

ENVIRONMENTAL PRIVACY IN AN OPEN-BAY NEONATAL INTENSIVE CARE UNIT:
A CASE STUDY OF BEDSIDE SPACE FOR LACTATING MOTHERS

By

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A THESIS PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF INTERIOR DESIGN

UNIVERSITY OF FLORIDA

2011

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To my family, with love

ACKNOWLEDGMENTS

I would like to extend my sincerest thanks to Dr. Maruja Torres-Antonini, my committee chair, for her guidance, support and encouragement throughout this process. I would also like to thank Professor Candy Carmel-Gilfilen, my co-chair, for her thoughtful critiques and wordsmithing. The teachings of these two professors have been invaluable throughout my career as a design student and it is remarkable how well they balance each other's instruction. Without their advice and dedication, this document may never have been completed.

A special thanks to Dr. Leslie Parker for assisting me throughout my research; especially for the time spent in the neonatal intensive care unit (NICU) collecting data. Her time, effort and encouragement are very much appreciated. I would also like to thank Drs. James and Sandra Sullivan for their role in establishing the connection with the Department of Interior Design to conduct research at Shands NICU.

I would like to thank Shands Hospital at the University of Florida for allowing me to collect information about the design of their interior. I would also like to thank the staff of Shands NICU for their hospitality and for allowing me to use their workplace for my research. I am especially thankful for all of the participants who contributed to this study for their honest responses and willing participation.

Finally, I would like to thank my family and friends, especially my parents, Davide and Jackie Price, for all of their love and support. I could not have done this without them!

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LIST OF ABBREVIATIONS

CDC	Centers for Disease Control and Prevention
CPR	Cardiopulmonary Resuscitation
EBD	Evidence-Based Design
HIPAA	Health Insurance Portability and Accountability Act
IRB	Institutional Review Board
LPN	Licensed Practical Nurse
MBTI	Meyers-Briggs Type Indicator
NICU	Neonatal Intensive Care Unit
PSS:NICU	Parental Stressor Scale: Neonatal Intensive Care Unit
SFR	Single-Family Room

Abstract of Thesis Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Master of Interior Design

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December 2011

Chair: Maruja Torres-Antonini
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Major: Interior Design

Over 400,000 babies are admitted to a neonatal intensive care unit (NICU) each year in the United States where premature and critically ill newborns are given intensive medical attention. Hospitalization of a newborn is recognized by families and caregivers alike as being inherently difficult, emotional and stressful. The addition of environmental stressors while in the unit further increases parents' perceived stress. Yet, it has been established that having a sense of control with respect to potential environmental stressors can markedly reduce or even eliminate its negative effects.

The challenge is for NICU designers and staff to provide mothers with the necessary tools and support to be able to supply their valuable breast milk, while simultaneously attempting to establish a relationship with their infant. Breastfeeding facilitates mother-infant bonding and reduces rates of physical diseases. Lactation and bonding activities require environmental privacy which involves individual privacy control. To feel comfortable performing activities such as skin-to-skin contact, milk expression and breastfeeding, mothers need to have control of individual privacy

mechanisms. There is a need to explore the specific contribution that the physical environment of the NICU may play in this process.

This study addresses the behavioral patterns, opinions and desires of mothers in an open-bay NICU environment. Included in the study are mothers of infants currently admitted to the NICU that have at least attempted to express milk or breastfeed at their infant's bedside. The mother's options for spatial, visual and auditory privacy are reviewed by observation, interview and questionnaire, while the Parental Stressor Scale: Neonatal Intensive Care Unit (PSS:NICU) rating scale is utilized to judge whether environmental privacy issues are contributing additional stress to the individuals.

Findings indicate that the Level III NICU utilized in this study achieved more of the recommended standards for environmental privacy design than NICU II, yet noise in both units impacted lactating mothers more than any other environmental privacy factor due to this being the issue over which they have the least amount of controllability. Overall privacy findings indicate that the lactating mothers' perceived control of their environmental privacy conditions does affect their overall experience in an open-bay NICU, as over half did not achieve their desired privacy level. However, the connection between environmental privacy design and the mothers' perceived levels of stress was unable to be made through the use of the parental stressor scale. Despite this, the perceived stress levels recorded were similar among study participants in both units which indicates the participants were not affected by the environmental privacy design at their infant's bedside as much as other stressors in an open-bay NICU.

Results from this study contain implications for NICU designers and staff to assist in the promotion of the parental role through control of the built environment to gain

privacy and reduce the effects of environmental stressors. In the future, particular attention needs to be directed towards placement of the mothers within the open-bay unit according to their internal psychology, which plays a role in how the individual copes with environmental stressors. Mothers should also be afforded individual control of the spatial and visual privacy mechanisms at the infant's bedside in order to feel comfortable performing intimate activities such as breastfeeding. This sense of control was proven to be an important factor that influenced the mother's stress level and contributed to mother-infant bonding. Finally, it is important that auditory privacy strategies remain in the forefront of NICU design since unwanted environmental sounds were reported to have a negative effect on the individuals when attempting to perform lactation which requires relaxation.

CHAPTER 1 INTRODUCTION

Over 400,000 babies are admitted to a neonatal intensive care unit (NICU) each year in the United States (Cooper, Gooding, Gallagher, Sternesky, Ledsky, & Berns, 2007; Prematurity Campaign, 2011). A NICU is the part of any hospital where premature infants - infants born before the 37th week of pregnancy or have a birth weight of less than 5.5 pounds - and critically ill newborns are given intensive medical attention (Neonatal Intensive Care Unit, 2009). According to the March of Dimes Prematurity Campaign, infants born preterm are at risk of severe health problems and lifelong disabilities, as 12.7 percent of births in this country are born at least three weeks before full term (Gorman, Aguayo, Bjerklie, Cuadros, & Whitaker, 2004; Masters, 2006; Park, 2009). In addition, the premature birth rate has risen by 36 percent over the last 25 years (Prematurity Campaign) due, in part, to the introduction of modern fertility treatments which caused a spike in the number of multiple births, such as twins and triplets, who were born early (Masters). Conversely, 83 percent of premature infants were single premature births that may have been caused by factors such as bacterial infections, high blood pressure, stress, smoking or alcohol consumption (Masters).

Although these premature birth statistics are higher than most health experts would like, Gorman et al. (2004) remind us that advances in neonatal care have saved many infants who might have otherwise died; most of which grow up to be healthy adults. In addition, neonatal specialists can ensure that 95 percent of preterm infants will survive (Masters, 2006), considering the current combination of specialized neonatal care and increased parent-child interaction.

Forcada-Guex, Pierrehumbert, Borghini, Moessinger and Muller-Nix (2006), who compare preterm mother-infant interaction patterns with term dyads, found that supporting mother-infant interactions can improve both behavioral and developmental outcomes of premature infants. Barnard's Parent-Child Interaction Model also found the behaviors of parent and child, as well as environmental factors, to be critical determinants of a child's wellbeing (Goepfinger & Fitzpatrick, 2000; Parent-Child Interaction, 1996). Of importance is Barnard's finding that early parent-child interaction is a predictor of later cognitive and language development of children at risk (Goepfinger & Fitzpatrick; Parent-Child Interaction).

Breastfeeding is a form of mother-infant interaction that is linked to improved brain development and better immunity in infants, as well as a reduced cancer risk and less postpartum depression in mothers (Thean, 2011). The Centers for Disease Control and Prevention (CDC) reports a steady increase in breastfeeding in the United States (Breastfeeding, 2011). Since 2007, the three month exclusive breastfeeding rate has increased more than five percent and the six month exclusive breastfeeding rate has improved more than four percent, yet the changes are not attributable to any single factor. A woman's ability to reach her breastfeeding goals can be influenced by her family, community, employer or health system. The CDC also reports that more than ever before, babies are being born in facilities that have made special efforts to support breastfeeding, as the hospital period is the critical period for mothers and infants to learn to breastfeed (Breastfeeding). When studying the effect NICU admission has on breastfeeding rate, Colaizy and Morriss (2008) found that admission to the NICU has a positive influence on breastfeeding continuation for mothers of preterm infants and

improves the overall likelihood by ten percent. This means that mothers of premature infants admitted to the NICU were more likely to continue breastfeeding than mothers of non-admitted infants (Colaizy & Morriss).

In a literature summary which considers barriers inherent in current NICU design, White (2004) explains that not all mothers feel that privacy is important for activities such as breastfeeding, as long as the social setting of the NICU is supportive. Yet for many mothers, fully engaging in skin-to-skin care and breastfeeding will only occur if the setting allows full privacy (White). In a summary of literature by Shepley (2004) which discusses design for infants and staff in the NICU, it is revealed that the more vulnerable the person is, the more sensitive they may be to a challenging physical environment. Therefore, difficulty during mother-infant interactions in the NICU, such as breastfeeding, is stressful for mothers (Hughes, McCollum, Sheftel, & Sanchez, 1994; Perehudoff, 1990).

Ulrich's Theory of Supportive Design (1991) cites three components which help NICU families cope with the stressful experiences, resulting in improved health outcomes: a sense of control with respect to physical-social surroundings, access to social support, and access to positive distractions in physical surroundings (Ulrich, p. 99). As shown in Figure 1-1, these components can be translated into design-related counterparts, or characteristics of the physical environment.

	Physical Environment Characteristics	Reference to ...
Sense of Control	Enclosure Lighting Temperature Furniture Configuration	Ability to control spatial accessibility Ability to control sources of light Ability to control thermal comfort conditions Ability to manipulate furniture positions
Social Support	Family Space	Space provided for family interaction
Positive Distractions	Art Views of Nature Music	Aesthetically pleasant and emotionally satisfying artwork Visual access to natural vistas Auditorily soothing and enjoyable music

Figure 1-1. Theory of Supportive Design and its design-related counterparts.

For families in a health care environment, sense of control is one of the most important factors influencing stress level and wellness. Humans have a strong need for control and the related need of self-efficacy with respect to environments and situations (Stewart-Pollack & Menconi, 2005). A consistent finding in stress research has been that if an individual has a sense of control with respect to a potential stressor, the negative effects of the stressor are markedly reduced or even eliminated (Ulrich, 1991). For instance, families desire environmental privacy for intimate interactions in a NICU setting, thus have a great need for privacy control (Altimier, 2004). Mothers in particular need to have control of privacy mechanisms to feel comfortable performing activities such as skin-to-skin contact, milk expression and breastfeeding (Brown & Taquino, 2001).

In the last ten years, the design of many NICUs across the country has been moving from the open-bay configuration, or an open room supporting between ten to 50 infant beds (Shepley, Harris, & White, 2008), toward a single-family room (SFR) layout, or a series of private rooms in which families have the option to stay at bedside continuously while the infant is being cared for (Best Evidence Statement, 2011). This change is due in part to the relatively recent commitment to evidence-based design

(EBD), or the practice of basing built environment decisions on credible research to achieve the best possible result (Tannen, 2009). Studies conducted on this perspective determined that the active engagement of parents was most successful in the SFR configuration due to the provisions of increased environmental control and privacy (Domanico, Davis, Coleman, & Davis, 2010). Even though an open-bay unit also addresses environmental control and privacy concerns, it was still considered less successful by some (Harris, Shepley, White, Kolberg, & Harrell, 2006; Johnson, Abraham, & Parrish, 2004; Shepley et al., 2008). However, others determined that the open-bay configuration to be better for staff communication and coworker access, mutual parental support, and decreased space and financial commitments for the hospital (Domanico et al.).

Environmental privacy at the infant's bedside is a factor that plays a role in the promotion of a mother's interaction with her baby. Yet to date, the literature fails to focus on environmental privacy of the lactating mother in an open-bay NICU design, and only a few studies give mention to the privacy mechanisms that are utilized for this process. Therefore, a study of the physical attributes of an open-bay NICU was needed to illustrate how existing privacy mechanisms impact the user at the bedside. This includes obtaining information from users to find out whether the configuration of the space contributes positively or negatively to their experience, and whether they observe an increased stress level due to the properties of the physical environment.

Purpose of the Study

This study explores the connection between environmental privacy design and perceived stress levels of users when located at their infant's bedside in an open-bay NICU. As suggested by the literature, the study is based on the premise that a mother

who is breastfeeding her infant should feel satisfied with the spatial, visual and auditory privacy provided to her. Alternatively, she should be satisfied with the amount of control she can have over the physical environment if its conditions are not considered optimal.

To this end, this study aims to answer the following questions: Does the lactating mother's perceived control of her environmental privacy conditions affect her overall experience in an open-bay unit? To what extent, if any, does the physical environment of an open-bay NICU impact the perceived stress of lactating mothers?

Scope of the Study

This study addresses the behavioral patterns, opinions and desires of mothers in an open-bay NICU environment. Included in the study are mothers of infants currently admitted to the NICU that have at least attempted to express milk or breastfeed at their infant's bedside. The mother's options for spatial, visual and auditory privacy are reviewed by observation, interview and questionnaire, while a stressor rating scale is utilized to judge whether environmental privacy issues are contributing additional stress to the individuals.

CHAPTER 2 LITERATURE REVIEW

Introduction

This review of literature covers existing information relevant to the study of environmental privacy in a neonatal intensive care unit and the impact it has on lactating mothers' perceptions of stress. The review examines literature on lactation, skin-to-skin interaction, family-centered care, and the challenges that arise during the lactation process. Literature about environmental privacy and controllability; personal space; neonatal intensive care unit (NICU) design and standards; open-bay versus single-family room design; and environmental stressors are also evaluated.

Lactation in the Neonatal Intensive Care Unit

A very high value has been placed on breast milk and breastfeeding for preterm infants (American Academy of Pediatrics, 2005; Furman, Minich, & Hack, 2002; Schanler, 2001) as the benefits of breastfeeding are both psychological and physical. Breastfeeding facilitates mother-infant bonding and reduces rates of physical diseases, such as gastrointestinal disease, respiratory disease, asthma and some maternal cancers (Kervin, Kemp, & Pulver, 2010). The challenge is for NICU staff to provide mothers with the necessary tools and support to be able to provide their valuable breast milk, while simultaneously attempting to establish a relationship with their infant (Hurst, 2007).

Literature on lactation has focused on the discussion of promotion and support, location within the NICU, and maternal challenges. Meier (2001) reports that successful breastfeeding promotion in the NICU environment requires that mothers receive adequate support and resources needed in order to overcome challenges such as

separation, infant behaviors, and infant intolerance to feeding. Johnson et al. (2004) state that expressing milk at the infant's bedside is an important example of the type of intervention that encourages mothers to provide milk until their infant is ready for breastfeeding. However, Jaeger, Lawson and Filteau (1997) argue that breastfeeding can be challenging for many women, even in the best of conditions, and that facilitation of breastfeeding in the NICU can be particularly difficult. A premature delivery, sick newborn, or any other unexpected pregnancy outcome may change the mother's initial decision to breastfeed (Jaeger et al.).

Decision to Breastfeed

Literature on the decision to breastfeed is dominated by external variables that influence the mother's decision. Kervin et al. (2010) argue that supportive family and friends have a stronger influence on the decision to breastfeed than professional support, while Scott and Binns (1998) report the women's partner as the most significant influence on the breastfeeding decision. Kong and Lee (2004) add that the amount of breastfeeding knowledge a woman has influences her decision, as feelings of responsibility, self-worth and closeness with the infant impact the decision in favor of breastfeeding. Conversely, an observational study performed by Furman et al. (2002) found that higher socioeconomic status was directly related to the decision to breastfeed and early and frequent milk expression.

In a study by Lessen and Crivelli-Kovach (2007) where one hundred mothers were interviewed about factors that influenced a mother's choice of infant feeding, it was found that mothers of most age groups intended to breastfeed exclusively. Many of the mothers reported that their decision to breastfeed was based on the health benefits for the infant. Others reasoned that breastfeeding is easier, more economical and

promoted mother-infant bonding. In contrast, some mothers initially had decided to breastfeed, but changed their minds due to either receiving maternal medications or blood products, exhibiting disproportionate stress levels, or experiencing a preterm delivery. These findings supported previous studies that found a women's decision to breastfeed was mostly infant centered, while the decision to bottle-feed was mostly mother centered (Lessen & Crivelli-Kovach).

Milk Expression

For a mother planning to breastfeed, having her infant admitted to the NICU immediately following delivery can be difficult. Due to their size or condition, the infant cannot feed at the breast, so women must rely on a mechanical breast pump to initiate lactation and express milk. Hurst (2007) reported pumping to be a large, necessary part of the process to begin milk production when not initiated by the infant, yet the sensations experienced during pumping to be very different from those experienced by mothers when breastfeeding.

According to Hurst (2007), a mother's milk volume is driven by infant demand during breastfeeding. For pump-dependent mothers, demand is driven by her motivation to express her own milk while maintaining a level of milk production to meet her infant's needs. Mechanical milk expression at the NICU bedside is possibly the best way to achieve this; by having the infant nearby to provide the cues associated with breastfeeding, such as sucking, smacking, cooing, and crying. These actions allow for breast stimulation which helps the mothers to develop a pumping schedule that sufficiently maintains an adequate milk volume (Hurst).

Breastfeeding

The literature on breastfeeding indicates that the transition from expressing milk to breastfeeding the neonate is challenging for many mothers. Lessen & Crivelli-Kovach (2007) suggested that to succeed in breastfeeding their hospitalized infant, a mother needs three things: increased support from family members, timely breastfeeding education, and a supportive NICU environment. In the study performed by Lessen and Crivelli-Kovach where one hundred mothers were interviewed regarding factors influencing the initiation of breast-feeding, participants responded to questions regarding environmental factors in the NICU that interfered with breastfeeding. Some of the respondents reported difficulty breastfeeding because of the inability to relax due to noise, lack of privacy or too much equipment at the infant's bedside (Lessen & Crivelli-Kovach).

Skin-to-Skin Care

Furman and Kennell (2000) and Talmi and Harmon (2003) found few opportunities for relaxing and intimate interactions for parents with their hospitalized infant, which produced a great deal of stress and emotional turmoil for the parents. However, parents consistently reported positive emotional effects of early, close physical contact with their newborn, such as that found through skin-to-skin contact (Furman & Kennell; Hurst, Valentine, Renfro, Burns, & Ferlic, 1997; Johnson et al., 2004; Talmi & Harmon). Skin-to-skin care, also known as "kangaroo care", is a technique of placing the infant between the mother's breasts which enhances a hormonal response that encourages lactation (Browne, 2004; Hurst et al.; Johnson et al.) and aided the transition from gavages and bottles to breastfeeding (Lessen & Crivelli-Kovach, 2007).

Family-Centered Care

Literature on family-centered care reveals that it is becoming a standard of care in most NICUs. According to Brown and Taquino (2001), Cooper et al. (2007), and Fournier (1999), family-centered care is a type of developmentally supportive care that views the family as the child's primary source of strength and support. Additionally, it has been associated with numerous benefits including decreased length of stay, enhanced parent–infant bonding, improved wellbeing of the preterm infant, better mental health outcomes, and higher family satisfaction (Cooper et al.). Parker, Zahr, Cole and Brecht (1992), Shepley (2002), and Zeskind and Lacino (1984) found that increased visitation with the baby in the NICU results in a more realistic appraisal of the child's condition and contributes to bonding.

Shepley (2002) contends that providing opportunities for such parent-child interactions is critical. In a literature summary by Johnson et al. (2004) which reviewed NICU designs for optimal involvement of family, it was concluded that a NICU environment which supports the active engagement of parents in their infant's care encourages the parents to facilitate development of the child during and after hospitalization. Johnson et al. also found strong, positive evidence when observing practices in the NICU that reflect family-centered care, which include breastfeeding support, skin-to-skin contact, and developmental care.

Mothers' Stress

Johnson et al. (2004) and Seideman, Watson, Corff, Odle, Haase, & Bowerman, (1997) reported challenging experiences in the NICU compounded the stress levels in parents of premature, critically ill or low birth weight infants. These experiences included the altered appearance and behavior of the infant, a diminished parental role, and

separation from the child. It was also suggested that these challenging experiences can have long-term psychological effects that may hinder parent-infant relationships.

Literature on these challenging experiences in the NICU is focused on the experience that caused the highest amount of perceived stress in NICU parents. Though both parental role alteration and infant's behavior and appearance have been identified as top stressors, with Carter, Mulder and Darlow (2007), Dudek-Shriber (2004) and Seidman et al. (1997) assigning the highest priority to the parental role alteration, and Miles, Burchinal, Holditch-Davis, Brunssen and Wilson (2002) to the infant's appearance and behavior. Miles et al. and Seidman et al. agree, however, about additional experiences that were highly stressful to parents. These items include the inability to protect their child from pain, the inability to comfort or help, witnessing needles put in their child, and observing breathing problems (Miles et al.; Seidman et al.).

Spear, Leef, Epps and Locke (2002) provided additional literature on mothers' stress indicating that mothers who were more stressed had less positive feelings towards their infant than less stressed mothers, and that the likeliness to respond to infant cues was diminished if the mother was stressed. As a result of these behaviors, infants were less responsive and less likely to give clear cues to the mother (Spear et al.). Additionally, Spear et al. determined that there did not appear to be an association between the degree of the infant's health and parental stress; the two are independent. However, it was found that the parent's internal psychology and past experiences were the determining factors for the degree of maternal stress, as first-time motherhood lead to ineffectively coping with stress (Spear et al.).

Environment for Mother and Infant

Literature on the physical aspects of healing environments determined that they play a positive role in the care giving process. Shepley (2004) recognized that clinical, operational and social aspects play the most significant role in healing, yet also identified the physical environment as a critical factor. Healing environments can be defined as “spaces that make a positive contribution to health outcomes or the process of caregiving” (Shepley, p. 1). A more in-depth definition is proposed by Stewart-Pollack and Menconi (2005), who suggest that a healing environment is a positive physical environment that incorporates design elements providing comfort, security, stimulation, opportunities for privacy and control, positive distractions, and access to a patient’s social support network.

In addition, Stewart-Pollack and Menconi (2005) claim that a sense of control is one of the most important factors influencing stress levels and wellness for families in a health care environment. Sense of control, or controllability, can be defined as the perceived relationship between an individual and their environment. This relationship is essential for effective functioning, as humans have a strong need for control and the related need of self-efficacy with respect to environments and situations. When a mechanism for control is provided, the family’s wellbeing may be impervious to environmental stressors (Stewart-Pollack & Menconi).

