Changing Rooms in NICU.

A comparative descriptive study of
parental perceptions of the physical environment of
neonatal intensive care units.

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Abstract

The physical environment of a neonatal intensive care unit (NICU) is unique and can be challenging and stressful for families. As infant survival rates and technology improved, many NICUs became 'busy', overcrowded, noisy environments. New directions in the design of newborn nurseries highlight the potential for the physical environment to support parental needs and optimise the parenting experience. In October 2004 the NICU at National Women's Hospital (NWH) in Auckland (New Zealand), relocated to a new facility at Auckland City Hospital (ACH). A key principle in the design of the new NICU was improvement of family space at the cot side.

This non-experimental study sought to describe and compare parental perceptions of the physical environment of a traditional NICU configuration with a new custom built NICU. A sample of parents with infants hospitalised in NICU from NWH ($n = 30$) and a different group of parents from ACH ($n = 30$) completed a self report Likert-type questionnaire (with a scale from 1 = strongly disagree to 7 = strongly agree). Qualitative data was sought using open ended questions.

Significant differences were found between the old NWH NICU and the newly designed ACH NICU. Parents perception of the space at the cot-side was more adequate ($p = 0.001$), lighting levels more comfortable ($p = 0.002$), the cot-side was quieter ($p = 0.02$) and technology less intrusive ($p = 0.03$) at ACH NICU when compared to NWH NICU. Impact of these design changes on privacy, sense of belonging, and socialisation of parents did not show significant differences. Lack of cot-side space for NWH parents was the predominate theme from the open-ended questions. Parents viewed the family space and aesthetics of the new ACH rooms positively.

Providers of newborn services contemplating redesign need to consider that increasing cot side space and decreasing infant numbers in clinical rooms can significantly improve a parent's view of NICU and therefore provide an environment that is supportive to parent's needs.

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Glossary of Terms

Cot-side

Physical space surrounding the infant's bed (cot, incubator or heat table) that serves as area for parents, family members and staff to undertake care of the infant.

Decibel (dB)

Unit for measuring the intensity of sound.

Headwall System

Holds and delivers the mechanical requirements (equipment, electrical and gas) for each infant care space.

Level 3 Rooms

Intensive care area for medically unstable premature infants or critically ill newborn infants requiring mechanical ventilation or other intensive interventions.

Level 2 Rooms

Special care area for infants requiring less intensive respiratory support (such as Continuous Positive Airway Pressure (CPAP) or oxygen), infants requiring observation, infants recovering from acute illness and infants requiring less intensive interventions.

Luminance (Lux)

A measure of radiating or reflecting light.

Parent–Infant Nursery (PIN)

A low dependency area with an emphasis on supporting parenting prior to discharge.

Room Configuration

The number of infants in clinical rooms and placement of infant care spaces within the clinical rooms.

Skin to Skin Care

A care practice where a naked infant is rested semi-upright and prone on a parent's bare chest covered with a blanket.

1.0 Chapter One: Introduction

This chapter provides a background to the thesis and introduces a research project that explores parental perceptions of the physical environment of NICU. Background information is outlined that provides rationale for the study. Briefly introduced are the concepts and philosophies that lead to the development of the research aims and objectives. Finally, my personal interest for this research is explained, and an overview of the thesis chapters outlined.

Neonatal intensive care units (NICUs) are medically and technologically complex yet very human environments. These units evolved in the late 1970s and with advances in technology coupled with increased knowledge of preterm and newborn diseases, infant survival has markedly improved (MacFarlane & Mugford, 2005). Not purpose built as NICUs, the physical environment of many units now resemble overcrowded, busy, noisy environments that have been described as chaotic (Lupton & Fenwick 2001; Smith, 1994; White & Newbold, 1995). As extremely immature infants and their families now spend extended periods of time in a NICU, the effect of this physical environment is under scrutiny with a growing awareness that this situation is no longer acceptable (White & Newbold, 1995).

The focus of this thesis is the physical environment of NICU and how changes to this environment impact on parents, hence the title 'Changing Rooms in NICU.' Utilising a non-experimental comparative descriptive design and a questionnaire survey, this thesis presents the research that describes and compares parental perceptions of the physical environment of a traditional NICU configuration with that of a new custom built NICU.

