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The Association of Maternal Intention to Breastfeed, Early Skin-to-skin Mother/Infant Contact, and exclusive Breastfeeding during the Maternity Hospital Stay

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THE ASSOCIATION OF MATERNAL INTENTION TO BREASTFEED, EARLY SKIN-TO-SKIN MOTHER/INFANT CONTACT, AND EXCLUSIVE BREASTFEEDING DURING THE MATERNITY HOSPITAL STAY

By

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A Dissertation in Partial Fulfillment of the Requirements for the

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ABSTRACT OF THE DISSERTATION

The Association of Intention to Breastfeed, a Mother's Characteristics, Early Skin-to-Skin Mother/Infant Contact, and Exclusive Breastfeeding During the Maternity Hospital Stay

by

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Breastfeeding is the optimal method to nourish and nurture an infant. Exclusive breastfeeding rates in the United States have reached the goal of *Healthy People 2010* that 75% of mother's breastfeed in the immediate postpartum period. Yet, less than 35% of San Bernardino county mothers and 47.7% of Riverside county mothers are exclusively breastfeeding during their maternity hospital stays, with as many as 50% of the infants being weaned from the breast in the first 14 days of life.

This prospective study examined archived data collected by Perinatal Services Network (PSN) of Loma Linda University Medical Center/Children's Hospital for the period of July 2005 through June 2006. Participants are 21,842 mother/infant dyads who delivered in 19 PSN-contracted hospitals. We developed an adapted model of Ajzen's theory of planned behavior with the additions of skin-to-skin mother/infant contact and the hormone oxytocin (a mediator). Our hypothesis is that a mother's perceived

behavioral control and attitude toward breastfeeding are positively affected once she experiences early skin-to-skin contact during the first 3 hours following birth and this will increase the likelihood of her exclusively breastfeeding.

Current literature does not explore how the duration of early skin-to-skin mother/infant contact is associated with exclusive breastfeeding during the maternity hospital stay; nor does it address specific maternal socio-demographic characteristics and intrapartum variables and their relationship to early skin-to-skin mother/infant contact and exclusive breastfeeding. This study was an attempt to address these voids.

Statistical analysis included univariate and multivariable ordinal logistic regression. Our findings showed that as the duration of early skin-to-skin mother/infant increased during the first 3 hours following birth there was an increased likelihood of exclusive breastfeeding during the maternity hospital stay. We also identified maternal socio-demographic characteristics and intrapartum variables that are predictors of early skin-to-skin mother/infant contact. Mothers who stated their intention to exclusively breastfeed were more likely to experience early skin-to-skin contact and mothers who experience early skin-to-skin contact are more likely to exclusively breastfeed. Our findings, if incorporated into hospital based practices and protocols, can strengthen maternal/infant bonding/attachment and early exclusive breastfeeding behaviors.

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CHAPTER 1

INTRODUCTION

A. The Public Health Problem

Breastfeeding is acknowledged as the optimal method to nourish and nurture infants and was practiced as the gold standard of infant feeding and nutrition until early in the 20th century when rates began to drop (World Health Organization, 2003; Cunningham, 1995). Published reports conclude that currently as many as 50% of infants are weaned from the breast within the first 14 days of life (California Department of Health Services, 2004; Dungy, Christensen-Szakanski & Losch, 1992; Loughlin, Clapp-Channing, & Gehlback, 1985).

In San Bernardino County 34.6% of mothers are exclusively breastfeeding at the time of their maternity hospitalization discharge; while in Riverside County 47.4% of mothers are exclusively breastfeeding at the time of their maternity hospital discharge (California Department of Public Health, 2006).

The goal of Healthy People 2010 "to increase to 75% the proportion of mothers who breastfeed their babies in the early postpartum period" has been met (McDowell, Wang, & Kennedy-Stephenson, 2008). Breastfeeding position papers of professional organizations recommend exclusive breastfeeding for 6 months (American Academy of Family Physicians, 1994; American Academy Pediatrics Work Group on Breastfeeding, 2005; American Academy of Breastfeeding Medicine, 2006).

There is ample evidence of the numerous benefits of breastfeeding. Human milk is uniquely matched for the needs of the human infant, and overall, breastfed infants are

healthier than formula-fed infants. There is considerable evidence of the health risks to children as a result of not breastfeeding (American Academy of Pediatrics, 2005; Riordan & Auerbach, 1999). An infant who is not breastfeed has an increased risk of gastrointestinal illness (Mitra & Rabbani, 1995), respiratory illness (Howie, Forsyth, Ogston, Clark & Flore, 1990), otitis media (Teele, Klein, Rosner & Greater Boston Otitis Media Study Group, 1989), bacteremia, meningitis (Andersson, Porras, Hanson, Lagergard & Svanborg-Eden, 1986), and allergies (Saarinen & Kojosaari, 1995).

Breastfeeding benefits the infant by decreasing the incidence/severity of other infectious processes including diarrhea and urinary tract infections (Heinig, 2001; Istre, Conner, Broome, Hightower & Hopkins, 1985; Dewey, Heinig, & Nommsen-Rivers, 1995; Howie, et al., 1990). Some researchers suggest a decrease of sudden infant death, insulin-dependent and non-insulin dependent diabetes mellitus, lymphoma, leukemia, Hodgkin's disease, obesity, hypercholesterolemia, and asthma among those who are/were breastfed (Gdalevich, Mimouni, & Mimouni, 2001; Horne, Parslow, Ferens, Watts, & Adamson, 2004; McVea, Turner & Peppler, 2000; Gerstein, 1994; Bener, Denic & Galadari, 2001; Armstrong & Reilly, 2002; Davis, 1988; Arenz, Ruckerl, Koletzko & Von Kries, 2004; Grummer-Strawn & Mei, 2004; Owen, Whincup, Odoki, Gilg & Cook, 2002; Mayer, 1988; Shu, Clemens, Zheng, Ying, Ji et al., 1995). Breastfed infants are leaner than formula fed infants at 1 year of age. This may be one reason for the lower rates of diabetes, obesity, and lower cholesterol levels as adults among those who were breastfed (Dewey, Heinig, Nommsen, Peerson & Lonnerdal, 1993). Breastfed infants have been shown to have enhanced cognitive development and healthier lives (Jacobson,

Chiodo & Jacobson, 1999; Reynolds, 2001; Mortensen, Michaelsen, Sanders & Reinisch, 2002). Breastfeeding also acts as an analgesic to infants (Gray, Miller, Phillip & Blass, 2002; Carbajal, Veerapen, Couderc, Jugie & Ville, 2003).

Breastfeeding is also recognized as being beneficial to the health of the mother (Heinig & Dewey, 1997). A few of the benefits to a mother who breastfeeds are: general acceleration of recovery from childbirth (Riordan, 1993); promotion of maternal postpartum weight loss (Dewey, et al, 1993); decrease in postpartum bleeding; and increased uterine involution (Labbok, 2001). Exclusive breastfeeding produces lactational amenorrhea which provides a prolonged period of postpartum anovulation, thus increasing birth spacing, (Labbok, 2001; Kennedy & Labbok, 1996; Wang & Fraser, 1994). Breastfeeding mothers experience improved bone mineral repletion after weaning (Kalkwarf & Specker, 1995), and extended breastfeeding has been shown to reduce the risk of premenopausal breast, ovarian, and endometrial cancers in the mother who has breastfed (Heinig & Dewey, 1997; Byers, Graham, Rzepka, & Marshall, 1985; Rosenblatt & Thomas, 1995).

Ball and Wright (1999) have estimated that the federal government annually pays $3.6 billion to treat diseases and conditions that are associated with not breastfeeding. It also spends more than $578 million per year to cover programs such as the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) to purchase formula for infants who could have been breastfed (United States Breastfeeding Committee, 2002). Non-breastfeeding families pay approximately $1,200 to $1,500 each year for the purchase of formula (Tuttle & Dewey, 1996). Exclusive use of breastfeeding

would also decrease parental absenteeism from work because breastfed children are generally healthier than formula fed infants. There would also be a decreased environmental burden for the disposal of formula containers if breastfeeding were the norm (Weimer, 2001; Cohen, Mrtek & Mrtek, 1995; Jarosz, 1993; Levine & Huffman, 1990).

The California Children and Families Program, established by the enactment of Proposition 10 in November 1998, was funded by a tax on tobacco. Existing law stipulates these revenues be used for promoting, supporting, and improving the development of children from birth to 5 years of age. First 5 of San Bernardino and First 5 Riverside are, overseen by the California Children and Families Commission, and partner with Perinatal Services Network (PSN) of Loma Linda University's Children's Hospital to provide development and enactment of programs. These enhance bonding/attachment by early mother/infant skin-to-skin contact, which has been shown to increase breastfeeding rates of infants in the early postpartum period.

Perinatal Services Network identified current birthing practices throughout San Bernardino and Riverside counties that separated the mother and infant and which are not conducive to maternal/infant bonding/attachment and breastfeeding (Ainsworth & Bowlby, 1991; Righard & Alade 1990). Perinatal Services Network began a quality of care program that initiated early mother/infant skin-to-skin contact. The period immediately after birth is when the infant is most receptive to breast self-attachment, a behavior which is predictive for breastfeeding success (Prechtl, 1958; Righard & Alade, 1990; de Chateau & Wiberg, 1977). During this period, mothers and infants develop a

synchronous reciprocal interactive process when they maintain skin-to-skin contact (de Chateau, 1980; Kennell, Trause, & Klaus, 1975).

The first few minutes/hours of life are important for infants; it is the time when they exhibit a rhythmic nipple searching behavior which leads to self-attachment to the breast, generally within the first fifty minutes of the infant's life (Righard & Alade, 1990; Prechtl, 1958; Montagu, 1986). If left undisturbed, this period of mother/infant emotional bonding/attachment increases the likelihood of breastfeeding success (Widstrom, Wahlberg, Matthiesen, Eneroth, Uvnas-Moberg, Werner & Winberg, 1990).

Mother and infant are a single biological system prior to birth. After birth they require close contact to produce optimal physical and emotional homeostasis (Christensson, Siles, Moreno, Belaustequi, De La Fuente & Langercrantz et al., 1992).

Langercrantz (1996) reported that newborns experienced a surge of catecholamine after vaginal delivery, which is believed to aid in the infant's initial adaptation to life post birth. The act of being born elicits strong activity in the infant's sympathetic nervous system; this "stress of being born" is reduced by skin-to-skin mother/infant contact. Skin-to-skin mother/infant contact may be the natural way to reduce the negative consequences of the surge of catecholamine in the infant (Bystrova, Windstrom, Matthiesen, Ransjo-Arvidson, & Welles-Nystrom, et al., 2003). The mother acts as a regulator for the infant during close mother/infant interaction, thus increasing brain synaptic production in the infant which occurs during this "critical period" shortly after birth (Schore, 1994).

Our research will pull together variables present in the first hours post birth, taking a close look at the association of the mother's intention to breastfeed, her socio-

demographic characteristics and intrapartum variables (i.e., analgesia/anesthesia use and vaginal vs. caesarean delivery), the amount of early skin-to-skin mother/infant contact during the first 3 hours following birth, and the type of infant-feeding during maternity hospitalization. Identification of new variables which are associated with early skin-to-skin mother/infant contact and breastfeeding practices will provide innovative tools to public health professionals seeking to educate the public about the benefits of breastfeeding.

Breastfeeding deserves to be a public health priority since it reduces infectious disease, enhances the immune system, has nutritional and emotional benefits, reduces the risk of chronic disease, improves cognitive development in the child, improves maternal health, has economic and social benefits, and reduces health care costs (American Academy of Pediatrics, 2005; Cadwell, 2002).

B. Purpose of the Study

The purpose of this study is to examine the association of a mother's intention to breastfeed, early skin-to-skin mother/infant contact in the first 3 hours post birth, maternal socio-demographic characteristics, and intrapartum variables. There is a dearth of research examining the intention to breastfeed, early skin-to-skin mother/infant contact maternal socio-demographic characteristics, and intrapartum variables. Maternal socio-demographic characteristics to be examined include language, age, gravida, para, primary language, race/ethnicity, smoking status, living situation, intended infant-feeding type, education, type of delivery, receipt of a new parents kit, and analgesia/anesthesia. (Tables 1-6, pages 39-42). By analyzing these factors, we anticipate the identification of new

variables that will redefine best practices that could be utilized to increase early skin-to-skin mother/infant contact and exclusive breastfeeding in the early postpartum period.

C. Research Questions

Statistical methods related to questions 1 through 3 used univariate binary logistic regression. In addition, multivariable logistic regression was used for questions 4 and 5.

1. Is early skin-to-skin mother/infant contact during the first 3 hours following birth associated with the actual infant-feeding method the newborn receives during the maternity hospitalization?
2. Is early skin-to-skin mother/infant contact during the first 3 hours following birth adjusted for maternal infant feeding intention associated with the actual infant-feeding method the newborn receives during the maternity hospitalization?
3. Is early skin-to-skin mother/infant contact during the first 3 hours following birth adjusted for the different maternal socio-demographic characteristics associated with actual infant-feeding method the newborn receives during the maternity hospitalization?
4. Is early skin-to-skin mother/infant contact during the first 3 hours following birth adjusted for maternal infant-feeding intention and the significant maternal socio-demographic characteristics associated with actual infant-feeding method the newborn receives during the maternity hospitalization?
5. Is there a significant interaction between early skin-to-skin mother/infant contact and maternal infant-feeding intention as well as maternal socio-

demographic characteristics in predicting the actual infant-feeding method the newborn receives during the maternity hospitalization?

6. Are maternal socio-demographic characteristics associated with early skin-to-skin mother/infant contact during the first 3 hours following birth?
7. Is intended maternal infant-feeding method measured prior to birth associated with early skin-to-skin mother/infant contact during the first 3 hours following birth?
8. Are maternal socio-demographic characteristics and intrapartum variables adjusted for intended infant-feeding method associated with early skin-to-skin mother/infant contact during the first 3 hours following birth?

D. Theoretical Framework

In his theory of planned behavior, Ajzen (1991) sees behavioral intention as being an immediate predecessor of a behavior. Ajzen (1988) purported that the stronger a person's intention to perform a behavior, the more likely he/she would be to carry out that behavior. The behavior studied in this dissertation is breastfeeding and the application of this concept is shown in Figure 1. We propose that mothers who have the intention to breastfeed will wish to initiate early skin-to-skin mother/infant contact since this is a necessary precursor to breastfeeding.

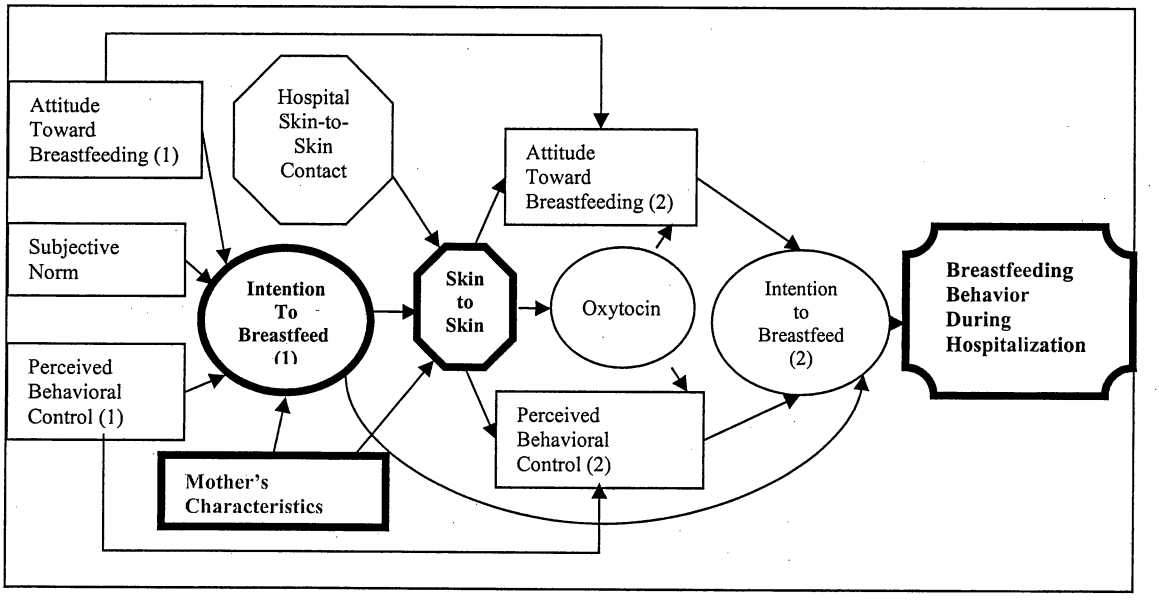


Figure 1. Conceptual Model of Ajzen's Theory of Planned Behavior with the additions of skin-to-skin mother/infant contact and oxytocin (a mediator) and their impact on breast feeding behavior. Intention, attitude toward breastfeeding, and perceived behavioral control are included at two time points in this model. One hypothesis in this study is that the mother's perceived behavioral control and attitude toward breastfeeding are positively affected once she experiences early skin-to-skin mother/infant contact (oxytocin) during the first 3 hours of the baby's life. The bolded symbols are the variables that were available for analysis in this study. The number (1) represents the mother's experience prior to birth, (2) represents the same variable immediately prior to breastfeeding.

We have added to Ajzen's theory of planned behavior the impact of the hormone oxytocin (a mediator) which we believe impacts breastfeeding attitude and perceived behavioral control. Oxytocin is liberated into the mother's blood stream during mother/infant skin-to-skin contact when the infant's hands touch the mother and explore her breast in preparation to their first feeding (Matthiesen, Ransjo-Arvidson, Nissen & Unvas-Moberg, 2001).

We hypothesize that the mother's breastfeeding behavior will be influenced by the hormone oxytocin and the infant's behavior, when mother/infant are in early skin-to-skin contact during the first 3 hours of the infant's life. Additionally, we suggest that the

hospital's policy to institute mother/infant skin-to-skin contact will affect the mother. The hospital policy to institute early skin-to-skin mother/infant contact has the potential to enhance the mother's attitude toward breastfeeding and her perceived behavioral control.

We also theorize that early skin-to-skin mother/infant contact enhances the mother's perceived behavioral control and her attitude toward breastfeeding through the influx of the hormone oxytocin into her bloodstream. Her behavioral control and attitude toward breastfeeding are being influenced by early skin-to-skin mother/infant contact (Uvnas-Moberg, 1998). Matthiesen et al., (2001) reported that during periods when the infant massaged the mother's breast with his hand (pre-feeding behavior) or when the infant was licking and/or sucking the breast, the mother's oxytocin levels rose, and conversely when the breast was not stimulated the mother's oxytocin levels lowered.