Environmental Stressors

Literature on environmental stress from Devlin and Arneill (2003), Topf (1994), and Veitch and Arkkelin (1995) claim that environmental stressors are long-term conditions of the physical environment that are uncontrollable and may potentially result in stress or anxiety. These negative conditions of the environment include noise, density and

unwanted observation (Devlin & Arneill). Stewart-Pollack and Menconi (2005) suggest that humans respond negatively to these environmental stressors because they affect the need for privacy.

Privacy is defined by Altman (1975, p. 18) as “selective control of access to the self or to one’s group.” Pedersen (1997) suggests a similar definition where privacy is viewed as an individual’s regulation of how and with whom to interact; much akin to boundary control. In a NICU setting, these would translate to shelter from unwelcomed viewing of oneself or one’s infant, unwanted noise, and invasion of personal space.

According to Stewart-Pollack and Menconi (2005), the two major contributors to environmental stress are lack of control over stimuli and constant change within the environment. Levels of stress vary depending on the environmental stimuli, such as spatial organization, movement, noise and the presence of people in the setting. A greater need for environmental privacy is required for mothers of NICU infants since stress and anxiety can be higher in the NICU environment than in many other settings due to these environmental stimuli (Stewart-Pollack & Menconi).

Environmental Privacy

Literature on environmental privacy consists of discussion on spatial, visual and auditory privacy. Spatial privacy, or boundary control, is a category of spatial need that can be defined by Pedersen (1997) as the need to control physical access to oneself. Physical barriers, location within the unit, layout of the unit, and distance from others are all features of the environment that may affect spatial privacy (Pedersen).

Visual privacy, also covered by Pedersen (1997), is the level of shelter that protects an individual from unwanted observation or viewing. It also allows for personal autonomy, which provides the opportunity for self-discovery and offers a chance to

experiment with new behaviors without social condemnation. Burden (1998) claimed that new mothers especially need visual privacy when they begin to gain lactation skills, as time is needed to experiment with their bodies without judgment from others in case they fail.

Literature by Stewart-Pollack and Menconi (2005) on auditory privacy states that the effect of noise, or unwanted sound, varies for each individual and is dependent on personal and environmental factors. Auditory privacy is the level of shelter that protects an individual from unwanted sound, which can interfere with concentration and the performance of tasks requiring relaxation, such as lactation. Noise can also cause frustration or irritation, which in turn can lead to a heightened stress level in an individual (Stewart-Pollack & Menconi).

Personal Space

Even though people are more accepting of the necessary personal space violations in a healthcare setting, it is no less traumatic than in other settings. Stewart-Pollack and Menconi (2005) would even argue that personal space violation is more traumatic due to the stress and uncertainty surrounding the healthcare experience. Literature also indicates that the more intimate the spatial relationship, the more people refuse to accept intrusion by others (Human Behavior and Interior Environment, 1997).

Personal space is a term used to describe perception of social spacing. Gottlieb (1996) and Sommer (1969) illustrate this idea by describing personal space as the social distance defined by an invisible concentric bubble around an individual. These invisible boundaries are always changing depending on the interaction needs of individuals, whose ever changing needs determine both the extent of the boundaries at

any given time as well as their level of comfort with proximity to others (Stewart-Pollack & Menconi, 2005).

Altman (1975) reported that individuals with extroverted attitudes maintain closer personal space than those with introverted attitudes and are therefore more comfortable with proximity to others. Introversion and extroversion are terms from psychology originally used by Carl Jung to explain the different attitudes people use to direct their energy. The extroverted attitude is an outward flow of personal energy with an interest in and a dependence on events, people, things, and relationships. In addition, an extrovert can be motivated by outside factors and influenced by the environment, as well as be sociable and confident in unfamiliar surroundings (Altman; Jung's Theory, 2009). Conversely, those with introverted attitude tend to be withdrawn and have an inward flow of personal energy, preferring inner reflection over activity; and are happy when alone due to their rich imagination (Altman; Jung's Theory).

The size of the personal space is further determined by density in each designated space. Density can be defined as the physical condition involving space limitations and the number of people the space contains at any point in time (Stewart-Pollack & Menconi, 2005). As Aiello and Baum (1979) point out, increased density can cause the inability to perform tasks, effectively interact with others, cope with unpredictable situations, or attain certain goals. When density increases, the probability that our personal space will be violated also increases (Stewart-Pollack & Menconi). In addition, Kaya and Feyzan (1999) and Evans and McCoy (1998) indicate that the result of increased density is feeling a lack of control, loss of privacy, or crowding.

Stewart-Pollack and Menconi (2005) define crowding as a negative psychological response to overstimulation and lack of control within a densely populated environment. This includes a perceived excessive amount of interaction within a limited space, which may be caused when privacy mechanisms fail to work (Stewart-Pollack & Menconi). According to McAndrews (1993), crowding is a condition which can be temporary or chronic. Temporary, or short-term, crowding can affect our ability to perform complex tasks, among numerous other negative effects (McAndrews). Chronic, or long-term, crowding can cause an individual's socially supportive relationships to collapse and cause an increase in psychological distress (Evans, Maxwell, & Hart, 1999; McAndrews). Stokols (1972) reports that in addition to crowding, lack of privacy and restriction of movement can also contribute to a negative psychological state and feelings of encroachment. The negative effects of encroachment upon personal space include dislike for the intruder, poor performance of a given task, or experience of negative emotions, such as anger, hostility, or feelings of violation (Baumeister & Bushman, 2008).

Privacy Control

Stewart-Pollack and Menconi (2005) identified mechanisms for privacy control including nonverbal behavior and use of the physical environment. Nonverbal behavior involves positioning and movement of the body to communicate with others. This is sometimes referred to as "body language." The body communicates on both obvious and subtle levels; for example, movement toward others signals openness to communicate, while movement away from others signals avoidance (Stewart-Pollack & Menconi). Some of the most obvious nonverbal behavior humans use to communicate is directional orientation, which can be interpreted as nonverbal communication that

may signal openness to communicate or whether interaction is welcomed (Gifford & O'Conner, 1986; Stewart-Pollack & Menconi). The usual interpretations given to these behavior signals are: 1) if an individual is facing inward from the circulation path, this indicates preference for isolation; 2) if an individual is sitting with the circulation path at his or her side, this indicates partial openness to interaction; and 3) if an individual is facing outward toward the circulation path, this indicates openness to interaction with others. Another mechanism for privacy control is the adjustment of the physical environment. The physical environment helps us to control our personal space and interaction with others by allowing regulation of communication and access to our bodies through manipulation of its features, such as the introduction and positioning of physical privacy devices (Stewart-Pollack & Menconi).

In an observational study of the methods women use to maintain or preserve their privacy within a maternity ward environment, Burden (1998) found curtain positioning to be the primary privacy mechanism used. This method of interaction became known as 'signaling'. Women would position their individual curtain to send silent messages to others in the ward environment. The degree of closure of the curtain around the individual's bed would signal whether the woman was open to interaction with others or if they would prefer to maintain their isolation (Burden).

Burden (1998) also suggested that the different stages of pregnancy and social issues contributed to the need felt by certain mothers for heightened privacy measures. Reasons that were stated for maintaining isolation, with the curtain closed completely around bed, were: a fear of judgment from others, to avoid others views of them in labor or breastfeeding, to avoid social contact, or because they were experiencing feelings of

self-doubt. This happened more often when social norms were not the same for all individuals in the space (Burden), which relates to Stewart-Pollack and Menconi's (2005) mention of use of culturally approved behavioral norms as yet another mechanism that combines nonverbal behavior and use of the physical environment for privacy control.

According to Altimier (2004), Newell (1998), and Turnock and Kelleher (2001), all families desire privacy in the NICU and equate it with patient dignity. Unfortunately, the consideration given to providing privacy for one's body in a healthcare setting is not the same consideration typically given in any other environment due to the necessary interaction with healthcare staff (Turnock & Kelleher). Stewart-Pollack and Menconi (2005, p. 2) agree and add that "without the kind of control that the process of privacy uniquely provides, we are less able to cope with or benefit from these [healthcare] situations and circumstances." It is generally thought that people resist intrusion by others as the intimacy of the spatial relationship increases (Human Behavior and Interior Environment, 1997).

Literature on environmental privacy is concluded by differentiating between desired and achieved privacy. Desired privacy can be defined as the personal feeling about the perfect level of interaction with others at any particular time, whereas achieved privacy is the actual amount of interaction individuals have with others. Stewart-Pollack and Menconi (2005, p. 10) claim that the end result of achieving the desired level of privacy is a lessened perception of stress, or "being more relaxed." However, Altman (1975) and Westin (1967) state that when achieved privacy is greater than what was desired, the person is more socially isolated than was intended or

wanted. Conversely, when achieved privacy falls short of what was desired, the individual's control of social interaction is inadequate and the person may feel crowded (Altman; Westin). An environment where mothers have the ability to achieve desired privacy levels and are more comfortable performing activities such as skin-to-skin contact, milk expression or breastfeeding, is a necessary part of creating a restorative healing environment (Brown & Taquino, 2001; Stewart-Pollack & Menconi, 2005).

NICU Design

The NICU is described in the literature as part of a hospital that admits newborns in need of critical care or serious medical attention at birth. Approximately ten to 15 percent of newborns require this type of care and are admitted to a NICU where advanced technology and healthcare professionals provide these fragile infants with the specialized care they need. Some NICUs also give intermediate or continuing care for less critical infants that are also in need of specialized nursing care (Neonatal Intensive Care Unit, 2009).

Cooper et al. (2007) reported the unfamiliar environment of a NICU to be quite overwhelming for a parent, thus consideration must be paid in designing a NICU that supports families caring for their infant. The environment's physical characteristics should complement the care provided by the family and should offer relief, instead of contributing to the overwhelming nature of the experience (Cooper et al.). Johnson et al. (2004, p. 1) agree that "the physical features of a NICU and its approach to care go hand in hand."

The *Recommended Standards for Newborn ICU Design* is a set of guidelines that provide the professionals involved in the planning of NICUs with a comprehensive set of design standards based on clinical experience and an evolving scientific database

(Marshall-Baker, 2006; White, 2007b). Standards listed in these guidelines are minimum recommendations, not codes or standards required by law. Their intent is to optimize design within the constraints of available resources and facilitate health care for the infant in a setting that supports the role of the family and the needs of the staff members (White).

One of the twenty-seven standards from the list of *Recommended Standards* pertains especially to the study of environmental privacy in an open-bay NICU. *Standard 3* considers minimum space, clearances and privacy requirements and specifically states:

Each infant space shall contain a minimum of 120 sq ft of clear floor space, excluding hand washing stations, columns and aisles. There shall be an aisle adjacent to each infant space with a minimum width of 4 ft in multiple-bed rooms.

Multiple-bed rooms shall have a minimum of 8 ft (2.4 m) between infant beds. There shall be provision for visual privacy for each bed. (White, 2007b, p. S7)

These guidelines imply that bedside area should provide enough space for parenting and family involvement, as well as interaction of the healthcare staff with the infant. Furthermore, permanent objects such as hand washing stations or columns should not infringe upon the bedside space or overlap adjacent areas such as circulation, as circulation has its own spatial requirements. The guidelines also imply that visual privacy for the family should be addressed both at each bedside, as well as in the overall unit design (White, 2007b).

A second standard from the list of *Recommended Standards* is relevant to the environmental privacy afforded to the infants' family in an open-bay NICU. *Standard 7* describes clearances for handwashing stations and specifically suggests:

In a multiple bed room, every infant bed shall be within 20 feet (6 meters) of a hands-free handwashing station. Handwashing stations shall be no closer than 3 feet (0.9 meter) from an infant bed or clean supply storage (White, 2007b, p. S8).

This guideline implies that a handwashing station should be close enough to infant bedsides to be convenient for use by staff or family, yet there should exist enough distance from the nearest bedside so as to not cause a disturbance. The handwashing station should also provide ease of operation and consider noise control (White, 2007b).

Shepley et al. (2008) explored the design implications of single-family room (SFR) NICUs relative to open-bay arrangements and the caregiver experience. From staff viewpoints, SFRs support privacy for families and infants better than open-bay units. Staff also agrees that SFRs are viewed to be less stressful for family members, as SFRs provide family members with sleeping and waiting areas. Factors that raise stress levels, such as unwelcomed viewing of oneself or child and intrusion of excessive noise, are mitigated in the SFR in comparison to open-bay unit options (Shepley et al.). According to Stewart-Pollack and Menconi (2005), the challenge for open-bay NICUs, where families must share space, is to provide as much control and individual privacy within the limited space as the SFR units.

However, literature on the disadvantages of the SFR design from Domanico et al. (2010) and White (2003) reports that even with today's technological advances in patient monitoring, nurses generally feel more confident about the condition of their patients if they can physically see them at all times. White also indicates that SFRs configurations tend to isolate nurses from one another, as nurses are used to working as a team, even if they are given individual assignments. It is easier for nurses to

collaborate and socialize in an open-bay unit, which is not afforded to them in a NICU where most of the beds are in individual rooms (White).

In addition, Domanico et al. (2010) and White (2003) suggest that this issue of isolation is a factor for parents as well as nurses. Inter-parental socialization was difficult in SFR configurations due to the relative isolation of parents. Domanico et al. also found that the open unit outperformed the SFR regarding the ease of meeting other parents and providing parental support to make the hospital stay better (Domanico et al.). White reported another disadvantage to SFR design is the cost. Individual rooms are more expensive due to their larger space consumption. Even if the beds were afforded the same square footage in each type of unit, the space required for individual rooms is greater due to the existence of more walls, which consume space and limit circulation and flexibility (White).

Conclusion

Many studies have been conducted about perceived stress levels of parents and other caretakers in the neonatal intensive care unit. Few have linked a mother's stress to environmental privacy during the lactation process in an open-bay unit. Specifically, little is known about stress created by the lack of environmental privacy during milk expression and breastfeeding processes at the infant's bedside. It is necessary to clarify the impact environmental privacy has on lactating mothers' perception of stress.

CHAPTER 3 RESEARCH METHODOLOGY

The research objectives of this study were to determine whether a mother's perceived control of her environmental privacy conditions affects the mother's overall experience in an open-bay neonatal intensive care unit (NICU) and whether the extent of environmental privacy affects the perceived stress level of mothers who are expressing milk or breastfeeding at their infant's bedside. Based on the findings as well as previous empirical work, the study also proposes recommendations for privacy design techniques to benefit NICU designers and staff.

Research Study Design

A case study method was utilized in this study. This design approach provided information to understand maternal behavior at the infant's bedside and the impact the physical environment had on lactation and stress. The ability to utilize a variety of evidence is the unique strength of the case study design and justifies its selection for this application. The study relied on observations, interviews, and questionnaires to examine the mothers' nonverbal behavior, feelings toward the physical environment, preferences for privacy, as well as perceptions of stress.

This study's single-case design was chosen to represent the experience for a mother whose infant has been admitted to a NICU and who is carrying out lactation functions at her infant's bedside. The lessons learned from this study are assumed to reveal the experiences of an average woman in these circumstances.

Non-participant observations were selected for use in this situation to record each mother's behavior, as well as their interactions with the physical environment of the NICU. These observations were utilized to provide conclusions about the mothers'

functions in the open-bay unit (Kumar, 2005). In addition, the process of architectural analysis was employed to define the architectural characteristics of the physical environment (Architectural Analysis, 2011). Floor plans were examined and information was derived to gain insight the infant's bedside space utilization.

The interview was a critical source of information in this case study since it focused on the human behavioral events. Each interview became a guided conversation rather than a structured set of questions, and the delivery of questions was friendly and nonthreatening in nature. The interviews for this study could be considered focused interviews as the participants were interviewed for a shorter period of time and followed a set of predetermined questions (Gerring, 2007; Yin, 2009).

The case study method also allowed for more structured and targeted questions, in the form of a questionnaire. The questionnaire produced small amounts of quantitative data from the parental stressor rating scale and demographic information as part of the case study evidence.

Theoretical Framework

A review of the literature established that the hospitalization of a newborn is an inherently stressful, difficult and emotional experience for parents; and that parent-child interaction, such as lactation and skin-to-skin contact, are beneficial to both mothers and infants. As revealed by the literature, many factors could affect the parent-child interaction time in an open-bay NICU and may influence the mother's perceived stress level. The most singular of these is articulated in Magnusson's Stress Theory, which provides the theoretical anchor for this study.

Magnusson's (1982) Stress Theory viewed stress as a person's reaction to demands that approach or exceed the limits of their coping resources (see Figure 3-1).

Environmental stressors in specific situations were Magnusson’s main concern. This framework was selected with the premise that mothers need control to alleviate stress and need privacy to have peace of mind. Mothers in the NICU suffer stress partly due to their environmental conditions, which consequently affects their parenting and capacity to interact with their child (Magnusson).

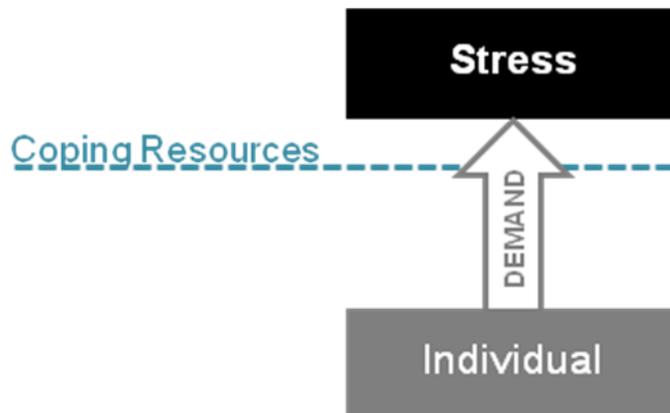


Figure 3-1. Magnusson’s Stress Theory.

Application of this theory established that the mother’s reaction to the demands of privacy issues is viewed as stress, depending on the individual’s coping capability. Subsequently, a theoretical model was informed by this theory and resulted in the determination of factors that influence the lactating mothers’ privacy. These privacy factors include social, cultural and environmental factors (see Figure 3-2). Altman (1975, p. 207) defines privacy as a “changing self/other boundary-regulation process in which a person or a group sometimes wants to be separated from others and sometimes wants to be in contact with others.” According to Altman, different types of social units can be involved in privacy; for instance, individuals, families, or other groups. Therefore, privacy involves a diversity of social relationships, such as individuals and individuals, individuals and groups, groups and individuals, etc.

(Altman). Altman also points out that all cultures have behavioral methods for managing accessibility of people to others. The difference between cultures is how they achieve control over interaction (Altman). Finally, Altman views environmental design for privacy as the creation of physical environments that permit differing degrees of controllability over interaction with others.

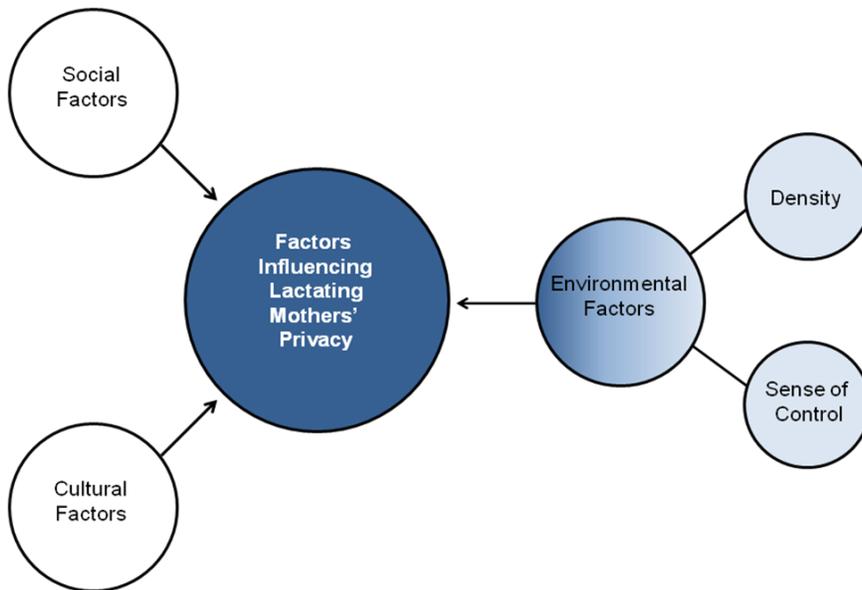


Figure 3-2. Factors influencing lactating mothers' privacy.

This study focuses specifically on existing environmental factors in an open-bay unit which relate to the mother's experience while performing lactation at her infant's bedside and may lead to additional stress. An environmental factor can be thought of as an identifiable element in the physical environment that affects behavioral operations while in a particular setting. In the case of an open-bay NICU, the environmental elements that affect the privacy of mothers while lactating include density and sense of control. Density is a spatial condition which involves space limitations and the number of people within that space (Altman, 1975; Stewart-Pollack & Menconi, 2005). Increased density can cause the inability for a mother to perform lactation, effectively interact with

her infant, or cope with an unpredicted situation. Sense of control, on the other hand, is a perceived relationship between an individual and their environment (Altman; Stewart-Pollack & Menconi). When a mechanism for control is provided, the mother's welfare may be impervious to environmental stressors.

Setting

The site of this research study was two open-bay NICUs, both residing at Shands Hospital at the University of Florida. Shands is a private, not-for-profit university hospital that specializes in tertiary care for critically ill patients and is dedicated to patient care, education and research. The team of caregivers at Shands' NICU has the capability to provide intensive care for infants around the region (Neonatal Care, 2011).

Founded in 1963, the first of the two NICUs is the Level III NICU, which was renovated and expanded in January 2005. At that time, the space was increased to include capacity for 22 beds and has since boasted a 97% occupancy rate (Overview, 2009). A Level III NICU, or subspecialty NICU, is a special care nursery organized with continuously available staff and equipment which are able to provide constant life support and comprehensive care for extremely high-risk infants or those with complex or serious illnesses. The ability to provide care to infants with differing degrees of complexity and risk is what distinguishes the Level III NICU from other levels of care (Levels of Neonatal Care, 2011).

Adjacent to the NICU III, the Level II NICU has the ability to accommodate up to 30 beds and has a 96% occupancy rate (Overview, 2009). A Level II, or specialty NICU, is a NICU with personnel and equipment that are able to provide care to infants who are moderately ill, but that are expected to improve at a fairly rapid pace. These newborn infants are generally those who were born after 32 weeks' gestational age, weighing

more than 1500 grams at birth. A number of infants in this NICU are patients recovering from an illness that was originally treated in the Level III NICU (Levels of Neonatal Care, 2011).