1.1 Background to the Study

1.1.1 Definitions

The broad use of the term environment is said to refer to a combination of elements, both natural and artificial, which influence the surroundings of individuals and systems. It also encompasses social factors that affect living beings (European Environment Information and Observation Network, 2005). The word environment is often used interchangeably with the term physical environment. The physical environment, however, is described as a narrower subgroup that relates to the material objects and surroundings of individuals or systems (European Environment Information and Observation Network, 2005). It encompasses the focus of this study; the built environment. Venoila (1988), a prominent architect and writer on contemporary design of buildings, suggests that the influence of the built environment on well-being is considerable and often overlooked. The literature review (Chapter Two) expands on these definitions, and introduces the notion that quality design of buildings can enhance health and wellness.

1.1.2 Significance of the Study

The NICU setting is a coexistence of infant, family and health professionals, all with their own unique environmental needs. Growing evidence suggests that the physical environment, in particular light and sound levels, has negative impacts on the developing neurological system of the preterm infant (Als, 1986; Als et al., 1994; Symington & Pinelli, 2006; Taquino & Lockridge, 1999). Developmental problems of prematurity are now being attributed in part to environmental factors (Harrison, Lotas & Jorgensen, 2004). Consequently developmental care plans and strategies are now commonplace in NICUs (Taquino & Lockridge, 1999). Some strategies involve modifications to the physical environment, such as reduction of light and sound (Graven, 2000). Many NICUs, however, remain restricted by their very design; large open plan units resembling warehouses or multi-bed rooms with limited space between infant cots. The need to consider the infant's physical environment was, therefore, the first catalyst in advocating major changes regarding the way NICUs are now designed and built.

Intensive care environments, including NICU, are known to also be stressful for nurses (Ohler, Davidson, Starr & Lee, 1991). Environment stressors are frequently encountered and often related to technology (Gibbons, Geller & Glatz, 1997; Heuer, Bengiamin, Downey & Imler, 1996). There is little information on the environmental needs of NICU nurses apart from one study by Gibbons et al. (1997) where a need for nurses to talk and work together in NICU rooms was shown. Nurses, while attending to the environmental requirements of infants and families in their care, may have their own specific needs.

NICU has long been identified as a challenging environment for parents. Aspects of the physical environment, namely the sights and sounds of NICU, have been identified as a frequent stressor for parents (Miles, Funk & Kasper, 1991; Raeside, 1997) and an obstacle to parent-infant interactions (Hutchfield, 1999; Rushton, 1999). Some effects of the NICU physical environment seem enduring as mothers recalled disturbing images of NICU years later (Werezchzak, Shandor-Miles & Holditch-Davis, 1997). Given these factors and that some studies indicate the potential for increased levels of maternal anxiety, depression and distress after preterm birth (Doering, Moser & Dracup, 2000; Miles, Holditch Davis, Burchinal & Nelson, 1999), the effect of the physical environment cannot be taken lightly.

1.1.3 Family-Centred Care (FCC)

Family–centred care (FCC) is a philosophy that underpins health care delivered to children and families (Hutchfield, 1999). Recognition of the family as the constant in a child's life (Shelton & Stepnanek, 1995) and health professionals caring for the baby and family as one unit (Beresford, 1997a) are fundamental views within descriptions of FCC. Once being viewed as visitors, parents are now the focus of care in NICU, along with the infant (Fenwick, Barclay & Schmied 2001; Hutchfield, 1999). Consequently, providers of neonatal care are now required to consider the impact of the NICU environment not only on the infant but also on the family.

Guidelines for practice of FCC philosophies reflect the above broad critical elements, but it is recognised that parents in NICU have unique issues (Hutchfield, 1999). For instance,

NICU parents have a new infant that they do not know and often parent and infant are separated (Dobbins, Bohlig & Stephen, 1994). Thus, establishing a parent-infant relationship and initiating care-giving by parents is said to be a prime focus of FCC practice in NICU (Siegal, Gardner, & Merenstein, 2004). Therefore the underlying principle of this research was how the NICU physical environment can promote active involvement of parents in the care of their infant.

