
***Facilitating Change and Evaluating Impact during a
Neonatal Intensive Care Redevelopment:
A Participatory Action Research Project***

Mrs Margaret Broom

RN, RM, BA Nursing

A thesis submitted to complete requirements for the Degree of

Doctor of Philosophy

September 2016

School of Nursing, Midwifery and Paramedicine,

Canberra Campus

Australian Catholic University

Statement of Originality

I, *Margaret Broom*, declare that the Doctorate of Philosophy thesis titled:

Facilitating Change and Evaluating Impact during a Neonatal Intensive Care

Redevelopment: A Participatory Action Research Project contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated this thesis is my own work and has the approval of the relevant ethics committees.

Yours in research

Margaret Broom

Signature:

A handwritten signature in cursive script that reads "Margaret Broom".

Date: 30 September 2016

Dedication

I dedicate my thesis to my family and the Neonatal Intensive Care Unit families with whom I had the honour to share my journey into research.

Firstly to my amazing family Michael, Jeremy and Timothy who challenge and support me every day. Without your support and advice this would not have been possible Michael. Thank you especially to my Mum Catharine, you have travelled the journey with me always eager to hear about the next chapter. To my three brothers Mark, Tony, Dan and all my wonderful friends, your faith and determination that I could complete my doctorate, even when I thought it was a ridiculous dream, has been outstanding.

To my Neonatal Intensive Care Unit family, this is my 20th year as a member of the Neonatal Intensive Care Unit team, the only real home I have had in my nursing career. Your dedication, enthusiasm and willingness to challenge adversity to improve the future of every neonate in our unit overwhelm me and your support has given me the motivation to document our story. Thank you to all the staff who have participated in the research I have completed over the past five years, especially the members of the Change and Networking Group who worked above and beyond expectations during the transition to our new Neonatal Intensive Care Unit. I am honoured to have shared the experience with such an amazing group of colleagues.

To the families I have had the privilege to care for in the Canberra Neonatal Intensive Care Unit, especially those who have supported and encouraged my research. Your strength and courage, when faced with overwhelming challenges, makes me more determined to continue to foster research that will benefit our entire our Neonatal Intensive Care Unit family: neonates, families and staff.

Acknowledgements

“When you do what you love, the seemingly impossible becomes simply challenging, the laborious becomes purposeful resistance, the difficult loses its edge and is trampled by your progress.” Steve Maraboli, 2009

As many PhD Candidates have acknowledged before me, it is impossible to gain a Doctorate of Philosophy alone. I would like to express my deepest appreciation and gratitude to the people and authorities who have mentored and supported me during the past five years.

I have had the privilege of being mentored by three supervisors. Professor Zsuzsoka Kecskes in her role as the Clinical Director of the Neonatal Intensive Care Unit, has supported my work since the outset of this project. Thank you for encouraging me to apply for the position of Neonatal Intensive Care Unit research nurse and take the first step to enrol in a Master’s program and also provide financial support for staff to assist in the research.

Professor Sue Kildea, I would like to thank you for guiding my introduction to the Australian Catholic University, action research and sharing my joy of becoming a nursing researcher. I am thankful for your guidance and support throughout the many challenges of my candidature and upgrading to a PhD.

Professor Anne Gardner, who over the past two years has undertaken the role of my primary supervisor, thank you for the advice and wise counsel you provided at each of the steps taken in completing my doctoral journey. I would also like to thank all members of Professor Gardner’s team, who welcomed and supported me over the past two years.

I would like to acknowledge the Australian Capital Territory Office of Nursing and Midwifery for granting me funding to take six weeks' study leave to complete my thesis. I have been fortunate to receive funding from the Neonatal Intensive Care Foundation and the Private Practice Fund over the past four years to present my project at conferences throughout Australia, for which I am also deeply grateful.

Table of Contents

| | |
|---|-----------|
| Statement of Originality | ii |
| Dedication | iii |
| Acknowledgements | iv |
| List of Tables..... | x |
| List of Figures..... | xi |
| List of Reflection Boxes | xii |
| List of Abbreviations | xiii |
| Abstract..... | 1 |
| Title | 1 |
| Background..... | 1 |
| Objectives | 2 |
| Study Methodology..... | 2 |
| Data Generation..... | 3 |
| Data Analysis | 3 |
| Study Findings | 4 |
| Conclusion | 6 |
| Research Portfolio..... | 7 |
| Publications included in the thesis..... | 7 |
| Statements of contribution to jointly published manuscripts..... | 8 |
| Presentations during candidature | 12 |
| Design of Thesis by Publication..... | 16 |
| Overview of Chapters | 18 |
| Chapter 1: Introduction | 21 |
| Prologue..... | 21 |
| Neonatal Intensive Care Units | 21 |
| Neonatal intensive care in Australia..... | 22 |
| History of Neonatal Intensive Care Unit Design..... | 23 |
| Thesis Context | 24 |
| Thesis Rationale..... | 25 |
| Study Objectives | 26 |
| Overview of Research Project and Scope of Thesis | 27 |
| Chapter 2: Literature Review | 29 |
| Prologue..... | 29 |
| Review process | 29 |
| Study Methodologies | 35 |
| Study Themes | 36 |
| Summary..... | 40 |
| Article 1: How can we help staff transition to a new NICU design?..... | 42 |
| Abstract..... | 42 |

| | |
|--|-----------|
| Introduction..... | 43 |
| Aim | 45 |
| Methodology | 45 |
| Results | 45 |
| Discussion | 50 |
| Conclusion..... | 51 |
| Main Findings | 52 |
| Current Research Gaps..... | 53 |
| Summary | 54 |
| Chapter 3: Choosing a new Neonatal Intensive Care Unit Design | 56 |
| Prologue | 56 |
| Background | 56 |
| Original Open Plan Neonatal Intensive Care Unit Design | 60 |
| Rationale for Building a New Neonatal Intensive Care Unit..... | 63 |
| Choosing the new Neonatal Intensive Care Unit Design..... | 64 |
| Two Cot Neonatal Intensive Care Unit..... | 66 |
| Formation of the Change and Networking Group..... | 67 |
| Article 2: World Café Methodology an Innovative method to engage stakeholders in designing a Neonatal Intensive Care Unit..... | 71 |
| Abstract | 71 |
| Introduction..... | 72 |
| Setting | 73 |
| Methods..... | 74 |
| Results | 77 |
| Stakeholder’s Decision | 80 |
| Conclusion..... | 81 |
| Main Findings | 82 |
| Summary | 82 |
| Chapter 4: Methodology | 84 |
| Prologue | 84 |
| Background | 84 |
| Participatory Action Research..... | 90 |
| Rationale for the Participatory Action Research Project..... | 94 |
| Article 3: Facilitating staff transition from an open plan to a two cot neonatal intensive care unit: A participatory action research approach..... | 98 |
| Abstract | 98 |
| Introduction..... | 100 |
| Background | 100 |
| Study Setting | 101 |
| Study Aim | 102 |
| Ethics..... | 102 |
| Methodology | 102 |
| Role of the Researcher | 108 |
| Participants..... | 108 |
| Data Collection | 108 |