The unit is staffed by board-certified neonatologists and pediatric surgeons, neonatal nurse practitioners and physician assistants, as well as nurses, respiratory therapists, transport specialists and other specially trained support staff. All of these caregivers are on hand around the clock to respond to newborn infants in need of highly skilled care. The team also prepares each family for life at home with essential training in infant care, cardiopulmonary resuscitation (CPR) and appropriate follow-up (Neonatal Care, 2011).

Layout. The two NICUs, although separated from each other by two short hallways, each have a floor plan organized as an open-bay unit, meaning neither one contain general patient areas that are physically separated from one another by solid walls. Even though they have the commonality of the open plan, the units have very different configurations.

The Level III unit contains two four-bed pods in the central space of the linear unit, with an additional 14 beds located around the perimeter (see Figure 3-3). Two of the perimeter beds were enclosed so that privacy could be controlled for surgical or other special procedures. Two additional perimeter beds were semi-enclosed by glass walls to curtail noise or other contaminants that could potentially enter the space. The Nurse's Station is located adjacent to these four special rooms, yet still provides accessibility and support to the rest of the unit.

The Level III NICU incorporates other design features that differ from NICU II. Curved and angled lines in NICU III create fluid directionality within the unit. A curved wall is prominently located at the visitor entrance to the unit which has a softened effect when entering the space. It is complemented by other walls, furniture and applied décor that have curved or eased forms which contribute to the perception of a calm environment by creating relief from sharp edges that may harm or suggest harm.

Conversely, the furniture and equipment in the Level II NICU are set up in a linear fashion in three rows that run parallel from one end of the room to the other, with equipment storage acting as a barrier to separate two of the three rows (see Figure 3-4). None of the patient spaces can be enclosed in this unit to provide special procedures or to grant privacy from others, and the infant beds are situated closer to one another in this unit. The nurse's station is located towards one end, but can be easily viewed by anyone standing in the unit. Unlike the Level III NICU, the Level II NICU features only rectilinear forms.

Limited space exists in each NICU for families to visit, including mothers, fathers, and extended family members. Families spend many hours in the restricted space allotted to them at their infant's bedside when the NICU staff is not attending to the infant. Only one private room in the unit is available for an overnight stay, which is located in the Level II unit, and is utilized by the parents of both units. Another private room is available in the Level II unit for other personal activities, and is sometimes used as an overnight room for parents to stay when occupancy is at capacity. Although extended family is allowed into the unit during visiting hours, there is also a large waiting

room adjacent to both NICUs that can accommodate visitor overflow. In addition, a milk expression room is offered to those mothers who desire to lactate in private.

Color and light. Further differences between the two units can be found in the coloration and materiality of the spaces. The Level III NICU features a calming gray, white and blue color scheme on the walls and surfaces with hints of other pastel colors as accents. The Level II design is comprised of white walls and surfaces, but has incorporated a flooring material that simulates wood. By using a material that evokes nature, this feature creates a warming effect in the space as opposed to the gray and white marbled flooring in the Level III NICU.

One more key difference between the two spaces is the amount of natural light permitted into the unit. Level III allows ample amounts of light from windows in one of the longer walls which allows natural light to enter into the space, while the Level II unit has only six small windows to let the light in. Due to the critical state of the infants whose exposure to light may not always be desirable, all of the windows feature operable shading measures.

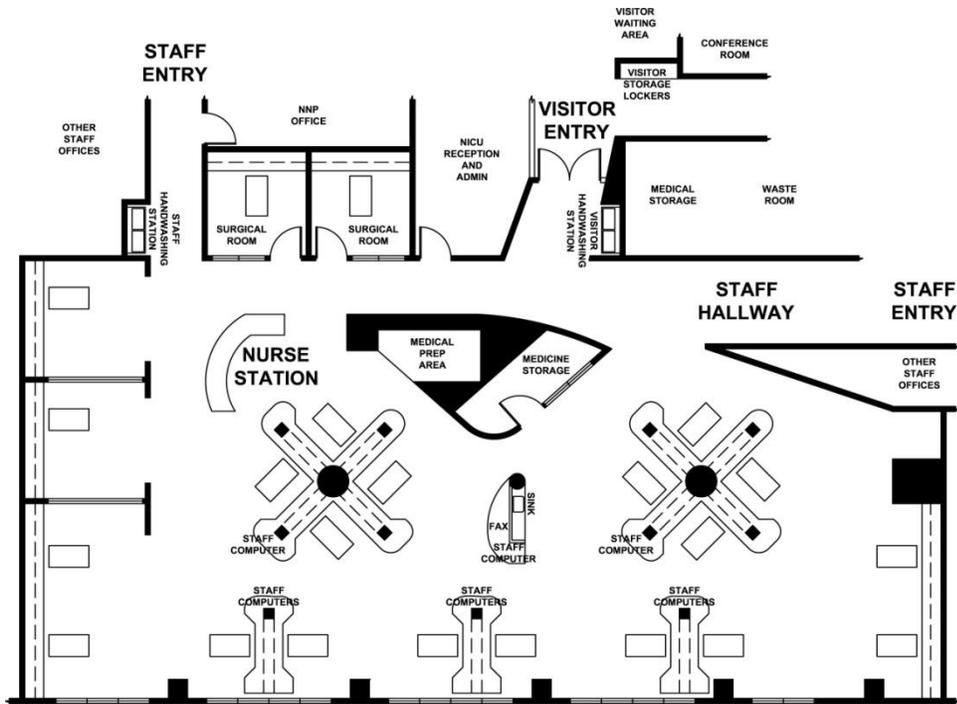


Figure 3-3. Level III NICU floor plan (not to scale).

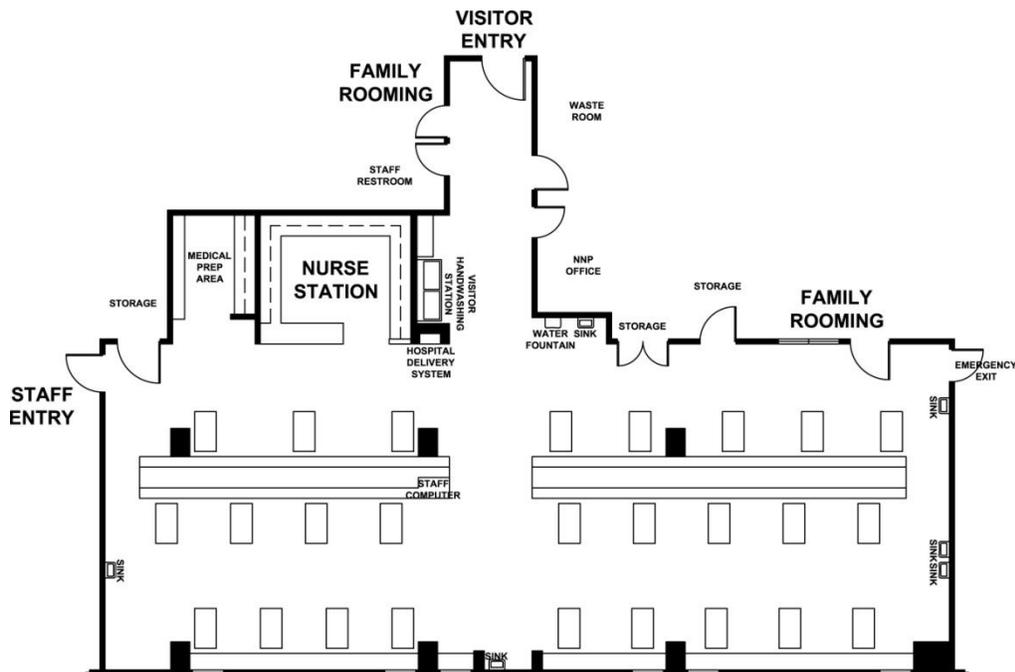


Figure 3-4. Level II NICU floor plan (not to scale).

Seating. The seating available at each infant's bedside for mothers is the same in each unit. The mothers have the option of selecting a pink or blue upholstered recliner

chair that is vinyl-covered and on lockable casters, a rocking chair made entirely of wood with a contoured seat, or an upholstered office chair with arms and casters (see Figure 3-5). There is a limited amount of each type available in the units, so options are contingent on how many chairs are already being used at the time of selection. The office chairs were originally placed in the unit for staff to use at the satellite computers and nurses' stations, but have been made available to the mothers if they desire them. A nursing stool is also available for mothers who are nursing (see Figure 3-5).



Figure 3-5. Furniture examples similar to those found in both NICUs. A) recliner chair (www.swmedsource.com), B) rocking chair (www.simplybabyfurniture.com), C) office chair (www.steelcase.com) and D) nursing stool (www.medelabreastfeedingus.com).

Study Instruments

In response to the extremely sensitive nature of the patients' and their families' circumstances, as well as the Health Insurance Portability and Accountability Act of 1996 (HIPAA) which limits the type of information that can be accessed or referenced for external examination, data was collected through suitable methods such as observation, interview, and questionnaire. The collected information provided evidence of each participant's beliefs, attitudes, values and behaviors. The data also reported the participant's physical, mental and emotional wellness impacted by the physical environment of the NICU.

Interview. The focused interview instrument was prepared to be conversational in nature with 14 open-ended questions to guide the interviewer. These questions inquired about the participants' spatial, visual and auditory privacy, physical control of the space, comfort provided to them at their infant's bedside, aid of NICU staff, and whether desired privacy was achieved. A recording device was used during each interview to provide a more accurate account of the conversation.

Questionnaire. A 54-question structured questionnaire instrument was created for each participant to self-report stressors occurring in the physical and psychosocial environment of the NICU. First, the questionnaire asked mothers about the time spent visiting their child and her activities while visiting in the NICU. Next, the questionnaire utilized the Parental Stressor Scale: Neonatal Intensive Care Unit (PSS:NICU), an instrument developed by Miles, Funk and Carlson (1993) to measure the parental perception of stress in the NICU environment. Finally, the questionnaire collected demographic information.

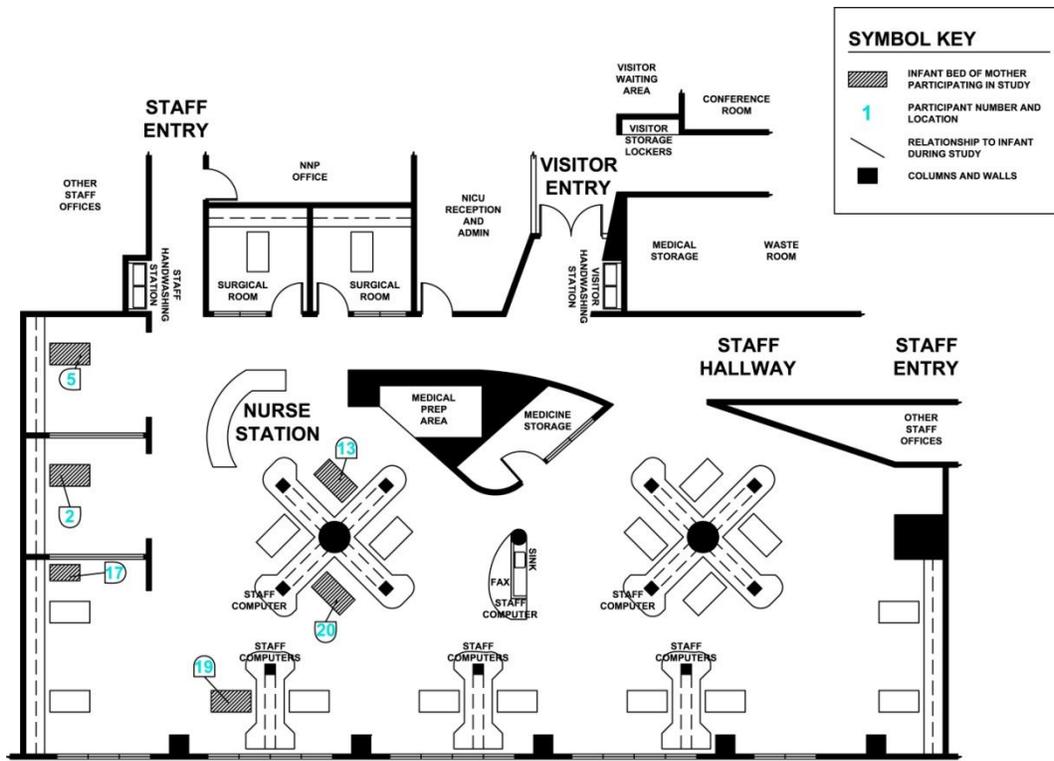
The PSS:NICU instrument asked the participants to rate the stressfulness of their experiences on a scale of 1 to 5 in three categories. The three dimensions of the PSS:NICU are: Sights and Sounds of the Unit, Infant Behavior and Appearance, and Parental Role Alteration (Miles et al., 1993). The rating scale can be defined as follows: 1 or “not at all stressful,” 2 or “a little stressful,” 3 or “moderately stressful,” 4 or “very stressful,” and 5 or “extremely stressful.” The participants also had the option to select “N/A” if they did not have an experience.

Pilot Study. Before the final data collection occurred, a pilot study was conducted to refine the collection strategy with respect to both the content of the data and the procedures to be followed. Three participants were approached to participate in this segment of the study. The first participant was chosen out of convenience to the researcher from another hospital’s open-bay NICU environment. This participant utilized a retrospective view at the time of interview. The other two participants were selected from the current population within the NICU environment that was later to be used for the final case study. One of these two participants was located in the open space of NICU II, the other was located in a surgical room within NICU III and was utilizing a retrospective account as she had previously spent time in the open space of the Level III NICU.

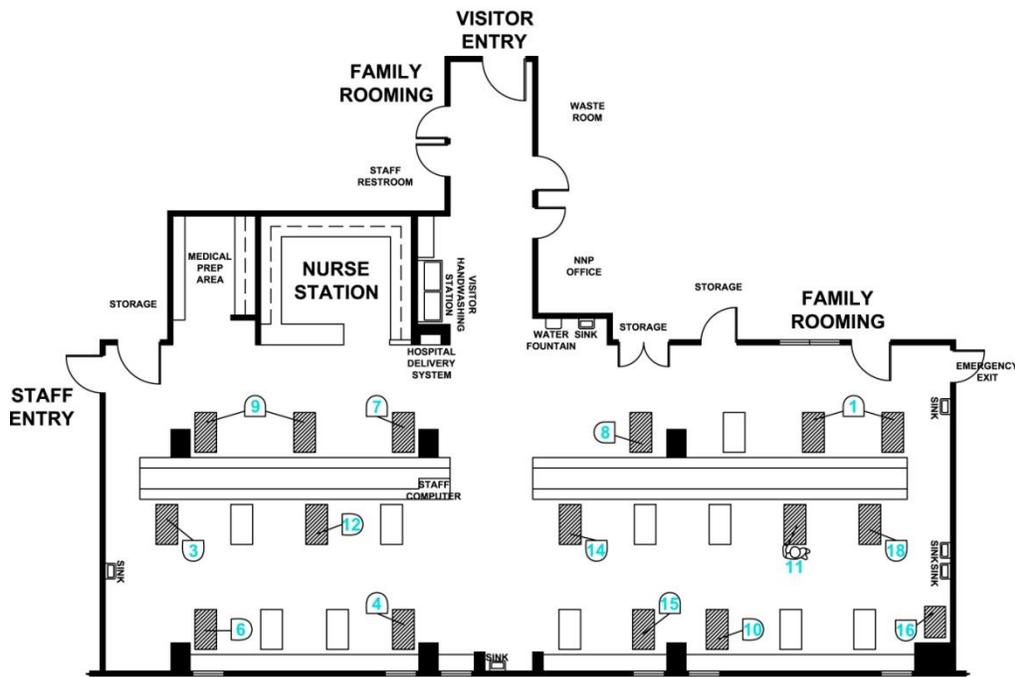
As a result of this pilot test, there were minor changes to the process and instrument prior to the final study. It was first determined that no retrospective accounts should be made as these reports were not as reliable as the account made by the participant currently in the unit. Furthermore, the participants’ bedside behavior was not able to be observed in a retrospective account. Secondly, it was decided that the

participant's infant would need to have occupied the space for more than 24 hours as this time allotment was judged to be enough time spent in the unit to have experienced most of the behaviors being studied. This time allotment had also been used for previous studies by others (Burden, 1998; Carter, Carter, & Bennett, 2008; Fontes Pinto Novaes, Knobel, Bork, Pavão, Nogueira-Martins, & Bosi Ferraz, 1999). Third, the interview questions were reordered to provide a better flow of conversation. Finally, it was decided that mothers who were not yet successful at expressing milk or breastfeeding would also be asked to participate, instead of only approaching mothers who were currently breastfeeding. This could possibly determine whether the unit configuration, in regards to privacy, had any influence on the success rate of lactation.

Observation. Field notes and measurements were taken during data collection to create behavioral maps that chart the individual locations within the NICU space (see Figure 3-6). The information gathered was used to illustrate the possible factors that influence each participant's behavior and explore whether their location within the unit affected their perceived privacy (Sommer & Sommer, 2002).



A



B

Figure 3-6. Behavioral maps with location of each participant. A) NICU III and B) NICU II.

Sampling Procedure

For this study, a non-probability sampling design known as quota sampling was utilized (Kumar, 2005). Following this model, the sample was selected from participants located within the NICU environment. Whenever a person with relevant characteristics was available and willing, that person was asked to participate in the study.

To obtain these study participants, a Neonatal Nurse Practitioner currently working in the NICU screened for possible participants by privately asking each potential participant about involvement in the study prior to introduction to the principal researcher. This meant that identifiable information was not shared with the researcher and no connection can be made between the collected data and participants of the study. Criteria for selection were: 1) participants' infants should have been admitted to the NICU more than 24 hours prior; 2) participants' infants were located in one of the open-bay infant beds, which excluded the closed surgical rooms; 3) most, but not all of the participants should be expressing milk or lactating prior to participating in this study. A participant who was not expressing milk or breastfeeding at the time of study was included to find out if the NICU environment was keeping her from establishing lactation.

Data Collection

Informed Consent

Participants were presented with an informed consent form to obtain written consent to complete the study. The study posed no risks to participants and they could withdraw at any time. The participant was given the opportunity to consider all options and ask questions about the process. Their signature was required for control purposes; however, it was not associated with the participant's name, but an assigned code. A

copy of the informed consent document was released to the participant for their reference.

Questionnaire

Participants were next asked to fill out the four page questionnaire about their experience at their infant's bedside. Participants were also encouraged to ask if they had any questions about the instrument. Notes and observations about the individual participants' local environment were taken while the subject was filling in questionnaire answers. Included in these notes were: date and time; location of participant within the NICU; how much family surrounded the mother; extra information provided to the researcher by the participant upon first meeting; source of auditory noise; lighting source and availability of additional lighting, approximate density; whether staff was attending to their infant; furniture used by mother; space being utilized by personal belongings; and if they were presently breastfeeding at the time of interview.

Interview

Following the questionnaire, participants were asked if they were willing to participate in an interview to provide further information about their environmental privacy experiences in the NICU. All but one participant obliged. The interview consisted of a series of open-ended questions where the participant was encouraged to say as little or as much as they would like. Most were willing to engage in thoughtful conversation. These interviews lasted between 15 to 45 minutes, depending on the depth of the individual's response to each question.

A small gift was presented to each participant upon completion of all data collection. The gift was in appreciation of the participants' willingness to inform the researcher of their experiences while in the NICU environment.

This process continued until sufficient data was collected; the total study lasted approximately eight weeks. During this time, the census of these combined NICUs was low, with an average 36 of 52 beds filled at the time of data collection.

Sample

The participant group in this study consisted of 20 mothers who had at least attempted milk expression or breastfeeding at their infant's bedside within one of the open-bay NICUs (n=20). Fourteen participants were obtained from the Level II NICU and six from NICU III.

All participants were American citizens originally from either the 50 states or overseas territories. This group included females whose ages ranged from 19 to 39 years of age, with the average age of the participants being 29.7 years. All of the age ranges were well represented with the most frequent age range being between the ages of 31-35 years old as seen in Table 3-1.

Table 3-1. Participant age (n=20)

Age in Years	Number	(%)
18-20	2	10
21-25	3	15
26-30	5	25
31-35	7	35
36-40	3	15

Table 3-2 reveals that just over half of these female study participants are currently married, with a quarter of the participants being single or never married. Only three mothers were divorced or separated, and none of the participants were widowed.

The majority of participants attended at least some college (see Table 3-3) which could be expected due to the hospital's location in a university setting. Many had also completed college or held a professional degree.

More than half of the participants declared they were employed, as seen in Table 3-4. Also to be expected due to the hospital's university affiliation was the most common employment position of Teacher or Professor (n=4). Other employment positions included National Sales Assistant, Family Liaison Specialist, Accountant, Cashier, Insurance Instructor, Licensed Practical Nurse (LPN) and Pharmacist. Additionally, the most common range of combined family income was less than \$20,000 per year (see Table 3-5).

Table 3-2. Marital status (n=20)

Status	Number	(%)
Married	11	55
Single/Never Married	5	25
Divorced/Separated	3	15
Widowed	0	0
Chose Not to Answer	1	5

Table 3-3. Years of school completed (n=20)

Education	Number	(%)
Attended Some High School	2	10
High School Graduate	2	10
Attended Some College	8	40
College Graduate	5	25
Hold a Graduate or Professional Degree	3	15

Table 3-4. Employment (n=20)

Employment	Number	(%)
Were Employed	11	55
Were Not Employed	9	45

Table 3-5. Combined family income (n=20)

Income	Number	(%)
Less than \$20,000	6	30
\$20,000-\$40,000	3	15
\$40,001-\$60,000	4	20
\$60,001-\$80,000	2	10
\$80,001-\$100,000	3	15
More than \$100,000	0	0
Chose Not to Answer	2	10

Data Analysis

The data collected in this study is generally qualitative, which is defined by a flexible method that explores the nature of the problem while capturing the richness and diversity of each participant's experience (Kumar, 2005; Sommer & Sommer, 2002). The data was obtained through observations, interviews and questionnaires, which were then analyzed.