Oxytocin is considered the "mother love" hormone and plays a major role in the reciprocal synergism between mother/infant (Matthiesen et al., 2001; Christensson, Cabrera, Christenson, Uvnas-Moberg & Winberg, 1995; Johanson, Spencer, Rolfe, Jones & Malla, 1992). Schore (1994) refers to this as "affective synchrony" when he describes the infant's immature and developing internal homeostatic system as being co-regulated by the mother's more mature and differentiated nervous system.

E. Attachment Theory

Bowlby (1969), Ainsworth (1969), and Ainsworth and Bowlby (1991) based their attachment theory work on ethological conclusions, that the first hours after birth are the optimal period for the mother to interact with her child. The mother is the foundation

of security (attachment theory) for the newborn infant (Bowlby, 1958; Ainsworth, 1969; Ainsworth & Bowlby, 1991). Bowlby (1969) postulated that the infant is seeking a personalized relationship with his/her mother, and this relationship is established by close physical mother/infant contact while they are both awake and interactive. The theory of ethology identified a series of responses called instinctive behaviors. These instinctive behaviors (e.g., pre-feeding behaviors, breastfeeding, etc.) are spontaneous in the newborn and are innately programmed. Instinctive behaviors are responsive to the environment and influenced by the timing at which the stimulus is encountered. In terms of breastfeeding, the longer the mother and infant are separated immediately after birth has been shown to negatively impact affectional and bonding behaviors in the mother (Anisfeld & Lipper, 1983).

The typical hospital delivery environment is not conducive to the fostering of early mother/infant attachment. "Dramatic evidence exists indicating that the first minutes after birth are probably important for the emotional attachment of the mother to her child and thus for the development of the mother-child relationship" (Eibl-Eibesfeldt, 1989). When the infant does not establish close contact with the mother, the infant exhibits separation upset, first by protesting (crying) and then becoming silent (despair) (Bergman, 2005; Eibl-Eibesfeldt, 1989). Christensson et al. (1995) label this postnatal crying as the human equivalent of a distress signal when the infant is not in skin-to-skin contact with their mother (Michelssson, Christensson, Rothganger, & Winberg, 1996).

F. Significance to Health Education

When there is early skin-to-skin mother/infant contact in the first 3 hours post birth, the mother's perceived behavioral control and attitude toward breastfeeding will be affected. This may prevent or alleviate potential breastfeeding problems and increase breastfeeding rates in the early postpartum period. These behaviors may then positively affect behavior outcomes, i.e., breastfeeding during the postpartum period, and breastfeeding for longer periods of time (Anderson, 1989; Widstrom, et al., 1990).

If the findings from this study uphold the beneficial effects of early skin-to-skin contact correlated to the mothers' intention to breastfeed, and the mother's socio-demographic characteristics and intrapartum variables, it may support the increase in time duration of early skin-to-skin mother/infant contact which will, in turn, increase the proportion of mothers who initiate breastfeeding. Advancing toward the Healthy People 2010 goal of attaining breastfeeding initiation rates of 75% in the immediate postpartum period would significantly benefit the public's health (United States Department of Health and Human Services, 2000).

The results of this study may add to the continued focus on mother/infant bonding/attachment, early skin-to-skin mother/infant contact and breastfeeding education as a national public health policy priority. Additionally, findings from this study have the potential to support the development of policies and procedures that focus on breastfeeding-friendly practices in hospitals. Maintenance and support of breastfeeding health education measures will positively influence the health of mothers and their breastfeeding infants, and it follows that society as a whole will benefit if mothers and

infants are healthier and have stronger bonds. Utilization of breastfeeding-friendly public health education practices spurred on by the findings from this research may affect a positive change in breastfeeding rates.

CHAPTER 2

REVIEW OF LITERATURE

A. Overview

This literature review will include current breastfeeding recommendations, mothers' intentions to breastfeed, early skin-to-skin mother/infant contact in the immediate postpartum period, maternal socio-demographic characteristics and intrapartum variables, breastfeeding initiation, oxytocin as it affects skin-to-skin mother/infant contact and breastfeeding, the theory of planned behavior as the basis for the study, and attachment theory.

B. Current Breastfeeding Recommendations

The California Department of Health Services has made breastfeeding a public health focus (California Department of Health Services, 1997). Current recommendations of the American Academy of Pediatrics, the American Academy of Family Medicine, and the American Academy of Breastfeeding Medicine are that mothers breastfeed exclusively for 6 months since breast milk is the best food choice for infants (American Academy of Family Physicians, 1994; American Academy Pediatrics Work Group on Breastfeeding, 2005, American Academy of Breastfeeding Medicine, 2006).

The United States has met Healthy People 2010 goal of 75% of mothers initiating breastfeeding in the immediate postpartum period (McDowell, et al., 2008). Recent reports cite that as many as 50% of infants are being weaned from the breast within the first 14 days of life (Dungy, et al., 1992; Loughlin et al., 1985).

C. Intention to Breastfeed

Gijsbers, Mesters, Knottnerus, and Van Schayck's (2006) randomized trial of 89 women less than 7 months pregnant concluded that intention and duration of breastfeeding are strongly correlated with attitudinal beliefs of the mothers and are predictive of actual breastfeeding behavior. Gijsbers et al. utilized a bipolar 5-point scale to assess the positive and negative attitudinal beliefs about breastfeeding. Intention to breastfeed measured early in pregnancy was predictive of actual initiation of breastfeeding and associated with the duration of breastfeeding.

Anderson, Damio, Chapman, and Perez-Escamilla (2007) in their assessment of 162 mother-infant dyads, adjusted for mother's age and parity, found that mothers who reported their intention to breastfeed exclusively during their pregnancy were more likely still to be breastfeeding at the time of hospital discharge.

Duckett, Henley and Garvis (1993) conducted a multivariate, descriptive, prospective, longitudinal investigation in an effort to determine which specific maternal antecedents were the best predictors of short, moderate and long duration breast feeders. Their research study participants completed questionnaires during their postpartum hospitalizations. Participants were all mothers who intended to breastfeed. These women were queried regarding their reasons for breastfeeding, attitudes, perceived success of early breastfeeding, social milieu regarding breastfeeding encouragement, and breastfeeding knowledge. Women who intend to breastfeed do so for a variety of reasons; one reason given was their belief in the advantages of breastfeeding, and which they felt were important both to themselves and to their babies. Although all of the participants

had the intention to breastfeed, they listed numerous interfering events during their maternity hospitalizations that affected their breastfeeding success. An important limitation of this study is that the mothers were of one race/ethnicity (95%), and most had delivered vaginally (90%). Therefore, this study lacks generalizability.

Based on results from a large longitudinal cohort-based study, Donath, Amir and the Avon Longitudinal Study of Pregnancy and Childhood team (ALSPAC) (2003) reported that maternal infant feeding intention at 32 weeks of pregnancy was a strong predictor of feeding outcomes in the first 6 months of an infant's life, with maternal intention being a stronger predictor than demographic characteristics. Logistic regression using intended duration as the only explanatory variable predicted 91.4% of breastfeeding initiation and 72.2% of infant feeding at 6 months.

Scott, Landers, Hughes and Binns (2001) reported that women who decided to breastfeed after becoming pregnant were almost 8 times more likely to discontinue breastfeeding during their maternity hospitalization than women who had made the decision to breastfeed before becoming pregnant.

Lawson and Tulloch (1995) identified predictors of a mother's intention to breastfeed prior to the birth of her baby. They reported that a mother's level of education, her intended duration of breastfeeding, the timing of her decision to breastfeed, her commitment to breastfeeding, and her confidence in control of her breastfeeding behavior are predictors of her intention to breastfeed.

Wambach's (1997) findings indicate that maternal breastfeeding attitude is a dominant predictor of infant feeding intention. Wambach's causal model predicted the duration of breastfeeding through 6 weeks postpartum by prenatal intention (1997).

Duckett, Henly, Avery, Potter, Hills-Bonczyk, et al., (1998) also reported that based on the theory of planned behavior, a mother's intention to breastfeed is predicted by her attitude and subjective norms (Figure 1).

Buxton, Gielen, Faden, Brown, Paige et al. (1991) interviewed 187 women prenatally who intended to breastfeed during the postpartum period. Among the participants, 18% of these women either failed to initiate breastfeeding or stopped breastfeeding within 1 week. Four variables were identified that were significantly predictive of not continuing to breastfeed. These variables were: delayed first breastfeeding experience, mother/infant not sharing a room ("rooming in"), lower confidence in the ability to breastfeed, and less certainty in the decision to breastfeed.

Manstead, Plevin and Smart (1984) recruited 60 primiparous mothers on a voluntary basis from an antenatal clinic in Manchester, England who were at least 28 weeks pregnant. Of the original 60 participants, 50 completed a follow-up questionnaire 6 weeks after their delivery. Manstead, et al. assessed the association between mothers' attitudes towards methods of feeding antenatally and the feeding method at 6 weeks following birth. They found that 34 of the mothers (68%) intended to breastfeed. When questioned at 6 weeks postpartum, 17 of the 34 mothers (50%) were exclusively breast-feeding and 6 more were feeding their infants both breast and bottle. They concluded that attitudes regarding breastfeeding significantly contributed to the prediction of

breastfeeding behavior, and that a mother's intention to breastfeed was significantly correlated to breastfeeding behavior 0.82 ($p< 0.001$).

D. Early Skin-to-Skin Mother/Infant Contact

The benefits of early skin-to-skin mother/infant contact immediately following birth are numerous (Walters, Boggs, Ludington-Hoe, Price & Morrison, 2007). Early skin-to-skin mother/infant contact promotes interaction between the mother and her newborn (Anderson, Moore, Hepworth & Bergman, 2003; Moore, Anderson & Bergman, 2007). During skin-to-skin contact mothers exhibit affectional behaviors, verbal interaction, and tactile comfort with their newborn (Anderson, et al., 2003; Moore, et al, 2007).

Early skin-to-skin mother/infant contact is the preferred heat source for infant thermoregulation immediately after birth. Newborns who maintain close physical contact with their mother's in skin-to-skin contact maintain the optimal temperature range (Anderson, et al., 2003; Moore, et al., 2007; Walters, et al., 2007).

The American Academy of Pediatrics recommends that breastfeeding be initiated within the first 30-60 minutes following birth (2005). Breastfeeding initiation and success are strongly correlated with the implementation of early skin-to-skin mother/infant contact immediately after birth (Anderson et al., 2003; Moore, et al., 2007).

Awi and Alikor (2004) found that postpartum procedures (cleaning and measuring the baby, episiotomy repair, etc.,) were common factors that interfere with the mother and infant initiating their first contact, and recommend that immediate contact between newborn and mother take precedence over routine hospital procedures.

In the Walters et al. pilot study, the infants were immediately placed on their mother's abdomen after birth, skin-to-skin, belly-to-belly, while the infant was dried (2007). They found that during Birth Kangaroo Care (skin-to-skin mother/infant contact) that a full-term infant's temperature remained in the neutral thermal zone and blood glucose levels were (65.13 mean) at 60 minutes post birth (Walters, et al., 2007).

Bystrova et al. state that early skin-to-skin mother/infant contact eases the transitional period of the infant immediately after birth to extra-uterine life, and infants' neurobehavioral responses are positively influenced when they experience skin-to-skin mother/infant contact in the immediate postpartum period (2003). Infants who experience early skin-to-skin mother/infant contact spend more time in a quiet state, sleep longer, and are better organized at 4 hours of age (Ferber & Makhoul, 2004).

Moore's (2007) randomized controlled trial of 23 mother/infant dyads reported that infants who experienced very early skin–to-skin contact with their mothers had breastfeeding success in the early postpartum period. Two groups were used in Moore's study, a control group and an intervention group. The control group consisted of mothers/infants who were cared for according to standard hospital protocol, e.g., infant shown briefly to its mother after birth, taken to a radiant warmer for physical exam/suctioning, vitamin K injection, application of erythromycin ophthalmic ointment, and measuring of blood glucose. The intervention group infants were given to their mothers immediately after birth, and placed prone on the mother's abdomen. These infants were gently dried, covered with blankets, and caps were placed on their heads. After the umbilical cord was cut, the infant was moved to a warmer for the same

procedures experienced by the control group. The intervention infants were then returned to their mothers, placed on her bare chest and covered by warm blankets, remaining skin-to-skin with their mothers for almost 2 hours. Moore notes that an ideal intervention would include the mother/infant dyad experiencing skin-to-skin contact as early and as often as possible for as long as possible during maternity hospitalization.

Righard and Alade (1990) observed 72 vaginally delivered newborn babies and their mothers following delivery. Mothers were told that the researchers would like to observe the birth and the newborns' behavior to improve hospital routines. Two groups were established, a contact group in which mothers and infants were not separated following delivery, and the separation group, in which mothers and infants were separated to undergo routine measuring and weighing procedures after birth and then reunited. Both these groups included mothers/babies from medicated and unmedicated births. More infants in the contact group showed the correct sucking technique over the separation group (24/38 vs. 7/34 respectively). Forty of the 72 infants (56%) whose mothers had received labor medication did not suck at all. Righard and Alade concluded that successful initiation of breastfeeding required mother/infant skin-to-skin contact after birth, providing the infant an optimal environment in which to adapt to extra-uterine life. They also recommend that labor and delivery medications be restricted.

Infants who are allowed to experience skin-to-skin contact immediately after birth self-attached to the mother's nipple (Meyer & Anderson, 1999). Allowing infants to latch on to the breast for approximately 15 to 30 minutes, thus allowing for extra skin-to-skin contact, may prevent disturbance in the breastfeeding process and alleviate potential

breastfeeding problems (Meyer & Anderson, 1999; de Chateau & Wiberg, 1984). Other experts also recommend a return to the practice of placing a newborn skin-to-skin on his mother, dried, and covered by a warm blanket (Anderson, Moore, Hepworth, & Bergman, 2003; American Academy of Pediatrics, 2002; Chantry, Howard & McCoy, 2003; Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN), (2000).

Vaidya, Sharma, and Dhungel's (2005) prospective study of 92 lactating mothers during the infant's first 6 months of life revealed that their early postpartum mother-baby skin-to-skin contact significantly prolonged the duration of exclusive breastfeeding ($p<0.001$). Early skin-to-skin mother-baby contact was found to be more significant than early initiation of breastfeeding ($p<0.05$). They recommend that health care centers adopt policies that allow for early postpartum mother-baby skin-to-skin contact and early initiation of breastfeeding for vaginal and cesarean deliveries to promote breastfeeding.

The Mikiel-Kostyra, Mazur and Boltruszko (2002) cohort study findings confirmed that early skin-to-skin mother/infant contact lasting longer than 20 minutes increased the duration of exclusive breastfeeding. Authors of other studies examined periods of skin-to-skin mother/infant contact lasting for only a few minutes, which is frequently occurring in hospitals and is not supportive of breastfeeding (Kennell & Klaus, 1998).

Carlsson et al. (1978) studied 120 primiparous women to determine the association between mother/infant contact for the first 1-2 hours after birth and its relationship to breastfeeding behavior. Participants were divided into three groups:

Group A had extended mother/infant contact together with new hospital routines (which allowed the mother/infant to interact between meals and mothers were encouraged to breastfeed); Group B had extended mother/infant contact with standard hospital routines (which did not allow for mother/infant contact between meals and did not encourage breastfeeding); and Group C had limited mother/infant contact and standard hospital routines (no mother/infant contact between meals and no encouragement of breastfeeding). Their results showed that more mother/infant contact immediately after birth positively affected breastfeeding behavior during the first 4 days post delivery, and that separation by traditional hospital routines reduced affectionate mother/infant interactions.

Post delivery care routines that were found to negatively impact breastfeeding were identified by de Chateau, Holmberg, Jakobsson, and Winberg, (1997). Their study utilized an "experimental" group of non-separated mother/infant dyads and a control group of "standard" care dyads which included mother/infant separation. It was determined that even life-sustaining processes in the maternity ward that separated the mother from her infant easily disturbed the infant's innate agenda and affected breastfeeding success.

Anderson et al., (2003) authors of the Cochrane review study titled "Early skin-to-skin contact for mothers and their healthy newborn infants" reported that mothers of infants who experienced early skin-to-skin mother/infant contact were twice as likely to still be breastfeeding 1 to 3 months post birth compared to mothers in control groups who

did not experience early skin-to-skin contact or only experienced minimal skin-to-skin contact.

The timing of skin-to-skin contact is also thought to be critical in breastfeeding success since most healthy newborns will spontaneously grasp the nipple and suck by approximately 55 minutes post birth, but if made to wait too long most infants tend to become sleepy and difficult to arouse after the first 2 hours of life (de Chateau et al., 1997). Reports from a number of systematic review studies of skin-to-skin contact between mothers/infants state that early contact between mother and baby had a statistically significant positive effect on successful breastfeeding (Bernard-Bonnin, Stachtenko, Girard & Rosseau, 1989; Perez-Escamilla, Pollitt, Lonnerdal, & Dewey, 1994; Fairbank, O'Meara, Renfrew, Woolridge, Sowden, & Lister-Sharp, 2000).

In a randomized study Christensson et al., (1992) followed 50 vaginally delivered, healthy, full term babies (25 babies in each group). Those babies held skin-to-skin with their mothers were found to be significantly warmer than the babies in the control group who were separated from their mothers and had been put in a warm "cot." Christensson, et al., found that infants who experienced early skin-to-skin mother/infant contact cried less than babies separated from their mothers. They noted that early skin-to-skin mother/infant contact brought about a more rapid metabolic adaptation to extra uterine life than in the "cot" babies.

Early skin-to-skin mother/infant contact is thought to give the mother an added sense of behavioral control, positively affecting her attitude toward breastfeeding (de Chateau & Wiberg 1984). Mothers with low confidence are 3 times more likely to

prematurely wean their babies (O'Campo, Faden, Gielen, & Wang, 1992). Low breastfeeding confidence is often associated with perceived low breast milk supply (Hill, & Humenick, 1996).