| | |
|---|------------|
| Data Analysis | 109 |
| Study Findings..... | 110 |
| Discussion | 115 |
| Conclusion | 117 |
| Main Findings..... | 119 |
| Summary..... | 120 |
| Chapter 5: Measuring the Impact of Two Cot Neonatal Intensive Care Unit Design .. | 122 |
| Prologue..... | 122 |
| Project Rationale | 122 |
| Research Context..... | 123 |
| <i>Article 4: A comparative prospective longitudinal study of staff walking distances, behaviour, and perceptions of open plan and two cot NICU design.</i> | 126 |
| Abstract..... | 126 |
| Introduction | 127 |
| Setting | 129 |
| Study Procedures..... | 133 |
| Study Results | 135 |
| Discussion..... | 142 |
| Conclusion | 146 |
| Acknowledgements | 146 |
| Main Findings..... | 149 |
| Summary..... | 150 |
| Chapter 6: Learning in Action..... | 152 |
| Prologue..... | 152 |
| Personal Profile..... | 153 |
| Role as a Researcher..... | 154 |
| Theoretical Premise | 155 |
| Methods of Learning..... | 156 |
| Learning about Action Research Methodology | 156 |
| Upgrading to a Doctoral Candidature | 157 |
| Where to next?..... | 157 |
| Learning through Literature | 158 |
| Learning from Mentors | 159 |
| Journaling as a learning tool..... | 160 |
| What I have learned | 165 |
| Learning as a member of a group..... | 165 |
| Becoming a researcher | 166 |
| Learning about myself | 167 |
| Final Thoughts | 168 |
| Chapter 7: Summary and Conclusions | 170 |
| Introduction | 170 |
| Overview | 170 |
| Contribution to Current Knowledge..... | 173 |
| Recommendations for Future Research | 179 |

| | |
|---|------------|
| Study Conclusion..... | 181 |
| Chapter 8: References..... | 183 |
| Appendices | 193 |
| Appendix A: Examples of Change and Networking Group Newsletter and Poster ... | 193 |
| Appendix B: Australian Catholic University Ethics Committee Approval | 196 |
| Appendix C: Change and Networking Group | 199 |
| Appendix D: Staff Surveys | 204 |
| Appendix E: Walking Distance and Behaviour Mapping..... | 219 |
| Appendix F: Article 1..... | 228 |
| Appendix G: Article 2 | 233 |

List of Tables

| | |
|---|-----|
| Table 1.1: Number of neonates admitted to the Neonatal Intensive Care Unit | 25 |
| Table 2.1: List of articles included in the literature review | 32 |
| Table 2.2: List of articles included in the literature review (continued) | 33 |
| Table 2.3: List of articles included in the literature review (continued) | 34 |
| Table 3.1: Key milestones of the Neonatal Intensive Care Unit redevelopment | 64 |
| Table 4.1: Staff evaluation of the CAN Group | 112 |
| Table 5.1: Comparison of Distance Walked by Clinical Groups | 136 |
| Table 5.2: Comparison of time spent by staff in seven activity categories | 137 |
| Table 5.3: Staff Satisfaction Survey | 140 |
| Table 7.1: Summary of main findings | 171 |
| Table 7.2: Summary of main findings (continued) | 172 |
| Table 7.3: Summary of main findings (continued) | 173 |

List of Figures

| | |
|--|-----|
| Figure 2.1: Literature review process | 31 |
| Figure 3.1: Open Plan Neonatal Intensive Care Unit floorplan | 61 |
| Figure 3.2: Open plan Special Care Nursery room (Photo 1) | 62 |
| Figure 3.3: Open plan Neonatal Intensive Care room (Photo 2) | 62 |
| Figure 3.4: Floorplan of the two cot Neonatal Intensive Care Unit | 69 |
| Figure 3.5: Two cot Special Care Nursery room (Photo 3) | 70 |
| Figure 3.6: Two cot Neonatal Intensive Care room (Photo 4) | 70 |
| Figure 3.7: Six key principles for hosting a World Café | 74 |
| Figure 4.1: Lewin's origin cycle | 86 |
| Figure 4.2: Participatory action research cycle | 93 |
| Figure 4.3: PAR approach undertaken by the NICU CAN Group | 105 |
| Figure 4.4: Fishbone analysis of neonates, staff and family needs | 107 |
| Figure 4.5: Overview of projects undertaken by the CAN Group and staff | 111 |
| Figure 5.1 Floorplan of Open Plan NICU | 130 |
| Figure 5.2 Floorplan of Intensive Care room | 131 |
| Figure 5.3 Floorplan of Special Care room | 132 |

List of Reflection Boxes

| | |
|---|-----|
| Reflection Box 1: Outline of reflection box methodology | 20 |
| Reflection Box 2: Help I am lost! | 41 |
| Reflection Box 3: NICU World Café | 66 |
| Reflection Box 4: Forming the CAN Group | 96 |
| Reflection Box 5: Enrolling in my Masters | 97 |
| Reflection Box 6: CAN Group Role 2012 | 125 |
| Reflection Box 7: First twelve weeks | 147 |
| Reflection Box 8: Surveying staff and parents | 154 |
| Reflection Box 9: Enrolling for MNR | 157 |
| Reflection Box 10: Action research workshop | 158 |
| Reflection Box 11: CAN Group learning together | 160 |
| Reflection Box 12: Stage 1: Context | 162 |
| Reflection Box 13: Stage 2: Process | 162 |
| Reflection Box 14: Stage 3: Premise | 163 |
| Reflection Box 15: The rollercoaster ride | 166 |
| Reflection Box 16: Becoming a researcher | 167 |

List of Abbreviations

ACT Australian Capital Territory

CAN Change and Networking Group

NICU Neonatal Intensive Care Unit

OP Open Plan

PAR Participatory Action Research

SCN Special Care Nursery

SFR Single Family Room

Abstract

Title

Facilitating Change and Evaluating Impact during a Neonatal Intensive Care
Redevelopment: A Participatory Action Research Project

Background

There have been many reports indicating that if the design of Neonatal Intensive Care Units provides neonates with a more developmentally appropriate environment during the period of their admission, there would be significant neurodevelopmental benefits. To create such an environment, Neonatal Intensive Care floor plans have been modified from open plan to a single family room or larger rooms where 2-6 neonates are accommodated. Single family room design enables staff to adapt the physical environment (e.g. light, noise) to meet each neonate's gestational age and sleep/wake cycle requirements. However, previous researchers have suggested that changing room design from an open plan to a single family room increased staff walking distance, workload and staffing requirements. Transitioning staff to a new design also requires changes in workflow and nursing practices.