A simple content analysis was used to analyze the participants' interview responses to see what themes emerged and how they related to each other. First, an utterance analysis was performed which found the frequency at which a topic was mentioned. Steps in this process included transcribing the interviews, performing topical analyses of the content, identifying primary and secondary categories, performing a frequency count on the different categories, quantifying frequencies, and calculating percentages and averages. Second, an interview analysis by respondent was performed to summarize the interview responses. The responses and main themes that emerged were then integrated into the findings chapter.

Alternately, the PSS:NICU data was analyzed by quantitative methods. Since the study's focus was on the NICU environment, Miles et al. (1993) recommended using Metric 1, or the Stress Occurrence Level, system for scoring the results. For this type of scoring, only those participants who reported having the experience provided a score for each item. Others who did not have the experience were coded as missing. An average score was then calculated for each item which included all participants who experienced that stressor (Miles et al.). These results allowed the data from the stressor scale to be ranked from the most to the least stressful NICU experience.

Limitations

Limitations of this study include the use of an available NICU with its existing environmental features, the research performed at only one site, the available number of participants at time of data collection, and the maturation of its participants. Also, the University of Florida Institutional Review Board (IRB) rules about the Health Insurance Portability and Accountability Act of 1996 (HIPAA) were followed, which limited the kind of information that could be accessed, referenced or used in this study. A few examples of the information not used due to IRB and HIPAA regulations with respect to behavioral research included the participant's name, the birth weight of the newborn, and the infant's condition or treatment.

Assumptions

It was assumed that even though the layout design of the two NICUs were different, findings will be similar since each environment utilizes the same staff, privacy mechanisms and furniture. It was also assumed that even though each mother is afforded the same privacy mechanisms, introverted mothers would have a more difficult experience in an open-bay NICU due to their preference for inner reflection over activity and comfort with solitude.

CHAPTER 4 FINDINGS

This chapter presents the results of data collected from the combined neonatal intensive care units (NICUs) as described in the previous chapter. The characteristics of participants, lactation, stress, environmental privacy and unit design were observed and analyzed. The impact these factors had on the participants' experience is described below.

Mothers' Profile

Twenty participants agreed to take part in the written questionnaire portion of the study. In addition, 19 mothers agreed to participate in the verbal interview and made observations which contributed to the body of findings.

As revealed by the results of the questionnaire, all mothers participating in this study (100%, n=20) reported spending most, and sometimes all of their time at the infant's bedside while in the NICU. Of these participants, 15 percent (n=3) included spending time in the milk expression room and five percent (n=1) reported spending time in the NICU but not at their infant's bedside.

The length of time each participant's infant spent in the NICU at time of study varied due to their date of admittance to the NICU. Nonetheless, the average number of days the participants reported that their infant had spent in the NICU was revealed by the questionnaire results to be 23.9 days. The longest length reported was 77 days, and the shortest length was only two days.

The amount of time each participant spent visiting their infant in the NICU varied as well. Visiting hours were limited to a twelve hour period, from 9 a.m. to 9 p.m., seven days a week (Visiting Hours, 2006). In addition, there was little to no space for each

mother to stay overnight near her infant. The questionnaire results indicated that the number of visits and each visit's length to be relative, with the average length of visit per day being 7.4 hours. Table 4-1 illustrates that the majority of mothers either visited their infant for less than four hours (40%, n=8) or more than nine hours (40%, n=8). The remaining 20 percent (n=4) spent between five and eight hours with their infant per day.

Table 4-1. Average length of time participants spent in the NICU per day (n=20)

Hours	Number	(%)
0-4.0	8	40
4.1-8.0	4	20
8.1-12+	8	40

Lactation

The NICU spaces were found to support the active engagement of parents in the care of their infant, which is the basis of family-centered care. The NICU and its staff support breastfeeding, skin-to-skin contact, and developmental care.

Lactation ability

The majority of participants (95%, n=19), revealed by the questionnaire, were able to lactate at time of study. The one participant who reported inability to lactate had been admitted to the unit just two days prior and had attempted to breastfeed, but at the time of participation had not yet been successful. One respondent even mentioned that the hospital offers a lactation specialist if a mother is having trouble lactating.

The questionnaire also indicated that 75 percent of participants (n=15) were successful at expressing milk at their infant's bedside, whereas only 60 percent (n=12) were successful at breastfeeding at bedside (see Table 4-2). Even though the success rate for breastfeeding was lower than for expressing milk, 75 percent of the participant

population (n=15) reported the ability to make skin-to-skin contact with their infant right before beginning a lactation session.

Table 4-2. Success of expressing milk or breastfeeding at the infant's bedside (n=20)

	Expressing Milk		Breastfeeding	
	Number	(%)	Number	(%)
Successful	15	75	12	60
Attempted, Not Successful	1	5	5	25
Had Not Attempted	4	20	3	15

Distraction

Content analysis by respondent established the primary environmental distraction which kept mothers from initiating lactation while in the NICU was the noise level; including crying infants and monitor alarms (27%, n=5). Secondary distractions included movement, people or busyness around the participant (11%, n=2), lack of visual privacy (6%, n=1), or environmental privacy, in general (6%, n=1). Surprisingly, the majority of participants (50%, n=9) found no environmental distractions keeping them from initiating lactation.

Even though 50 percent (n=9) of respondents suggested they were not affected by distractions in the environment, other non-environmental distractions were noted that kept participants from initiating lactation. These disturbances included trouble with the baby latching on (6%, n=1); finances or other internal thoughts (6%, n=1); difficulty positioning the baby for breastfeeding (6%, n=1) or providing enough milk for twins (6%, n=1); lack of availability of a pump or the child (6%, n=1); and the infant's cords and lines for necessary medical equipment getting in the way of lactation (6%, n=1).

Maternal Stress

Previous experience

According to the results of the questionnaire, this experience was found to be the first child rearing experience for 50 percent of the participants (n=10). Even though the remaining 50 percent of respondents reported having other children, 20 percent of them (n=2) had not previously breastfed or expressed milk. Therefore, a total of 60 percent of all participants in the study (n=12) did not possess previous lactation experience (see Figure 4-1).

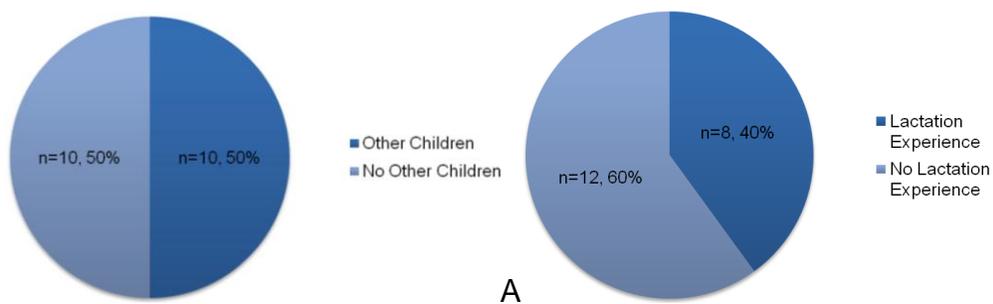


Figure 4-1. Participants with previous experience. A) With other children. B) With lactation experience.

In this study, having another child or previous lactation experience were found to not be factors in determining whether the participant was more or less stressed. Experienced mothers reported overall stress levels similarly to inexperienced mothers. By cross-referencing questionnaire data regarding previous experience to the mothers' overall Parental Stressor Scale: Neonatal Intensive Care Unit (PSS:NICU) scores, it was revealed that each participant who answered this question (n=17) claimed the experience of having their baby hospitalized in the NICU was between a score of 3 and 5, or from moderately to extremely stressful (see Table 4-3), with a median score of 3.71.

Table 4-3. Previous child rearing and lactation experience and how each relates to overall stressfulness of the NICU environment (n=17)

Rating	1	2	3	4	5
Child experience, frequency					
No other children	0	0	5	3	2
With other children	0	0	3	3	1
Lactation, frequency					
No lactation experience	0	0	6	3	2
With lactation experience	0	0	2	3	1

a) Self-reported general stressfulness of NICU experience on a scale of 1 to 5.

Internal psychology

Mothers in this study were asked whether they considered themselves introverts or extroverts. Questionnaire findings revealed that 60 percent of the participants (n=12) reported that their internal psychology was introverted (see Figure 4-2). Thirty-five percent of respondents (n=7) described their personality as extroverted and one participant chose not to answer this question.

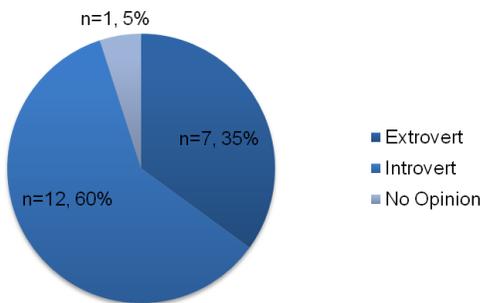


Figure 4-2. Extroverted versus introverted internal psychology.

The study found that self-assessed introverts reported higher ratings of stress more times than extroverts. Of the participant population that considers themselves an introvert (n=12), all combined PSS:NICU stressor scores fell between the ratings of 2 to 5 -- a little stressful to extremely stressful -- with a median score of 3.24. In contrast, the extroverted participants' stressor scores (n=7) fell between 1 and 4 -- not at all stressful to very stressful -- with a median score of 2.93 (see Figure 4-3).

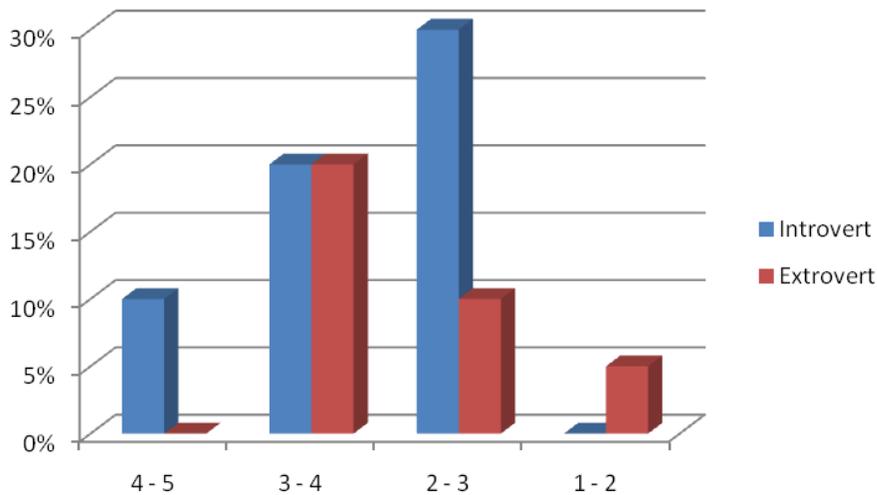


Figure 4-3. Overall stress level rating of introverts and extroverts.

Neonatal intensive care unit experiences

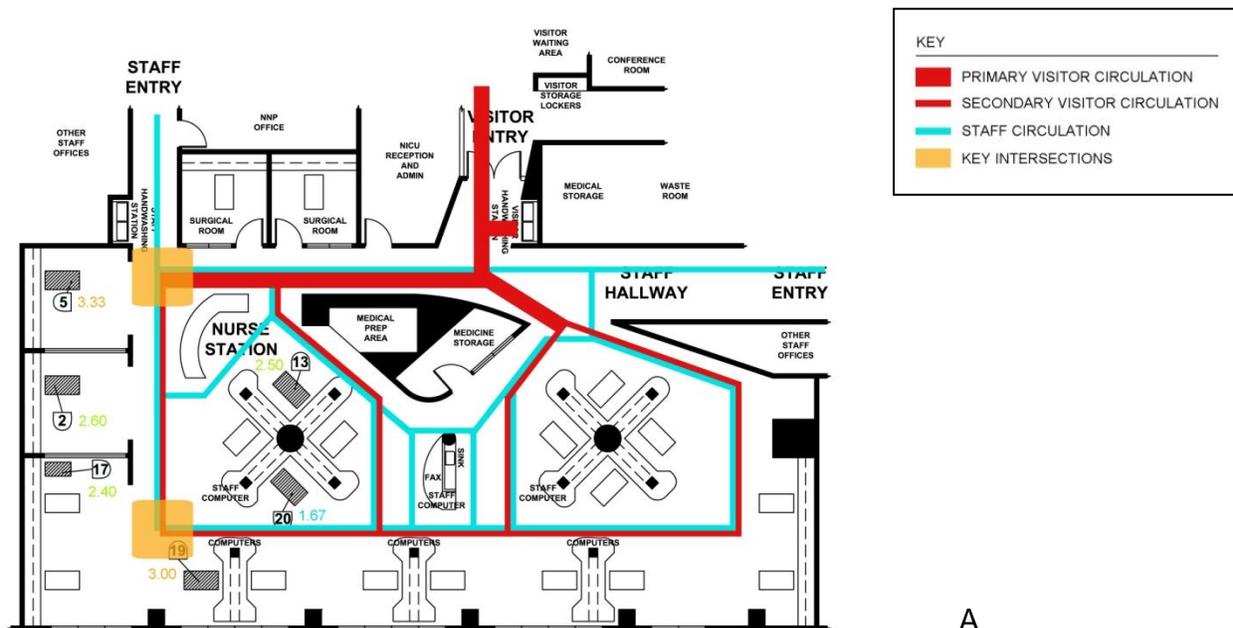
The PSS:NICU, which was embedded in the participant questionnaire, required participants to rate stressors in three categories: *Sights and Sounds*, *Baby Looks and Behaves/Treatments*, and *Relationship with Baby/Parental Role*. Table 4-4 illustrates the average rating given by participants to the experiences in each category, and the number of participants who experienced it. If a participant did not have the experience in the NICU environment, they were not included in the frequency count.

Table 4-4. Average rating of stressors and frequency of participant experience from the PSS:NICU (n=20)

Stressor	Average Rating	n
Sights and Sounds		
Having a machine breathe for baby	3.33	9
Sudden monitor alarm noise	2.95	20
Constant monitor and equipment noise	2.55	20
Monitors and equipment presence	2.35	20
Other sick babies in the room	2.22	18
Large number of staff in the unit	1.90	20
Baby Looks and Behaves/Treatments		
Baby seemed to be in pain	4.21	19
Baby looked sad	3.67	15
Needles and tubes put in baby	3.50	18
Unusual or abnormal breathing patterns	3.36	14
Limp and weak appearance of baby	3.36	11
Tubes/equipment on or near baby	3.05	20
Bruises, cuts, incisions on baby	3.00	15
Unusual color of baby	3.00	12
Baby looked afraid	3.00	8
Small size of baby	2.93	15
Baby fed by intravenous line or tube	2.56	16
Jerky or restless movements of baby	2.44	18
Wrinkled appearance of baby	1.23	13
Relationship with Baby/Parental Role		
Being separated from baby	4.58	20
Not being able to hold baby when I want	4.19	16
Feeling helpless and unable to protect baby from pain	4.11	19
Feeling helpless about how to help baby during this time	3.94	18
Not having time to be alone with baby	3.41	18
Not being able to care for baby myself	3.41	17
Not feeding baby myself	3.37	20
Inability to share baby with family members	3.08	13
Being afraid of touching or holding baby	2.23	13
Overall Rating		
General stress rating of having baby hospitalized in the NICU	3.71	17

In the Sights and Sounds category, “having a machine breathe for my baby” was rated the most stressful experience, with an average rating of 3.33 on a scale of 1 to 5, with nine of the 20 participants experiencing this stress indicator. The second most stressful item, which the entire maternal participant population experienced (n=20), was “the noises of monitor alarms” and had an average rating score of 2.95. This rating corresponds with the content analysis results by respondent which found noise levels in the NICU to be the biggest distraction that kept mothers from initiating lactation. Findings indicate that 54 percent of those who were distracted during lactation were agitated by noise.

The environmental questions within the Sights and Sounds section of the PSS:NICU asked for participants to rate the presence of equipment, noise, other sick infants, and staff nearby. The participants who gave the highest ratings in this category were the subjects located near key intersections in each NICU environment (see Figure 4-4).



A

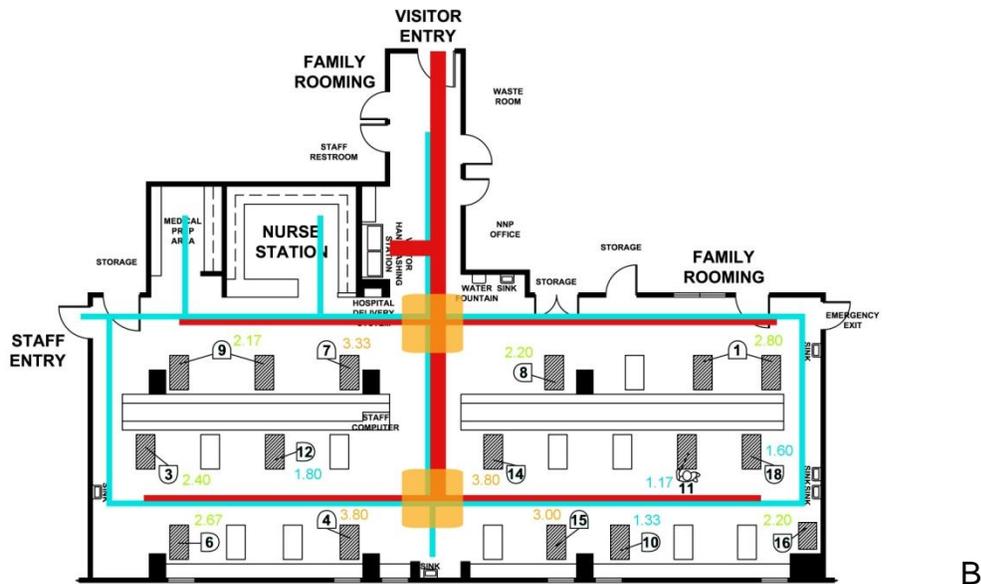


Figure 4-4. Behavioral map of Sights and Sounds category scores. A) NICU III and B) NICU II.

In the Baby Looks and Behaves/Treatments category from the PSS:NICU, the most stressful experience reported by mothers was “when my baby seemed to be in pain.” This item was experienced by 95 percent of participants with an average rating of 4.21 on the 5-point scale. The experience in the Relationship with Baby/Parental Role category that was rated most stressful was “being separated from my baby.” This item had an average rating of 4.58 and was experienced by all mothers participating in this study. These factors, though extremely significant, escape the scope of this study.

When the PSS:NICU scores were tallied per stressor, the environmental privacy experiences were located toward the bottom half of the list (see Figure 4-5). These experiences were not found to be as highly stressful to mothers in the NICU environment. The experience that was ranked as the highest stressor among participating mothers was “being separated from my baby,” while “the wrinkled appearance of my baby” was ranked the lowest. In addition, 79 percent of the

PSS:NICU items were rated above the halfway point of the 1 to 5 ratings, meaning that only 21 percent of experiences were in the range from zero to 2.5; the median score of the 28 stressors was 3.10.

Order	Stressor	Average Rating
1	Being separated from baby	4.58
2	Baby seemed to be in pain	4.21
3	Not being able to hold baby when I want	4.19
4	Feeling helpless and unable to protect baby from pain	4.11
5	Feeling helpless about how to help baby during this time	3.94
6	Baby looked sad	3.67
7	Needles and tubes put in baby	3.50
8	Not being able to care for baby myself	3.41
9	Not having time to be alone with baby	3.41
10	Not feeding baby myself	3.37
11	Unusual or abnormal breathing patterns	3.36
12	Limp and weak appearance of baby	3.36
13	Having a machine breathe for baby	3.33
14	Inability to share baby with family members	3.08
15	Tubes/equipment on or near baby*	3.05
16	Bruises, cuts, incisions on baby	3.00
17	Unusual color of baby	3.00
18	Baby looked afraid	3.00
19	Sudden monitor alarms noise*	2.95
20	Small size of baby	2.93
21	Baby fed by intravenous line or tube	2.56
22	Constant monitor and equipment noise*	2.55
23	Jerky or restless movements of baby	2.44
24	Monitor and equipment presence*	2.35
25	Being afraid of touching or holding baby	2.23
26	Other sick babies in the room*	2.22
27	Large number of staff in the unit*	1.90
28	Wrinkled appearance of baby	1.23

A) PSS:NICU items experienced by less than one-third of subjects were eliminated from the analysis.

* = Environmental Stressors

	RELATIONSHIP WITH BABY/ PARENTAL ROLE CATEGORY
	BABY LOOKS AND BEHAVES/ TREATMENTS CATEGORY
	SIGHTS AND SOUNDS CATEGORY

Figure 4-5. Order of stressors by average PSS:NICU score per experience (n=20).

Environmental Privacy

Environmental Stressors

In order to determine which environmental stressors in the open-bay unit design affected the participants' perceived privacy during lactation, an utterance analysis of the interviews was performed. The results of the analysis uncovered the participants' most frequent references to the environmental stressors (see Figure 4-6). The utterance analysis also revealed which references were most frequent concerning coping with these stressors (see Figure 4-9).

Utterance analysis of mother interviews suggests that environmental stressors in the NICU could be grouped into three categories: *Environmental Features*, *Furniture*, and *Family Intrusion*. Out of 113 utterances, the Environmental Features category, consisting of references to lighting influence, noise intrusion and spatial layout, appeared to be the most frequently referred to, with 49 percent of utterances (n=55). The next highest cited category was Furniture, which claimed 34 percent of utterances (n=39) and contained comments about seating and storage options at the infant's bedside. The third highest cited category regarding environmental stressors was Family Intrusion, which amassed 17 percent of the utterances (n=19), and indicated that other family members in the unit contributed as stressors to the participants.

Category	Sub-Category	References to ...	Code	Freq.	%
Unit Design	Environmental Features	Features that exist in the unit that may or may not contribute to stress (LTG + NSE + SLO)	EVF	55	49
	Lighting Influence	Lighting sources which affect mother or infant in the unit	LTG	6	
	Noise Intrusion	Noise in the unit; generally negative sound intrusion	NSE	14	
	Spatial Layout	Reference to the space being open (generally negative); room configuration; distance from others; personal space; or private rooms	SLO	35	
	Furniture	Moveable or stationary articles for comfort at bedside (STG + SRG)	FUR	39	34
	Seating	Seating options for use during lactation at bedside	STG	24	
	Storage	Location of personal belongings; cabinetry (drawer, counter top), floor, bassinet	SRG	15	
People	Family Intrusion	Reference to the participants' family or other infants' families affecting the mother's experience	FMI	19	17

Figure 4-6. Content analysis of participant utterances regarding environmental stressors (n=113)

The unit design

Recommended standards. The physical environment of the open-bay NICU was evaluated by means of an architectural analysis. Space utilization of the NICU was assessed by comparing the current environment to the guidelines listed in the Recommended Standards for the Newborn ICU Design. However, the Recommended Standards were overhauled in 2006, a full year after the NICU renovation and expansion occurred for the Shands' NICU.