E. Maternal Socio-demographic Characteristics

Maternal socio-demographic characteristics have been shown to be predictive of breastfeeding initiation. Younger and less educated mothers are less likely to breastfeed or to breastfeed for shorter periods of time (Ross Products Division, 1997). The Ross Survey also found that African-American women have lower reported rates of breastfeeding, lagging behind Caucasians and Hispanics (Ross Products Division, 1997). Mexican American and non-Hispanic white mothers are significantly more likely to breastfeed compared to non-Hispanic Black mothers (McDowell, et al., 2008). The breastfeeding rates of non-Hispanic blacks increased from 36% in 1993-1994 to 65% in 2005-2006 this is still below the goal of *Healthy People 2010* (McDowell, et al, 2008).

Chin, Myers, and Mangus explored the relationship between race, education and breastfeeding among 3,515 women in Louisiana. Significant differences between black breastfeeding initiators and non-initiators were found for maternal age, education, household income marital status, receipt of Medicaid before pregnancy, and WIC participation during pregnancy. Black primiparous mothers of singletons were only 38% as likely to initiate breastfeeding as their white counterparts. Black woman with some college were more than 4 times more likely to breastfeed than those with less than a high school education OR 4.28: 95% CI 3.03-6.04. The factors they identified to be significantly associated with breastfeeding initiation among white woman were: greater

maternal education, older maternal age, not currently working or attending school, nonsmoking, vaginal delivery, and not participating in WIC during pregnancy (2008).

Merewood, Patel, Newton, MacAuley, Chamerblin, Francisco, and Mehta, (2007) examined the medical records of 350 infants born in 2003 at the Baby-Friendly Boston Medical Center. They reported that breastfeeding rates at 6 months increased with maternal age, and was higher for mothers born in Africa or in an unrecorded birthplace. Merewood et al., noted that among predominantly low income black mothers, breastfeeding rates at 6 months are traditionally low and comparable to the overall US population.

Anderson, Damio, Chapman & Perez-Escamilla found from their study of 162 mother-infant pairs assessing the efficacy of breastfeeding peer counseling, that Hispanics (mainly Puerto Ricans) are more likely to mix-feed or formula-feed than exclusively breastfeed compared to Caucasians. Factors they identified which lead to exclusive breastfeeding at the time of maternity hospital discharge were a planned pregnancy and the infant's maternal grandmother not residing in the USA (2007).

A USA population study showed that breastfeeding rates varied according to family income level. The highest income category had a 71.8% breastfeeding rate, while only 36.6% in the lowest income level breastfed (Martinez & Kreiger, 1984). McDowell et al. reported that differences in breastfeeding rates by family income were observed among non-Hispanic White and non-Hispanic Black families, but not among Mexican American families. But within all income groups breastfeeding rates among non-

Hispanic White and Mexican Americans are significantly higher than non-Hispanic Blacks (2008).

Buxton et al., (1991) reported that 92% of Blacks and 87% of Whites with more than a high school education were still breastfeeding 7 days following birth. The educational level of the mother is associated with family income, and is correlated with breastfeeding frequency and duration. The lowest breastfeeding rates were found among Black and White women who had less than high school educations.

Celi, Rich-Edwards, Richardson, Kleinman and Gillman (2005) recruited 1,829 pregnant women in Massachusetts to study the impact of immigration status, social, and economical factors on breastfeeding. The authors found that, regardless of ethnicity, minority groups who were not culturally assimilated tended to have relatively high breastfeeding initiation rates. They concluded that cultural assimilation of Hispanic and immigrant Black mothers to the United States was a deterrent to breastfeeding initiation.

Heck, Braveman, Cubbin, Chavez and Kiely (2006) examined data from the California Maternal and Infant Health Assessment (MIHA) for 1999-2001. They analyzed the socioeconomic factors of family income, maternal education, paternal education, maternal occupation, and paternal occupation on 10,519 women delivering live births in California. They found a significant association of maternal and paternal education with breastfeeding; women with lower education levels and lower incomes were more likely not to breastfeed. Latino women born outside the U.S. and Washington, D. C. were more likely to breastfeed their infants than any other race/ethnic group, despite lower educational levels and lower family income.

Donath and Amir and the ALSPAC Study Team (2000) conducted a multistage study of 21,787 households in all Australian states in 1995. They report that women who had higher body mass indices (>BMI 30) were less likely to initiate breastfeeding. The likelihood that a mother with a BMI of >30 kg/m^2 would cease breastfeeding was 1.36 fold greater than a mother with BMI of <25 kg/m^2. They also found a significant difference between the mean and median duration of breastfeeding among obese (BMI >30) and non-obese mothers (BMI <25) and that women with fewer concerns about their body shapes were more likely to intend to breastfeed their infants during the first week (Barnes, Stein, Smith, Pollock & the ALSPAC Study Team, 1997).

Avery, Duckett, Dodgson, Savik and Henly (1998) screened 2,950 new mothers at a large private hospital in a major Midwestern city. One group of 84 who weaned during the first week were significantly younger, had completed fewer years of education, had more positive bottle feeding attitudes, were less positive in their breastfeeding attitudes, intended to breastfeed for a shorter period, had lower breastfeeding knowledge scores, and had higher perceived insufficient milk supply scores than other new mothers.

McDowell et al reported that younger mothers are less likely to have ever breastfed; overall breastfeeding rates have increased significantly as mothers increase in age for all race/ethnicities (2008).

A relationship has been found between maternal smoking and breastfeeding, with mothers who smoke less likely to breastfeed and substantially more likely to breastfeed for a shorter duration than non-smokers (Lyon, 1983).

Merewood et al., (2007) studied breastfeeding duration and factors affecting continued breastfeeding at Boston Medical Center among 244 mother-infant dyads. Breastfeeding initiated in the hospital was less likely among mothers who smoked or who had other smokers in the household. Additionally, mothers with a smoker in the home were more likely to cease breast feeding by the time their babies were 6 months of age.

F. Impact of Analgesia/Anesthesia on Breastfeeding

One intrapartum variable that will be examined in this study is the association of analgesia/anesthesia used during labor and delivery and infant feeding during maternity hospitalization. Generally researchers report that epidural analgesia given during labor and delivery negatively affects the sucking ability of newborns in the immediate postpartum period, and maternal analgesia leads to disorganized behavior in the infant which can result in delayed breastfeeding (Henderson, Dickinson, Evans McDonald & Paech, 2003; Baumgarder, Muehl, Fischer & Pribbenow, 2003; Volmanen, Valanne, & Alahuhta, 2004; Beilin, Bodian, Weiser, Hossain, Arnold, et al, 2005, Sinusas & Gagliardi, 2001).

Most analgesic agents commonly used during labor and delivery readily transfer to the fetus via the placenta; these analgesic medications have the potential to disturb normal neonatal neurobehavioral transition to extra-uterine life (Briggs & Wan, 2006). Morphine, Meperidine, and Fentanyl are the opioids that have been most commonly studied in labor analgesia research. These have been associated with infant respiratory depression. Opioids are known for their high lipid solubility, which allows for the rapid transfer of the drug through the placenta to the fetus (Poole, 2003).

Henderson et al., (2003) in a prospective study of 992 women, investigated the impact of labor epidural analgesia on breastfeeding. They observed that intrapartum epidural analgesia was associated with shorter breastfeeding duration in their population of primiparous women. Women in their study who had epidurals in labor had a 1.4 times greater risk of stopping breastfeeding at any time in the first 6 months of the infant's life.

Baumgarder et al., (2002) enrolled 231 mothers in their study, in which they evaluated whether there were at least two successful breastfeeding sessions in the first 24 hours following delivery. They studied 115 consecutive women who received epidural analgesia and matched them with 116 control patients who did not, and found a negative association between epidural analgesia and breastfeeding assessment scores. They also identified a strong association between maternal epidural analgesia and infants receiving formula supplementation while hospitalized. Baumgarder et al. hypothesize that epidural analgesia caused transient neuromotor impairment of the infant, thus affecting the infant's breastfeeding skills.

Volmanen et al., (2004) conducted a retrospective study that questioned 164 mothers in Finland on their labor pain, obstetrical procedures, and breastfeeding practices. They found that mothers who had epidural analgesia more often reported the perceived breastfeeding problem of "not having enough milk," which caused the mothers not to breastfeed exclusively. In their sample, 67% of the mothers who had epidural analgesia and 29% of the mothers who labored without epidural analgesia reported partial breastfeeding or formula feeding (p=0.003).

Beilin et al. (2005) reported in a prospective randomized double blind study on 182 women, 65 women of whom were assigned to receive no epidural analgesia, 59 were assigned to received an intermediate dose of epidural analgesia, and 58 were assigned to receive a high dose of epidural analgesia. They found that women who were randomly assigned to receive the high dose of epidural analgesia reported difficulty breastfeeding more often than the mothers who received an intermediate dose of epidural analgesia (although this did not reach statistical significance). Infant neurobehavioral scores were lowest in the group who received the high dose epidural analgesia. The researchers' main finding was that women who had previously successfully breastfed, delivered vaginally, and had received a high dose of epidural analgesia were less likely to be breastfeeding at 6 weeks postpartum compared to mothers who received less epidural analgesia.

Torvaldsen, Roberts, Simpson, Thompson, and Ellwood (2006) reported on a population-based prospective cohort study that aimed to determine if there was an association between intrapartum epidural anesthesia and breastfeeding in the first week postpartum. They found that women who had received epidural analgesia were more likely to be partially breastfeeding, as opposed to exclusively breastfeeding, their babies one week postpartum. They hypothesize that the main deterrent to successful breastfeeding resulting from the use of epidurals is associated with a "sleepy baby." Additionally, they found that there was an association between maternal analgesia, maternal age and education, and breastfeeding cessation before the infant was 24 weeks of age.

Ransjo-Arvidson, Matthiesen, Lilja, Nissen, and Widstrom, et al., (2001) found that exposure to bupivicane via epidural analgesia negatively influenced the infants breastfeeding behavior and the amount of infant crying. In their group of mothers who had received analgesia during labor the authors noticed that the infant's massage-like hand movements on the mother's breast, hand to mouth movements, touching of the areola and nipple with the infant's hands, and sucking behavior were exhibited less among those who were exposed to epidural analgesia.

Halpern, Levine, Wilson, MacDonnell, Katsiris & Leighton (1999) did a prospective study on the impact of epidural analgesia on 189 healthy pregnant women delivering at Women's College Hospital who planned to breastfeed. Of these, 59% received epidural analgesia, 72% breastfeed exclusively, and 20% partially breastfed. Women's College Hospital has 50 staff members from various disciplines who are international board-certified lactation consultants. This institution also has post-delivery breastfeeding teaching and encourages skin-to-skin mother/infant contact and suckling; they maintain a strong focus on breastfeeding during the postpartum hospitalization and after discharge, with all healthy babies rooming-in with their mothers. Labor epidural analgesia was not associated with a reduction in breastfeeding success in this study. Halpern et al. concluded that when a hospital finds decreased breastfeeding success in women receiving epidural labor analgesia their hospital should re-examine their post-delivery breastfeeding/lactation care.

G. Breastfeeding Initiation

The initiation of the first breastfeeding shortly after birth is influential, since newborns have strong rooting reflexes which allow them to seek out and latch on to the mother's nipples (Widstrom & Thingstrom-Paulsson, 1993; Righard & Alade, 1990). Healthy babies who are born to non-sedated mothers develop a predictable behavioral pattern in which they find the nipple without help and begin to suck (Widstrom et al., 1990).

The World Health Organization's (WHO) Baby-Friendly Hospital Initiative (BFHI) recommends that breastfeeding be initiated within one-half hour of birth (WHO, 1998). In the Walters et al., pilot study the mean time for the baby to latch was 53.44 minutes after birth (2007).

Buxton et al., (1991) identified variables that predicted failure of breastfeeding for more than 7 days: late initiation of first breastfeeding, lack of rooming-in with the infant and low maternal confidence in ability to breastfeed. They also reported that 77% of the women who stopped breastfeeding in the first 7 days reported not breastfeeding their newborn in the delivery or recovery room, compared with women 50% who did breastfeed past 7 days.

Langercrantz (1996) found that newborns experienced a surge of catecholamine that enabled them to stay awake and alert immediately after their birth. This "is a limited period of high vulnerability to both endogenous and exogenous events" (Cairns, 1979, p. 94). This is the opportune time for the beginning of bonding/attachment and the initiation

of pre-feeding behaviors and/or breastfeeding (Anisfeld & Lipper, 1983; Klaus, Jerauld, Kreger, McAlpine, Steffa & Kennell, 1972)

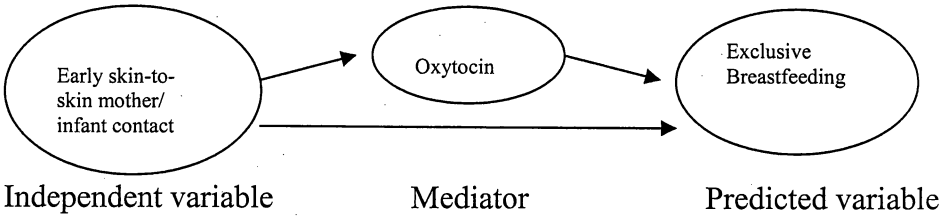
Perez-Escamilla, Segura-Millan, Pollitt, and Dewey (1992) conducted a study which controlled for a number of variables. They found that rooming-in (the practice of having the infant remain with the mother on a 24 hour basis while in the hospital) was positively associated with breastfeeding initiation. They proposed that rooming-in provided more opportunity to initiate early and frequent breastfeeding.

H. Oxytocin

Riordan and Auerbach (1999) define oxytocin as a lactogenic (milk producing) hormone produced in the posterior pituitary gland which is released during sucking, touch, and nipple stimulation, causing milk ejection and uterine contractions which slow uterine blood loss. Oxytocin also aids the mother by making her feel calm and responsive (Matthiesen, et al., 2001).

Oxytocin is a core component in mediating certain social behaviors characterized by repeated physical contact (e.g., prefeeding behaviors and breastfeeding). Since oxytocin release is triggered by warmth and touch, it is an easily conditioned response (Uvnas-Moberg, Ingemar, & Magnusson, 2005). Bennett (2000) defines a mediator (oxytocin) as being predicted by an independent variable; in this study we are viewing early skin-to-skin mother/infant contact as the independent variable that explains why or how the outcome (breastfeeding) is predicted. Baron and Kenny (1986) state that a mediator meets the following criteria when: (a) the independent variable accounts for the

variations in the mediator, and (b) that the mediator significantly accounts for variations in the predicted variable.



Independent variable Mediator Predicted variable

Figure 2. Conceptual Model of the Mediator Effect

A newborn infant's rhythmic nipple searching (pre-feeding behavior) leads to self-attachment to the breast (generally within 50 to 55 minutes after an unmedicated birth) and positively affects the release of oxytocin into the bloodstreams of both mother and infant (Prechtl, 1958; Righard & Alade, 1990). This outpouring of oxytocin into the mother's bloodstream produces attachment behaviors (e.g., nipple stimulation by the infant, sensory/tactile stimulation of the infant's skin, olfactory stimulation of the scent of the breast, etc.) in the infant and bonding by the mother (Uvnas-Moberg, 1998).

Uvnas-Moberg (1998) reports that oxytocin facilitates the onset of maternal behaviors and promotes bonding. Breastfeeding women are calmer and more socially interactive than similarly-aged women who are not breastfeeding. Mothers who experience early skin-to skin contact with their babies spend more time with them and interact with them more while breastfeeding (Widstrom, Wahlberg, Matthiesen, Eneroth, Uvnas-Mogerg, et al., 1990).

Matthiesen, et al., (2001) studied videos of mothers who had not experienced labor analgesia and found that the relationship between maternal oxytocin blood levels and the infant's hand movements or sucking behavior in the immediate postpartum period

is established when the mothers and babies were placed skin-to-skin. They recorded the interactions between mothers and their infants from birth to the first breastfeeding and identified a correlation between blood oxytocin levels (drawn every 15 minutes) and the infants' and mothers' behaviors, which included hand, eye, and locomotion of the infant before the initial breastfeed. The infants focused on their mother's face and after about 15 minutes following birth mothers began to touch their babies gently, initially touching them with their fingertips, then with their mother's entire hand, examining the baby's ears, and hands, etc. Then the mothers began an "embedding process" with the mother nestling with their infants close beside them.

Ransjo-Arvidson, et al., (2001) noted that infants who are exposed to labor analgesia have depressed development of breastfeeding behavior, including disturbed stimulation of the mother's breast; it is possible that analgesia may also adversely affect oxytocin release in the mother and thereby interfere with milk ejection, uterine contractions, and the development of the mother/infant relationship.

I. Theory of Planned Behavior

The theory of planned behavior (Ajzen, 1991; Ajzen & Madden, 1986) is an extension of the theory of reasoned action developed by Ajzen and Fishbein in 1980. The theory of planned behavior posits that behavior is located on a continuum from full choice and control to no choice and no control. Perceived behavioral control, along with attitudes toward a behavior and subjective norms, are assumed to influence behavior directly by way of intention. The more favorable the attitude and the greater the

individual's intention, the more likely the individual's intention will lead to a specified performance of a behavior.

The theory of planned behavior performs well in explaining many health related behaviors with the constructs of intention, perceived behavioral control, attitude, and subjective norm (Godin & Kok, 1996). An individual's attitude and perceived behavioral control are consistent predictors of intention of breastfeeding behavior, with intention an antecedent to the behavior (Ajzen, 1991; Duckett, et al, 1998; Wambach, 1997).

Predictors of breastfeeding initiation and duration in the literature focus on the incremental components of the theory of planned behavior. These components are: attitude toward breastfeeding, normative beliefs and social support from influential individuals, and perceived control beliefs, (the belief the mother has that she will be able to successfully carry out breastfeeding behavior) (Duckett et al, 1993).

Stockdale (2001) applied regression analysis to test the hypothesis of the theory of planned behavior in her cohort of 99 women with the mean age of 28.7 years. One finding of interest is that the intention to breastfeed in the age category of < 25 years was 41.1% compared with the age category of > 31 years, in which the intention to breastfeed was 75.5 %. Stockdale concluded that the theory of planned behavior is a beneficial psychosocial tool when investigating breastfeeding intention and behavior.

Avery et al, (1998) based their work with primiparas on the theory of planned behavior by diagramming the socio-demographic characteristics which influence maternal breastfeeding intention and duration. They proposed that the mother's age,

education, and marital status impact her beliefs and attitudes about breastfeeding behavior, explaining 36% of the variance of intended duration of breastfeeding.