In 2012, the Canberra Neonatal Intensive Care Unit transitioned from open plan to two cot design. The two focuses of this project were to find solutions to facilitate the change of room design and to add to current knowledge on facilitating staff transition to, and the effect on staff of, the two cot Neonatal Intensive Care Unit design.

Objectives

The thesis followed the timeline of the redevelopment of the new Neonatal Intensive Care Unit, with four key objectives:

1. To review current literature on transitioning from open plan to two cot Neonatal Intensive Care Unit design.
2. To engage stakeholders in the Neonatal Intensive Care Unit design process.
3. To explore participatory action research as a methodology to facilitate the change of Neonatal Intensive Care Unit design from open plan to two cot.
4. To evaluate the impact of the two cot design on staff walking distance, activity and perceptions.

Study Methodology

This is a descriptive prospective study undertaken during the design, construction and transition from an open plan to a two cot design. To address the study objectives, a variety of methods have been employed during the research process. Research methods were aligned with each of the objectives:

Objective 1: An integrated literature review of strategies implemented to facilitate transition to a new Neonatal Intensive Care Unit design.

Objective 2: World Café methodology to engage stakeholders in the Neonatal Intensive Care Unit design process.

Objective 3: Participatory action research methodology, survey methods and focus groups to facilitate the change by identifying staff needs, and formulating and implementing solutions.

Objective 4: Longitudinal comparative prospective studies to evaluate the impact of two cot design on staff walking distance, workflow and practice.

Data Generation

Thesis data; both qualitative and quantitative, were generated using a participatory action research methodology of engagement with others; in an emergent process of enquiry, action and evaluation.

Data Analysis

For each of the study objectives, analyses were completed in a manner that suited the type of data collected:

Objective 1: Current literature methodology and themes were analysed thematically in alignment with review inclusion criteria.

Objective 2: A qualitative descriptive approach was used to thematically analyse the Neonatal Intensive Care Unit World Café data.

Objective 3: A qualitative thematically descriptive approach was used to analyse data generated through the exploration of the participatory action research process, e.g. staff meetings, workshops, group minutes, posters, question boards and the qualitative component of staff surveys. Quantitative survey data were analysed using the Mann–Whitney non-parametric test, with a p-value of < 0.05 considered to be statistically significant.

Objective 4: Descriptive and frequency tables of data from the design impact studies were compiled using SPSS 20. Multivariate analyses of quantitative data were completed using one-way analysis of variance (ANOVA) tests to calculate estimated marginal means, standard deviations and 95% confidence intervals.

Survey results were compared at the three time periods. Survey results report estimated marginal means and percentage % of staff that agreed or strongly agreed with each question (m [%], p < value). A qualitative descriptive approach was used to thematically analyse the qualitative component of the staff surveys.

Study Findings

Objective1: To review current literature on transitioning from open plan to two cot Neonatal Intensive Care Unit design.

Current research has focussed on single family room design. No articles were found that described transition to a two cot design, or evaluated its impact on staff workflow and practice. Findings of these studies highlighted that the majority of researchers used survey methodology to gauge staff perceptions of the physical aspects of the environment with limited published quantitative data (empirical evidence) to support or refute staff perceptions. Participants in previous studies described the benefits of single family room design as including the capacity to provide a developmentally appropriate environment that facilitates privacy to promote family bonding and breastfeeding prior to discharge. When considering workflow and practice, participants of previous studies have described the complexities of maintaining effective communication between staff and the need to provide additional support and education for staff working in single family room design.

Opinion remains divided on the impact of design on walking distance, workload and staffing requirements, with researchers concluding that there is a need for future research to assess the long term impact of Neonatal Intensive Care Unit design on staff; however, there is no evidence of any such research having been undertaken post two years of adopting single family room design. There is also a significant gap in research that considers the impact of Neonatal Intensive Care Unit design on staff in the Australian health care context.

Objective 2: To engage stakeholders in the Neonatal Intensive Care Unit design process.

World Café methodology facilitated stakeholders' exposure to a variety of opinions and information regarding the Neonatal Intensive Care Unit's proposed new design. World Café principles allowed stakeholders to focus on key issues and find answers to their questions. The Neonatal Intensive Care Unit World Café stakeholders identified a core group of requirements essential to creating a functional Neonatal Intensive Care Unit: flexibility, visibility, privacy, skills, safety and sense of community. Stakeholders agreed that these requirements could be addressed most effectively in both two and single cot rooms, detailing their recommendations for the architects.

Objective 3: To explore participatory action research as a methodology to facilitate the change of Neonatal Intensive Care Unit design from open plan to two cot.

This study highlights the benefits of participatory action research methodology in finding solutions to reduce the impact of two cot Neonatal Intensive Care Unit design on clinical practice. It also contributes new evidence to the literature about participatory action research methodology, including the group formation which involved a process that has since been successfully translated to other situations and groups undergoing remodelling or restructure.

The study provides insight into the highlights and challenges that redevelopment teams will be confronted with as they align clinical practice with a new Neonatal Intensive Care Unit design. Furthermore, exploring participatory action research methodology was undertaken to complete the second (thesis) cycle associated with undertaking a doctoral program describing the enquiry-reflection process of learning in the transition from student to researcher.

Objective 4: To evaluate the impact of the two cot design on staff walking distance, activity and perceptions.