Findings from the architectural analysis revealed that each NICU met Standard 3's minimum suggested aisle clearance adjacent to each infant bed, even though the minimum clearance was increased to eight feet between infant beds in 2006. Similarly, visual privacy provisions were met although there were no fixed screening devices at the bedside. Plenty of visual privacy provisions were available however, including the use of portable screens, nursing covers, blankets, and the milk expression room. NICU III met and exceeded the recommended space allotment for bedside from Standard 3, however, the bedsides in NICU II failed to meet the minimum square footage requirement. Similarly, NICU III is compliant with the guideline for minimum clearance between infant beds with an average 9'-0" allowance between the beds, but with an average clearance of 6'-6", NICU II is not.

Another guideline, Standard 7: Handwashing Stations, was revised in 2006 to recommend that infant beds were to be located no closer than 3 feet to a handwashing station. The results of the architectural analysis indicated that neither NICU completely accommodates the distances specified by this standard. NICU III met the minimum 3 foot clearance between the handwashing stations and infant beds, yet failed to meet the maximum distance from the stations to every bed in the unit. Conversely, NICU II met the maximum 20 foot distance from each infant bed to at least one handwashing station, but just missed complying with the 3 foot minimum due to the addition of a temporary infant bed located within 3 feet of a handwashing sink.

Furniture for storage. Utterance analysis of participant interviews indicated that out of the 39 utterances related to furniture in the NICU design, 38 percent (n=15) made reference to the bedside storage for the participant's belongings. Results of the content

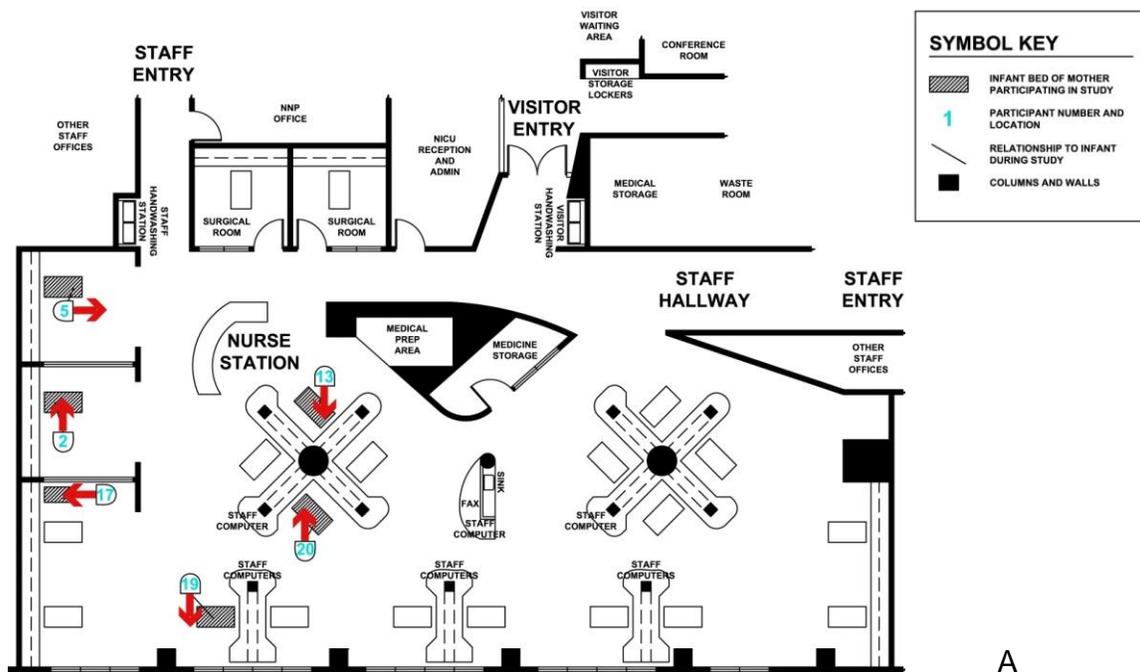
analysis by respondent established storage strategies at each bedside space to include a drawer under the bassinet which is dedicated to the infant's belongings, the counter top which was also used by NICU staff, or the floor at the infant's bedside. One of the respondents in NICU II expressed worry about her belongings being in the nursing staff's way when she placed her things on the counter; and expressed preference for a cubby or dedicated space for her possessions. A second participant in the same unit thought of her belongings as a tripping hazard on the floor, with another participant mentioning her aversion to her things being on the floor since she was unsure of its cleanliness. A third respondent made note that she would prefer not to have to transport her belongings back and forth from home each day; and would like to see some sort of long-term storage for parents. Lockable storage did exist, however, near the NICU III entry for families currently visiting the infant.

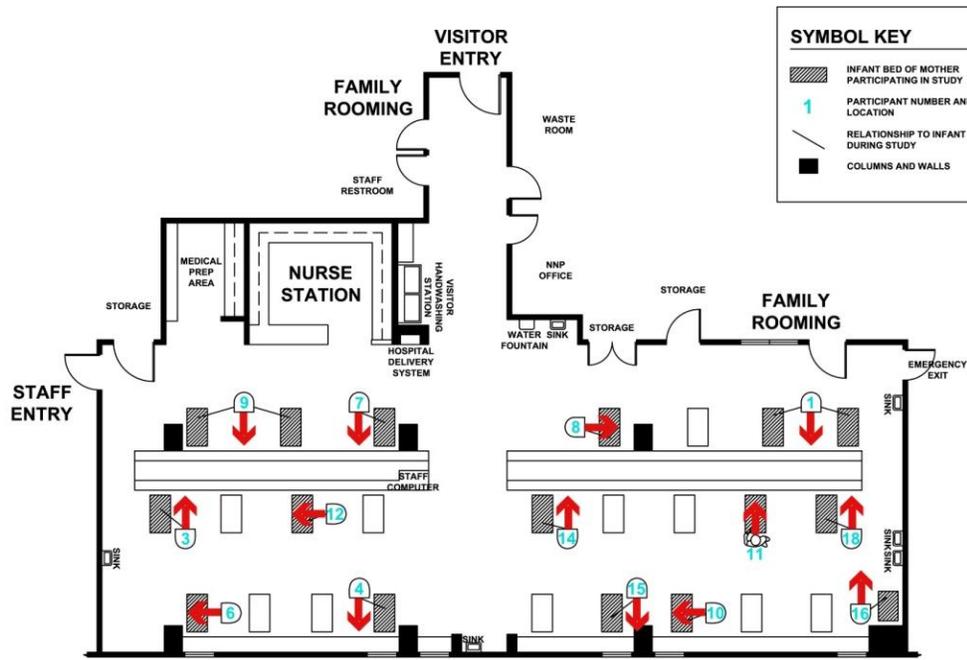
Seating for lactation. According to utterance analysis results of the interviews, 62 percent (n=24) of the 39 comments about furniture in unit design were related to seating options used during lactation at the infant's bedside. Furthermore, content analysis by respondent established that 59 percent of participants (n=10) found the furniture at their infant's bedside provided adequate comfort to be able to express milk or breastfeed. Alternately, 41 percent of participants (n=7) thought the furniture did not provide adequate comfort during lactation, yet there was not a clear preference for type of seating by mother. Respondent analysis found that 47 percent of participants (n=8) favored the cushioned recliner chair, 23 percent (n=4) had only used the rocking chair and found it uncomfortable, 18 percent (n=3) liked both the wooden rocking chair and

cushioned recliner chair, 6 percent (n=1) preferred the wooden rocker, but not the cushioned recliner, and 6 percent of participants (n=1) did not like either chair.

Spatial orientation and circulation

Measurements of each NICU space were recorded and notes of participant behavior patterns and locations were documented via behavioral maps. Mapping the participants' behavioral patterns helped to explain the variation in positing toward the infant which was exhibited by mothers. The spatial orientation, or nonverbal behavior, of each participant was observed by the researcher. The majority of the mothers (65%, n=11) faced inward from the circulation path, while 25 percent (n=5) directly faced their infant's bed with the circulation path at their side, including one mother who was standing instead of sitting. The final ten percent of participants (n=2) faced outward toward the circulation path as seen in Figure 4-7.





B

Figure 4-7. Behavioral maps illustrating the participants' nonverbal behavior. A) NICU III and B) NICU II.

Relationship of the bedside space with respect to the circulation path is also illustrated by a behavioral map. Mapping of this relationship is important in determining the amount of movement or incidental interaction exists in the unit. Infant bedsides that are located directly adjacent to the circulation path garner the least amount of spatial or visual privacy. Figure 4-8 illustrates the primary and secondary circulation paths of the visitors, as well as the circulation path of the NICU staff.

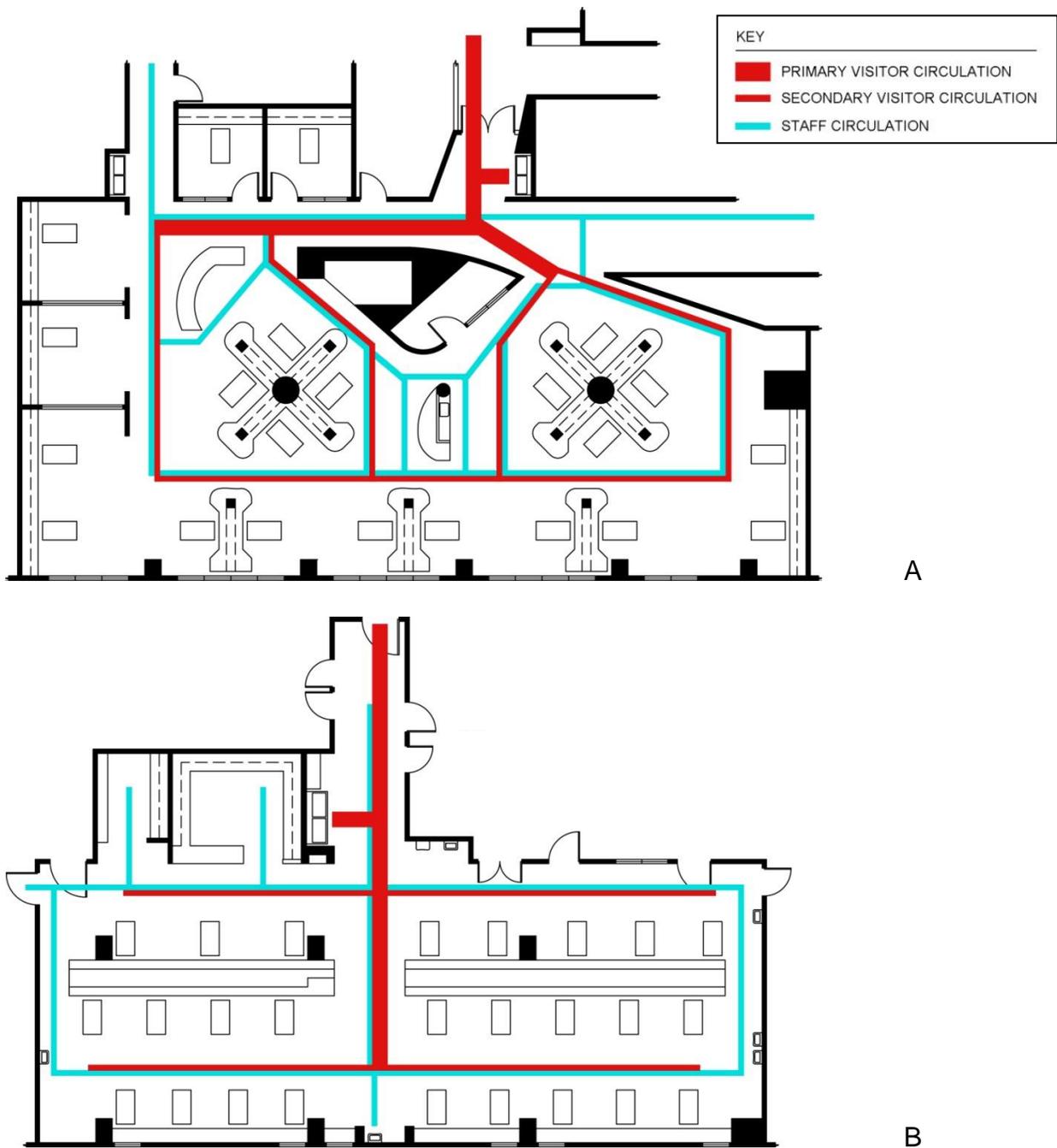


Figure 4-8. Behavioral map of visitor and staff circulation. A) NICU III and B) NICU II.

Coping with Environmental Stressors

Another group of participant utterances were related to coping with environmental stressors. Results of utterance analysis indicated that coping strategies could be categorized as Control of Environmental Features and Staff Accommodation (see

Figure 4-9). Out of 152 utterances, the most significant category of reference was related to Control of Environmental Features, or lighting, noise and spatial controllability, with 78 percent (n=118) of utterances. Spatial controllability, a sub-group of Control of Environmental Features, included four sub-categories: spatial shield, body shield, body direction and seating as shield. Participants also noted Staff Accommodation as a strategy for coping with the environmental stressors with 22 percent of utterances (n=34).

Category	Sub-Category	References to ...	Code	Freq.	%
Unit Design	Control of Environmental Features	The ability to manipulate the features that surround the infant's bed (LTC + NSC)	CEF	118	78
	Lighting Controllability	Control of lighting sources	LTC	18	
	Noise Controllability	Control of sound/noise	NSC	20	
	Spatial Controllability	Physical barriers between an individual and others (SPS + BDS + BDY + STC)	SHD	80	
	Spatial Shield	A screen, crib, Isolette® or incubator; used to shield bedside space from others	SPS	54	
	Body Shield	A nursing cover, blanket, jacket or sweater; used to shield the mother's body from view	BDS	21	
	Body Direction	Mother physically turns body away from others	BDY	4	
	Seating as Shield	Back of chair used to shield mother from others	SAS	1	
People	Staff Accommodation	Nurses' help to overcome a potential stressor	NSA	34	22

Figure 4-9. Content analysis of participant utterances related to coping with environmental stressors (n=152)

Spatial privacy

As reported by utterance analysis, 64 percent of interview utterances related to environmental features (n=35) were about the spatial layout of the unit design.

Comments regarding spatial layout of the open-bay environment included references to personal space, the space being “open,” distance from others, room configuration or private rooms. Of these respondents, one mother expressed, “It’s just really all about the baby, so I just need enough space to hold her.” Conversely, another participant stated that there was “definitely not” enough space and that “you’re stuck with what you’ve got.”

Encroachment. Mothers generally appear to be either more accepting of the necessary encroachment unto allocated or perceived personal space in a healthcare setting, or else more traumatized by it due to the additional uncertainty about their infant’s health. This experience applies to an individual’s privacy and designated space violations during lactation in an open-bay NICU. The content analysis by respondents revealed that 58 percent of participants (n=11) have felt their body was exposed at some point during their visit to the unit. One respondent shared her experience:

Well, after the [caesarean section] you kind of lose your modesty, to be quite honest with you. But yes, even with the screens, there are always doctors, nurses coming through and you’re just kind of ‘hanging out’. It doesn’t bother me as much as it might bother some other people, but I know all the nurses are professionals and they’re just here to help, so that doesn’t bother me. Sometimes in the [space] next door, the father would come visit his baby, I would feel a little like “ok, where’s my cover up” just because he might turn around not knowing what’s going on and get a peek. It does make it a little intimidating. Or you’ll see somebody walk by and I’ll be like, “was that a nurse? Or somebody else?” One time they were giving a tour and I didn’t have the screen closed all the way and one of the nurses was like “let me help you here” and I’m like, “oh, sorry! Thanks! Sorry about that.” Yeah, there’s definitely that open, you feel kind of exposed.

The other 42 percent (n=8) revealed to have felt their body was either well covered when performing private tasks, performed lactation tasks in the enclosed milk expression room, or accepted the necessary personal space violations while in the NICU setting.

Controllability. Utterance analysis of interview responses indicated that mothers used a number of strategies within their designated space at the infant's bedside to gain more spatial and visual privacy. Out of 118 references to the control of environmental features, 68 percent (n=80) were about spatial controllability in an effort to provide spatial privacy. The most frequently cited strategies were: using between 1 to 3 mobile screens; using an incubator, Isollette®, crib or large chair as a screening device; covering themselves with a nursing cover or blanket; and turning their body. These strategies can be clustered into sub-categories of spatial controllability including: spatial shield (68%, n=54), body shield (26%, n=21), body direction (5%, n=4), and seating as shield (1%, n=1), as seen in Figure 4-10. The spatial shield strategies include the utilization of a screen, crib, Isollette® or incubator to shield the bedside space from others, while strategies of the body shield category consists of a nursing cover, blanket, jacket or sweater used to shield the mothers' body from others' view. When a mother turns her body away from others to physically shield her activities from view, it is considered a body direction strategy. The seating as shield category includes the strategy of utilizing the back of a chair to shield the mother from others' view.

Category	Sub-Category	References to ...	Code	Freq.	%
Spatial Controllability	Spatial Shield	A screen, crib, Isolette® or incubator; used to shield bedside space from others	SPS	54	68
	Body Shield	A nursing cover, blanket, jacket or sweater; used to shield the mother's body from view	BDS	21	26
	Body Direction	Mother physically turns body away from others	BDY	4	5
	Seating as Shield	Back of chair used to shield mother from others	SAS	1	1

Figure 4-10. Utterance analysis of participant interviews which relate to spatial controllability (n=80)

There are as many individual feeding schedules as there are mothers in the NICU environment. Multiple participants reported that feeding schedule overlap caused a limited number of privacy screens to be available during peak visiting hours (see Figure 4-11). In fact, respondent content analysis revealed that 95 percent of participants (n=18) always used a portable privacy screen during lactation, sometimes with the addition of another privacy device.

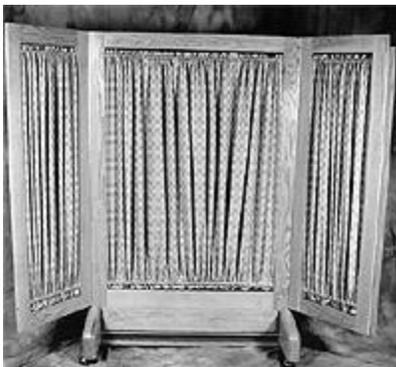


Figure 4-11. Privacy screen similar to those found in both NICUs (www.virtualtoydrive.org).

Staff accommodation. Results from content analysis by respondent indicated that the majority of participants (84%, n=16) were offered at least one type of privacy

device or mechanism by the NICU staff to manage environmental privacy during lactation. One participant only used the pump room to express milk as she was not yet breastfeeding; therefore she wasn't offered to use a privacy mechanism.

Physical distance. Physical distance is a key factor of spatial privacy. According to the content analysis by respondent, 5 of 6 participants (83%) in the level III NICU reported having an adequate amount of physical distance from others at their infant's bedside to be able to express milk or lactate. The sixth mother reported having enough space in the unit until her infant's health began to improve and did not need to be in the incubator. The infant was then moved to a mobile crib and placed in the space between the original incubator and a window wall, which the mother perceived as insufficient physical distance.

The level II NICU had a greater variance in results. Forty-two percent of mothers believed there was not an adequate level of physical distance from others; 33 percent of participants felt there were variables to consider that impacted their perception of available space, such as time of day, day of week, how many infants were in the unit, bed placement in the unit, and if neighboring baby's family members were visiting at the time; and only 25 percent of mothers reported having an adequate amount of physical distance from others to relax and express milk or lactate.

Visual privacy

Shelter from view. As established by respondent analysis of the interviews, only 32 percent of participants (n=6) felt their infant's bedside area provided an adequate level of shelter from unwanted observation or viewing to relax and express milk or lactate. Three of these participants specifically mentioned their answer to this question was how they felt when they were using a privacy screen. Yet another participant stated

that even though she felt the privacy level was acceptable, she would still prefer more visual privacy. Forty-two percent (n=8) did not feel the area provided adequate visual privacy, and 26 percent (n=5) reported their sense of privacy was dependent on variables such as staff accommodations for privacy or the amount of people within the unit.

Lighting. Findings from utterance analysis revealed that out of 55 references to environmental features in the NICU, 11 percent (n=6) were utterances about lighting sources that affected the mother or infant. The interview analysis also indicated that respondents who were bothered by a light source at their infant's bedside nonetheless had the ability to individually adjust the lighting. This was confirmed in the utterance analysis, with 118 references dedicated to coping via environmental features. Of these, 15 percent of utterances (n=18) were related to lighting controllability. In addition, 21 percent (n=4) of the interview respondents did not even know they had control over the lighting at their infant's bedside.

Lighting privacy measures taken by participants who knew they had controllability included using bedside switches to dim the lights around the infant's bed, asking a nurse to dim the lights, or closing the window covering on a window adjacent to their space. One participant was bothered by lighting in a neighboring space, which she was unable to control. Another participant, who had spent time in both the Level III and Level II NICUs, considered NICU III to be "brighter and [have] more of a medical feel" than NICU II. A few of the participants reported fondness for the natural lighting from exterior windows in NICU III, which contributed to the brighter atmosphere in the unit.

Additionally, it was noted by the researcher and participants that the 2' x 2' fluorescent fixtures in the ceiling were never illuminated in either NICU environment. Instead, the lighting source was a series of dimmable recessed down lights controlled by a switch at each infant's bedside location. Furthermore, the only lighting that was judged "harsh lighting" was supplied by incubators in NICU II. This lighting was unable to be controlled by the mother as it was being used as a healthcare technique to improve the infants' wellness. The ambient lighting of NICU II was also judged to be "not as bright" as NICU III. Contrast between the perceived amount of ambient light delivered to the Level II NICU and that from the incubator made the incubator lighting seem harsh in this setting.