1.1.4 Healing by Design

In the past hospital environments were designed for efficiency, and to incorporate technology in intensive care settings, Currently there is a philosophical shift to focus hospital design on the needs of patients and their families. Alongside these philosophies are recommended standards for hospital and NICU design. The notion that the quality of healthcare surroundings can improve patient and family outcomes, called 'healing by design', has been suggested by Horsburgh (1995). New directions in the design of NICUs highlight the potential for the physical environment to optimise family interaction with infants and encourage "...long stays at the bedside" (Philbin, 2004, p.340). Many of the current guidelines and standards for NICU design are based on expert opinion (White, 2006). The cost of new facilities within a financially constrained health care system means information on the effectiveness of NICU redesign projects is essential. Experts are therefore calling for evidence based redesign and for recommendations to be based on research (Shepley, 2002; White, 2003).

1.2 Changing Rooms in NICU

In October 2004 the NICU at National Women's Hospital (NWH) in Auckland, New Zealand relocated to the new Auckland City Hospital (ACH). The principal redesign objectives were to further support infant neurodevelopment, to improve family space at the bedside and to provide an efficient and functional unit for staff. Cot-space was increased in all levels of care throughout the new NICU. Provision of a designated parental chair and locker within each cot space offered a more defined family space. This relocation presented a unique opportunity, to not only seek parental perceptions of the

physical environment of NICU, but also to evaluate the impact of the new design concepts.

1.2.1 Personal Statement

My motivation for 'healing by design' began six years ago. In my role as a NICU nurse educator, it was customary to tour the Paediatric Intensive Care Unit (PICU). The PICU was not purpose built and the nine intensive care beds where all visible to each other. As we toured the unit it was difficult not to focus on the activity of a central bed. A boy had been admitted critically ill with meningococcal B meningitis. By the end of our tour it was obvious that the young boy had arrested and full resuscitation was in progress. A nurse hurried around the bed trying to achieve some privacy with an inadequate screen. The sound of his mother wailing is something I will never forget and the horrified look on the faces of the other parents in the rooms. As NICU nurses, one would think you would be somewhat desensitised to intensive care drama, however, we all left a little traumatised and thinking that in NICU we do better. Over the ensuing years there have been times when I have been reminded of this incident and how the NICU physical environment has fallen well short of a respectful and nurturing place for infants, parents and staff.

1.3 Research Aim and Objectives

The **aim** of the study was to describe and compare parental perceptions of the physical environment of two NICUs, with a focus on the infant rooms and the immediate infant cot space. Additionally, it is anticipated that insights into the effectiveness of changes in room design may be revealed. The specific **research objectives** were to:

1. Describe parental perceptions of the physical environment within the infant rooms at NWH and ACH NICUs.

2. Compare differences in parental perceptions between the physical environment of the original NICU at NWH and the redesigned NICU at ACH.

1.4 Overview of the Thesis

Chapter One has outlined the thesis and commences the discussion around the impacts that the physical environment has on health and the importance of quality design of healthcare facilities. The research study 'Changing Rooms in NICU' has been introduced to describe and compare parental perceptions of the physical environments of NWH and ACH NICUs. Justification for the study relates to environmental issues for the key participants in NICU: infants, nurses and parents. Finally, the purpose of the study and the research aims are outlined.

Chapter Two presents a review of three key areas of literature. Firstly reviewed is existing knowledge on the theories and guidelines relevant to the impact the physical environment has on health, and the design of hospitals. Secondly, the past and current design of NICU is discussed and new directions for NICU design examined. Finally, the previous research on parental perceptions of the physical environment of NICU is reviewed, ending with a discussion on the commonly utilised research instruments.

Chapter Three outlines the design of the study and the methods used to answer the research questions. Ethical issues relevant to this study are detailed and discussed. The physical characteristics of the two NICUs are outlined and illustrated. Data collection is described, along with justification and explanation of the analytical procedures used. Finally the validity of the study is discussed.

Chapter Four presents the results from the three parts of the questionnaire: parent and infant demographics, the rating scale and the responses to the open-ended questions. The rating scale and demographic data are summarised in tables and figures. Themes derived from the parental responses to the open-ended questions are presented and discussed further in Chapter Five.

Chapter Five discusses in detail the research findings from the rating scale and the open-ended questions in relation to the research questions, the literature and clinical practice. Strengths and limitations of the study are addressed.

Chapter Six concludes by summarising the key findings of the study and offers suggestions for the future design of NICUs. Practice implications for nurses are discussed and future research possibilities outlined.