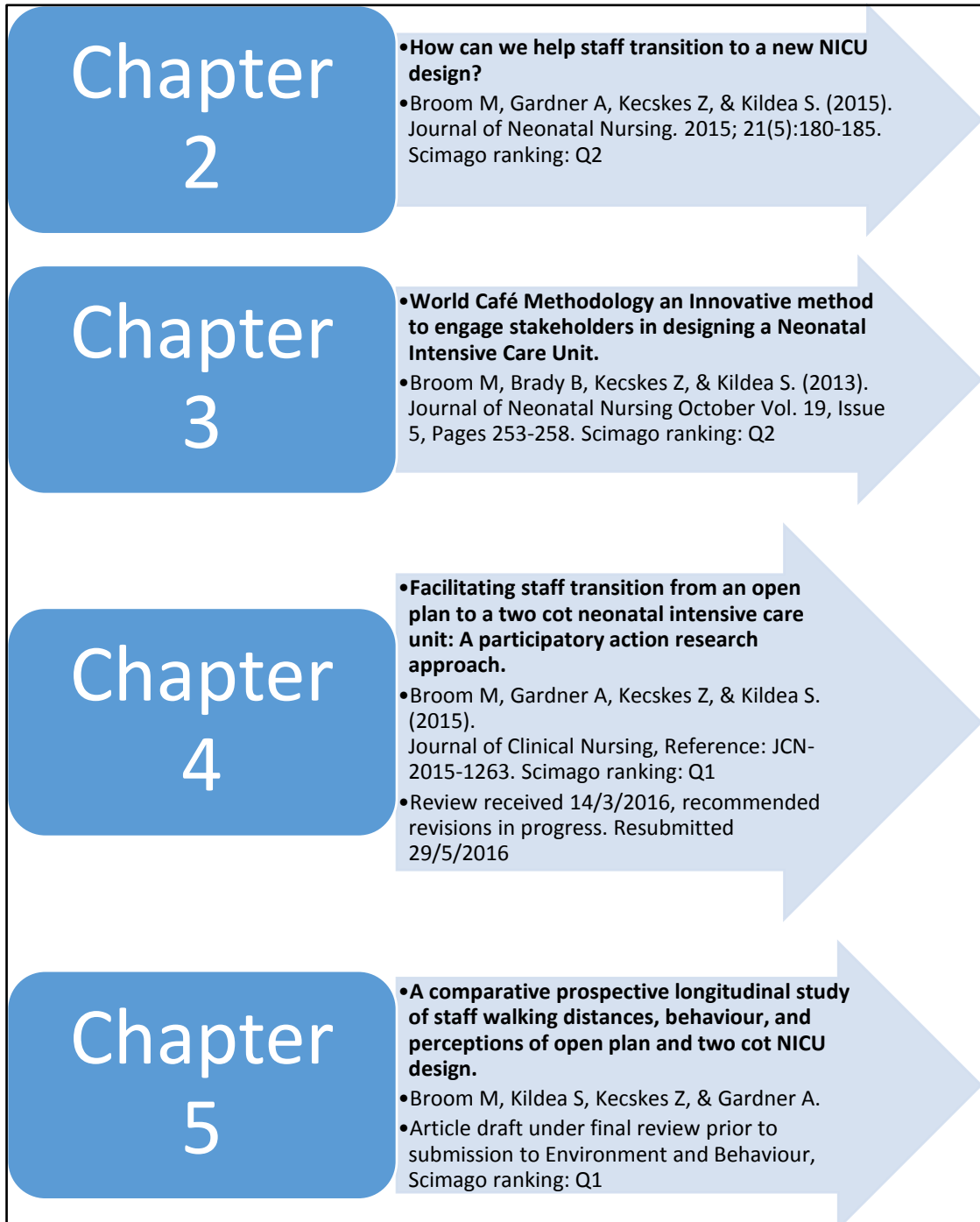
Findings showed that clinical nurses do not walk further in a two cot Neonatal Intensive Care Unit and that there was no reduction in time spent providing direct clinical care. Staff perceived that the two cot design provided a significantly improved and developmentally appropriate family-centred environment that facilitated communication and collaboration between staff and families. The challenges identified with a two cot design include effective staff communication, access to educational opportunities and the isolation experienced by staff and families.

Conclusion

This is the first longitudinal study to evaluate methods to facilitate staff transition to a two cot design and to measure the impact of this two cot design using participatory action research methodology. Study results highlight the positive impact of a structured approach to; and the inclusion of staff during, the design, construction and transition to a two cot Neonatal Intensive Care Unit design. This study provides evidence regarding: methods to reduce the negative impacts of the two cot design through design modifications and fit out; staff perceptions of the benefits of two cot design for neonates and families; and the need for a process of continual improvement in communication, provision of educational opportunities and reduction in isolation following transition to the two cot design. This study has also highlighted the need for continued research that considers approaches to providing staff with a supportive environment in which to care for neonates, and assesses the long-term impact of Neonatal Intensive Care Unit design on staff wellbeing.

Research Portfolio

Publications included in the thesis



Statements of contribution to jointly published manuscripts

Statement of Authorship ¶

Jointly published manuscript incorporated into Chapter 2 ¶



¶ It is acknowledged that all co-authors jointly authored the manuscript included in Chapter 2 of this thesis. The co-authors consent to the inclusion of this manuscript in this thesis and agree with Mrs Margaret Broom's contribution to the manuscript as outlined in the statement of contributions as set out below: ¶

| | | |
|----------------------|--|---|
| ¶ Title ¶ | How can we help staff transition from open plan to a new NICU design? ¶ | ○ |
| Authors ¶ | Margaret Broom, Professor Anne Gardner, Professor Sue Kildea, Professor Zsuzsoka Kecskes ¶ | ○ |
| Journal-Referenced ¶ | Journal of Neonatal Nursing, 2015;21(5):180-5 ¶ | ○ |

¶ First author's contribution to the manuscript: ¶

During the development and submission of this manuscript I have carried out the following actions: ¶

1. → identification of the problem ¶
2. → formulated methodology and study design ¶
3. → undertaken literature review of manuscript topic ¶
4. → interpreted and critically analysed study results ¶
5. → finalisation of the manuscript and submission. ¶

Signature of the PhD student *Margaret Broom* Date: 23/12/15

Co-author's contribution to the manuscript have included:

Professor Anne Gardner
Critically reviewed manuscript drafts and edited final version

Signature: *A. Gardner* Date: 15-12-15

Professor Sue Kildea
Critically reviewed manuscript drafts and edited final version

Signature: *Sue Kildea* Date: 11/3/16

Professor Zsuzsoka Kecskes
Critically reviewed manuscript drafts and edited final version

Signature: *Zsuzsoka Kecskes* Date: 23/12/15

Statement of Authorship ¶
 Jointly published manuscript incorporated into Chapter 3 ¶



It is acknowledged that all co-authors jointly authored the manuscript included in Chapter 3 of this thesis. The co-authors consent to the inclusion of this manuscript in this thesis and agree with Mrs Margaret Broom's contribution to the manuscript as outlined in the statement of contributions as set out below: ¶

| | |
|----------------------|--|
| Title ¶ | World Café Methodology: An Innovative Method to Engage Stakeholders in Designing a Neonatal Intensive Care Unit ¶ |
| Authors ¶ | Margaret Broom, Professor Sue Kildea, Professor Zsuzsoka Kecskes ¶ |
| Journal-References ¶ | Journal of Neonatal Nursing October (2013) Vol. 19, Issue 5, Pages 253-258. ¶ |

First author's contribution to the manuscript: ¶

During the development and submission of this manuscript I have carried out the following actions: ¶

1. → undertaken literature review of manuscript topic ¶
2. → interpreted and critically analysed study results ¶
3. → written the first draft of the manuscript ¶
4. → undertaken revisions to meet journals final approval ¶
5. → finalisation of the manuscript and submission. ¶