Auditory privacy

Noise intrusion. According to utterance analysis of participant interviews, 55 references to environmental features in the design of the unit, 25 percent (n=14) of which were negative responses about noise intrusion. Conversely, findings from content analysis by respondent indicated that 68 percent of mothers were bothered by the noise level at their infant's bedside; however, most mothers still reported the ability to produce milk even though they were disturbed. Noise in the unit included infant monitor alarms sounding, other infant's crying, family and staff conversing, the disruptive sound of hand-washing sinks nearby, or noise from the medicine delivery system when receiving a package. One participant even thought the monitors in NICU III were louder than the monitors in NICU II.

Two of the participants who were not bothered by noise in the NICU were located in the two semi-enclosed rooms with glass walls, which created noise barriers but still experienced a lack of visual privacy. Another participant who was not disturbed stated,

“I am a teacher, so I can block out noises. So the noises don’t necessarily take away from anything, for me.” One last unaffected respondent reported the monitors did not create a disturbance for her since she is a nurse and used to those sounds. She was, however, afraid that the noise bothered her infant.

The level II NICU is a louder environment than the level III NICU due to the more critical state of its patients and thus its higher level of medical activity. Since the infants in NICU II are in a less critical state of health, there can be more interaction with them. This could also be justified given that the NICU II has less square footage yet contains more infant beds, thus tends to have increased social density. Additionally, it was perceived by the researcher that staff conversation levels were the same within each NICU environment.

Controllability. Alarms, conversations, and crying infants are an inevitable part of the NICU environment. According to the utterance analysis of interviews, 17 percent of utterances about control of the environmental features (n=20) focused on noise controllability. Moreover, 78 percent of participants (n=15) believed there was nothing they could do to mitigate noise when at their infant’s bedside, indicated by the content analysis by individual participant responses. Eleven percent (n=2) reported not being bothered by the noise, and another 11 percent (n=2) found a solution or positive distraction to diminish the noise level. The techniques used to avoid the undesirable noise quality included asking a nurse to shut off an alarm, having the auditory alarm turned off in her infant’s monitor while breastfeeding so only the light flashes, or concentrating on the soothing music from a device brought in by a neighboring mother.

Several participants shared additional comments about noise in the environment. Numerous mothers reported the nurses were “pretty good about attending to alarms shortly after they sounded, or even sending another staff member to do so if they were not able to attend to it themselves.” One participant who had already spent a long time in the space even stated, “I can’t turn off the alarms I know on her machine. They’ve taught me how to reset it if it becomes blocked - how to straighten her arm and push restart, but I don’t do that with all the nurses because I don’t know if they feel comfortable with me knowing how to do it.”

Overall privacy

Milk expression, breastfeeding and skin-to-skin contact are private experiences for many mothers. Even though the hospital provides privacy devices and mechanisms to shelter mother-infant interactions from others in the NICU, some mothers bring in their own devices to help gain refuge from the surrounding environment. According to the results of the content analysis by respondent, 26 percent of participants (n=5) reported bringing in an extra privacy mechanism from home. These devices included a nursing cover, blanket or jacket to shield the mother’s body from view. It was also found that a few participants brought items from home for physical comfort during their time in the NICU. For instance, one participant brought in a feeding pillow to assist her in positioning the child to comfortably breastfeed.

Content analysis by respondent also suggested that 55 percent of participants (n=10) were unable to achieve the overall privacy they desired while trying to lactate at their infant’s bedside. Thirty-nine percent (n=7) reported achieving their desired overall privacy level and 6 percent (n=1) expressed occasional achievement.

Conclusion

In summary, findings related to participant characteristics, lactation, stress, privacy and unit design range were discussed. The key results from the demographic information collected by the questionnaire reported that all of the participants had at least attempted lactation at the time of study, half had reported having other children, 40 percent reported having previous lactation experience, and 60 percent of the participants thought of themselves as having an introverted personality.

Findings from the Parental Stressor Scale embedded in the questionnaire, established that the most stressful experiences were those related to parental role alteration, yet environmental experiences were not found to be as stressful as anticipated. Nonetheless, the participants for whom these were negative experiences, and also gave the highest ratings to the environmental category of experiences, were those individuals located at key intersections of circulation. This location most certainly contributed to the participants' responses to the environmental stressors.

Utterance analysis of the focused interviews established that the largest amount of references to environmental stressors were on the environmental features of the unit design, such as spatial layout, noise intrusion and lighting influence. It was also revealed that the largest amount of utterances regarding how participants coped with environmental stressors were related to control of those environmental features, including spatial, noise and lighting controllability. Additionally, all but one of the participants in NICU III felt there was adequate spatial privacy for lactation; however, NICU II participants showed greater variance in their responses.

Findings from the content analysis by respondent indicated that 68 percent of participants in both units felt there was not enough auditory privacy for lactation.

Similarly, unwanted noise was reported to be the primary distraction that kept participants from lactating. With these findings, it is not surprising that 55 percent of participants found they were unable to achieve the overall privacy they desired while attempting to lactate at their infant's bedside.

Through architectural analysis of each open-bay unit, it was found that the Level III NICU complied with the bedside space and privacy standard from the *Recommended Standards for Newborn ICU Design*, but the Level II NICU did not. Therefore, the design of NICU II does not provide the minimum space prescribed for privacy, nor to address the complexity of care needed for family involvement at bedside. Given these spatial constraints, observations were made which found nonverbal behavior of chair positioning signaled an individual's preference for interaction with others. Over half of participants faced inward from the circulation path which indicates a preference for isolation.

CHAPTER 5 DISCUSSION

The purpose of this case study was to evaluate the physical environment of an open-bay neonatal intensive care unit (NICU) to discover the extent to which its features contributed to environmental privacy, perceived stress and overall comfort of an infant's mother when performing lactation at bedside. Much of the current literature on NICU design is focused on staff interactions with the environment, evolution of floor plans from the open-bay to single-family room configuration, and the affect different NICU layouts have on an infant's health. However, previous research has not centered on the connection between the mother's experience of privacy at the infant's bedside during lactation and the affects the environmental features have on these experiences. Therefore, the purpose of this study was to investigate mothers' interactions with the physical environment during the process of lactation, as well as determine if privacy features in the open-bay configuration contribute to environmental stress. Below are the main highlights which connect findings to the study's purpose and significance.

Findings revealed that participants who gave the highest score to the Sights and Sounds category of environmental stressors on the Parental Stressor Scale: Neonatal Intensive Care Unit (PSS:NICU) rating scale were those located at key intersections of the circulation path in each unit, yet these experiences overall were not found to be scored as highly as experiences related to parental role alteration or the infant's appearance. In fact, the most stressful experiences in this sample group were those stressors related to alteration of the parental role.

Findings from this study also revealed *environmental features* of the unit design as the most important factor in regards to environmental stressors; followed by *furniture*

and *family intrusion*. It was discovered by architectural analysis that the environmental features in the Level III NICU complied with the space and privacy standards set forth by the *Recommended Standards for Newborn ICU Design* for an open-bay unit, but the Level II NICU did not. Interestingly, 64 percent of participant utterances were about the spatial layout related to environmental features in the unit design (n=35). Spatial layout comments were generally negative and included references to personal space, the space being open, distance from others, room configuration or private rooms. Additionally, just over half of participants found at least one of the seating options comfortable enough for lactation at the bedside space, even though there was not a chair that was an overwhelmingly preferred choice.

In order to cope with the environmental stressors in the unit, mothers were observed spatially orienting their chair in whatever direction felt most comfortable or most private in the bedside space. The largest amount of participants chose to face inward, away from the circulation path, which indicted their preference for isolation. In addition, participants mentioned other ways in which they coped with environmental stressors. These comments indicated that the most significant category of utterances was *control of the environmental features*, which claimed 78 percent of the comments; while the other 22 percent of utterances was about coping via *staff accommodation*.

The findings also uncovered a link between environmental privacy and the configuration of each unit. The majority of participants (83%) in NICU III, where beds are placed at larger physical distances from one another, felt there was an adequate amount of spatial privacy. Conversely, NICU II, where beds are physically closer to each other, contained only a quarter of participants (25%) that were satisfied with the

spatial privacy. Contrary to the split findings of spatial privacy, the majority of participants in both units felt there was not adequate visual privacy (42%, n=8) or auditory privacy (68%, n=13) for lactation activities. In addition, 68 percent of references to control of environmental features (n=80) were regarding spatial controllability in an effort to provide spatial and visual privacy, whereas only 17 percent of utterances were about noise controllability.

As briefly highlighted above, this chapter discusses findings in regards to the mothers' profile, which includes maternal characteristics and stress, as well as environmental privacy, which features discussion of frequent issues, location in the unit and staff accommodation. Recommendations are given to enhance the mother's experience in the open-bay NICU environment, as well as implications for future research on this topic.

Mothers' Profile

Maternal Characteristics

Time in the neonatal intensive care unit

Data from the interview instrument confirmed that every mother who participated in this study reported spending most, and sometimes all of their time at the infant's bedside. This perhaps occurred since the infant was the mothers' priority and the only reason for visiting the NICU, yet could have also occurred due to the limited spaces designed for family members to spend time. The only other spaces accessible to NICU mothers were the milk expression room and the family waiting areas. While televisions, magazines and internet access were provided as entertainment in both waiting rooms, access to nature was not afforded.

The number of days each participant reported that their infant had spent in the NICU was revealed by the questionnaire results, which highly varied from two to 77 days. Further research is needed to find out if the length of time the infant has been in the NICU correlates with a change in the comfort, satisfaction, perception of privacy or perception of stress experienced by the mother.

The questionnaire provided information which showed that the average amount of time each participant spent visiting their infant in the NICU varied from three to twelve hours per day. The length of time per day each mother spent with their infant did not correspond with their employment status, nor did it link to any other demographical statistic such as age, marital status, family income, schooling, or whether they had other children. Additional research with a larger sample may possibly uncover statistical relationships in regards to time.

Lactation

Jaeger et al. (1997) established that even in the best of conditions breastfeeding was a challenging task for many women, and that facilitation of breastfeeding in the NICU can be particularly difficult. Yet this study's questionnaire findings indicated that all but one individual in the participant sample had the ability to lactate at time of study, with 60 percent having breastfeeding success. This finding suggests that the built environment did not play as significant a role as expected in facilitating lactation, meaning that motivation is a greater force than environmental influence. Perhaps this occurrence could instead be attributed to the timing of information each mother received before the birth of their infant. Lessen and Crivelli-Kovach (2007) reported a significant correlation between the breastfeeding information mothers received prenatally and postpartum with the initiation of lactation; as mothers who received knowledge

prenatally were more likely to initiate lactation than those who were informed of lactation benefits postpartum.

As Furman and Kennell (2000) and Talmi and Harmon (2003) point out, there are few opportunities for relaxed and intimate interactions for parents with their hospitalized infant, which typically produces a great deal of stress and emotional turmoil for the parents. However, skin-to-skin care can be a stabilizing experience for the mother and infant and provide an opportunity for intimacy (Furman & Kennell; Talmi & Harmon). Seventy-five percent of participants in this study were able to make skin-to-skin contact with their infant before a lactation session, which conceivably had positive emotional effects on the mother-infant connection (Hurst et al., 1997) and aided the transition from gavages and bottles to breastfeeding (Lessen & Crivelli-Kovach, 2007).

Maternal Stress

Previous experience

Spear et al. (2002) observed the mothers' previous experience to be the determining factor for the degree of stress they suffered. Mothers without a previous infant were considered to have less ability to cope with stress than more experienced mothers (Spear et al.). In this study however, there was no conclusive evidence that having another child or previous lactation experience determined the degree of stress. Experienced mothers tended to report overall stress levels similar to inexperienced mothers. This finding could suggest that the intensity of the stress related to having a premature child and all of its associated emotional and financial ramifications override the effect of previous experience. Further research on psychosocial issues affecting NICU mothers might explore whether this is the case.

Internal psychology

Another factor Spear et al. (2002) related to the degree of stress suffered by the maternal population was their internal psychology. Introversion and extroversion were the internal psychology characteristics used in this study to determine how a mother would cope in the unfamiliar NICU environment. It was hypothesized that introverted mothers would have a more difficult experience in, or a harsher opinion of, an open-bay NICU due to their hesitance to engage with others with whom they are unfamiliar. It was also thought that introverts would have trouble with the lack of permanent physical barriers which separate their space from others. Findings in this study indicate slight differences between the experiences of introverted and extroverted mothers. Sixty percent of participants reported an introverted internal psychology, 35 percent reported an extroverted psychology, and five percent, or one participant, opted not to answer the question. Of the respondents, it was found that the combined PSS:NICU scores of the introverts were higher overall than the scores of the extroverts. In other words, on a scale of 1 to 5, the introverts' scores ranged from 2 to 5, with a moderately high median score of 3.24, while extroverts' scores were between 1 and 4, with a lower median score of 2.93. Perhaps this was because introverts found violations of their designated space to be more stressful than extroverts, whereas extroverts feel more comfortable maintaining closer personal distances than introverts (Altman, 1975; Jung's Theory, 2009).

When applying Magnusson's (1982) Stress Theory to this study, it was established that the lactating mother's reaction to the demands of environmental privacy was viewed as stress when the environmental load exceeded the limits of their coping capability. This theoretical framework related to the findings in this study through the

internal psychology factor of extroversion and introversion. Related findings were about the differences that exist between the experiences of introverted and extroverted mothers as the combined parental stressor scale scores of the introverts were higher than the scores of the extroverts. An additional finding related to the theoretical framework was the discovery of higher environmental stress levels reported by introverts located at key circulation intersections in each unit, whereas the extrovert that was located in the same region reported the only lower environmental stressor score, relatively speaking.

Neonatal intensive care unit experiences

In the PSS:NICU instrument, experiences are divided into three categories: Sights and Sounds, Baby Looks and Behaves/Treatments, and Relationship with Baby/Parental Role. Overall scores for each of the three categories, as well as individual participants, were able to be determined by utilizing the self-reported information of this instrument.

Average scores for each individual PSS:NICU experience were determined, then ranked from the most to the least stressful experience. The highest ranking experience was “being separated from my baby” which falls under the Relationship with Baby/Parental Role category of the instrument. This study confirms the findings of Carter et al. (2007), Dudek-Shriber (2004) and Seideman et al. (1997) which report the experiences in the Relationship with Baby/Parental Role category as the top set of stressors, with the Baby Looks and Behaves/Treatments category of experiences rating second highest. These findings conflict with a study by Miles et al. (2002), which observed stressors in the Baby Looks and Behaves/Treatments category to be the top cause of stress in the NICU. However, the literature did not report the unit configuration

for either of these studies; therefore, future studies are needed with larger sample sizes and varying configurations.

The same list of ranked stressors revealed all environmental experiences to be located near the bottom of the list and with lower scores, which indicates that these experiences were not found to be as highly stressful to mothers as many other items from the Relationship with Baby/Parental Role and Baby Looks and Behaves/Treatments categories. This may have occurred because the inherent strength of the bond between mother and child, or the severity of the infant's illness, may have overridden the effect the NICU environment had on mothers. Other explanations were offered by Dudek-Shriber (2004) for the lower environmental stressor scores, which include: perception that the environment is helping the infant's health or illness, familiarity with intensive care units via media outlets, and parental experience that may have prepared them for the NICU environment.

In this study, the median of the Sights and Sounds category of the PSS:NICU, the category which contains the largest number of environmental experiences, landed at the center of the five-point scale, or 2.49. Yet it was found that not all experiences relating to environmental privacy were included in the instrument. This indicates that this instrument may not accurately illustrate a true stressor score for all environmental qualities. Qualitative findings in the study relating to privacy mechanisms suggest influences that were missed in this category, which indicates that further research on inclusion of these stressors may help determine whether environmental qualities relating to privacy design are factors of increased perceived stress of the infant's mother.

When cross-referencing the individual scores of the Sights and Sounds category to the location of each participant within each unit, it was found that participants located near key intersections of the circulation path reported the highest level of environmental stress, or highest Sights and Sounds scores. In conjunction with this finding, all but one of the participants located at the key intersections gave a relatively high Sights and Sounds score of 3.0 or higher on a scale of 1 to 5. The one participant who reported a lower score was the only one in this group who reported having an extroverted internal psychology, which meant they have an interest in people and activity, and are influenced by their environment (Jung's Theory, 2009). The rest of the participants at intersections were introverts who preferred inner reflection over activity, and were more stressed by their location in the NICU environment.

Overall stressor scores

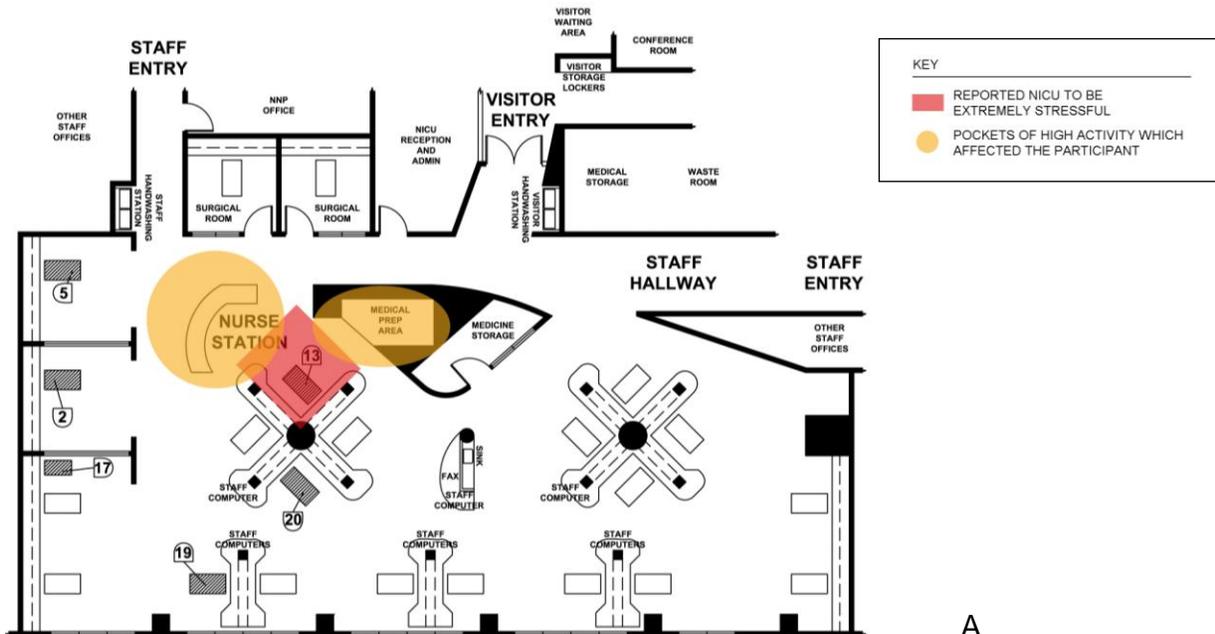
For the PSS:NICU instrument, there were two scores for each participant that could be considered "overall" scores. The first is the averaged score of the combined experiences per individual, comprised of the individual scores from the three PSS:NICU categories. The scores on a scale of 1 to 5 for all the individuals' experiences were averaged together to produce this combined score, with the final score being rounded to the hundredth decimal place. The second overall score refers to the question from the PSS:NICU that asked participants to indicate "how stressful, in general, the experience of having their baby hospitalized in the NICU has been for them" (Miles et al., 1993, p. 3). This overall score was rated similarly as the individual experiences in a five-point scale. This "in general" score, however, is a whole number as it is not averaged with any other score.

A comparison of these scores showed that the single “in general” score exceeded the averaged “combination” score per respondent 75 percent of the time, with the exception of five participants who reported the opposite. On a scale of 1 to 5, the average of the “in general” scores was 3.27, yet the average of the “combined” scores was 3.71. Even though they are both considered moderately stressed scores, this finding could indicate that there are more environmental privacy experiences in the open-bay NICU that are not currently being captured by the PSS:NICU instrument. This claim is supported by comments made by two of the participants. It is worth noting that these comments were made prior to exposing the participants to questions about environmental privacy during the interview, although they were told the main focus of the study prior to agreeing to participate. One participant reported, “In general the privacy to breastfeed or pump [was stressful during the time in the NICU];” “Not having enough privacy causes stress;” and “The area is too open, even with screens.” The second participant’s comments were as follows:

The entire experience is not one that I wish to repeat or have anyone go through if not absolutely necessary. Some tests were not accurate and this was very stressful. We eventually fixed the problem; however, the timing was very bad and unavoidable. PRIVACY would have been very important and still is.

Out of nine participant who left comments, the other seven commented about stress related to the separation from their infant, which includes not being able to stay with the infant overnight and not being able to take the infant home; lack of communication between doctors and parents—for instance, the inability to speak to the doctor if the parents miss the doctor during “rounds”; internal thoughts such as financial stress; having different caregivers—for example not being able to have a constant person that is taking care of their infant; and not knowing an exact release date for their infant.

The three participants in this study who reported their “in general” NICU experience to be “extremely stressful” were located adjacent to areas of high activity, such as the unit entrance, medicine storage, family rooming, and nurse station, usually with two or more pockets of activity nearby (see Figure 5-1). This seems to indicate that mothers of infant’s whose beds are located near high occurrences of activity are likely to report higher overall stressor scores for their experience in the NICU environment. Additionally each of the participants who gave their NICU experience the highest possible stressor rating reported their internal psychology to be introverted, meaning that these individuals prefer inner reflection over activity and are happiest when alone (Jung’s Theory, 2009). However, this phenomenon requires further investigation as the lowest stressor scores did not belong solely to extroverts.