Wambach (1997) and Duckett et al., (1998) developed causal models that utilized the theory of planned behavior to predict prenatal breastfeeding intentions and postpartum outcomes. Duckett et al., (1998) suggest that it "may be possible to alter beliefs about outcomes of breastfeeding and to help women gain strategies that change their control beliefs" (p. 334). Wambach (1997) suggested that additional variables be incorporated into the theory of planned behavior to potentially predict breastfeeding intention. We propose that two such variables are early skin-to-skin mother/infant contact and oxytocin stimulated by skin-to-skin mother/infant contact.

J. Attachment theory

John Bowlby's (1958) attachment theory is integrated with ethology and sociobiology. Bowlby's concept of attachment uses the term "behavioral system," an organized group of observable behaviors which include feedback mechanisms consisting of smiling, crying, approaching, clinging, etc. The infant's attachment behavior is a social action that brings the adult into proximity to the infant and serves to activate bonding in the parent. From birth, the infant's behaviors are focused on the mother or the attachment figure.

"Attachment" is an affectional tie that one person forms with another specific individual (Ainsworth, 1969). It is not a transient relationship, but one in which an infant forms a long-term attachment with its mother or primary caregiver. The emotional life of the infant is dependent on the formation and maintenance of attachment relationships,

with infancy, childhood, and adolescence viewed as sensitive periods during which attachment behaviors develop normally or abnormally based on the experiences the individual has with his attachment figures.

After the infant is placed skin-to-skin with his mother following birth, exploration begins. This exploration enhances affectional behaviors from the attachment figure (mother); and is a time of utmost importance to the mother and infant in their relationship. These behaviors are rudimentary in early skin-to-skin mother/infant contact leading to attachment (Anisfeld & Lipper, 1983).

K. Conclusion

Numerous studies extol the benefits of breastfeeding to the infants, their mothers, society, and the environment. Through the literature review process we have found that intention to breastfeed is a precursor to breastfeeding and a predictor of breastfeeding duration. Maternal socio-demographic characteristics and intrapartum variables correlate to and are predictive of breastfeeding initiation and behaviors. The first 3 hours following birth are the prime time to establish early skin-to-skin mother/infant contact and the initiation of breastfeeding. We have not located research that combined the above variables in a single study. Given the benefits of breastfeeding we believe it would be advantageous to examine in one study the individual components of intention to breastfeed, maternal socio-demographic characteristics and intrapartum variables, early skin-to-skin mother/infant contact in the first 3 hours following birth, and the method of infant-feeding during the maternity hospitalization.

The literature review did not reveal how a mother's intention to breastfeed (measured upon admission for maternity hospitalization) the time duration of early skin-to-skin mother/infant contact during the first 3 hours following birth and maternal socio-demographic characteristics and intrapartum variables are associated with exclusive breastfeeding during the maternity hospital stay; nor did it reveal studies of the association of maternal socio-demographic characteristics and intrapartum variables and early skin-to-skin mother/infant contact. The proposed study will address these voids in the literature.

CHAPTER 3

METHOD

A. Study Design

This is a prospective cohort study that examined archival de-identified data collected by the Perinatal Services Network of Loma Linda University Medical Center/Children's Hospital, in Loma Linda, California for the period of July 2005 through June 2006. Variables that were included in the analysis were: intention to breastfeed, maternal socio-demographic characteristics, maternal intrapartum variables, early skin-to-skin mother/infant contact during the first 3 hours following birth, and the type of infant-feeding during the maternity hospital stay (exclusive breastfeeding or other).

B. Participants

Participants were mother/infant dyads from the 19 San Bernardino and Riverside county hospitals that were contracted with PNS during the study period. Data was collected on 21,842 mother/infant dyads during their maternity hospitalization. Participants were included in the study if they: (a) delivered a healthy live singleton (gestational age between 37 to 40 weeks), and (b) were not separated from their infant for more than 1 hour during their hospital stay. We determined to only include singleton births in this study, multiple births (twins, triplets, etc.) have additional variables which we did not wish to include. Most research literature focuses on singleton births and we referred to these research studies in our literature review.

Table 1. Operational Definitions of Infant-Feeding Types which define the 3 levels of infant feeding to be analyzed as a dependent variable. We coded exclusive breastfeeding and other.

Breast feeding only	Exclusive breastfeeding
Formula feeding only	Exclusive feeding of formula only.
Breast and formula feeding	Mixed feeds, (breast milk and formula) with some breast milk and some formula fed to infant.

C. Procedures

During the maternity hospital stay data was collected on each mother/infant. Each of the 19 PNS-contracted hospitals collected data and transferred it to PSN on a monthly basis. This data was transferred at a specific time each month to PSN via a secure Internet connection.

D. Variables

The independent variables studied were maternal initial infant-feeding method intention, maternal socio-demographic characteristics (e.g., age ethnicity, and primary language), and intrapartum variables (analgesia/anesthesia, vaginal vs. caesarean delivery), and the amount of time spent in early skin-to-skin mother/infant contact.

Infant-feeding type during maternity hospitalization was one of the dependent variables used in this research analysis. The type of feeding the infant received during the maternity hospital stay was broken into 3 subgroups: (1) breast feeding only, (2) formula feeding only, or (3) mixed feeding (breast and formula). In this study we categorized the variable of infant-feeding type as exclusive breastfeeding and other. The second dependent variable for this study was the time duration of early skin-to-skin mother/infant contact during the first 3 hours following birth.

E. Data Collection

Data were collected in the individual hospitals by a specific data collection person or nurses and transferred monthly to PSN. There was no precise time that data was to be collected; some of the data was collected at discharge from chart review. Nurses observed the method of infant-feeding occurring during the hospital stay and charted it in the medical record/patient chart. If data were missing or if discrepancies were present in the data, PSN would contact the individual responsible for the data collection at that specific hospital and clarify the discrepancy.

F. Measuring Tools

Perinatal Services Network developed a data collection measurement tool that included the variables that they were interested in collecting. These tables list the variables for the descriptive and quantitative portion of the study (Tables 1-7).

The 19 PSN-contracted hospitals utilized a data collection measurement tool originally prepared by PSN (Appendix A). This form was supplemented by the PSN data collection dictionary, which provided choices and explanations for the PSN data collection form to ensure standardized responses (Appendix B).

Table 2. Operational Definitions of Mother's Socio-Demographic Characteristics

Language	English as native language English speaking, but not primary language Mother does not communicate in English	Ordinal
Age	Mother's age in years	Ratio
Race/ethnicity	African/American Non-Hispanic Caucasian-Non Hispanic Hispanic/Latino/Spanish Asian/Pacific Islander Native American Multi-racial Other	Nominal
Smoking Status	Yes/No	Nominal
Education	<High School High School Any college Graduate degree or higher	Ordinal
Kit for New Parents First 5 Children and Families Commission	Yes/No	Nominal

Table 3. Operational Definitions of Intention to Feed Variables

Desired type of infant feeding (intention) upon admission to the hospital	Undecided Breastfeeding only Mixed feeding (breast and formula) Formula feeding only	Ordinal

Table 4. Operational Definition of Skin-to-Skin Variables

Skin-to-skin mother/infant contact. At least 1 hour during the first 3 hours	Yes/No	Nominal
The length of time of skin-to-skin during the first 3 hours (if less than 1 hour)	None <15 minutes 16-30 minutes 31-59 minutes	Ordinal

Table 5. Operational Definition of Infant Feeding Choices

Type of feeding during the hospital stay	Breast feeding only Mixed feeding (breast and formula) Formula feeding only	Ordinal

Table 6. Operational Definitions of Intrapartum Variables
(to be Included with Maternal Socio-demographic Characteristics)

Type of Delivery	Vaginal Cesarean	Nominal
Analgesia/anesthesia	None Epidural Narcotic/sedative Local Spinal General Other	Nominal

G. Intervention

We are focusing this study by looking at the primary quality assurance implementation of early skin-to-skin mother/infant contact instituted by PSN in the 19 PSN-contracted hospitals. Early skin-to-skin mother/infant contact is primarily a nurse driven practice, and as expected, level of adherence varied within the contracted institutions. Some hospitals implemented early skin-to-skin on a routine basis, others did not. Hospitals only had to implement 2 of 3 practices to be included in the funding and only one of the three practices was early skin-to-skin mother/infant contact during the first 3 hours following birth. The other 2 practices that the hospitals could choose to implement were rooming-in and breastfeeding.

Early skin-to-skin mother/infant contact has been defined by PSN as "skin-to-skin contact between a mother and her infant with the infant wearing only a diaper and/or

hat and covered with a blanket on the mothers' naked chest within the first 3 hours post delivery; this time is to be unhurried and uninterrupted with no painful procedures performed either on the mother or the infant."

H. Data Analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) software, version 15 (SPSS, Inc., Chicago, IL) and SAS version 9 (SAS Institute Inc., Cary, NC). Variable responses from the PSN data collection form had been previously entered into the PNS data base. Independent variables for the quantitative data analysis included early skin-to-skin mother/infant contact (dose response), intention to breastfeed, and maternal socio-demographics (which included age, primary language spoken, race/ethnicity, and educational attainment) and intrapartum variables (analgesia/anesthesia, and type of delivery). The dependent variable for the quantitative data analysis was feeding type, i.e., exclusive breastfeeding of the infant during the maternity hospitalization or other infant-feeding type, and the length of time in early skin-to-skin mother/infant contact during the first 3 hours following birth.

I. Research Questions/Statistical Tests

Statistical methods related to questions 1 through 3 used univariate binary logistic regression. In addition, multivariable logistic regression was used for questions 4 and 5. Statistical methods related to questions 6-7 used univariate binary logistic regression. Question 8 was analyzed using multivariable logistic regression.

1. Is early skin-to-skin mother/infant contact during the first 3 hours following birth associated with the actual infant-feeding method the newborn receives during the maternity hospitalization?
2. Is early skin-to-skin mother/infant contact during the first 3 hours following birth, adjusted for maternal infant feeding intention, associated with the actual infant-feeding method the newborn receives during the maternity hospitalization?
3. Is early skin-to-skin mother/infant contact during the first 3 hours following birth adjusted for maternal characteristics associated with the actual infant-feeding method the newborn receives during the maternity hospitalization?
4. Is early skin-to-skin mother/infant contact during the first 3 hours following birth adjusted for maternal infant-feeding intention and the significant maternal characteristics associated with the actual infant-feeding method the newborn receives during the maternity hospitalization?
5. Is there a significant interaction between early skin-to-skin mother/infant contact and maternal infant-feeding intention as well as maternal socio-demographic characteristics in predicting the actual infant-feeding method the newborn receives during the maternity hospitalization?
6. Are maternal socio-demographic characteristics associated with early skin-to-skin mother/infant contact during the first 3 hours following birth?
7. Is the intended maternal infant-feeding method measured prior to birth associated with early skin-to-skin mother/infant contact during the first 3 hours following birth?

8. Are maternal socio-demographic characteristics and intrapartum variables, adjusted for intended maternal infant-feeding method, associated with early skin-to-skin mother/infant contact during the first 3 hours following birth?

J. Power Analysis

We hope to detect a small effect size (ES) of f^2 (.01) and power of .80 with an alpha of .05 for the Chi square test with 6 *df* calling for a sample size n= 1,887 (Cohen, 1992). This study has 21,842 participants therefore; lack of power should not be a problem. The lowest power for the above questions was for the chi square described in Question 1.

K. Human Subjects Benefits and Risks

Procedures to protect the identity of participants were strictly observed by de-identification of names and other identifiers for the study. Risks to participants were minimal. Each participant signed the hospital's standard informed consent prior to their maternity hospitalization admission; this was kept with their individual hospital medical record at the individual hospital. Participants were treated with respect and as autonomous individuals, in an ethical manner. Each mother was given the opportunity to accept or reject the PSN quality assurance intervention of early skin-to-skin mother/infant contact.

The Institutional Review Board of Loma Linda University Medical Center/ Children's Hospital approved this study.

CHAPTER 4

The effect of early skin-to-skin mother/infant contact during the first 3 hours following birth on exclusive breastfeeding during the maternity hospital stay

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Summary Statement: Although benefits of early skin-to-skin mother/infant contact are known, not all hospitals include it in their standard practices. Records of mother/infant dyads (*n=21,842)* part of an intervention that promoted early skin-to-skin mother/infant contact, were examined. Extended early skin-to-skin mother/infant contact was related to increased rates of exclusive breastfeeding during the maternity hospital stay.

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Abstract

A nurse-driven hospital-based prospective cohort study of data collected in 19 hospitals in San Bernardino and Riverside counties, California by Perinatal Services Network (PSN) on all mothers (n= 21,842) who delivered a singleton (37-40 weeks gestation) between July 2005 through June 2006. Multivariable ordinal logistic regression showed that maternal infant-feeding method intention (measured prior to birth) socio-demographic characteristics, intrapartum variables, and early skin-to-skin mother/infant contact during the first 3 hours following birth (controlling for hospital) were correlated with exclusive breastfeeding during the maternity hospitalization. Compared to mothers who experienced no early skin-to-skin mother/infant contact, exclusive breastfeeding was higher in mothers who experienced skin-to-skin contact for 1-15 minutes (OR 1.376, 95% CI: 1.189-1.593), 16-30 minutes (OR 1.665, 95% CI: 1.468-1.888), 31-59 minutes (OR 2.357, 95% CI: 2.061-2.695), and > 1 hr (OR 3.145, 95% CI: 2.905-3.405).

Keywords: exclusive breastfeeding, early skin-to-skin, socio-demographic characteristics, intrapartum variables

There is ample evidence of the numerous benefits of breastfeeding.[1] Human milk is uniquely matched for the needs of the human infant, and breastfeeding benefits the health of the infant.[2,3,4] Breastfeeding rates in the United States have reached the goal of *Healthy People 2010* "to increase to 75% the proportion of mothers who breastfeed their babies in the early postpartum period."[5] In San Bernardino County 34.6% of mothers are exclusively breastfeeding at the time of their maternity hospitalization discharge; while in Riverside County 47.7 % of mothers are exclusively breastfeeding at the time of their maternity hospital discharge.[5] One factor influencing whether a mother breastfeeds during the immediate postpartum period is standard hospital practices that separate the mother and infant during a time when the infant is most receptive to self-attachment to the breast and breastfeeding.[6] The Academy of Pediatrics (AAP) recommends that healthy newborns be placed and remain in direct skin-to-skin mother/infant contact until the first breastfeed is accomplished.[1] Common hospital-based practices prevent the mother and infant from the attachment experience that early skin-to-skin contact would provide. Newborns are routinely alert and are capable of latching to the breast without assistance within the first-hour following birth.[7] Mothers and infants who experience early skin-to-skin mother/infant contact are more likely to have breastfeeding success during the early postpartum period.[8,9] The benefits of early skin-to-skin mother/infant contact immediately following birth are numerous; skin-to-skin contact eases the infant's transition to extra-uterine life. The close body contact of the mother helps to regulate the infant's newborn temperature, energy conservation, acid-base balance, respirations, crying, and nursing behaviors. [10,11]

We have not identified current literature that addresses in one study the impact of maternal infant-feeding intention, early skin-to-skin mother/infant contact, the mother's socio-demographic characteristics, maternal intrapartum variables, hospital of birth, and exclusive breastfeeding during the maternity hospital stay. It is important to include these variables in one study because any one of the variables could be confounded with early skin-to-skin contact mother/infant contact. It is possible that one apparent connection between early skin-to-skin contact and exclusive breastfeeding during the maternity hospitalization could be the result of the implementation of specific hospital polices (i.e., early skin-to-skin mother/infant contact). Therefore, such variables must be controlled if we are to determine the true relationship between early skin-to-skin contact and exclusive breastfeeding during the maternity hospital stay.

The Perinatal Services Network (PSN) of Loma Linda University Medical Center/Children's Hospital identified hospital birthing practices (physical exam, suctioning, vitamin K injection, application of erythromycin ophthalmic ointment, and wrapping of the infant) that separate the mother and infant immediately following birth and during the recovery period; these practices are not conducive to maternal/infant bonding/attachment or breastfeeding.[6] From July 2005 through June 2006 PSN enacted a prospective cohort nurse-driven hospital-based quality assurance intervention (n=21,842) to promote, support, and improve the development of newborns through bonding/attachment and early mother/infant skin-to-skin contact during the first 3 hours following birth.

Analysis of the PSN data will provide the opportunity to fill the gap in the early skin-to-skin literature. It was our intention to include in one study maternal infant-feeding

intention, socio-demographic characteristics, intrapartum variables, and the length of time spent in early skin-to-skin mother/infant contact during the first 3 hours following birth (and control for hospital of birth) to determine their association with exclusive breastfeeding during the maternity hospital stay. Specifically, this program allows us to determine what duration of early skin-to-skin mother/infant contact within the first 3 hours following birth will increase the likelihood of exclusive breastfeeding during the maternity hospital stay (dose response).

Methods

Study Design

This study involves analysis of data from a prospective cohort quality assurance intervention. We analyzed data collected on 21,842 mother/infant dyads who delivered in the 19 PSN-contracted hospitals during the study period of July 2005 through June 2006. These births represent 95% of the births in the 19 hospitals for that time period.

The hospitals that contracted with PSN were anxious to join with PSN. Each hospital agreed to implement two of three hospital practices in order to be funded by PSN. Prior to the PSN quality assurance program initiation, nurses from each of the 19 PSN-contracted hospitals attended training at the PSN headquarters, this training included the practices that were to be implemented in the hospital. Those trained in bonding/attachment, breastfeeding and rooming-in had the potential to incorporate early skin-to-skin mother/infant contact into their standard hospital routines. At the onset of the intervention each institution utilized the same PSN Data Measurement Collection Form and data dictionary to track specific variables of the mother/infant dyads.

Participants

The cohort consisted of all mothers who delivered in one of the 19 PSN-contracted hospitals during the study period and were included in the PSN data collection (n=21,842). Mothers included in the study included all races/ethnicities, English and Spanish speakers, and represented the existing patient population census in Riverside and San Bernardino counties. Mothers were included in the study if they: (a) delivered a healthy singleton (gestational age 37 to 40 weeks), and (b) were not separated from their infant for more than one hour during the mother's maternity hospital stay. Table 1 shows the demographics for the sample, as well as a breakdown of the demographic variables that were collected by PSN. Our participant population represented the ethnically diverse demographics of this area in Southern California. Study participants were mostly non-smoking Hispanics with educational background of high school or less. The mean age (± standard deviation) was 26.7 ± 6.1. The majority of the women intended to exclusively breastfeed at entry, experienced vaginal delivery, and more than one hour of early skin-to-skin mother infant contact during the first 3 hours of life. Each participant signed an informed consent at the time of her maternity admission; these informed consents were specific to each maternity institution.