Signature of the PhD student

Date: 23/12/15

Co-authors' contribution to the manuscript:

Professor Sue Kildea

Critically reviewed manuscript drafts and edited final version

Signature:

Date:

11/03/16

Professor Zsuzsoka Kecskes

Developed the study methodology

Provided guidance on study results

Critically reviewed manuscript drafts and edited final version

Signature:

Date:

23/12/15

-Statement of Authorship -¶

Jointly published manuscript incorporated into Chapter 4¶



¶ It is acknowledged that all co-authors jointly authored the manuscript included in Chapter 4 of this thesis. The co-authors consent to the inclusion of this manuscript in this thesis and agree with Mrs Margaret Broom's contribution to the manuscript as outlined in the statement of contributions as set out below.¶

| | |
|--------------------|--|
| Title¶ | Facilitating the transition from an open plan to a two cot neonatal intensive care unit: A participatory action research approach. ¶ |
| Authors¶ | Margaret Broom, Professor Anne Gardner, Professor Zsuzsoka Kecskes, , Professor Sue Kildea. ¶ |
| Journal Reference¶ | Submitted to Journal of Clinical Nursing --- December 2015¶ |

First author's contribution to the manuscript: ¶

During the development and submission of this manuscript I have carried out the following actions:¶

- 1.→ identified the problem¶
- 2.→ formulated methodology and study design.¶
- 3.→ undertaken literature review of manuscript topic¶
- 4.→ organised and coordinated clinical studies¶
- 5.→ interpreted and critically analysed study results¶
- 6.→ written the first draft of the manuscript¶
- 7.→ finalisation of the manuscript and submission.¶

Signature of the PhD student

Margaret Broom

Date: 23/14/15

Co-author's contribution to the manuscript have included

Professor Anne Gardner

Critically reviewed manuscript drafts and edited final version

Signature: *A. Gardner*

Date: 15-12-15

Professor Sue Kildea

Guided methodology and study design

Supervised Data Analysis

Critically reviewed manuscript drafts and edited final version

Signature:

[Handwritten signature of Sue Kildea]

Date: 11/3/16

Professor Zsuzsoka Kecskes

Critically reviewed manuscript drafts and edited final version

Signature: *[Handwritten signature of Zsuzsoka Kecskes]*

Date: 23/12/15

Statement of Authorship ¶

Jointly published manuscript incorporated into Chapter 5 ¶



It is acknowledged that all co-authors jointly authored the manuscript included in Chapter 5 of this thesis. The co-authors consent to the inclusion of this manuscript in this thesis and agree with Mrs Margaret Broom's contribution to the manuscript as outlined in the statement of contributions as set out below: ¶

| | |
|---------------------|--|
| Title ¶ | A comparative prospective longitudinal study of staff walking distances, behaviour, and staff perceptions of open plan and two cot NICU design. ¶ |
| Authors ¶ | Margaret Broom, Professor Anne Gardner, Professor Sue Kildea, Professor Zsuzsoka Kecskes. ¶ |
| Journal Reference ¶ | Submitted to Journal of Perinatology—December 2015 ¶ |

First author's contribution to the manuscript: ¶

During the development and submission of this manuscript I have carried out the following actions: ¶

1. → identified the problem ¶
2. → formulated methodology and study design ¶
3. → undertaken literature review of manuscript topic ¶
4. → organised and coordinated clinical studies ¶
5. → interpreted and critically analysed study results ¶
6. → written the first draft of the manuscript ¶
7. → finalisation of the manuscript and submission. ¶

Signature of the PhD student

Date: 23/12/15

Co-author's contribution to the manuscript have included:

Professor Anne Gardner

Supervised Data Analysis

Critically reviewed manuscript drafts and edited final version

Signature:

Date: 15-12-15

Professor Sue Kildea

Critically reviewed manuscript drafts and edited final version

Signature:

Date: 11.3.16

Professor Zsuzsoka Kecskes

Guided methodology and study design

Critically reviewed manuscript drafts and edited final version

Signature:

Date: 23/12/15

Presentations during candidature

2016

Transitioning from an open plan to a dual occupancy NICU: A participatory action approach: Counsel of International Nurses Conference, Vancouver, Canada, August 2016 (Oral Presentation)

Snapshot of staff and parent activity in a two cot NICU: Perinatal Society of Australia and New Zealand, Townsville, Australia, May 2016 (Oral Presentation)

2015

Exploring the road to becoming a researcher! Canberra, Australia: Women, Youth and Children Meeting, Canberra, Australia, Nov 2015 (Oral Presentation)

Facilitating Change and Evaluating the Impact during a Neonatal Intensive Care Redevelopment: A Participatory Action Research Project: Pre-completion Seminar: Canberra Campus, Canberra, Australia, September 2015 (Oral Presentation)

Snapshot of staff and parent activity in a two cot NICU: Neonatal Grand Rounds, Department of Neonatology, Canberra, Australia, September 2015 (Oral Presentation)

Snapshot of staff and parent activity in a two cot NICU: Annual Neonatal Nursing Conference, Sydney Australia, September 2015 (Oral Presentation)

Snapshot of staff and parent activity in a two cot NICU: Canberra Health Area Research Meeting, Canberra, Australia, August 2015 (Oral Presentation)

2014

Facilitating Change and Evaluating Impact during a Neonatal Intensive Care Redevelopment: A Participatory Action Research Project: Higher Degree Seminar Canberra Campus, December 2014 (Oral Presentation)

Comparison of Open Plan and Two Cot Design: Results of Staff Surveys: Neonatal Grand Rounds, Department of Neonatology, Canberra, Australia, July 2014 (Oral Presentation)

Caring for neonates in the 21st Century: Creating a NICU environment for the Future! 3rd Biennial Australian Capital Region Nursing and Midwifery Research Centre Conference Canberra, Australia, October, 2014 (Oral Presentation)

2013

Snapshot of the Current and Future NICU Designs impact on workflow and practice: Higher Degree Seminar Brisbane Campus, Dec 2013 (Oral Presentation)

Review of CAN Group 2009-2013: Final Change and Networking Group Meeting, Department of Neonatology, Canberra, Australia, October 2013 (Oral Presentation)

Facilitating Change during a Neonatal Intensive Care Redevelopment: The National Nursing Forum, Canberra, Australia, October 2013 (Oral Presentation)

Does design make a difference? Comparison of open plan and two cot rooms: Annual Neonatal Nursing Conference, Adelaide, Australia, September 2013 (Oral Presentation)

Does design make a difference? Comparison of open plan and two cot rooms: Canberra Health Area Research Meeting, Canberra, Australia, August 2013 (Oral Presentation)

Does design make a difference? Comparison of open plan and two cot rooms: Perinatal Society of Australia and New Zealand, Perth, Australia, April 2013 (Poster Presentation)

