressure	>29 mm Hg	0
	20–29 mm Hg	9
	<20 mm Hg	19
Corporal temperature	>35.6°C	0
	35–35.6°C	8
	<35°C	15
Birth weight	<999 g	0
	750–999 g	10
	<750 g	17
SGA <3rd percentile	no	0
	yes	12
PO <sub>2</sub> /FiO <sub>2</sub> ratio	>2.49	0
	1–2.49	5
	0.3–0.99	16
	<0.3	28
Lowest serum pH	>7.19	0
	7.10–7.19	7
	<7.10	16
Urine output	>0.9 ml/kg/h	0
	0.1–0.9 ml/kg/h	5
	<0.1 ml/kg/h	18
Multiple seizures	none	0
	yes	19
Apgar score at 5 min	>7	0
	<7	18
SGA = Small for gestational age.		


## Appendix I

## NTISS: Neonatal Therapeutic Scoring System

<b><u>Respiratory</u></b>	
Supplemental oxygen	1
Surfactant administration	1
Tracheostomy care	1
Tracheostomy placement	1
Continuous positive airway pressure administration	2
Endotracheal intubation	2
Mechanical ventilation	3
Mechanical ventilation with muscle relaxation	4
High – frequency ventilation	4
Extracorporeal membrane oxygenation	4
<b><u>Cardiovascular</u></b>	
Indomethacin administration	1
Volume expansion ( $\leq 15$ ml/kg)	1
Vasopressor administration (1 agent)	2
Volume expansion ( $> 15$ ml/kg)	3
Vasopressor administration ( $> 1$ agent)	3
Pacemaker on standby	3
Pacemaker used	4
Cardiopulmonary resuscitation	4
<b><u>Drug therapy</u></b>	
Antibiotic administration ( $\leq 2$ agents)	1
Diuretic administration (enteral)	1
Steroid administration (postnatal)	1
Anticonvulsant administration	1
Aminophylline administration	1
Other unscheduled medication	1
Antibiotic administration ( $> 2$ agents)	2
Diuretic administration (parenteral)	2
Treatment of metabolic acidosis	3
Potassium binding resin administration	3
<b><u>Monitoring</u></b>	
Frequent vital signs	1
Cardiopulmonary monitoring	1
Phlebotomy (5-10 blood draws)	1
Thermoregulated environment	1
Noninvasive oxygen monitoring	1
Arterial pressure monitoring	1
Central venous pressure monitoring	1
Urinary catheter	1
Quantitative intake and output	1
Extensive phlebotomy ( $> 10$ blood draws)	2
<b><u>Metabolic/nutrition</u></b>	
Gavage feeding	1
Intravenous fat emulsion	1
Intravenous amino acid solution	1
Phototherapy	1
Insulin administration	2
Potassium infusion	3
<b><u>Transfusion</u></b>	
Intravenous gamma globulin	1
Red blood cell transfusion ( $\leq 15$ ml/kg)	2
Partial volume exchange transfusion	2
Red blood cell transfusion ( $> 15$ ml/kg)	3
Platelet transfusion	3
White blood cell transfusion	3
Double volume exchange transfusion	3
<b><u>Procedural</u></b>	
Transport of patient	2
Single chest tube	2
Minor operation	2
Multiple chest tubes in place	3
Thoracentesis	3
Major operation	4
Pericardiocentesis	4
Pericardial tube in place	4
Dialysis	4
<b><u>Vascular access</u></b>	
Peripheral intravenous line	1
Arterial line	2
Central venous line	2

## Appendix J

Table 1. Data Collection Procedure Timetable

Days of NICU infant's life	7-10 day	14 day	21 day	28 day
1. Recruit	✓			
2. Collect Maternal Information	✓			
3. Collect Infant Information	✓			
4. Maternal Log (daily)				
5. Check-in interview		✓	✓	✓
6. PDSS (collect & score)		✓		✓
7. In-depth qualitative interview				✓

## Appendix K



November 25, 2015

Victoria Vazquez  
Doctoral Student  
University of Connecticut  
241 Branford Rd un 256  
North Branford, CT 06471

Re: Postpartum Depression Screening Scale (PDSS)

Dear Victoria,

This follows up your request of 25Nov'15, regarding permission to reprint selected test items #1, #2, #3, #4, #5 from the Postpartum Depression Screening Scale (PDSS), in your upcoming dissertation paper.

WPS permits your reprint of the requested items for the described purpose and indicated edition only, on provision that the following required notice appears in its entirety on each reprint that you make of the PDSS:

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