Data Collection

Mothers were interviewed by the peripartum staff who admitted them to their maternity hospitalization in their language of choice (English or Spanish). This baseline data collection included maternal socio-demographics and desired maternal infant-feeding method intention. During the intrapartum and postpartum period additional data were collected which included the type of delivery (vaginal or cesarean), maternal

intrapartum analgesia/anesthesia usage, amount of time spent in early mother/infant skin-to-skin contact, and the type of feeding the infant received during their hospital stay.

In order to maintain confidentiality, PSN utilized a secure Internet connection with each hospital. De-identified data were collected in the individual hospitals and transferred monthly to PSN. If data were missing or if discrepancies were present in the data, PSN would contact the individual responsible for the data collection at the specific institution and clarify the situation. Data was cleaned at PSN prior to our receiving it. Initially, data were collected on 23,074 mother/infant dyads; PSN identified missing data on 1,232 mother/infant dyads, which left us with a sample size of 21,842 mother/infant dyads.

Instrument

The one-page PSN Data Collection Measurement Form was developed in-house by PSN. The variables to be included in the data collection instrument were decided upon by PSN staff according to their interest, research knowledge, and expertise. The peripartum staff who trained at PSN were experienced with the PNS Collection Form and data dictionary since they were trained by PSN. The same data collection measurement instrument was utilized to gather data in each of the 19 maternity hospitals and became part of each mother's medical record. Each participant signed an informed consent at the time of her maternity admission; these informed consents were specific to each maternity institution.

The PSN quality assurance program was not a research based project, therefore, prior to the beginning of the program they did not test their Data Collection Measurement Form for reliability. After the program was underway PSN attempted to validate the data

they had collected by comparing it to the data collected in the 2006 California Newborn Screening. They demonstrated the validity of their assessment of breastfeeding rates in their preliminary analysis which showed a Spearman's ρ correlation of .90 (Melcher & Kennedy, 2008). This study received Institutional Review Board approval from Loma Linda University.

Independent Variables

The key independent variables examined and reported were: (1) maternal infant-feeding method intention, (2) maternal socio-demographic characteristics, which included mother's primary language, race/ethnicity, age, smoking status, educational level, and the maternal intrapartum variables of analgesia/anesthesia usage and mode of infant delivery (vaginal or cesarean), (3) the duration spent in early skin-to-skin mother-infant contact during the first 3 hours after delivery, subdivided as shown in Table 1.

Each of the variables included in our analysis have been examined individually in previous research studies and have shown their independent association with breastfeeding. Maternal socio-demographic characteristics are predictive of the likelihood of a mother's likelihood to breastfeed.[12] Maternal intrapartum analgesia/anesthesia readily transfers to the fetus via the placenta and has the potential to disturb the neonatal neurobehavioral transition to extra-uterine life.[13] Maternal intrapautum analgesia/anesthesia leads to disorganized behavior in the newborn infant which can result in a delay in effective breastfeeding.[14] Cesarean section delivery is a significant barrier to the implementation of mothers initiating breastfeeding within 30-60 minutes following birth, since early skin-to-skin mother/infant contact is not a common practice, especially after cesarean births.[15]

Outcome Variable

The outcome variable was the actual type/method of feeding the infant received during the maternity hospital stay as entered by peripartum staff on the PSN Data Collection Form. The various types of infant-feeding were: exclusive breastfeeding, breast and formula feeding, and formula feeding. However, for analysis purposes these were divided into two categories: exclusive breastfeeding or other.

Statistical Methods

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) software, version 15 (SPSS, Inc., Chicago, IL). Univariate logistic regression assessed confounding by including each potential confounder to the model that included early skin-to-skin mother/infant contact. Confounding variables that produced more than 10% change in the odds ratio when added to the model that only included early skin-to-skin mother/infant contact as the independent variable were considered to be significant. The confounding variables that produced more than a 10% change in the odds ratio were then included in a multivariable regression model to determine the effect of early skin-to-skin mother/infant contact after adjusting for the confounding variables.[16] In addition, the multivariable model also included interaction terms between early skin-to-skin mother/infant contact and other covariates. Interaction was tested by assessing the difference in the log likelihood ratio with and without the interaction terms.[17]

The 19 hospitals were controlled for in this study to explore whether the variation in the implementation of early skin-to-skin mother/infant contact contributed to the difference in exclusive breastfeeding. A dummy variable was entered into the analysis to

represent each hospital except the hospital with the most births which served as the reference group.

Results

Table 2 shows the differences between mothers who did and did not breastfeed exclusively during their maternity hospitalization. Mothers who breastfed exclusively were more likely to be Hispanic, have completed High School, intend to breastfeed exclusively at baseline, have delivered vaginally, utilize non-CNS analgesia/anesthesia, experience more than 1 hour of early skin-to-skin mother/infant contact during the first 3 hours following birth, and less likely to smoke.

Table 3 indicates that maternal infant-feeding method intention, measured at entry to the maternity hospital stay and the type of delivery (vaginal or cesarean), were significant confounders associated with early skin-to-skin mother/infant contact during the first 3 hours following birth. Maternal infant-feeding intention and type of delivery produced more than a 10% change in the odds ratio when added to the model that only included early skin-to-skin mother/infant contact.

These confounders were added to a multivariable analysis to create a logistic regression model to assess the effect of early skin-to-skin mother/infant contact after adjusting for maternal infant-feeding intention and type of delivery. The resulting model is shown in Figure 1. Figure 2 shows the model after adjusting for all potential confounders found in Table 3 including hospital of birth. In both multivariable logistic regression analyses we see that the odds ratios of the likelihood of exclusively breastfeeding continue to increase as the period of early skin-to-skin mother/infant contact increases. The *p*-value for trend test was statistically significant in both analyses

($p = 0.000$ & $p = 0.000$ respectively). Interaction terms between early skin-to-skin contact and other covariates were not significant in either of the multivariable analyses in figures 2 or 3.

The analysis, which controlled for the 19 hospitals, explored whether the variation of the hospital implementation of early skin-to-skin mother/infant contact contributed to the rates of exclusive breastfeeding during the maternity hospital stay. We found that even when the differences among the hospitals were controlled for, early skin-to-skin mother/infant contact still was strongly associated with exclusive breastfeeding in a dose response manner as figure 2 shows.

To summarize, we determined that the longer a mother experiences early skin-to-skin mother/infant contact during the first 3 hours following birth, the more likely that she will breastfeed exclusively during her maternity hospitalization.

Discussion

Our hypothesis that longer periods of early skin-to-skin mother/infant contact would lead to an increased likelihood of exclusive breastfeeding during the maternity hospital stay was confirmed. Additionally, we were interested in which maternal socio-demographics and intrapartum variables were significantly correlated with early skin-to-skin mother/infant contact and exclusive breastfeeding during the maternity hospital stay. To our knowledge this is the first analysis which included maternal infant-feeding intention, socio-demographic variables, intrapartum variables, early skin-to-skin mother/infant contact, hospital of birth, and exclusive breastfeeding during the maternity hospital stay. Previous studies have included one or more of these variables in their research but not all. We do not know of any other study which examined the dose response relationship between increasing time duration of early skin-to-skin mother/infant contact and exclusive breastfeeding during the maternity hospital stay.

Are the current study results consistent with the literature?

Moore and colleagues identified numerous early skin-to-skin contact studies in their Cochrane Review in 2007.[17] Two of these studies measured breastfeeding at hospital discharge as their outcome variable. [18,19] Neither study included all the variables that were analyzed in our study. Our results are consistent with previous studies that suggest the relationship between maternal infant-feeding intention,[20] education, [21] age, [22] race/ethnicity, [20, 21] smoking,[23] maternal intrapartum analgesia/anesthesia,[24] type of delivery[25] and breastfeeding. Moore and colleagues summarized in the Cochrane Review that there are no adverse effects found with early skin-to-skin mother/infant contact.[16] Previous authors have suggested that the duration of early skin-to-skin mother/infant

contact positively impacts the duration of breastfeeding.[26, 27] Their study grouped early skin-to-skin contact into short contact (1-19 minutes) and extended contact (20 minutes or more). Results of their findings demonstrated that there was a significant positive magnitude effect on exclusive breastfeeding duration. Mothers in the extended contact group (20 minutes or more), had breastfeeding duration that was more than 3 months longer compared to those with no skin-to-skin contact. However, this study did not control for intention to breastfeed prior to birth. Without this control it is possible that mothers who intended to breastfeed deliberately made an effort to get more skin-to-skin contact and it was the intent to breastfeed that was presumably responsible for the apparent advantage of skin-to-skin contact.

Interpretation

The maternal variables of education, type of delivery (vaginal or cesarean), maternal infant-feeding intention measured prior to birth, smoking, race/ethnicity, primary language, hospital, intrapartum analgesia/anesthesia, only slightly attenuated the overall odds ratio of the positive effect that early skin-to-skin mother/infant contact had on the outcome variable of exclusive breastfeeding during the maternity hospital stay (Figure 2). We conclude that extended early skin-to-skin mother/infant contact has a profound positive effect on exclusive breastfeeding during the maternity hospital stay (dose response).

Mothers who initially intend to exclusively breastfeed may read about early skin-to-skin mother/infant contact and its benefits and are looking forward to it as part of their birth experience. Mothers who were not initially intending to exclusively breastfeed may not have been exposed to early skin-to-skin mother/infant contact by the hospital staff.

Consequently, intent to breastfeed is an important potential confounder in studies of the effects of skin-to-skin contact.

Additionally, we controlled for the 19 PSN contracted hospitals to explore whether the variation of early skin-to-skin mother/infant contact implementation contributed to the difference in exclusive breastfeeding. The association of early skin-to-skin with exclusive breastfeeding was not merely a function of the differences among the hospitals; the association still existed when we controlled for the hospitals. Our analysis showed that a mother who went to one of the 19 hospitals was 11 times more likely to experience early skin-to-skin mother/infant contact compared to another mother who went to the hospital we used as the reference hospital. The mother in the typical hospital we studied was over 4 times more likely to experience early skin-to-skin mother/infant contact as the reference hospital. We can see from this analysis that early skin-to-skin mother/infant contact was not uniformly implemented in the hospitals. Yet even when these differences in implementation were controlled statistically by including a dummy variable for hospital in the analysis, skin-to-skin contact had considerable impact and a dose-response impact at that on maternal exclusive breastfeeding rates.

Strengths and Limitations

The current study has several strengths. It collected information on 21,842 mother/infant dyads for one fiscal year, and is racially/ethnically representative of the population base in Southern California (Table 1). Maternal socio-demographic data that was collected from the existing patient population census was characteristic of San Bernardino and Riverside counties population. We identified a positive correlation

between early skin-to-skin mother/infant contact and exclusive breastfeeding during the maternity hospital stay (dose response).

We had the opportunity to analyze data on the variables that PSN was interested in collecting; we were not able to structure the study to collect data on variables we wished to evaluate. Longer follow-up studies are needed to determine the impact of extended uninterrupted early skin-to-skin care on breastfeeding duration after the hospital discharge, since the interval between early skin-to-skin mother/infant contact and the final assessment of exclusive breastfeeding was short. A longer interval would have been preferable. This was not a randomized controlled study; the original data was collected as part of a quality assurance program instituted by PSN. The hormone oxytocin (mediator) was not measured in this study; we relied on findings from previous research studies. Some of the 19 PSN contracted hospitals implemented early skin-to-skin mother/infant contact on a routine basis and others did not.

Implications

The clinical implications for this study are numerous. The current study has provided data that suggests early skin-to-skin mother/infant contact is clinically effective with respect to exclusive breastfeeding during the maternity hospital stay (dose response). Results from our study imply that there is a need to increase the length of exposure of early skin-to-skin mother/infant contact during the early postpartum period. These results provide important information that peripartum staff can include in their postpartum program planning, policies, and intervention. Maternity caregivers can specifically allocate resources to woman who may be less likely to breastfeed by highlighting skin-to-skin contact during the early postpartum period. Walters and colleagues surveyed their

hospital peripartum nursing staff after their early skin-to-skin mother/infant contact intervention (birth kangaroo care) pilot study. The peripartum personnel surveyed after the study stated that implementing early skin-to-skin mother/infant contact did not take them longer nor did its implementation add to their workload.[28]

There are numerous interfering events during the maternity hospital stay that can cause problems for mothers who intend to breastfeed.[29] Events that interfere with breastfeeding may be limited by allowing the mother and infant uninterrupted early skin-to skin mother/infant contact. Programs such as PSN's pave the way to reestablish breastfeeding as the gold standard and one way to accomplish this seems to be facilitating uninterrupted extended early skin-to-skin mother/infant contact. We agree with Moore's suggestion that "an ideal intervention would include early skin-to-skin mother/infant contact, as early as possible, as often as possible, as long as possible, at least during the entire postpartum hospital stay" (p. 123) Our findings, if incorporated into hospital based practices and protocols, can strengthen maternal/infant bonding/attachment and early exclusive breastfeeding behaviors. This is the ultimate goal, but in the interim we recommend the continuation and enlargement of programs such as PSN's early skin-to-skin mother/infant contact nurse-driven hospital-based intervention for a minimum of one hour during the first 3 hours following birth.

Table 1. Maternal Variables of the Sample

	N	%
Age (mean ± standard deviation)	26.7 ± 6.1	
Education		
Less than High School	6068	32.7
High School	6920	37.3%
College	4473	24.1%
Graduate	1113	6.0%
Ethnicity		
African Americans	1319	5.8%
Caucasians	7254	31.7%
Hispanics	13017	57.0%
Others	1261	5.5%
Smoking`		
Yes	1053	4.7%
No	21449	95.3%
Intention at Entry		
Undecided	208	0.9%
Exclusive Breastfeeding	13334	58.5%
Formula Only	2752	12.1%
Breast and Formula	6516	28.6%
Anesthesia		
CNS	516	3.0%
Non-CNS	16423	95.8%
Both	208	1.2%
Type of Delivery		
Vaginal	15876	69.8%
Cesarean Section	6866	30.2%
Exclusive Breastfeeding During Hospital Stay		
Yes	10915	49.9%
No	10927	50.1%
Skin to Skin		
None	4872	22.4%
1 to 15 Minutes	1068	4.9%
16 to 30 Minutes	1469	6.8%
31 to 59 Minutes	1212	5.6%
1 to 3 Hours	13126	60.4%

* Significant at an alpha of 0.05

Table 2. Maternal Socio-Demographics Characteristics, Maternal Intrapartum Variables and Exclusive Breastfeeding Rates During the Maternity Hospitalization

Variables	Exclusive Breastfeeding During Hospital Stay				*p*-value
	Yes		No		
Age (Mean ± SD)	26.85 ± 5.91		26.5 ± 6.25		0.000*
Education ($\chi^2 = 452.8$, d.f = 3)					0.000*
Less than High School	2328	26.5%	3448	38.6%	
High School	3243	36.9%	3370	37.7%	
College	2526	28.7%	1740	19.5%	
Graduate	693	7.9%	382	4.3%	
Ethnicity ($\chi^2 = 559.2$, d.f = 3)					0.000*
African Americans	462	4.3%	760	7.0%	
Caucasians	4197	38.7%	2614	24.1%	
Hispanics	5626	51.8%	6824	63.0%	
Others	572	5.3%	389	5.8%	
Smoking ($\chi^2 = 162.8$, d.f = 1)					0.000*
Yes	290	2.7%	682	6.4%	
No	10377	97.3%	10029	93.6%	
Intention at Entry ($\chi^2 = 5040.5$, d.f = 3)					0.000*
Undecided	80	0.7%	89	0.8%	
Exclusive Breastfeeding	8770	81.0%	3879	35.8%	
Formula Only	129	1.2%	2490	23.0%	
Breast and Formula	1854	17.1%	4374	40.4%	
Anesthesia ($\chi^2 = 80.3$, d.f = 2)					0.000*
CNS	135	1.2%	315	2.9%	
Non-CNS	7895	72.3%	7713	70.6%	
Both	82	0.8%	117	1.1%	
Type of Delivery ($\chi^2 = 614.1$, d.f = 1)					0.000*
Vaginal	8482	78.6%	6830	63.3%	
Cesarean Section	2311	21.4%	3966	36.7%	
Skin to Skin ($\chi^2 = 1144.5$, d.f = 4)					0.000*
None	1162	11.2%	2947	28.6%	
1 to 15 Minutes	429	4.2%	594	5.8%	
16 to 30 Minutes	664	6.4%	776	7.5%	
31 to 59 Minutes	650	6.2%	544	5.3%	
1 to 3 Hours	7512	72.1%	5447	52.8%	

* Significant at an alpha of 0.05

Table 3: Univariate Logistic Regression Analysis for Confounder Assessment Dependent Variable – Exclusive Breastfeeding Yes/No

Variables	Odds Ratio (95% CI)	% Change in OR After Adjustment
Early skin to skin (Unadjusted)		
None (ref)	-	-
1 to 15 Minutes	1.548 (1.350,1.776)	N/A
16 to 30 Minutes	1.835 (1.629,2.066)	N/A
31 to 59 Minutes	2.562 (2.254,2.911)	N/A
1 to 3 Hours	2.957 (2.763,3.165)	N/A
Early skin to skin + Education		
None (ref)	-	-
1 to 15 Minutes	1.519 (1.323,1.744)	1.91%
16 to 30 Minutes	1.772 (1.571,1.997)	3.56%
31 to 59 Minutes	2.515 (2.210,2.851)	1.87%
1 to 3 Hours	2.996 (2.769,3.176)	-1.30%
Early skin to skin + Type of Delivery*	-	-
None (ref)	1.379 (1.200,1.585)	12.26%
1 to 15 Minutes	1.627 (1.441,1.836)	12.78%
16 to 30 Minutes	2.213 (1.942,2.521)	15.77%
31 to 59 Minutes	2.493 (2.320,2.678)	18.76%
1 to 3 Hours		
Early skin to skin + Intention at Entry*	-	
None (ref)	1.559 (1.335,1.821)	-0.71%
1 to 15 Minutes	1.711 (1.496,1.957)	7.35%
16 to 30 Minutes	2.303 (1.992,2.663)	11.25%
31 to 59 Minutes	2.687 (2.490,2.899)	10.05%
1 to 3 Hours		
Early skin to skin + Smoking		
None (ref)	-	-
1 to 15 Minutes	1.526 (1.330,1.751)	1.44%
16 to 30 Minutes	1.816 (1.612,2.046)	1.05%
31 to 59 Minutes	2.514 (2.212,2.859)	1.91%
1 to 3 Hours	2.923 (2.731,3.129)	1.16%
Early skin to Skin + Ethnicity		
None (ref)	-	-
1 to 15 Minutes	1.532 (1.333,1.760)	1.04%
16 to 30 Minutes	1.777 (1.576,2.005)	3.26%
31 to 59 Minutes	2.511 (2.206,2.859)	2.03%%
1 to 3 Hours	2.913 (2.720,3.121)	1.51%