2012

Facilitating Change during a Neonatal Intensive Care Redevelopment Project: Using a Participatory Action Research Approach. Higher Degree Seminar, Brisbane Campus, December 2012 (Oral Presentation)

Encompassing Family Centred Care in NICU Design: 2nd Biennial Australian Capital Region Nursing and Midwifery Research Centre Conference, Canberra, Australia, October 2012 (Oral Presentation)

2011

Facilitating Change during a Neonatal Intensive Care Redevelopment Project: Using a Participatory Action Research Approach. Higher Degree Seminar, Brisbane Campus, December 2011 (Oral Presentation)

Changing Rooms: NICU Style, How far we have come! ACT Nurse Practice Development Forum, Nursing and Midwifery Week, Canberra, Australia, May 2011 (Oral Presentation)

Facilitating Change during a Neonatal Intensive Care Redevelopment Project: Using a Participatory Action Research Approach. Confirmation of Candidature, Australian Catholic University, Brisbane Campus, March 2011 (Oral Presentation)

2010

Changing Rooms (NICU Style): facilitating change using World Café Methodology.

Annual PSANZ meeting: Wellington, New Zealand, April 2010 (Poster Presentation)

Facilitating Change in a Neonatal Intensive Care Redevelopment: Neonatal Nurses 5th

Annual Conference, Wellington, New Zealand, April 2010 (Oral Presentation)

A Holistic Approach to Implementing Evidence Based Practice in the NICU: 2nd Biennial

Australian Capital Region Nursing and Midwifery Research Centre Conference,

Canberra, Australia, April 2010 (Oral Presentation)

What does Changing Practice Mean? Working in a Two Cot NICU: NICU Planning Day

Canberra, Australia, September 2010 (Oral Presentation)

2009

Changing Rooms: Moving from an open planned NICU to a Family Centred two cot pod design. Annual Neonatal Nursing Conference, Sydney Australia, September 2009 (Oral Presentation)

Changing Rooms (NICU Style): Facilitating Change using World Café Methodology:

Perinatal Society of Australia and New Zealand, Townsville Australia, April 2009 (Poster Presentation)

Design of Thesis by Publication

This thesis by publication follows the timeline of a Neonatal Intensive Care Unit redevelopment in which the design was changed from open plan to two cot rooms. The thesis begins by outlining the process of choosing the Neonatal Intensive Care Unit design, then details how transition was facilitated and ends by providing the comparative studies that evaluated the impact of the two cot design on staff workflow and practice.

While several of the processes: such as the formation of the participatory action research group, transition to the two cot Neonatal Intensive Care Unit and the comparative design studies; were in progress concurrently, the thesis has been structured to provide the reader with a longitudinal perspective of the project.

The thesis consists of eight chapters, which includes four manuscripts documenting different studies undertaken as part of the doctoral research for this thesis. To consolidate the style of the thesis, minor alterations have been made to the formatting of the articles. In response to supervisor and journal feedback, the phrase 'single or small room design' (SRD) in article 1 (published) and term 'single room design' (SRD) in article 2 (published), have been refined and replaced with single family room (SFR) throughout the thesis as well as in articles 3 & 4. Reference lists have not been added at the end of each chapter; all references are provided in Chapter 8.

Six chapters (1-5, 7) of the thesis have been written in the second person; with my role being a participant in the research group, describing the project from the group's perspective (Coghlan & Brannick, 2009). Chapter 6 covers my reflection about my process of learning and has therefore been written in the first person.

The final draft of the thesis has been externally edited to meet the relevant requirements of the Guidelines on the Preparation and Presentation of a Research or Professional Doctoral Thesis for Examination (18 February 2015).

Overview of Chapters

This thesis encompasses a detailed description of a participatory action research project undertaken during the transition of an Australian Neonatal Intensive Care Unit from an open plan to a two cot room design during a five year period from 2009-2014.

Chapter 1 presents a broad overview of Neonatal Intensive Care Units, the Neonatal Intensive Care Unit population and the Australian Health Care System. It then presents a brief background to the project, outlining the history of Neonatal Intensive Care Unit design, the context in which the research was conducted and the rationale for undertaking a thesis on this topic. The chapter concludes with an explanation of the objectives of the study and an overview of the research project that defines the scope of the thesis.

Chapters 2 - 5 are organised in a similar format, with a prologue, journal publication (either published or submitted), main findings and summary. Chapter 4 also includes an overview of the history of participatory action research methodology and consideration of its benefits, challenges, ethics and limitations.

Chapter 2 provides an overview of current literature on the impact of single family room design on staff and what other Neonatal Intensive Care Units have done to help staff transition to a new design. It includes a peer-reviewed journal manuscript: *How can we help staff transition to a new NICU design?* Published in the Journal of Neonatal Nursing, 2015; 21(5):180-185.

Chapter 3 outlines the NICU World Café undertaken to choose the new Neonatal Intensive Care Unit design. World Café is a creative methodology for hosting authentic conversations around questions that matter (Brown & Isaacs, 2005). Participants join together at Café style tables where they hold conversations exploring the question of the Café (Brown & Isaacs, 2005). The chapter includes a peer-reviewed journal manuscript: *World Café Methodology an Innovative method to engage stakeholders in designing a Neonatal Intensive Care Unit*. Published in the Journal of Neonatal Nursing, 2013; 19(5):253-258.

Chapter 4 describes participatory action research methodology and how this has been contextually intertwined into this project. It includes a journal manuscript: *A Participatory Action Research Approach to transitioning from an open plan to a two cot Neonatal Intensive Care Unit design*. Submitted to the Journal of Clinical Nursing; Dec 2015. Resubmitted with revisions 29/05/2016. Accepted for publication 07/08/16.

Chapter 5 outlines the prospective comparative design studies undertaken to measure the impact of the two cot room design on nursing staff workflow and practice. It includes a journal manuscript: *A comparative prospective longitudinal study of staff walking distances, behaviour, and perceptions of open plan and two cot NICU design*. Article draft under final review prior to submission to Environment and Behaviour, Scimago ranking: Q1.

Chapter 6 describes the *second or thesis cycle* (Coughlan & Braddick, 2009) as applied to this study. It reports on the *participatory action research enquiry – reflection process* of learning in action: my role, the theoretical premise, the methods of learning and an analysis of what I have learnt through this research process. This Chapter has been written in the first person to portray the journey of personal learning I experienced

during the project. In addition to the learning process detailed in Chapter 6, I have included reflection boxes throughout the manuscript to provide greater contextual understanding of my role and learning on specific topics. The Reflection Box methodology is explained below:

Reflection Box 1: Outline of reflection box methodology

To explore my experience during the four year period of the Neonatal Intensive Care Unit redevelopment, I undertook to journal the project successes and challenges, my thoughts and feelings, as well as a self-assessment of what I learned throughout the process. I have used this observational data, as well as minutes and notes written during the redevelopment, to create reflection boxes that outline my role or learning as related to particular issues or sections of the project. I have explored this reflective process in greater depth in Chapter 6.