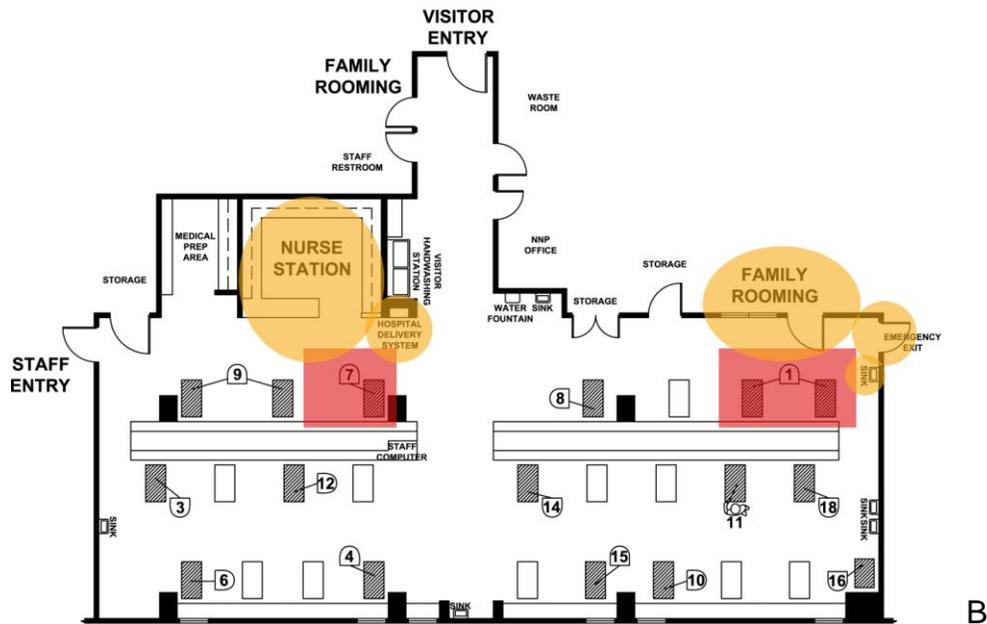


Figure 5-1. Location of participants with the highest overall PSS:NICU scores. A) NICU III and B) NICU II.

Environmental Privacy

This study has revealed environmental privacy issues missing from the PSS:NICU instrument which could improve the instrument if they were added. These privacy issues include the adequacy of visual privacy, or shelter from unwanted observation, and spatial privacy, or distance from others and designated space, provided to each participant. Recommendations are given later in this chapter as these environmental privacy issues should at least be considered during scoring as they may determine the discrepancy in the overall perceived stress ratings of the parental population.

Frequent Issues

According to the utterance analysis of participant interviews, two groups of utterances were discovered within the original set of participant comments: those about perceived environmental stressors and those related to coping with them. Literature indicates that environmental stressors are long-term conditions of the physical

environment that are uncontrollable and may potentially result in stress or anxiety (Devlin & Arneill, 2003; Topf, 1994; Veitch & Arkkelin, 1995). In addition, Stewart-Pollack and Menconi (2005) suggest that people respond negatively to environmental stressors since they affect the individual's need for privacy.

In this study, the categories that emerged in the course of the utterance analysis from the group of environmental stressors responses were environmental features, furniture and family intrusion. Environmental features was the most frequent utterance category of the three as it was mentioned 55 times and generated 49 percent of comments in this group. It was also discovered that two categories emerged from the coping with environmental stressors utterances. These categories were control of environmental features and staff accommodation, with control of environmental features being the most frequent utterance category as it was mentioned 118 times and amassed 78 percent of the group's comments. The relationship of these findings can be interpreted to mean that privacy and satisfaction of participants in an open-bay NICU heavily relies on the environmental features, as well as the control of these features. In support of this finding, literature on controllability established that the perceived relationship between an individual and their environment is essential for effective functioning, as people have a strong need for control with respect to situations and environments (Stewart-Pollack & Menconi, 2005). Furthermore, having control with respect to a potential stressor reduces and sometimes eliminates the negative effects of the stressor (Stewart-Pollack & Menconi; Ulrich, 1991).

Spatial configuration

By analyzing each open-bay NICU configuration it was found that the NICU III complied with the Recommended Standards for Newborn ICU Design, *Standard 3*:

Minimum Space, Clearance, and Privacy Requirements for the Infant Space (White, 2007b), while NICU II did not. The Recommended Standards are not a requirement, yet are highly encouraged. However, this finding suggests that at the time of the NICU II renovation, the square footage of the unit was not increased to meet the recommended standard, perhaps because space for other unit features such as storage or refrigeration were prioritized. Additionally, the limited clearance between patient beds in NICU II was perhaps dependent on the hospital's census demand which took precedence over the amount of space that was allotted at bedside. In a study by Gifford and O'Conner (1986) which examined the effects of physical distance on the intimacy of seating arrangements, it was found that intimacy was strongly related to physical distance. Further research is needed to determine priority of space allocation in an open-bay NICU and to make a stronger case for physical distances between bedside spaces given the intimacy of mother-infant interaction during lactation.

Storage. The other 38 percent of participant utterances regarding furniture in the NICU from the utterance analysis was in reference to bedside storage. The current options for the family's belongings were limited to the counter top or the floor at the infant's bedside. Since both of these may also be in the way of the NICU staff when caring for the infant and perhaps may become a hazard, other options should be considered for dedication of the family's personal effects. One participant stated that, "I try not to spread out that much. I try to keep my belongings pretty minimal and together. I do have someplace to put my stuff, but I do feel like I'm apologizing a lot because I do feel like I'm in the way. And they say that I'm not, but I still feel like I don't have enough space." Another participant added that:

There's no where really for us to our stuff besides the floor and I don't know how often that area's mopped. And there's a lot of stuff, ya know. I think, because we're trying to keep our hands clean, and I don't want to reach down to the stuff and then, possibly need hand washing.

Standard 11: Family Support Space from the Recommended Standards also has a provision for lockable storage which suggests that "secure storage for personal items should be provided at each infant space" (White, 2007b, p. S10).

Seating. According to utterance analysis of participant interviews, 62 percent of comments regarding furniture in the unit were about the seating options used during lactation, while 59 percent of participants agreed that the seating at bedside had provided an adequate amount of comfort for lactation activities. Even though more than half of participants found the seating options acceptable, they were unable to agree on their favorite chair. The variance in seating preference is clearly the reason why NICUs are designed with seating options. One participant who claimed liking different chairs for different reasons stated, "Sometimes depending if you've been here for awhile the rocking chairs seat get a little hard, so the nurses will bring you a pillow. Or they have nice comfy recliners. The recliners are definitely the best, but I like to rock him too, so... If I'm going to be here for a long period of time, I'll usually use a combination of both. I'll rock him for a little bit, then I get the recliner." Furthermore, *Standard 11: Family Support Space* from the Recommended Standards for newborn ICU design suggests comfortable seating be provided for lactation (White, 2007b), which can be interpreted to mean that comfort strategies for different body types should be accommodated for use during milk expression and breastfeeding.

Spatial orientation

Directional orientation is interpreted as nonverbal communication that may signal openness to communicate or whether interaction is welcomed (Gifford & O'Conner, 1986; Stewart-Pollack & Menconi, 2005). According to observations in both NICU environments, the directional orientation of each participant at their infant's bedside varied, with 65 percent of mothers facing inward from the circulation path which indicated preference for isolation. One of these participants indicated using the chair back as a privacy mechanism, which supports the theory. However, alternative interpretations of the participants' directional behavior are possible. The individual's chair could have been directionally oriented by a nurse upon arrival, or perhaps the participant could have felt unable to reorient the chair due to the spatial limitations of the bedside area.

Spatial privacy

Utterance analysis of participant interviews also determined that the most frequent sub-category of environmental features, or 64 percent of utterances, was in regards to spatial layout of the unit; including references to personal space, the space being "open," distance from others, room configuration or private rooms. This finding infers that the layout of the unit was the overwhelming environmental feature that had an effect as a stressor on participants. Recent studies have previously concluded this, which is perhaps the reasoning for the shift to the single-family room (SFR) unit configurations. Shepley et al. (2008) explain that SFR units support privacy for parent-infant interactions better than open-bay units and are viewed to be a less stressful unit configuration as the individual rooms provide families with improved environmental privacy, as well as sleeping and waiting areas. Stewart-Pollack and Menconi (2005)

therefore claim that the challenge is for open-bay NICUs to provide as much control and individual privacy within the limited space as the SFR units.

Similarly, the most frequent sub-category related to control of environmental features from the utterance analysis was spatial controllability, with 68 percent of utterances. Spatial controllability strategies include using a spatial shield or a body shield, manipulating body direction and positioning the seating to use as a shield. These findings were interpreted to mean that mothers heavily rely on spatial control mechanisms to create their desired privacy. According to Stewart-Pollack and Menconi (2005), controllability is one of the most important factors influencing perceived privacy and stress levels for mothers in a health care environment; therefore, control of personal space is important in establishing privacy requirements (Human Behavior and Interior Environment, 1997) so it does not develop into further stress for the individuals.

More than half of the mothers in this study felt that their body had been exposed at some point during a lactation session in the NICU. This can be interpreted to mean that at some point while expressing milk or breastfeeding, these mothers were not well covered by a privacy control mechanism. Each individual has their own levels of modesty, or reserved behavior, which determines the level of spatial violations they are able to accept. Additionally, those mothers that experienced moments of exposure gave reasons why they felt the personal violations were unacceptable, which included: unfamiliar staff circulating; other parents in the unit, specifically fathers in neighboring bedside spaces; and groups touring the unit. Literature indicates that the more intimate the spatial relationship, the more people refuse to accept intrusion by others (Human Behavior and Interior Environment, 1997).

Visual privacy

Shelter. Lactation activities such as skin-to-skin care, milk expression and breastfeeding are private experiences for many mothers who prefer to perform these activities unobserved. In this study, it was found that 42 percent of participants felt the environment did not provide an adequate level of visual privacy during lactation. Similar to the effects felt by a lack of spatial privacy, many mothers acknowledged the existing visual privacy mechanisms were greatly relied upon to create a level of privacy where they could relax and let down. This aligns with the literature by Burden (1998) who claimed that visual privacy is needed, especially by new mothers, when beginning to gain lactation skills, as time is needed to experiment with their bodies without judgment from others in case they fail.

Lighting. Even though only 11 percent of references to environmental features from the utterance analysis were about lighting sources, and 15 percent of references to coping with environmental features related to lighting controllability, the majority of participants, or 79 percent of the maternal sample, knew they had control of the lighting at their infant's bedside. This can be interpreted as a positive finding; not only because the unit was designed to give mothers control of their individual bedside lights, but because most of the participants had been informed by the staff of individual controllability. In addition, one of the participants indicated that she liked the natural light from the windows adjacent to her infant's bed because it evened out the infant's circadian rhythm. To support this thought, a study by Stevens, Akram Khan, Munson, Reid, Helseth, & Buggy (2007), which examined the change in the NICU environmental sound and illumination in relationship to a single family room facility as compared with a

conventional NICU, found that neonates could be exposed to extremely high levels of natural illumination in exterior rooms.

Auditory privacy

Noise intrusion. Although the utterance analysis of participant interviews reported that only 25 percent of comments regarding environmental features in the unit consisted of utterances about noise in the unit, a total of 68 percent of mothers stated that they were bothered by the noise level in the unit. Perhaps personal levels of auditory tolerance can be attributed with the slight variance of respondents who reported being bothered by noise during lactation. Stewart-Pollack and Menconi (2005) support this idea and report that the effect of noise varies for each individual and is dependent on personal and environmental factors.

Controllability. Seventy-eight percent of participants believed there was nothing they could do to control the unwanted noise that invades the bedside space; however some mothers found a way to control noise for themselves, such as asking the NICU staff to shut off an alarm, playing relaxing music, having the auditory alarm on the infant's monitor turned off while breastfeeding so only the light flashes. This finding can be interpreted to mean that most mothers accept the noise disturbances as they assume the disturbances are a necessary part of the hospital setting. However, Philbin (2004) suggests that in an open-bay NICU, sound-absorbing surfaces on the walls and ceiling will help to prevent noise from bouncing back into the space. In addition, circulation and open staff work areas need to address protection of the open infant space from the noise generated by activities not directly related to infant care (Philbin).

Location in the Unit

In the Level II NICU, confirmed that all mothers located in the row of infant beds closest to areas of high activity did not report achieving any of the environmental privacy factors to be able to relax and express milk or breastfeed at the infant's bedside (see Figure 5-2). These privacy factors include visual privacy, auditory privacy, physical distance and personal space, as well as achievement of desired overall privacy. Participants who reported adequacy of at least one type of these privacy factors were located in the second and third rows of infant beds, past the partial obstruction of cabinetry and equipment storage which divides the NICU into two sections. This indicates that a partial physical barrier from high activity may increase the adequacy of environmental privacy for lactating mothers. In support of this finding, Philbin (2004) explains that in an open-bay NICU where full walls are not able to be added to lessen noise intrusion, carefully designed partial barrier walls can play a role in noise controllability. It was suggested that increasing the height of the barrier will ease the sound diffracted over the top of the barrier, and increasing the length or turning the ends toward the source of the loudest noise will ease the sound that is diffracted around the edges. It was also noted that infant bedsides near the partial wall may be more protected from the sources of noise than the infants at a distance from the partial barrier (Philbin).

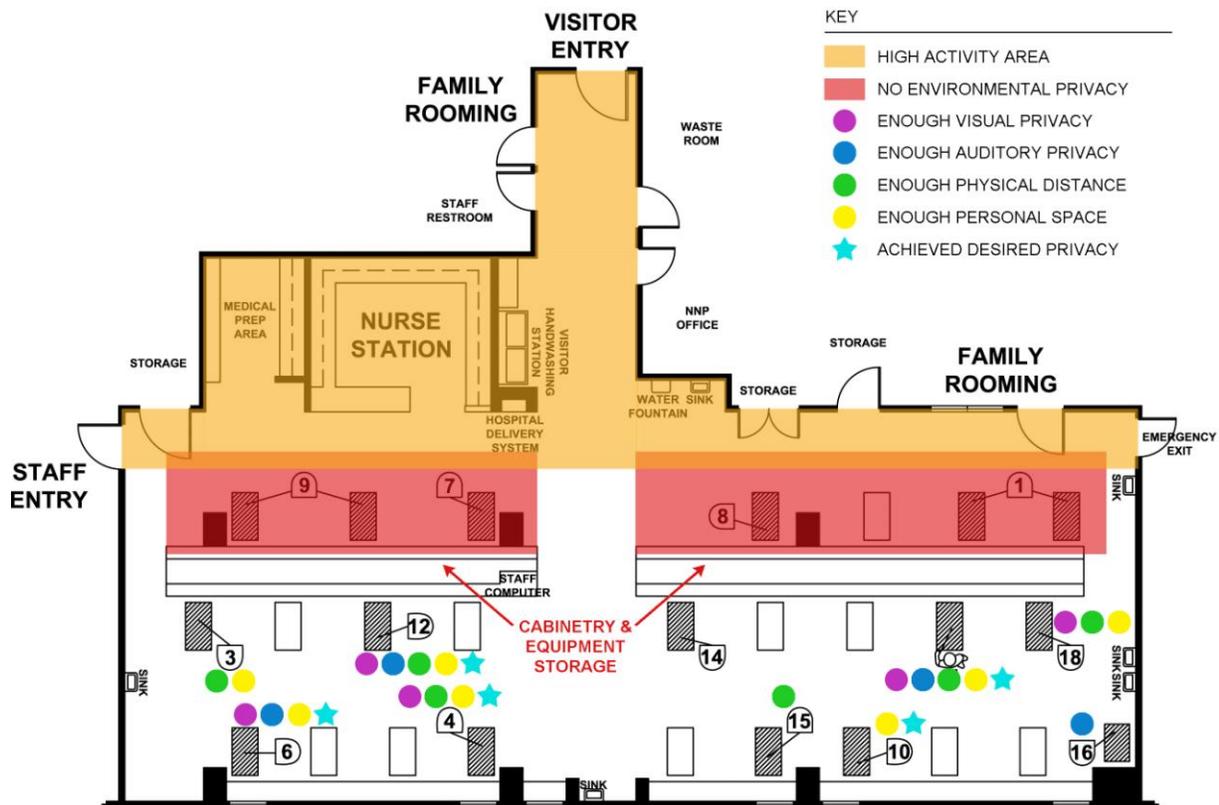


Figure 5-2. Environmental Privacy Issues in NICU II.

Two participants in NICU II reported achieving all of the environmental privacy indicators, including desired overall privacy level. These two mothers shared conditions favoring privacy which were uncovered by this study. Both mothers were located in the second row of infant beds with the barrier of cabinetry and equipment separating them from the higher activity of the entrance and nurses' station. They were assigned to a space in the middle of the row, not near an end or intersection, and they chose to directly face their infants' bed which indicated partial openness to interaction. These mothers and their infants had been admitted between 20 to 30 days prior to this study, suggesting that perhaps they had already "found their rhythm" in caring for their infant in the NICU, or that at the time they were familiar enough with the space to create their desired level of environmental privacy in the bedside space. Additionally, both mothers

stated that they were currently able to lactate and were successful at making skin-to-skin contact, expressing milk and breastfeeding at their infant's bedside. They also reported their internal psychology to be "extroverted" which may indicate their possible tolerance for any privacy violations that may have occurred. Additionally, the two mothers were unemployed at the time of the study, which may have afforded them more time to spend with their infant without the additional job-related thoughts or stressors. Finally, they both had other children and therefore had previous experience caring for a child. Given these mothers' satisfaction with their privacy arrangements, further study is recommended to determine whether these conditions favor all mothers who are comfortable expressing milk or breastfeeding in an open-bay NICU.

Staff Accommodation

Eighty-four percent of participants reported feeling a sense of accommodation by members of the NICU staff when preparing for and during a lactation session. In a study by Lessen and Crivelli-Kovach (2007) which examined maternal, neonatal and outside influences associated with feeding intention, it was found that assistance from nurses and other medical staff is needed for mothers to feel more confident in the environment, as well as their breastfeeding abilities. One of the participants described her experience:

For what it's worth, everybody here has made it absolutely, the utmost importance for our comfort and everything like that, so that's the first thing that everyone of the nurses included, made sure that we had the comfortable chair and we have the screen and everything like that. They're doing everything that they possibly can to help.

Another participant added, "[The staff is] really accommodating and very parent oriented. For me they have been. I don't know about other people. They've trained me how to take her out, how to do everything with her. I can change her diaper, so I'm

comfortable doing all of that. They say, 'Do you need anything?' If I do, they're there, but if not, they just let me do what I need to do."

Recommendations for Environmental Privacy and Comfort

A major motivation of this research was to recommend design solutions that will limit the environmental privacy issues from becoming additional sources of stress to mothers in the NICU. The findings from this study, as well as previous research, provide guidance to these recommendations which could be applicable to future open-bay NICU designs. Below are recommendations which center on environmental features and comfort at the infant's bedside.

Mothers' Preferences

The factor found in this study which most commonly accounted for maternal stress was the internal psychology factor, or whether the individual was an extrovert or introvert. One introverted participant described her experience:

Well, the reason [the infants] move [location] is because of the different nurse shifts. They usually try to give [the infants] the same area, but if someone didn't show up, they have to readjust them. The first time they warned me that she might be moved, so I was okay. The second time was when I came in this morning. This is the third spot we've been in so...we're real close to my neighbors and I'm an introvert, not an extrovert, so...

Future research is recommended to determine whether internal psychological traits do, in fact, determine the degree of stress perceived by lactating mothers. Perhaps each mother's internal psychology could be determined before, or very soon after their infant is admitted to the NICU, which is important as the mothers may particularly benefit from identification that could define their best location in relationship to key circulation intersections, perhaps reducing anxiety and perceived stress levels. Additionally, the PSS:NICU instrument could be combined with another instrument specifically designed

to measure internal psychology or personality, such as the Meyers-Briggs Type Indicator (MBTI), so that personality type could be more accurately measured in the future. Along the lines of this recommendation, Dudek-Shriber (2004) also recommends that occupational therapists or other health care practitioners should determine the perceived stressors of the parents to better address their needs, reduce their stress, and enhance their ability to understand the situation and cope with their hospitalized infant.

Spatial and Visual Privacy

Sixty-eight percent of all participants felt their infant's bedside area either never provided an adequate level of shelter from unwanted observation or viewing to relax and express milk or lactate, or that their sense of privacy was dependent on variables such as staff accommodations for privacy or the amount of people within the unit at the time. Some of the participants even reported needing multiple privacy devices to feel even a semblance of privacy, as described by one participant, "It takes a lot of screens. I think I've had three at one time and a sheet in between and still not feel completely covered." One recommended improvement for the Level II NICU would be the addition of translucent dividers installed above the existing center line of cabinetry and equipment storage (see Figure 5-3). This would protect the visual privacy of mothers attempting to lactate from individuals standing on the other side of the partition without feeling visually heavy or blocking natural light from the exterior windows. This strategy already exists in the Level III NICU, and participants in this unit found there was adequate visual privacy at bedside during lactation.



Figure 5-3. Cloud-shaped translucent partition (www.3-form.com).

Without the visual separation of solid walls, an open-bay unit should invest in additional privacy screens to increase the amount of visual privacy for lactating mothers at the bedside space. In support of this recommendation, one participant claimed:

Like, my husband, last night, he was in here, and he said he turned and didn't, he just turned around and saw her... he just thinks she didn't realize he was here so maybe she only had one [privacy screen] up, so... because she starting to breastfeed, so she's pumping there at the bedside too and feeding him.

This view is also maintained by Altimier (2004) who states that promotion of privacy lessens the mothers' anxiety which, in turn, increases mother-child interaction. Since there is limited space to store the bulky screens that are currently in use, and more of them would only clutter the already limited space, screens with a thinner profile and lightweight aesthetic should be considered since they take up less storage space. A

flexible system of folding panels should also be considered which could be portable, extend from the cabinetry, or be maneuverable on a track in the ceiling.

Auditory Privacy

Sixty-eight percent of participants were bothered by an inadequate level of shelter from unwanted noise at their infant's bedside. Noise from monitor alarms, adult conversations, and crying infants is unavoidable in the NICU environment and was reported to be the primary environmental distraction that kept participants from initiating lactation. Seventy-eight percent of participants believed there was nothing they can do to mitigate noise when at their infant's bedside. One participant claimed, "There's not really any way to keep the noise out. There's just really not. It's kind of like an open restaurant ... Everything is out there for everybody to hear." Unfortunately, the noise from the NICU can be detrimental as mothers need to hear the infant cues, include sucking, smacking, cooing, and crying (Hurst, 2007), which are important in initiating lactation.

Noise controllability. Much of the noise in both NICUs is comprised of reflected noise, as most of the surfaces are made of hard materials with the exception of the small amount of fabric of the privacy screens, vinyl recliner chairs, and linens used in the infant's beds. Specifying sound absorbing ceiling tiles is not enough to create an environment that minimizes noise reflection in the open-bay NICU setting. Sound absorbing acoustical panels affixed to the walls could go far in alleviating some of the reflected noise. Contemporary, acoustic fabric is available in many colors as well as in printed patterns that can camouflage into the environment. Literature by Evans and Philbin (2000), in which architectural design and construction for achieving quiet nursery environments are discussed, supports the need for acoustically absorptive surfaces.