Table 3 (Continued)

Variables	Odds Ratio (95% CI)	% Change in OR After Adjustment
Early skin to Skin + Anesthesia		
None (ref)	-	-
1 to 15 Minutes	1.543 (1.345,1.770)	0.32%
16 to 30 Minutes	1.821 (1.617,2.051)	0.77%
31 to 59 Minutes	2.531 (2.227,2.877)	1.22%
1 to 3 Hours	2.935 (2.741,3.142)	0.75%
Early skin to Skin + Age		
None (ref)	-	-
1 to 15 Minutes	1.557 (1.357,1.785)	-0.58%
16 to 30 Minutes	1.850 (1.642,2.083)	-0.81%
31 to 59 Minutes	2.584 (2.274,2.938)	-0.70%
1 to 3 Hours	2.980 (1.008,1.017)	-0.77%
Early skin to Skin + Hospital		
None (ref)	-	-
1 to 15 Minutes	1.376 (1.189,1.593)	-11.1%
16 to 30 Minutes	1.665 (1.468,1.888)	9.26%
31 to 59 Minutes	2.357 (2.061,2.695)	8.00%
1 to 3 Hours	3.145 (2.905,3.405)	6.35%

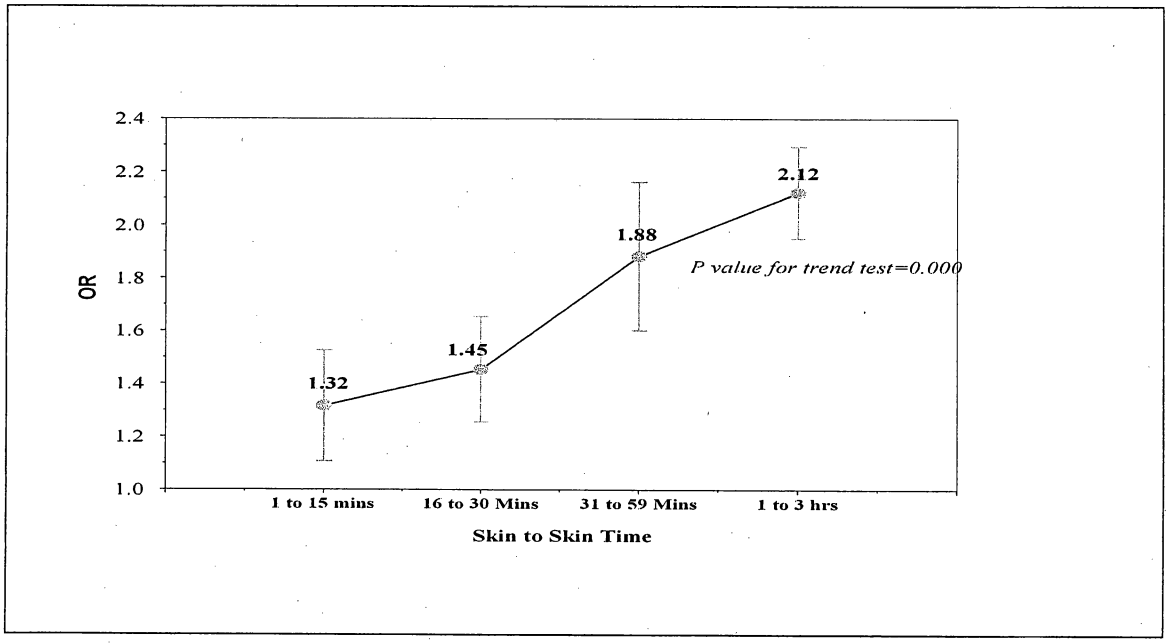

Figure 1. Multivariable analysis showing the odds ratio for exclusive breastfeeding adjusting for maternal infant-feeding method intention at entry to maternity hospital stay and type of delivery (vaginal or cesarean). Mothers experiencing no skin-to-skin mother/infant contact were the reference group.

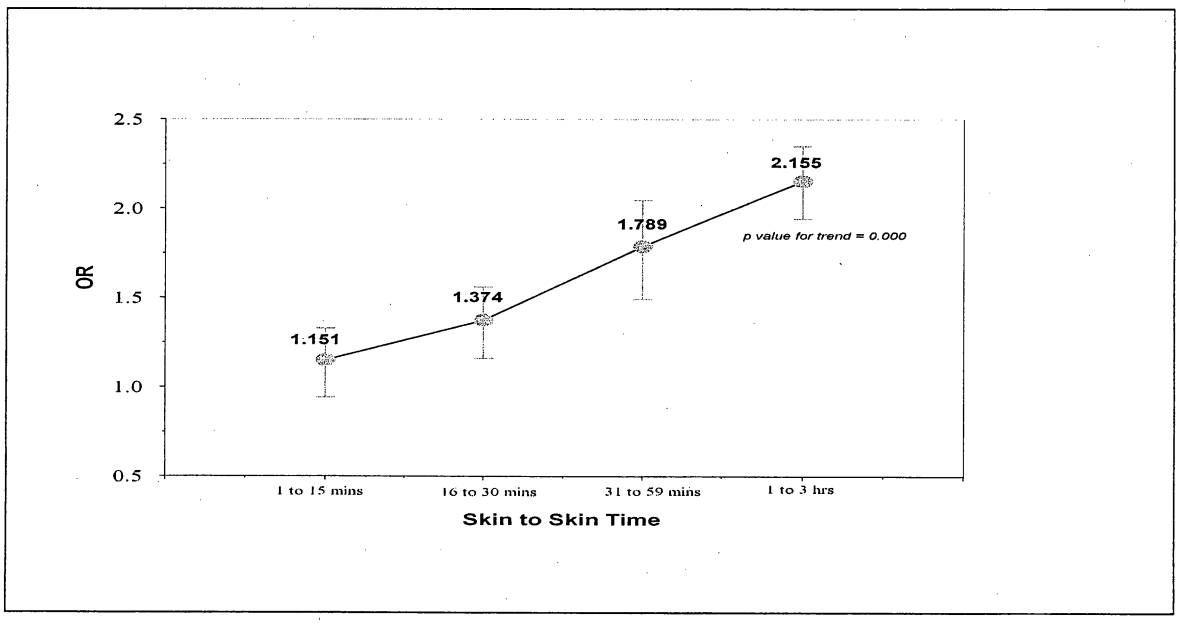

Figure 2. Multivariable analysis showing the odds ratio for exclusive breastfeeding adjusted for maternal infant-feeding intention at entry to maternity stay, mode of delivery (vaginal or cesarean), age, race/ethnicity, primary language, education, smoking status, maternal intrapartum analgesia/anesthesia, and hospital of birth. Mothers experiencing no skin-to-skin mother/infant contact were the reference group.

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CHAPTER 5

Predictors of Early Skin-to-skin Mother/infant Contact

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Summary Statement: Although benefits of early skin-to-skin mother/infant contact are known, not all hospitals include it in their standard practices. Records of mother/infant dyads (*n=21,842),* part of an intervention that promoted early skin-to-skin mother/infant contact, were examined. Maternal infant-feeding intention, maternal socio-demographic characteristics, and maternal intrapartum variables that were associated with an increasing likelihood of early skin-to-skin mother/infant contact were identified.

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5 Callouts

1. Maternal infant-feeding method intention measured prior to birth is associated with early skin-to-skin mother/infant contact during the first 3 hours following birth.
2. The maternal socio-demographic characteristics of age, educational level, race/ethnicity, primary language, smoking status, are associated of early skin-to-skin mother/infant contact during the first 3 hours following birth.
3. The maternal intrapartum variables of analgesia/anesthesia use and mode of delivery (vaginal vs. cesarean) are associated of early skin-to-skin mother/infant contact during the first 3 hours following birth.
4. Hospital of birth is associated with early skin-to-skin mother/infant contact.
5. Early skin-to-skin mother/infant contact during the first hours following birth is the appropriate method of introduction to extra-uterine life for the newborn.

4 key words

Early skin-to-skin mother/infant contact, maternal infant-feeding method intention, maternal socio-demographic characteristics, maternal intrapartum variables

Abstract

Purpose: Identification of maternal infant-feeding method intention, socio-demographic characteristics, and intrapartum variables that increased the likelihood of early skin-to-skin mother/infant contact during the first 3 hours following birth.

Study Design and Method: A nurse-driven hospital-based prospective cohort study of data collected in 19 hospitals in San Bernardino and Riverside counties, California by Perinatal Services Network (PSN). Mothers (n= 21,842) who delivered a singleton (37-40 weeks gestation, and not separated from their baby for more than one hour during the hospital stay) between July 2005 through June 2006 were included in the study. Univariate and multivariable ordinal logistic regression models were employed to identify predictors of an increasing likelihood of early skin-to-skin mother/infant contact (hospital and primary maternal language were controlled).

Results: Multivariable ordinal logistic regression showed that hospital of birth played a major role in predicting early skin-to-skin contact. After adjusting for hospital of birth, analgesia/anesthesia, high school education, college education and graduate education attainment, vaginal delivery, intention to exclusively breastfeed or mixed feed, and Caucasian background, were significantly associated with an increased likelihood of early skin-to-skin mother/infant contact during the first 3 hours following birth.

Clinical Implications: Early skin-to-skin mother/infant contact was found to be beneficial to both the mother and infant. This study revealed predictors of early skin-to-skin mother/infant contact. Health care providers understanding of what presages low skin-to-skin mother/infant contact may enable peripartum staff to provide those least likely to engage in early skin-to-skin mother/infant contact with special attention.

Predictors of Early Skin-to-skin Mother/infant Contact

The 2005 Policy Statement of Breastfeeding and the Use of Human Milk by the American Academy of Pediatrics (AAP) recommends that "healthy infants should be placed and remain in direct skin-to-skin contact with their mothers immediately after delivery until the first feeding is accomplished" (Gartner, Morton, Lawrence, Naylor O'Hare, & Schanler, et al., 2005, p. 498). Numerous other experts recommend that immediately after birth, the healthy newborn be placed in skin-to-skin contact on the mother's abdomen or chest, with all routine procedures being done with the infant remaining in skin-to-skin mother/infant contact (Academy of Breastfeeding Medicine Protocol Committee, 2003; AWHONN, 2002; World Health Organization, 1998).

Today common standardized hospital-based practices prevent the mother and infant from the attachment experience that early skin-to-skin mother/infant contact would provide. The handling of the newborn in many maternity settings involves the routine procedures of measuring, weighing, eye prophylaxis, and the vitamin K injections, etc., that separate the mother and infant from 2 to 4 hours.

These first few minutes to hours after birth are considered by Kennel, Trause, and Klaus as a "sensitive period" (1975). The newborn infant is normally awake and alert for 2-3 hours following birth; this is the optimum time for maternal/infant bonding/attachment. The benefits of early skin-to-skin mother/infant contact immediately following birth are numerous; such contact eases the infant's transition to extra-uterine life. Early skin-to-skin mother/infant contact is known to reduce the potential negative impact of the "stress of being born" (Bystrova, Widstrom Matthiesen, Ransjo-Arvidson, Wells-Nystrom, Wassberg, et al., 2003). The close body contact of the mother helps to

regulate the newborn's temperature (Bystrova, et al., 2003), energy conservation, acid-base balance, respirations, crying, and nursing behaviors (Walters, Boggs, Ludington-Hoe, Price & Morris, 2007). Early skin-to-skin contact accelerates the recovery of the infant to extra-uterine life by stabilization of the newborn's thermoregulation, respirations, and blood glucose levels (Durand, 1997; Ferber, Makhoul, 2004).

The American Academy of Pediatrics recommends that healthy newborns be placed and remain in direct skin-to-skin mother/infant contact until the first breastfeeding is concluded (2005). The mother's chest/breasts naturally warms or cools to regulate the infant's body temperature (Mikeil-Kostrya, Mazur & Boltruszko, 2002). Skin-to-skin mother/infant contact also exposes the infant to its mother's normal bacterial flora, which lowers the risk of the infant acquiring infections (World Health Organization, 1998).

The association of early skin-to-skin mother/infant contact and breastfeeding is well researched; this contact enhances maternal/infant bonding/attachment, and has been shown to increase breastfeeding rates of infants in the early postpartum period (Anderson, Moore, Hepworth & Bergman, 2003; Moore, Anderson & Bergman, 2007). Hospital practices that are supportive of maternal/infant bonding/attachment are also supportive of breastfeeding, and breastfeeding rates increase in these institutions (Murray, Ricketts, & Dellaport; 2007). Routine hospital practices should and can wait until after this "sensitive period".

While much is known about the association between early skin-to-skin mother/infant contact and breastfeeding, there is a dearth of information about the variables that might influence the occurrence of early skin-to-skin mother/infant contact.

In this study, we will explore which variables might be important predictors of early skin-to-skin mother/infant contact.

Maternal Infant-Feeding Intention

Early skin-to-skin mother/infant contact is a precursor to breastfeeding; therefore, we speculate that mothers who intend to breastfeed also intend to experience skin-to-skin mother/infant contact. Maternal infant-feeding intention to breastfeed is predictive of actual breastfeeding behavior (Gijsbers, Mesters, Knottnerus, & Van Schayck, 2006).

Maternal Socio-Demographic Characteristics

A mother's socio-demographic characteristics are an even stronger determinant to actual breastfeeding than the intention to breastfeed (Donath, Amir & the Avon Longitudinal Study, 2003). The 2007 policy update by the California Women, Infants, and Children (WIC) Association and the University of California, Davis, Human Lactation Center demonstrated that in-hospital breastfeeding rates differ widely by the mother's ethnicity; with women of color more likely to give their infants artificial baby milk supplementation during their maternity hospital stay (California Department of Public Health, 2006). A random selection chart review at the Baby-Friendly Boston Medical Center revealed that the likelihood of breastfeeding at 6 months increased with maternal age, and was greater for mothers born in Africa, or of an unrecorded birthplace than for other mothers. Merewood et al., went on to state that breastfeeding duration is traditionally less for low income, Black mothers in the United States than for other mothers. Older mothers with higher educational attainment, who are married, and who are in a higher income bracket are more likely to breastfeed exclusively (Ruowei, Darling, Maurice, Barker, & Grummer-Strawn, 2005).

Chin, Myers, and Mangus (2008) explored the relationship between race, education and breastfeeding among 3,515 women in Louisiana. Significant differences between Black breastfeeding initiators and non-initiators were found for maternal age, education, household income marital status, receipt of Medicaid before pregnancy, and WIC participation during pregnancy. Black primiparas mothers of singletons were only 38% as likely to initiate breastfeeding as their White counterparts. Black woman with some college were more than four times more likely to breastfeed than those with less than a high school education OR 4.28: 95% CI 3.03-6.04. The factors Chin et al. identified to be significantly associated with breastfeeding initiation among White woman were: greater maternal education, older maternal age, not currently working or attending school, nonsmoking, vaginal delivery, and not participating in WIC during pregnancy.

Maternal Intrapartum Variables

Righard and Alade (1990) noted that healthy babies born to non-sedated mothers developed a predictable post-birth behavioral pattern compared to infants born following interventions consisting of intrapartum analgesia/anesthesia administration. Most intrapartum analgesia/anesthesia agents commonly used during labor and delivery are readily transferred to the fetus via the placenta; these medications have the potential to disturb neonatal neurobehavioral transition to extra-uterine life (Briggs & Wan, 2006). Righard and Alade recommend that intrapartum analgesia/anesthesia be conservatively utilized.

Furthermore, the mode of delivery (vaginal or cesarean) affects the initiation of early skin-to-skin mother/infant contact. Cesarean birth can be a significant barrier to the

initiation of early skin-to-skin mother/infant contact, since a newborn from a cesarean delivery is commonly separated from its mother while she is recovering from surgery. It has been recommended that hospital practices be open to change and enable the implementation of early skin-to-skin mother/infant contact regardless of the mode of delivery (Rowe-Murray & Fisher, 2002).

Purpose of this study

We have not identified current literature that specifically addresses the association of maternal infant-feeding intention, socio-demographic characteristics, intrapartum variables, and hospital of birth with the likelihood of early skin-to-skin mother/infant contact during the first 3 hours post birth. The purpose of this study was to identify variables which are predictive of an increased likelihood of early skin-to-skin mother/infant contact during the first 3 hours following birth.

Method

This was a short-term prospective cohort study from a nurse-driven hospital-based quality assurance intervention (n=21,842 births) conducted by the Perinatal Services Network (PSN) of Loma Linda University Medical Center/Children's Hospital. Data were collected on all maternity patients who delivered in the 19 PSN-contracted hospitals throughout San Bernardino and Riverside counties, California from July 2005 through June 2006 (Table 1). These data represent 95% of the births in participating hospitals during the study period. The study was approved by the Institutional Review Board of Loma Linda University, California.

Prior to the PSN program initiation, peripartum staff from each of the 19 PSN-contracted hospitals attended training at PSN. They were taught about

bonding/attachment and the implementation of early skin-to-skin mother/infant contact into standard hospital routines. Each institution utilized the same one-page PSN Data Measurement Collection Form and data dictionary to track specific variables of the mother/infant dyads.

Participants

The cohort consisted of all mothers who delivered in one of the 19 PSN-contracted hospitals during the study period who: (a) delivered a healthy live singleton (gestational age 37 to 40 weeks), and (b) were not separated from their infants for more than 1 hour during their hospital stay. We chose to only study singleton births, since there are other variables we did not have access to that are present in multiple births. Each participant signed an informed consent specific to each maternity institution.