To provide consistency and fluidity in the document, reflection boxes follow the same format: heading, reflection, and reference. Reflections are italicised to indicate the change in my role from group member to researcher.

Chapter 7 presents a summary of findings, contributions to current knowledge, recommendations for future research and an overarching conclusion.

Chapter 1: Introduction

Prologue

This thesis provides a detailed description of a participatory action research project undertaken during the transition of an Australian regional Neonatal Intensive Care Unit from an open plan design to a two cot design during a five year period from 2009-2014. The study follows the timeline of the Neonatal Intensive Care Unit redevelopment, starting with the process undertaken to choose the new design and ending with the comparative design studies undertaken to evaluate the impact of the selected two cot design on staff workflow and practices.

Chapter 1 presents a broad overview of Neonatal Intensive Care Units, the Neonatal Intensive Care Unit population and the Australian Health Care System. It then presents a brief background to the project, outlining the context and rationale for undertaking a thesis on this topic, as well as outlining the objectives of the study.

Neonatal Intensive Care Units

Neonatal Intensive Care is the overarching name most commonly used to describe a group of facilities that are used to care for sick neonates. Neonatal units in Australia are categorised (levels 1-6) according to the level of care available in the facility:

Level 1-2 units, generally known as *well-baby nurseries*, provide postnatal care to healthy new-born infants, and stabilise and provide care for infants > 35 weeks gestation who remain physiologically well. Neonates in these units are often cared for by general practitioners (Chow, 2013).

Level 3-4 units, also known as *special care nurseries*, cater to infants > 32 weeks gestation who require low-level medical treatment. Neonates in these units are cared for by paediatricians (Chow, 2013).

Level 5 units, or *neonatal intensive care units*, provide comprehensive intensive care for infants with critical illnesses, irrespective of gestational age or birth weight.

Level 6 units manage the care of neonates who require surgical intervention or complex respiratory support (Chow, 2013). Neonates in level 5 and 6 units are cared for by neonatologists and qualified neonatal nurses.

Neonatal intensive care in Australia

Healthcare Provision and Funding

Health care in Australia is provided by both private and government institutions. Medicare; instituted in 1984 is Australia's publicly-funded universal health care system. It coexists with the private health system, allowing people to access a range of health care options for neonatal intensive care (Leeder, 2003).

Australian NICU Population

In 2013, the Australian and New Zealand Neonatal Network reported 7,887 babies registered as being cared for in 22 neonatal intensive care units in Australia and New Zealand. Of these babies; 2,971 (37.7%) were born before 32 weeks gestation, highlighting moderate to extreme prematurity as the most common reason for admission to a neonatal intensive care unit (Chow, 2013).

This same report revealed the ethnicity of neonates admitted to Australian Neonatal Intensive Care Units as predominantly Caucasian (78.1%) with Asian ethnicity listed as the second highest (11.1%). Notably, neonates identified as being of Aboriginal or Torres Strait Islander descent were significantly over-represented in Neonatal Intensive Care Unit admissions (5%) when compared to the total population (Chow, 2013).

History of Neonatal Intensive Care Unit Design

The first Neonatal Intensive Care Units were modified adult wards in which walls were removed to construct open plan units that generally catered for 20-50 neonates (Harris et al., 2006). Over the past 20 years there has been a progressive change in the philosophy guiding neonatal care. Providing neonates with a developmentally appropriate environment and allowing families more access to their babies have become key objectives in improving short and long-term outcomes for neonates who require intensive care (White, 2007). Single family room design has been noted in previous research as assisting in providing a developmentally appropriate environment for neonates (White, 2007). In a single family room, the levels of lighting, noise and temperature can be individually adjusted to meet the neonate's specific needs, which vary depending on their gestational age and severity of disease (Graven & Browne, 2006). As a consequence, hospitals around the world are in the process of changing their Neonatal Intensive Care Unit designs from open plan to a single family room, or larger rooms catering for 2-6 neonates (White, 2003).

Researchers are now evaluating how the Neonatal Intensive Care Unit design may impact on an infant's length of stay in hospital and the associated cost (Stevens et al., 2014). It is estimated to cost \$1,200-\$3,000 per day to provide care for an infant admitted to a Neonatal Intensive Care Unit in Australia, with an average cost of \$200,000 by the time the infant leaves hospital (Wishart, 2011). Studies have reported evidence that single family room design reduces the length of stay and infection rates, suggesting that such designs may improve long-term outcomes and reduce costs; however; conclusive findings remain limited, highlighting the need for further research (Pineda et al., 2014; White, 2011).

Previous studies have suggested that single family room design, while improving the physical environment for neonates and their families, may have a negative impact on

staff workflow and nursing practice. The potential effects include an increase in staff walking distances, heavier workload and an increase in the number of staff required to provide safe nursing care (Stevens et al., 2010). Research findings have reported that single family room design may negatively impact on communication between members of a clinical team and impede staff access to support and educational opportunities; all key aspects of effective nursing care in a Neonatal Intensive Care Unit (Shahheidari & Homer, 2012).

Thesis Context

In the 2008–2009 budget, the Australian Capital Territory (ACT) Government announced a 10 year plan for redevelopment of health infrastructure in the ACT. Funds were allocated for a number of initiatives; among these was the construction of the Women and Children’s Hospital adjoining the Canberra Hospital site, which included a complete redevelopment of the open plan Neonatal Intensive Care Unit to a new facility modelled on a two cot design.

This study was undertaken at the Canberra Hospital, which has a catchment area of approximately 6,840 square kilometres encompassing the Australian Capital Territory and areas of regional New South Wales. The original open plan Neonatal Intensive Care Unit was opened with 24 beds in 1995 with 536 admissions in the first year (NICU Annual Report, 1996). Since opening there has been a steady increase in the number of neonates admitted to the unit. During the period July 2010 – June 2011, 657 neonates were admitted to the Neonatal Intensive Care Unit, with an average occupancy rate of 90-100% (NICUS Database, 2011). Admissions have continued to increase since transition to the two cot Neonatal Intensive Care Unit in 2012, with 718 admissions in the financial year 2014 - 2015 (NICUS Database, 2015) as per Table 1.1.