They found that absorptive materials should be placed on both vertical and horizontal surfaces to control sound reflections on their first or second bounce; and can also be beneficial through control of random incidence reflections (Evans & Philbin).

Also to be considered are the use “white noise” equipment to mask noise in the unit, and rubber flooring to absorb the sound from impacts such as dropped items, rolling carts and noise from shoes. Rubber flooring is resilient, easily cleanable, highly durable, recyclable, provides a cushioning effect, and appropriate for healthcare environments, which are factors that should outweigh the initial cost of installation (White, 2007a).

Newer equipment and monitors have the ability to use visual alerts, such as flashing lights, and vibratory alerts, such as radiofrequency communication with vibrating pagers worn by the NICU staff. It is recommended that this technology be considered for alarms of less severity, especially when the mother is attempting a lactation session (Walsh-Sukys, Reitenbach, Hudson-Barr, & DePompei, 2001).

Positive distraction. Another recommendation for auditory privacy during lactation sessions is to provide individual music or television machines which can only be heard through a headset that the mother can bring with her. This strategy is considered a “positive distraction” as it blocks the environmental noise by overriding it and having the mother focus on sounds that are more pleasant and personalized to help them relax. This recommendation is supported by Ulrich’s Theory of Supportive Design (1991) which cites *access to positive distractions in physical surroundings* as one of the components that helps families cope with stress.

Furniture

Storage. Even though this unit is unable to increase physical distance between patients without lowering capacity per unit, there are ways to increase storage for personal belongings which may in turn create more bedside space for each individual and give the perception of increased physical distance. Dedicated storage could be created there for parents' daily use. For example, a cubby or drawer could be included in the equipment storage cabinetry at the infant's bedside. The storage space should be large enough for a tote bag and sweater, and possibly a small blanket or nursing pillow. According to White (2003), this personalization strategy is already being provided in SFR unit configurations as these rooms give families the opportunity to make their infant's bedside space their "home away from home." This sentiment is supported by one of this study's participants who has taken ownership of the bedside space and claimed, "This is kind of my space, we're kind of living here." Additionally, Williams (2001) suggests that careful consideration should be given to what is in the mothers' view, as a board to display cards and family pictures, as well as a space for personal belongings, would go far in making the unit seem more familiar, and less technical and intrusive (Williams).

Seating. The seating provided in the current units were not an overwhelming problem as 59 percent of participants found the chair at their infant's bedside provided adequate comfort during lactation. However, improvements are still recommended to raise this percentage. The number of recliner chairs could be increased as it was the top seating selection of the participants in this study. One of the participants stated that, "We have to fight over these [recliner] chairs. I mean, we don't fight, but it becomes 'that one's available, quick, grab it!'" Another recommendation is the addition of rotating

chairs that facilitate the orientation of the user. This would give mothers better control to indicate preference for isolation by simply rotating the chair while remaining seated. Cushioned glider chairs could also be a positive addition to the unit since they combine the rocking motion of the rocking chair and the cushioned seat and back similar to the recliner chair. If the addition of glider chairs is not an option, the addition of detachable cushions to the existing rocking chairs should be considered (see Figure 5-4). The cushions should be made of durable, high performance fabric that is inherently resistant to various fluids and stains. Cushions are necessary for mothers who have just given birth and who need to sit for extended periods of time. These cushions would especially help those mothers who have undergone abdominal trauma and find the ergonomic structure of the rocking chair superior to those of the recliner chair, to have greater comfort during the lactation experience.



Figure 5-4. Similar cushion for existing rocking chairs (www.therockingchaircompany.com).

Implications for Future Research

Given the lack of research in this area, this study should be perceived as exploratory. Further empirical research on the implications of the various environmental privacy factors is needed, in particular the privacy mechanisms each open-bay unit employs for individuals to gain control of their designated bedside space. Research on staff preferences and interactions with the privacy mechanisms used during maternal lactation is needed, particularly to determine whether additional stress is sustained by the NICU staff when present during lactation at the infant's bedside. Future open-bay NICU studies should compare more than one case to produce results that can be generalized.

The current version of the PSS:NICU covers most, but not all, of the potential stressors found in a NICU setting. It falls short of including all of the potential stressors that relate to privacy at the infant's bedside. While presently including experiences related to noise in the unit, it fails to include items related to spatial and visual privacy.

Recommended changes to be made to the PSS:NICU would be to include items under the Sights and Sounds category, such as:

- The physical distance from others in the unit
- The amount of bedside space provided to me
- The adequacy of shelter from unwanted observation

It is also recommended that *Environmental Qualities* be added to or be the replacement for the Sights and Sounds category name.

Finally, given that this study has centered on infants' mothers during a single visit to the NICU environment where the participants were in different stages of environmental familiarity and lactation, a longitudinal study of a mother's progression

from first admittance to discharge of her infant would be valuable to uncover whether environmental privacy had an impact on timing of lactation stages.

Conclusion

The Level III NICU utilized in this study achieved more of the recommended standards for environmental privacy design than NICU II, yet noise in both units impacted lactating mothers more than any other environmental privacy factor due to auditory privacy being the feature over which mothers had the least amount of controllability. Overall privacy findings indicate that the lactating mothers' perceived control of their environmental privacy conditions do affect their overall experience in an open-bay NICU, as over half did not achieve their desired privacy levels. However, the connection between environmental privacy design and the mothers' perceived levels of stress was unable to be made through the use of the parental stressor scale. Despite this, the perceived stress levels recorded were similar among study participants in both units which indicates the participants were not affected by the environmental privacy design at their infant's bedside as much as other stressors in an open-bay NICU.

This study's results contain implications for NICU designers and staff to assist in the promotion of the parental role through control of the built environment to gain privacy and reduce the effects of environmental stressors. In the future, particular attention needs to be directed towards placement of the mothers within the open-bay unit according to their internal psychology, which plays a role in how the individual copes with environmental stressors. Mothers should also be afforded individual control of the spatial and visual privacy mechanisms at the infant's bedside in order to feel comfortable performing intimate activities such as breastfeeding. This sense of control was proven to be an important factor that influenced the mother's stress level and

contributed to mother-infant bonding. Finally, it is important that auditory privacy strategies remain in the forefront of NICU design since unwanted environmental sounds were reported to have a negative effect on the individuals when attempting to perform lactation, which requires relaxation.

APPENDIX A
INSTITUTIONAL REVIEW BOARD LETTER OF APPROVAL



PO Box 112250
Gainesville, FL32611-2250
352-392-0433 (Phone)
352-392-9234 (Fax)
irb2@ufl.edu

DATE: January 11, 2011

TO: Jeannette M. Price
PO Box115705
Campus

FROM: Ira S. Fischler, PhD; Chair *ISF*
University of Florida
Institutional Review Board 02

SUBJECT: **Approval of UFIRB # 2011-U-0022**
Environmental Privacy in the Neonatal Intensive Care Unit (NICU)

SPONSOR: None

I am pleased to advise you that the University of Florida Institutional Review Board has recommended approval of this protocol. Based on its review, the UFIRB determined that this research presents no more than minimal risk to participants. Your protocol was approved as an expedited study under category 7: *Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.*

Given this status, it is essential that you obtain signed documentation of informed consent from each participant. Enclosed is the dated, IRB-approved informed consent to be used when recruiting participants for the research. If you wish to make any changes to this protocol, *including the need to increase the number of participants authorized*, you must disclose your plans before you implement them so that the Board can assess their impact on your protocol. In addition, you must report to the Board any unexpected complications that affect your participants.

It is essential that each of your participants sign a copy of your approved informed consent that bears the IRB approval stamp and expiration date.

Your approval is valid through **January 11, 2012**. If you have not completed the protocol by this date, please telephone our office (392-0433), and we will discuss the renewal process with you. It is important that you keep your Department Chair informed about the status of this research protocol.

ISF:dl

APPENDIX B INFORMED CONSENT DOCUMENT

Approved by
University of Florida
Institutional Review Board 02
Protocol # 2011-U-0022
For Use Through 01-11-2012

Informed Consent

Environmental Privacy in the Neonatal Intensive Care Unit (NICU)

Please read this consent document carefully before you decide to participate in this study.
Thank you in advance for your participation.

Purpose of the research study:

The purpose of this study is to examine the effects of spatial, visual and auditory privacy on lactating mothers in an open-bay neonatal intensive care unit.

What you will be asked to do in the study:

Following a brief consultation with a NICU staff member, you will be asked to fill out a questionnaire about your experiences at your infant's bedside. You will then be invited to speak with the principal investigator. It is not required that you take part in the discussion, but your participation in this study is encouraged and will be most welcome. A series of open-ended questions will be asked in which you may say as little or as much as you would like. The more information you are able to give, the richer the study. There are no wrong answers, so please be as honest and open as possible. The principal researcher will either have notes taken by a second researcher during this discussion, or ask for your permission to make an audio recording.

Time required:

30 minutes

Risks and Benefits:

You may or may not experience slight stress or anxiety during this process. If at any time you experience discomfort with the process, you may withdraw from the study without consequences. We do not anticipate that you will benefit directly by participating in this study. However, your participation in this study will help us understand the lactating mother's perspective and how the NICU setting could be enhanced. Therefore, it can potentially benefit yourself and other mothers in the future.

Compensation:

You will be given a small nursing-related gift of appreciation as compensation for participating in this research study.

Confidentiality:

Any personal demographic information will only be used to compare your answers to other participants. Your identity will be kept confidential to the extent provided by law and assigned a code identifier needed only to link the questionnaire and interview. Safety measures will be taken to protect all collected information, which will be stored in a locked filing cabinet in the principal researcher's supervisor's office or in a computer with a security password. Please be assured that your name will not be used in any report.

Voluntary participation:

Your participation in this study is completely voluntary. There is no penalty for not participating.

Right to withdraw from the study:

You have the right to withdraw from the study at anytime without consequence. You do not have to answer any questions that you do not want to answer. If you choose to withdraw, please inform the survey administrator and your survey will be destroyed.

Whom to contact if you have questions about the study:

Jeannette Price, Graduate Student, Department of Interior Design, University of Florida, P.O. Box 115705, Gainesville, FL 32611-5704, phone: (352) 392-0252 Ext. 339
Dr. Maruja Torres-Antonini, Associate Professor, College of Design, Construction and Planning, P.O. Box 115705, Gainesville, FL 32611-5704, phone: (352) 392-0252 Ext. 335

Whom to contact about your rights as a research participant in the study:

IRB02 Office, Box 112250, University of Florida, Gainesville, FL 32611-2250; phone: (352) 392-0433.

Agreement:

I have read the procedure described above. I voluntarily agree to participate in the procedure and I have received a copy of this description.

Participant: _____ **Date:** _____

Participant Code Identifier:

For identification purposes only, please write a six-character alphanumeric combination with your first and last initial and month and day of birth (e.g. JP0706). If you are selected to participate in this study, you will be asked to use this code identifier again.

CODE IDENTIFIER: _____
(*F, L, M, M, D, D*)

Principal Investigator: _____ **Date:** _____

Approved by
University of Florida
Institutional Review Board 02
Protocol # 2011-U-0022
For Use Through 01-11-2012

APPENDIX C
CERTIFICATE OF COMPLETION FOR HEALTH INSURANCE PORTABILITY AND
ACCOUNTABILITY ACT & PRIVACY - RESEARCH



Privacy Office

Certificate of Completion

This is to certify that

Jeannette Price

has successfully completed the

HIPAA & Privacy - Research

on

Sunday, February 20, 2011

APPENDIX D
PERMISSION TO USE PARENTAL STRESSOR SCALE: NEONATAL INTENSIVE
CARE UNIT RESEARCH INSTRUMENT

Permission to Use Research Instrument

From: Margaret S. Miles, RN, PhD, FAAN
Carrington Hall, CB 7460
School of Nursing
University of North Carolina
Chapel Hill, NC 27599-7460
mmiles.uncson@mhs.unc.edu

RE: Use of Parental Stressor Scale: NICU

You are free to download and use the Parental Stressor Scale: NICU for your research. However, the instrument is copyrighted (c Margaret S. Miles, RN, PhD 1987) and cannot be duplicated or copied without first submitting to Dr. Miles a signed copy of the permission form that follows. Requests for any changes or alterations in the instrument should be made in writing to Dr. Miles.

By filling in your name, address, phone number, and e-mail address and signing the agreement use below and mailing it to Dr. Miles at the above address, you are hereby given permission

* to copy or retype the PSS:NICU for use in your research. The permission is valid only for the study named below.

The author of the tool, Dr. Miles, requests that you send back to her the following:

- * an abstract of the findings or copy of the results of your study when completed
- * copies of any changes or translations of the tool that you were given permission to make.

When using the PSS:NICU, you are expected to use the following reference:

Miles, M.S., Funk, S.G., & Carlson, J. (1993). Parental Stressor Scale: Neonatal Intensive Care Unit. Nursing Research, 42, 148-152.

I agree to the above conditions for using the PSS:NICU.

Name: Jeannette Price (Master of Interior Design student)

Address: P.O. Box 115705
Gainesville, FL 32611-5704

Phone Number

E-mail address:

Institution: University of Florida

Title of Research Project: Environmental Privacy in The Neonatal Intensive Care Unit (NICU)

Signature Jeannette Price Date 2/28/11

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APPENDIX E INTERVIEW QUESTIONS

For identification purposes only, please write a six-character alphanumeric combination with your first and last initial and month and day of birth (e.g. JP0706).

CODE IDENTIFIER:
(*F*, *L*, *M*, *M*, *D*, *D*)

PART 1: Environmental Privacy

These are open-ended questions where the participant will be able to speak in detail about their experience in the Neonatal Intensive Care Unit (NICU).

- 1) Do you feel your infant's bedside area provides an adequate level of shelter from unwanted observation or viewing for you to relax and express milk or lactate?
_____ yes _____ no

Please explain:

- 2) If you are bothered by lack of visual privacy in the NICU, what can you do? (check all that apply)
- close the privacy screen
 - ask someone else to close the privacy screen
 - move into a private room
 - do nothing
 - other, please specify _____

- 3) If you are bothered by the lighting in the NICU, what can you do? (check all that apply)
- dim the lights
 - ask someone else to dim the lights
 - turn off some of the lights
 - ask someone else to turn off some of the lights
 - close the curtains
 - ask someone else to close the curtains
 - do nothing
 - other, please specify _____

- 4) Do you feel your infant's bedside area provides an adequate level of shelter from unwanted noise for you to relax and express milk or lactate?
_____ yes _____ no

Please explain:

- 5) If you are bothered by too much noise in the NICU, what can you do? (check all that apply)
- turn off the alarms
 - ask someone else to turn off the alarms
 - ask people to be quiet
 - do nothing
 - other, please specify _____

6) Do you feel your infant's bedside area provides an adequate level of physical distance from others for you to relax and express milk or lactate?
_____ yes _____ no

Please explain:

7) Do you feel your infant's bedside area provides adequate space for your personal use?
_____ yes _____ no

Please explain:

8) Have you felt your body was exposed at any time during your visits in the NICU?
_____ yes _____ no

If YES, please explain:

9) Have you been offered to use any type of privacy devices while trying to express milk or lactate?
_____ yes _____ no

If YES, please explain:

10) Have you taken any measures within your personal space at the infant's bedside to be more private?
_____ yes _____ no

If YES, please explain:

11) Have you brought in any privacy devices to help relax and express milk or lactate?
(e.g. headphones, extra blanket, etc.)
_____ yes _____ no

If YES, please explain:

12) Does the furniture at your infant's bedside provide enough comfort for you to express milk or lactate?
_____ yes
_____ no

If NO, please explain:

13) What is the biggest distraction while in the NICU that keeps you from initiating lactation?

14) Are you able to achieve the privacy you desire while at your infant's bedside, while trying to express milk or lactate?

_____ yes _____ no

Please explain:

APPENDIX F PARTICIPANT QUESTIONNAIRE

For identification purposes only, please write a six-character alphanumeric combination with your first and last initial and month and day of birth (e.g. JP0706). If you were selected to participate in this study, you may be asked to use this code identifier again.

CODE IDENTIFIER: _____
(FI, LI, M, M, D, D)

PART 1: Visiting in the Neonatal Intensive Care Unit (NICU)

For questions 1-4, please select or insert the most appropriate answer.

- 1) How long has your baby been in the hospital? _____ days _____ weeks
- 2) How many times did you visit in the last week? _____ times
- 3) What is the average length of your visit? (approximately) _____ hours _____ minutes
- 4) Where did you spend most of your time while visiting?

<input type="checkbox"/> At infant's bedside	<input type="checkbox"/> Quiet room
<input type="checkbox"/> In NICU, not at bedside	<input type="checkbox"/> Visitors' waiting area
<input type="checkbox"/> Milk expression room	<input type="checkbox"/> Other, please specify: _____

PART 2: Activities While Visiting the NICU

For questions 5-8, please select the most appropriate answer.

- 5) Are you currently able to lactate?
 yes no
- 6) Have you attempted or were you successful at expressing milk at your infant's bedside?
 attempted successful not applicable
- 7) Have you attempted or were you successful at breastfeeding at your infant's bedside?
 attempted successful not applicable
- 8) Have you been able to make skin-to-skin contact with your infant right before beginning a breastfeeding or milk expression session?
 yes no

PART 3: Parental Stressor Scale

Nurses and others who work in neonatal intensive care units are interested in how the experience of having a sick baby hospitalized in the neonatal intensive care unit (NICU) affects parents. We would like to know what aspects of your experience as a parent are stressful to you. **By stressful, we mean that the experience has caused you to feel anxious, upset, or tense.**

Please indicate how stressful each item listed below has been for you using the following scale:

1 = Not at all stressful: the experience did not cause you to feel upset, tense, or anxious

2 = A little stressful

3 = Moderately stressful

4 = Very stressful

5 = Extremely stressful: the experience upset you and caused a lot of anxiety or tension

If you did not have the experience, indicate this by circling N/A meaning that you have "not experienced" this aspect of the NICU.

- 30) Seeing my baby suddenly change color (for example, becoming pale or blue) NA 1 2 3 4 5
- 31) Seeing my baby stop breathing NA 1 2 3 4 5

The last area we want to ask you about is how you feel about your own **RELATIONSHIP** with the baby and your **PARENTAL ROLE**. If you have experienced the following situations or feelings, indicate how stressful you have been by them by circling the appropriate number. Again, circle NA if you did not experience the item.

- 32) Being separated from my baby NA 1 2 3 4 5
- 33) Not feeding my baby myself NA 1 2 3 4 5
- 34) Not being able to care for my baby myself (for example, diapering, bathing) NA 1 2 3 4 5
- 35) Not being able to hold my baby when I want NA 1 2 3 4 5
- 36) Feeling helpless and unable to protect my baby from pain and painful procedures NA 1 2 3 4 5
- 37) Feeling helpless about how to help my baby during this time NA 1 2 3 4 5
- 38) Not having time to be alone with my baby NA 1 2 3 4 5
- 39) Sometimes forgetting what my baby looks like NA 1 2 3 4 5
- 40) Not being able to share my baby with other family members NA 1 2 3 4 5
- 41) Being afraid of touching or holding my baby NA 1 2 3 4 5
- 42) Feeling staff is closer to my baby than I am NA 1 2 3 4 5

Using the same rating scale, indicate how stressful in general, the experience of having your baby hospitalized in the NICU has been for you (circle one):

- 1 = Not at all stressful: the NICU experience did not cause me to feel upset, tense, or anxious
- 2 = A little stressful
- 3 = Moderately stressful
- 4 = Very stressful
- 5 = Extremely stressful: the NICU experience upset me and caused a lot of anxiety or tension

Thank you for your help. **Now, was there anything else that was stressful for you during the time that your baby has been in the neonatal intensive care unit?** Please discuss below:

PART 4: Background Information

For questions 43-52, please select or insert the most appropriate answer.

43) **How old were you on your last birthday?**
_____ years

44) **What is your marital status?**

Single/Never Married Married Divorced/Separated Widow

45) **How many years of school have you completed?**
 Grade 1-8 Vocational/technical graduate
 Some high school Some college
 High school graduate College graduate
 Some vocational/technical school Graduate or professional degree

46) **Are you employed?**
 yes no
If YES, what is your current occupation? (job title) _____

47) **What is your combined family income in 2010?**
 Less than \$20,000
 \$20,000-\$40,000
 \$40,000-\$60,000
 \$60,000-\$80,000
 \$80,000-\$100,000
 More than \$100,000

48) **What country are you originally from?**

49) **What is your ethnicity?**

White Black Hispanic Asian Other

50) **Do you consider yourself an:**
 Extrovert Introvert

51) **Do you have other children?**
 yes no

52) **Have you previously expressed milk or breastfed another child?**
 yes no

PART 5: Volunteer Interview

Would you be willing to participate in an interview with the principal researcher and provide information about the environmental privacy you have experienced in the NICU?
 yes no

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BIOGRAPHICAL SKETCH

Jeannette Marie Price was born in Alexandria, Virginia, but moved to Florida when she was very young. She was raised in the town of Orange Park, a bedroom community just outside of Jacksonville. Throughout her life she has enjoyed a myriad of creative activities such as dancing, singing, playing an instrument and photography. When introduced to the field of interior design in 2004, she imagined herself doing nothing else.

While working towards her undergraduate degree in interior design, Jeannette interned at Ginny Stine Interiors and Catlin Design, as well as held the position of Materials Librarian for the Department of Interior Design. She received her Bachelor of Design in interior design from the University of Florida in the spring of 2009, graduating *summa cum laude*, and immediately began pursuing her graduate degree with a focus on the design of healthcare environments. While studying for her master's degree, Jeannette continued her internship at Catlin Design and held the position of Editorial Assistant for the *Journal of Interior Design*. In the summer of 2010, she studied abroad in Vicenza, Italy at Vicenza Institute of Architecture where she visited the *Spedale degli Innocenti*, Brunelleschi's Foundling Hospital in Florence. Subsequently, Jeannette graduated in the fall of 2011, receiving her Master of Interior Design degree from the University of Florida.