Data Collection

Each mother was interviewed by the hospital's peripartum staff as they entered their maternity hospitalization. Mothers were interviewed in their language of choice (English or Spanish). Baseline data collected prior to the infant's birth included maternal infant-feeding method intention and maternal socio-demographics characteristics. During the intrapartum period additional data were collected from the patients by the peripartum health professional or by chart review; data collected included type of delivery (vaginal or cesarean), maternal intrapartum analgesia/anesthesia use, early skin-to-skin mother/infant contact, and type of feeding the infant received during their hospital stay. Of the 23,074 patients originally participated in the study, there was complete data available for 21,842 mother/infant dyads. Data was cleaned by the PSN statistician prior to our receiving it for analysis.

Instrument

PSN developed a one-page data collection measurement instrument and corresponding data dictionary that included the variables they wished to collect. The same data collection tool and data dictionary were used in each of the 19 maternity hospitals to gather data and became part of each mother's medical record. The peripartum staff who trained at PSN was familiar with the data collection form and data dictionary from their training at PSN. Since the PSN quality assurance program was not a research-based project, they did not test the data collection form for reliability prior to the beginning of the program. After the PSN program was underway they demonstrated the validity of their assessment of breastfeeding rates by comparing theirs with independently collected data from the 2006 California Newborn Screening. Their preliminary analysis showed a Spearman ρ of above .90 (Melcher & Kennedy, 2008).

Outcome Variable

The outcome variable was the duration of early skin-to-skin mother/infant contact, which categorized the amount of time spent in early skin-to-skin mother/infant contact during the first 3 hours of the infant's life as: (1) None, (2) 1-15 minutes, (3) 16-30 minutes, (4) 31-59 minutes, and (5) 1 to 3 hours of early skin-to-skin mother/infant contact during the first 3 hours following birth.

Independent Variables

The independent variables were maternal infant-feeding method intention measured prior to birth, maternal socio-demographic characteristics (e.g. primary language, race/ethnicity, age, smoking status, and educational level), and the maternal

intrapartum variables which included analgesia/anesthesia use, type of delivery (vaginal or cesarean). These variables were categorized as shown in Table 1.

Analysis

Statistical analysis was done using Statistical Analysis Software (SAS), version 9.0 (SAS Institute Inc., Carey, NC). Univariate and multivariable ordinal logistic regression were employed to identify the predictors of increasing levels of early skin-to-skin mother/infant contact during the first 3 hours following birth. After initial analysis determined that the hospital of birth played a major role in predicting the duration of skin-to-skin contact, the 19 PSN-contracted hospitals were controlled in subsequent analyses using dummy variables. This allowed us to determine whether maternal socio-demographic characteristics and intrapartum variables predicted duration of skin-to-skin apart from any differences introduced by the differing hospital environments. Additionally, we controlled for maternal primary language to determine its impact on the outcome variables. Maternal primary language was not found to be a significant confounder.

Results

Table 1 is a breakdown of the maternal socio-demographic characteristics. The participant population represented the racial/ethnic diversity of the study area in Southern California. Study participants were mostly non-smoking Hispanics with an educational level of high school or less. The mean age (± standard deviation) was 26.69 ± 6.1. The majority of women intended to exclusively breastfeed (measured prior to birth), experienced vaginal delivery and had 1 to 3 hours of early skin-to-skin mother/infant contact during the first 3 hours following birth.

Table 2 is a breakdown of the maternal variables and early skin-to-skin mother/infant contact arranged according to the specific variable and the amount of time the mother and infant spent in early skin-to-skin contact during the first 3 hours following birth. Among the mothers who experienced 1-3 hours of early skin-to-skin contact during the first 3 hours following birth 57.4% were Hispanic, 30.2% had less than a high school education 39.6% had a high school education,53.3% more than 26 years of age, 62.7% intended to exclusively breastfeed, 96.0% did not smoke, 80.6% utilized CNS analgesia/anesthesia, and 81.7% delivered vaginally.

Table 3 shows both univariate and multivariable analysis employing ordinal logistic regression. In the univariate model, high school, college education attainment, being Caucasian, being undecided about infant-feeding method, intending to exclusively breastfeed, intending to mix-feed (breast and formula), and vaginal delivery were significant positive predictors of early skin-to-skin mother/infant contact. Utilization of intrapartum CNS or non-CNS anesthesia/analgesia and, being a smoker were negative predictors of early skin-to-skin mother/infant contact.

As you can also see in table 3, after controlling for the hospital of birth a number of apparent associations of maternal characteristics with early skin-to-skin mother/infant contact changed. Specifically, education became a more consistent predictor of early skin-to-skin contact while being African American was no longer a significant predictor of early skin-to-skin contact. Additionally, use of non-CNS analgesia became associated with greater early skin-to-skin contact. Maternal age (being less than 20 years of age), being Caucasian, a non-smoker, and intention to exclusively breastfeed or intention to mix-feed were also predictors of early skin-to-skin mother/infant contact.

Discussion

As we initially prepared for this research our literature review did not locate studies that identified maternal predictors of the increasing likelihood of early skin-to-skin mother/infant contact. Therefore, the purpose of this study was to identify factors independently associated with increasing levels of early skin-to-skin mother/infant contact during the first 3 hours following birth. In this cohort of women the variables that were identified as being associated with increasing levels of early skin-to-skin mother/infant contact are: being Caucasian, vaginal delivery, intention to exclusively breastfeed, being less than 20 years old and having completed high school, college or graduate education. These variables are basically consistent with the variables that have been identified with mothers who exclusively breastfeed (Buxton, Gielen, Faden, Brown, Paige, & Chwaldow,1991; Anderson, Damio, Chapman, and Perez-Escamilla, 2007; Chin et al, 2008).

Our analysis showed that not all of the 19 hospitals implemented early skin-to-skin the equally. One of the 19 hospitals was 11 times as likely to implement early skin-to-skin mother/infant contact compared to the hospital used as the reference hospital in our study. The mother in the typical hospital in our study was over 4 times more likely to experience early skin-to-skin mother/infant contact as the reference hospital. We ran two separate multivariable ordinal logistic regression analyses, one not controlling for the hospital of birth and the second controlling for the hospital of birth.

After controlling for the hospital of birth we determined that the use of non-CNS analgesia was associated with an increase in early skin-to-skin mother/infant contact. Mothers who utilize an epidural or other intrapartum analgesia are more likely to

be awake and coherent after the birth of their infant, compared to mothers who have experienced CNS anesthesia, who may feel groggy. Frequently mothers who have a cesarean section birth are medicated for pain, these women were found to be less likely to experience early skin-to-skin mother/infant contact. The use of a combination of CNS anesthesia and non-CNS analgesia was negatively associated with early skin-to-skin mother/infant contact in the first multivariable analysis but this association disappeared when the hospital of birth was controlled. Possibly hospitals which were less likely to implement skin-to-skin were also more likely to use a combination of CNS and Non-CNS anesthesia/analgesia. Mothers who deliver by cesarean birth still seem to be less likely to have the postnatal early skin-to-skin mother/infant contact compared to mothers who delivered vaginally.

Those with high school, college or graduate education were more likely to experience early skin-to-skin mother/infant contact as compared with those with less than a high school education. Being African-American no longer was associated with a reduction in early skin-to-skin mother/infant contact after hospital of birth was controlled. The first multivariable analysis showing an association between being African-American and not experiencing early skin-to-skin mother/infant contact was apparently due to some aspect of the hospitals serving African-Americans being less likely to implement early skin-to-skin mother/infant contact.

The association of early skin-to-skin mother/infant contact with exclusive breastfeeding was not just a function of the maternal socio-demographic characteristics and intrapartum variables, when potential maternal socio-demographic characteristics and intrapartum variables were adjusted by controlling for the hospital of birth these

associations changed. This leads us to speculate that early skin-to-skin mother/infant contact implementation varied between the hospitals.

The results of this study indicate that certain maternal socio-demographic characteristics and intrapartum variables are positively/negatively associated with mothers who experience early skin-to-skin mother/infant contact (after controlling for the hospitals). It would behoove healthcare professionals to be cognizant of the variables that have been positively/negatively associated with the increasing likelihood of early skin-to-skin mother/infant contact and the affect that hospital implementation has on early skin-to-skin contact. Focus can be drawn toward the mother less likely to experience early skin-to-skin mother/infant contact, so early skin-to-skin mother/infant contact can be implemented. Our findings, if incorporated into hospital based practices and protocols, can strengthen maternal/infant bonding/attachment and early exclusive breastfeeding behaviors. Since this is the first study we know of that has identified the predictors of early skin-to-skin mother/infant contact we recommend that further follow-up research be run to validate this study.

Clinical Implications

Healthcare professionals who care for childbearing woman should be aware that:

- maternal socio-demographic characteristics are associated with to early skin-to-skin mother/infant contact,
- maternal intrapartum variables are associated with early skin-to-skin mother/infant contact,
- maternal infant-feeding method intentions are associated with early skin-to-skin mother/infant contact,
- and that the hospital of birth significantly impacts early skin-to-skin mother/infant contact.

Table 1. Descriptive Statistics of Maternal Variables of the Sample (*n*=21,842).

	N	%
Age (mean ± standard deviation)	26.69 ± 6.1	
Education		
Less than High School	6068	32.7%
High School	6920	37.3%
College	4473	24.1%
Graduate	1113	6.0%
Ethnicity		
African American	1319	5.8%
Caucasian	7254	31.7%
Hispanic	13017	57.0%
Other	1261	5.5%
Smoking`		
Yes	1053	4.7%
No	21449	95.3%
Intention at Entry		
Undecided	208	0.9%
Exclusive Breastfeeding	13334	58.5%
Formula Only	2752	12.1%
Breast and Formula	6516	28.6%
Anesthesia		
CNS	516	3.0%
Non-CNS	16423	95.8%
Both	208	1.2%
Type of Delivery		
Vaginal	15876	69.8%
Cesarean Section	6866	30.2%
Exclusive Breastfeeding During Hospital Stay		
Yes	10915	49.9%
No	10927	50.1%
Skin to Skin		
None	4872	22.4%
1 to 15 Minutes	1068	4.9%
16 to 30 Minutes	1469	6.8%
31 to 59 Minutes	1212	5.6%
1 to 3 Hours	13126	60.4%

Table 2. Descriptive Statistics of Maternal Infant-Feeding Intention, Socio-demographic Characteristics, Intrapartum Variables, by Time Spent In Early Skin-to-Skin Mother/Infant Contact During the First 3 Hours Following Birth

Variables (*N*, %)	None 4872 (22.4%)	1 to 15 Min. 1068 (4.9%)	16 to 30 Min. 1469 (6.8%)	31 to 59 Min. 1212 (5.6%)	1 to 3 Hrs. 13126 (60.4%)
Maternal Age					
Less than 20	596 (12.3%)	136 (12.8%)	186 (12.7%)	145 (12.0%)	1591 (12.1%)
20 thru 25	1586 (32.6%)	353 (33.1%)	491 (33.4%)	402 (33.2%)	4525 (34.5%)
26 and more	2683 (55.1%)	557 (54.1%)	791 (53.9%)	664 (54.8%)	6991 (53.3%)
Ethnicity					
African American	442 (9.2%)	83 (7.9%)	77 (5.3%)	71 (5.9%)	587 (4.5%)
Caucasian	1324 (27.5%)	329 (31.1%)	490 (33.7%)	403 (33.5%)	4267 (32.7%)
Hispanic	2804 (58.3%)	572 (54.1%)	788 (54.2%)	666 (55.3%)	7497 (57.4%)
Other	245 (4.9%)	73 (7.0%)	99 (5.3%)	63 (5.4%)	707 (5.3%)
Education					
Less than High School	1616 (40.5%)	326 (33.9%)	338 (30.5%)	291 (29.3%)	3170 (30.2%)
High School	1242 (31.1%)	353 (36.7%)	467 (36.6%)	369 (37.2%)	4157 (39.6%)
College	917 (23.0%)	236 (24.6%)	317 (24.9%)	262 (26.4%)	254 (24.2%)
Graduate	220 (5.5%)	46 (4.8%)	101 (7.9%)	71 (7.2%)	634 (6.0%)
Smoking					
Yes	332 (6.9%)	44 (4.2%)	64 (4.4%)	37 (3.1%)	512 (4.0%)
No	4485 (93.1%)	1003 (95.8%)	1381 (95.6%)	1160 (96.9%)	12311 (96.0%)
Intention at Entry					
Undecided	53 (1.1%)	21 (2.0%)	10 (0.7%)	6 (0.5%)	106 (0.8%)
Exclusive Breastfeeding	2323 (48.1%)	558 (52.6%)	840 (57.8%)	760 (63.2%)	8167 (62.7%)
Formula Only	881 (18.2%)	170 (16.0%)	206 (14.2%)	145 (12.1%)	1160 (8.9%)
Breast and Formula	1571 (32.5%)	311 (29.3%)	398 (27.4%)	292 (24.3%)	3583 (27.5%)
Analgesia/anesthesia					
None	525 (11.8%	159 (16.8%)	186 (14.2%)	181 (16.7%)	1901 (16.6%)
CNS	3618 (82.2%)	752 (79.7%)	1079 (82.5%)	883 (81.3%)	9208 (80.6%)
Non-CNS	214 (4.9%)	27 (2.9%)	29 (2. 2%)	16 (1.5%)	188 (1.6%)
Both	42 (1.0%)	6 (0.6%)	14 (1.1%)	6 (0.6%)	124 (1.1%)
Type of Delivery					
Vaginal	1884 (39.1%)	720 (68.6%)	1027 (70.7%)	896 (74.7%)	10586 (81.7%)
Cesarean Section	2937 (60.9%)	333 (31.4%)	426 (29.3%)	303 (25.3%)	2376 (18.3%)

Table 3. Univariate and Multivariable Models with the Predictors of Early Skin-to-Skin Mother/Infant Contact During the First 3 Hours Following Birth.

Variable	Univariate Odds Ratio	95% CI Lower	95% CI Upper	Multi-variable Odds Ratio	95% CI Lower	95% CI Upper	Multi-variable Odds Ratio**	95% CI Lower	95% CI Upper
Maternal Age									
26 and more (ref)	-	-	-	-	-	-	-	-	-
Less than 20	0.988	0.910	1.074	1.170*	1.069*	1.280	1.116*	1.009	1.235
20 thru 25	0.928	0.876	0.983	1.041	0.978	1.107	1.032	0.963	1.105
Education									
Less than High School (ref)	-	-	-	-	-	-	-	-	-
High School	1.251*	1.175	1.331	1.200*	1.123	1.282	1.129*	1.045	1.218
College	1.078*	1.005	1.157	1.008	0.932	1.091	1.218*	1.113	1.334
Graduate	1.090	0.962	1.234	0.975	0.850	1.118	1.464*	1.261	1.699
Ethnicity									
Other (ref)	-	-	-	-	-	-	-	-	-
African American	0.606*	0.523	0.701	0.708*	0.605	0.827	1.011	0.850	1.202
Caucasian	1.232*	1.098	1.381	1.254*	1.111	1.417	1.149*	1.008	1.310
Hispanic	1.105	0.990	1.234	1.111	0.987	1.282	1.126	0.990	1.282
Smoking									
No (ref)	-	-	-	-	-	-	-	-	-
Yes	0.634*	0.562	0.715	0.789*	0.692	0.901	0.699*	0.603	0.810
Intention at Entry									
Formula Only (ref)	-	-	-	-	-	-	-	-	-
Undecided	1.324*	1.005	1.744	1.520*	1.133	2.038	0.963	0.705	1.314
Exclusive Breastfeeding	2.168*	2.004	2.345	2.115*	1.943	2.302	2.153*	1.960	2.365
Breast and Formula	1.578*	1.450	1.718	1.653*	1.509	1.811	1.642*	1.482	1.818
Analgesia/Anesthesia									
None (ref)	-	-	-	-	-	-	-	-	-
CNS	0.308*	0.258	0.367	0.850*	0.793	0.909	0.850*	0.786	0.919
Non-CNS	0.770*	0.723	0.819	0.944	0.782	1.139	1.414*	1.153	1.736
Both	0.927	0.693	1.240	0.424*	0.311*	0.580	1.232	0.869	1.745
Type of Delivery									
Cesarean Section (ref)	-	-	-	-	-	-	-	-	-
Vaginal	4.616*	4.356	4.891	4.897*	4.597	5.216	6.152*	5.732	6.604

* is significant at an alpha of 0.05 ** Adjusted for hospital of birth

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CHAPTER 6

CONCLUSION

A. Overview

Numerous studies have examined early skin-to-skin mother/infant contact and have found statistically significant and positive effects of early skin-to-skin mother/infant contact (Moore, Anderson, & Bergman, 2007). Still separation of mothers and their newborns is a widespread standard hospital practice. PSN identified hospital-based practices that separated mothers and their newborns and developed a quality of care improvement project to support mother/infant bonding/attachment during the maternity hospital stay. PSN had as one of their goals to improve early skin-to-skin mother/infant contact in the first 3 hours following birth. Data on 21,842 mother/infant dyads were studied in this research. Data were collected in 19 PSN-contracted hospitals throughout San Bernardino and Riverside counties, California. This study analyzed data from July 2005 through June 2006, and examined specific variables found in the literature review associated with maternal socio-demographic characteristics, intrapartum variables, early mother/infant skin-to-skin contact, breastfeeding intention, and breastfeeding initiation in the immediate postpartum period. Of particular interest to this team of researchers was the mother's infant-feeding method intention prior to her admission to the maternity hospital stay, the amount of time a mother/infant spent in early skin-to-skin contact within the first 3 hours following birth, maternal socio-demographic characteristics, intrapartum variables which included: maternal race /ethnicity, primary language,

smoking status, education level, intrapartum analgesia/anesthesia, type of delivery, hospital of birth, and the type of feeding the infant received during the maternity hospital stay. The study population represents the racial/ethnic make-up of our community in the 2 Southern California counties studied.

B. Research Questions

1. Question One

Is early skin-to-skin mother/infant contact during the first 3 hours following birth, associated with actual infant-feeding method the newborn receives during the maternity hospitalization? Chapter 4 table 3 shows that there is a dose response relationship between early skin-to-skin mother/infant contact during the first 3 hours following birth and exclusive breastfeeding during the maternity hospital stay.

2. Question Two

Is early skin-to-skin mother/infant contact during the first 3 hours following birth adjusted for maternal infant feeding intention associated with the actual infant-feeding method the newborn receives during the maternity hospitalization? Figure 3 in chapter 4 shows that when maternal infant-feeding method intention and type of delivery were controlled there was a dose response relationship between maternal infant-feeding method intention (measured prior to birth) and the actual method of feeding the infant receives.

3. Question Three

Is early skin-to-skin mother/infant contact during the first 3 hours following birth adjusted for the different maternal socio-demographic characteristics

associated with actual infant-feeding method the newborn receives during the maternity hospitalization? Table 3 in chapter 4 shows that when early skin-to-skin mother/infant contact is experienced during the first 3 hours following birth, adjusted for maternal socio-demographic characteristics associated with actual infant-feeding method the newborn receives during the maternity hospital stay, there is an increasing likelihood of exclusive breastfeeding during the maternity hospital stay, based on the duration spent in early skin-to-skin mother/infant contact (dose response).

4. Question Four

Is early skin-to-skin mother/infant contact during the first 3 hours following birth adjusted for maternal infant-feeding intention and the significant maternal socio-demographic characteristics associated with actual infant-feeding method the newborn receives during the maternity hospitalization? Figure 4 in chapter 4 shows there is a significant association between early skin-to-skin mother/infant contact and the actual method of infant-feeding the newborn receives during the maternity hospitalization when adjusting for maternal infant-feeding method intention and maternal socio-demographic characteristics.

5. Question Five

Is there a significant interaction between early skin-to-skin mother/infant contact and maternal infant-feeding intention as well as maternal socio-demographic characteristics in predicting the actual infant-feeding method the newborn receives during the maternity hospitalization? The interaction terms between early skin-to-skin mother/infant contact, maternal infant-feeding method intention, maternal socio-

demographics, and intrapartum variables in predicting the actual infant-feeding method the newborn received during the maternity hospital stay were not significant. The strength of the connection between early skin-to-skin mother/infant contact, and exclusive breastfeeding was not modified by the mothers initial infant-feeding method intention (the interaction was not statistically significant).

6. ***Question Six***

Are maternal socio-demographic characteristics associated with early skin-to-skin mother/infant contact during the first 3 hours following birth? Table 3 in chapter 5 shows the maternal socio-demographic characteristics and intrapartum variables associated with early skin-to-skin mother/infant contact during the first 3 hours following birth.

7. ***Question Seven***

Is intended maternal infant-feeding method measured prior to birth associated with early skin-to-skin mother/infant contact during the first 3 hours following birth? Table 3 in chapter 5 shows that maternal infant-feeding intention measured prior to birth is significantly associated with early skin-to-skin mother/infant contact.

8. ***Question Eight***

Are maternal socio-demographic characteristics and intrapartum variables adjusted for intended infant-feeding method associated with early skin-to-skin mother/infant contact during the first 3 hours following birth? Table 3 of chapter 5 shows the maternal socio-demographic characteristics and intrapartum variables adjusted for

intended maternal infant-feeding method that are associated with early skin-to-skin mother/infant contact during their first 3 hours following birth.

C. Limitations of Study

This study was not a randomized controlled study; data were collected as part of a quality assurance program. The interval between the experience of early skin-to-skin mother/infant contact and the final assessment of infant-feeding method (exclusive breastfeeding or other) was short. A longer interval would have been preferable. The level of oxytocin in the mother's blood was not studied for this research. Previous research on the hormone oxytocin was employed in forming this study's hypothesis.

1. Selection Bias

The patient population for this research was self selected, although a large sample was available (*n= 21,842).* Data from the births in this research did represent 95% of the births in the 19 PSN-contracted institutions during the study period from June 2005 through July 2006. There were mother/infant dyads that delivered at home or were delivered at free standing birthing centers throughout both counties that are not included in this study. Primarily mothers delivered in the hospital where they had insurance coverage or in the vicinity of their homes. The demographic characteristics of these hospitals may have differed significantly e.g., some hospitals having a larger Caucasian clientele; others a higher African-American or Hispanic patient base. The maternal socio-demographic data collected for this study however, was representative of San Bernardino and Riverside County's ethnic make-up.

2. *Instrumentation*

PSN did not envision their quality of care intervention as a research project when it was initially developed. PSN developed their one-page data collection measurement tool based on information they were interested in tracking for their grant (i.e., early skin-to-skin mother/infant contact and, breastfeeding). However, PSN demonstrated the validity of their assessment of breastfeeding rates by comparing them with the independently collected data from the 2006 California Newborn Screening. Their preliminary analysis shows a correlation above .90 (Melcher & Kennedy, 2008).

3. *Ambiguity of Causal Effects*

The PSN quality of care program was a nurse-driven hospital-based intervention; the peripartum health caregivers from the 19 PSN-contracted hospitals were educated regarding early skin-to-skin mother/infant contact and mother/infant bonding/attachment through PSN prior to the intervention itself. We analyzed data collected on mother/infant dyads. We did not take into account the percent of nurses per hospital that were trained by PSN to implement the PSN program intervention. Neither did we take into account which 2 of the 3 practices the hospital was implementing in their institution. The success of this intervention may be due to the education/intervention of the individual nurses during the peripartum period or the participation of the hospital or both.

A connection between early skin-to-skin contact and later exclusive breastfeeding might be explained by mothers who intended to breastfeed choosing to engage in longer periods of early skin-to-skin contact. Such variables were therefore

controlled to determine the true relationship between early skin-to-skin contact and exclusive breastfeeding during the maternity hospital stay. We found a strong positive correlation between early skin-to-skin mother/infant contact and exclusive breastfeeding during the maternity hospital stay even after controlling for such variables.

It is possible however that some unmeasured and uncontrolled variable accounts for the association between early skin-to-skin and exclusive breastfeeding. Perhaps nurses who were most rigorous about insuring that early skin-to-skin contact took place were also nurses who strongly encouraged breastfeeding thus explaining the early skin-to-skin and breastfeeding correlation, though if such difference between nurses was a function of differences among hospitals that was controlled.

D. Future Research

Maternity hospitalization of mothers is currently very short. Consequently this study's interval between the early skin-to-skin mother/infant contact and the final assessment of the infant-feeding method was brief. I would like to see further investigation of longer intervals between early skin-to-skin mother/infant contact and the type of feeding the infant receives.

How much of the PSN program's success was related to the healthcare giver? How much was related to the hospital where the mother delivered? The PSN program policies and practices were initiated in each hospital via nurse education by PSN. Nurse/healthcare professionals taught by PSN brought back to their institution what they had learned. How much influence did the administration of each hospital exert pro or con in the success of the PSN quality of care intervention? There is always the possibility

that a specific nurse, manager, administrator, or hospital may have been more or less adherent or accepting of the quality assurance intervention and instituted it more or less rigorously. I suggest these questions be investigated in future studies.

I also suggest that there be analysis of biomarkers (i.e., oxytocin) during early skin-to-skin mother/infant contact to document the involvement of oxytocin levels during the first hours following birth.

E. Implications for Public Health and Health Education

There is a need to identify mothers who are less likely to initiate early skin-to-skin mother/infant contact or breastfeeding, and incorporate policies, and practices that standardize interventions, which increase early skin-to-skin mother/infant contact and exclusive breastfeeding in the early postpartum period. The implementation of such practices into standard hospital-based protocols and practices will increase the likelihood of mother/infant bonding/attachment and exclusive breastfeeding during the maternity hospital stay (Anderson, Moore, Hepworth & Bergman, 2003).

We in Public Health can disseminate the findings about the benefits of early skin-to-skin mother/infant contact and exclusive breastfeeding since our findings are based on the knowledge that breastfeeding is the best known feeding method for the newborn (World Health Organization, 2003).

Public Health professionals are in a unique position to interact in society in many situations that would beneficially influence mother/infant bonding/attachment. Breastfeeding is a foundational premise of Public Health since breastfeeding is a cornerstone to the welfare of our infants, mothers, and society in general. Awareness of

the maternal and hospital predictors of early skin-to-skin mother/infant contact and exclusive breastfeeding could be used to motivate media, health caregivers, politicians, business owners, mothers, fathers and environmentalists alike to support and encourage early skin-to-skin mother/infant contact and exclusive breastfeeding as the norm in society.

F. Discussion

The implementation of early skin-to-skin mother/infant contact presumably varied between the hospitals, hence we decided to control for the hospital of birth to explore how the variation of the implementation of early skin-to-skin mother/infant contact from hospital to hospital affected early skin-to-skin mother/infant contact. We controlled for the 19 PSN-contracted hospitals, and found that each did a better job of implementing early skin-to-skin mother/infant contact than the reference hospital. Mother's going to a specific hospital were 11 times as likely to get early skin-to-skin mother/infant contact compared to a woman going to the reference hospital. The mother in the typical hospital was more than 4 times as likely to have experienced early skin-to-skin mother/infant contact as the reference hospital and all the hospital effects were stronger than every other effect other than the mother's initial infant-feeding method intention to exclusively breastfeed effect. Yet, some maternal socio-demographic characteristics and intrapartum variables predicted exclusive breastfeeding even after the hospital was controlled.

We also controlled for maternal language, and did not find language to be a significant predictor either of exclusive breastfeeding or of early skin-to-skin mother/infant contact. We did not take into account which of the 3 practices that the

hospital implemented during their PSN program intervention. It is possible that a large portion of the outcome of this intervention may be derived from the hospital itself, and which of the three practices they implemented (rooming-in, early skin-to-skin mother/infant contact or a focus on breastfeeding).

G. Conclusions

A change in labor and delivery practices that shape our birthing culture has the potential to produce a needed transformation in the birthing industry. The hospital practices that PSN initiated were found to have a positive impact on exclusive breastfeeding rates. What we do with the results of this research is partially dependent on organizational management (Public Health). Public Health practitioners can act upon the newly acquired knowledge to potentially bring about change.

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Appendix A: Perinatal Services Network Data Collection Tool

The mother's intended type of feeding for the infant at entry to the hospital.	a. Undecided, b. breast only, c. formula only, d. breast and formula.
Type of delivery	a. Vaginal, b. Cesarean
Analgesia/Anesthesia	a. none, b. epidural, c. narcotic/sedative, d. local, e. spinal, f. general, g. other.
At least one hour of skin-to-skin during the first three hours of the infant's life	Yes/no
If no (at least 1 hour of skin-to-skin during the first 3 hours of the infant's life) indicate amount of skin-to-skin time during the first 3 hours	a. none, b. <15 min c. 16-30 min d. 31-59 min
Mother's age	Mother's age in years
Primary language	English as a primary language, or English as a second language
Race/ethnicity Race/ethnicity refers to the mother and is determined by what race/ethnicity she states she is.	African American-Non Hispanic Caucasian-Non Hispanic Hispanic/Latino/Spanish Asian/Pacific Islander Native American Multi-racial Other
Smoking status Specifies if the mother used tobacco at any time and in any amount during the pregnancy.	Yes, or No Yes, is if she smoked during the pregnancy. No, is if she did not smoked during the pregnancy.

Current living status	a. alone, b. with children, c. with spouse, d. with relatives/parents, e. with friends, f. with partner (significant other), g. other, (homeless).
Education	a. < high school b. high school graduate, c. college, d. graduate.
Gestational age of infant	The gestational age is best taken from the gestational age document after birth, as the estimated date prior to delivery may be incorrect.
Birth order of infant	Gravida/para
Gender of infant	a. female b. male
Type of first feeding immediately after birth	The degree (amount) of feeding is not significant. If the infant breastfed to any degree it is marked as the first feed immediately after birth.
Mother/infant separation during the hospital stay	Indicate if the mother and infant were separated for more than 1 hour during "any 24-hour period". Example: If the infant is taken to the nursery only for a 30 minute period and a 50 minute period at different times during her whole hospital stay, you would select: couplet was not separated for more than one hour at any 24-hour.

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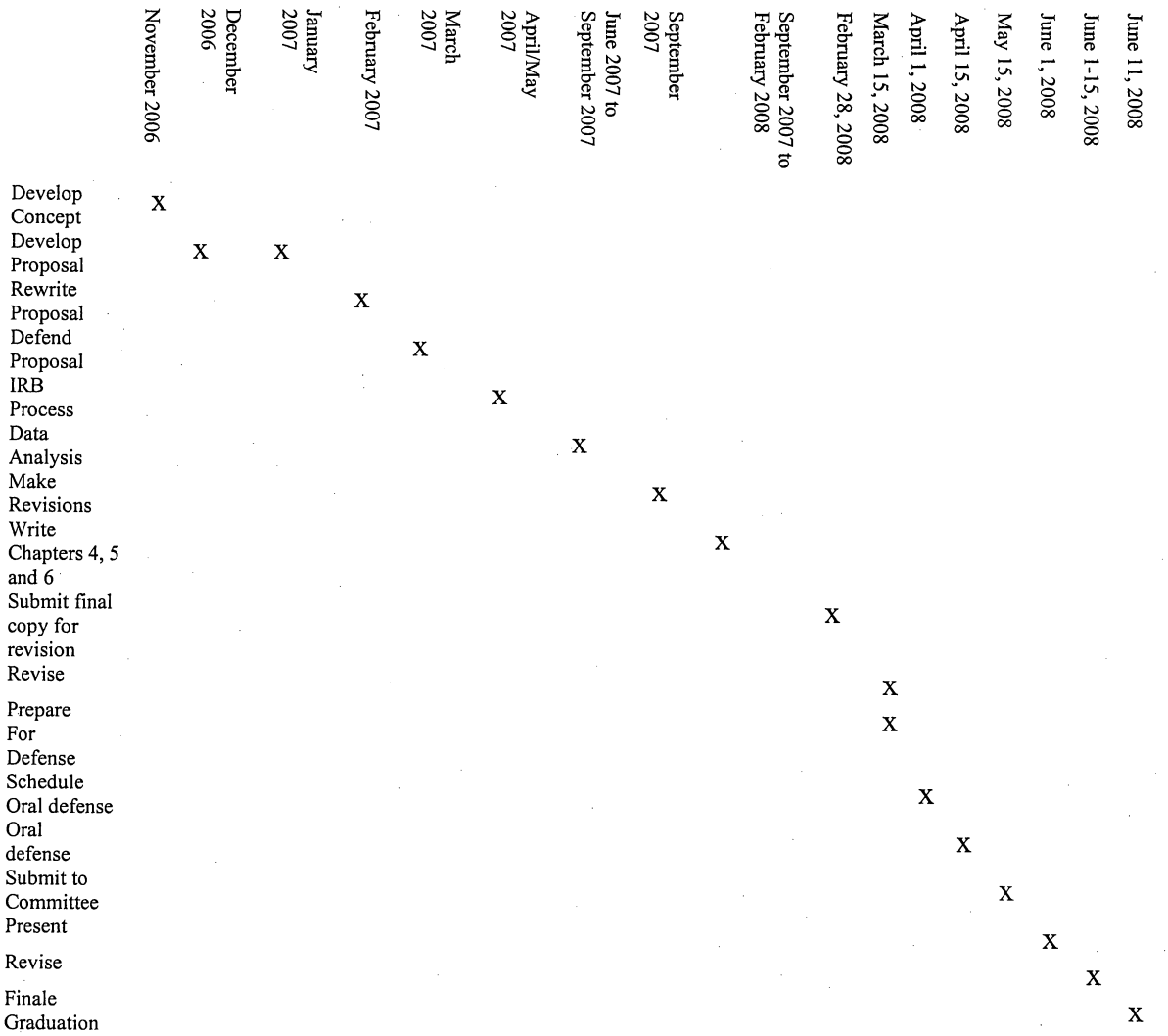
Mother's intended type of feeding at entry	Please indicate what the mother planned to feed her infant at the time of her entry to the hospital.
Type of delivery	Please mark vaginal for vaginal delivery And cesarean for a delivery by cesarean section.
Analgesia/anesthesia None Epidural Narcotic/sedative Local Spinal General Other	Please indicate type of analgesia/anesthesia given to the mother during labor and birth.
At least one hour of skin-to-skin during the first 3 hours	Mark Yes if mother and infant are skin-to-skin for a minimum of one hour (the hour may be divided into two segments. Mark No, if this did not occur on next question.
If answered No on previous question Indicate the amount of time of skin-to-skin the first 3 hours	Mark the period of time that mother and infant were skin-to-skin or None if skin-to-skin did not occur.
Mother's age	Mother's age in years
Primary language	Mark English is primary language if English is the mother's, but it is not her primary (native language, mark English as a second language, if the mother is unable to communicate effectively in English, mark, No English.
Race/ethnicity	Race/ethnicity refers to the mother and is determined by what race/ethnicity she states she is.

Smoking status a. Yes b. No	Please specify if the mother used tobacco at any time and any amount during the pregnancy. a. Mark, Yes if she smoked during pregnancy. b. Mark, No if she did not smoke during pregnancy.
Current living status	Please specify mother's living arrangement considering the adult support. With children refers to the mothers living with any children, foster children, etc. If none of the choices apply such as living in a women's shelter or homeless please mark other.
Education a. < High school b. High school graduate c. College d. Graduate	Please indicate mother's education: mark option a. if she hasn't finished high school, b. high school graduate, c. any college or college graduate, and d. graduate would be higher graduate degrees.
Gestational age of infant	Infant's gestational age is best taken from the gestational age document after birth, as the estimated date prior to delivery may be incorrect. Please indicate number of weeks and days. Ex. 40 weeks 2 days
Gravida	Including this pregnancy, total number of pregnancies (includes spontaneous or induced abortion or fetal death).
Para	Including this pregnancy, total number of births after 20 weeks gestation. Multiple gestations are counted as one birth.

Gender of infant	female male
Type of first feeding immediately after birth	The degree (amount) of feeding is not significant. If the infant breastfeeds to any degree it is marked as the first feed immediately after birth.
Mother/infant separation during the hospital stay	Indicate if the mother and infant were separated for more than one hour during "any 24 hour". Ex: If the infant is taken to the nursery only for a 30 minute period and a 50 minute period at different times during her whole hospital stay, you would select Couplet was not separated more than one hour at any 24 hour. If the couplet was separated mark it and answer the next question.
If the mother received the First Five Kit for New Parents	Mark Yes (from previous child) if the mother already has the kit from previous child, Yes (prenatally) if the kit was given to the mother during the pregnancy and Yes (in hospital) if the kit was given to the mother during her hospital stay. If the kit was not available to give in the hospital please give the 1 800 number and mark.

Appendix C: Gantt Chart for the Skin-to-Skin Study.



Appendix D: Budget

November 2006 to June 2008

Computer	**$2,000**
Printer	**$500**
Paper	**$85**
Ink	**$150**
Travel (car, 32 cents per mile)	**$1,305**
Statistical Analysis $50.00 per hour)	**$500**
Editing	**$200**
Total	**$4,700**