Table 1.1: Number of neonates admitted to the Neonatal Intensive Care Unit

| Gestational Age (weeks) | Annual Report 1996 | NICUS Data 2011 (open plan) | | NICUS Data 2015 (two cot) | |
|------------------------------------|-------------------------------|--|------------------|--------------------------------------|--|
| | <i>n (%)</i> | <i>n (%)</i> | <i>n (%)</i> | | |
| <28 | 30 (5.5) | 16 (2.5) | 15 (2.0) | | |
| 28-31 | 58 (11.0) | 60 (9.0) | 63 (9.0) | | |
| 32-36 | 180 (33.5) | 218 (33.5) | 241 (33.5) | | |
| Term | 268 (50.0) | 297 (45.0) | 321 (45.0) | | |
| Readmissions | | 47 (7.0) | 74 (10.0) | | |
| Non-neonates | | 19 (3.0) | 4 (0.5) | | |
| Total | 536 (100) | 657 (100) | 718 (100) | | |

(Sources: Annual Report, 1996, NICUS Database, 2011, 2015)

Thesis Rationale

In 2009, during the planning stage of the Neonatal Intensive Care Unit redevelopment, staff freely acknowledged the reported benefits of single family room design for neonates and their families and recognised the need for the new design to provide a family-centred, developmentally appropriate environment. However; when considering a single family room design issues revolved around the capacity to provide safe, quality care to neonates and the daily organisation and functionality of the new Neonatal Intensive Care Unit.

Factors included staffing the unit, access to assistance, supporting and educating junior staff. Staff also identified fears of isolation and anxiety related to working in a small room design Neonatal Intensive Care Unit. Staff were encouraged to be involved in the enquiry process of developing the new Neonatal Intensive Care Unit design through reading articles and attending design meetings; however, rather than providing resolution of the concerns, many staff found their fears of changing to a new design were reinforced by current literature that discussed increased workload and difficulties in maintaining effective team communication (Shahheidari & Homer, 2012).

Conversations and feedback to management centred on staff feeling disenfranchised from design processes, lacking information and considering other areas of health for their future employment.

In my position as the Neonatal Intensive Care Unit Research Nurse, I was interested in taking an evidence-based approach to finding ways to assist staff during this transition.

My main aim was to create a positive 'buzz' about the new unit; to encourage and excite staff about the transition and to build on the positive aspects of the new design.

I wanted to challenge negative perceptions and collaborate with staff to identify and resolve issues that arose. Thus began the search to find information. How had the other units in Australia managed the changes required? Could we replicate a model from a Neonatal Intensive Care Unit in America or the United Kingdom?

We wanted to learn from other Neonatal Intensive Care Units experiences but our unit staff members were both surprised and disappointed to learn that whilst representatives from Neonatal Intensive Care Units around the world, including those from Australia and New Zealand, had presented their new Neonatal Intensive Care Unit designs at conferences, few had documented what they had done to facilitate the transition. It should also be noted that no research was available specifically on the impact of a two cot design to assist in determining if the same potential problems seen in single family rooms would become apparent in the two cot design.

Study Objectives

1. To review current literature on transitioning from open plan to two cot Neonatal Intensive Care Unit design.
2. To engage stakeholders in the Neonatal Intensive Care Unit design process.
3. To explore participatory action research as a methodology to facilitate the change of Neonatal Intensive Care Unit design from open plan to two cot.
4. To evaluate the impact of the two cot design on staff walking distance, activity and perceptions.

Overview of Research Project and Scope of Thesis

Over the past five years I have coordinated the research required to assess the impact on neonates, staff and families of changing the Neonatal Intensive Care Unit design.

This research has included:

- comparative environment studies to assess the effect of the two cot design on provision of a developmentally appropriate environment (e.g. sound, lighting)
- facilitating the staff transition to the two cot Neonatal Intensive Care Unit through a participatory action research project
- evaluating the impact of two cot design on staff and families, through pre- and post-comparative design studies of activity and satisfaction.

Given the comprehensive scope of the project I was advised to limit the scope of the research reported in my thesis. Due to the current lack of evidence on the impact of small room design on staff, I have elected to present an overview of the research undertaken to facilitate the transition to a two cot room design and measure the impact on the staff.

This participatory action research project endeavoured to facilitate the staff transition to the new Neonatal Intensive Care Unit design. The next chapter (Chapter 2) outlines the current literature on Neonatal Intensive Care Unit design, its impact on staff and strategies implemented to assist staff during and post transition. An overview of the design process is detailed in Chapter 3 and the development of the Change and Networking Group is described in Chapter 4.

The focus of this thesis is centred on the impact of Neonatal Intensive Care Unit design on staff but we cannot ignore the main reason for changing Neonatal Intensive Care Unit design which is to improve the developmental outcomes of the neonates for whom we are most privileged to provide care. To address this aspect of my research and

emphasise the completeness of this study, I am currently drafting two articles for publication. These articles review the impact of the two cot design on the provision of a family-centred developmentally appropriate environment and document parental activity and perceptions. These will be submitted after this thesis is completed.

Chapter 2: Literature Review

"Those that fail to learn from history are doomed to repeat it."

Winston Churchill

Prologue

Chapter 2 provides a detailed review of the current literature related to transitioning from an open plan Neonatal Intensive Care design, to a single family room or larger room accommodating 2-6 neonates. The Chapter starts with background information and then describes the methodology of the review undertaken, outlining the search terms, keywords and themes that led to a summary of the current state of knowledge in this field. A reflection box describes my role during the design process. It is followed by the manuscript: *How can we help staff transition to a new NICU design?*; that describes strategies to facilitate staff transition from open plan to single family or small room design Neonatal Intensive Care Units. The phrase 'a single or small room design' (SRD) has been used in the manuscript included in this Chapter. The Chapter concludes with a critical review of the main findings, a description of gaps in the current literature and a summary.

Review process

Learning from previous research is well documented as providing an invaluable contribution to research awareness in nursing. Through undertaking a literature review, the researcher becomes aware of the current knowledge on their topic and is able to relate this to new settings (Timmins & McCabe, 2005).

Over the five years of this research, I carried out regular reviews of the literature to find studies that would assist in identifying solutions to the problems we were encountering,

such as: choosing design features, preparing to practice and dealing with staff resistance to change during the transition to the two cot Neonatal Intensive Care Unit. Although building and transitioning to a new Neonatal Intensive Care Unit impacts on patient care, nursing practice and families; recommendations or guidelines to facilitate the process were not provided in any recent nursing textbooks at the time this project started. Many of the articles listed in this final review were not published during the planning stage of the NICU from 2008-2010.

During the last stage of collating my thesis I undertook a final review of the literature. Abstracts, outlines and complete articles published from 1985-2015 were retrieved via electronic and manual searches of MEDLINE, CINAHL, Science Direct, Cochrane databases and Google Scholar. The literature review process involved an initial broad scan of the literature, with increasingly specific refinements applied to identify highly relevant studies (Figure 2.1).

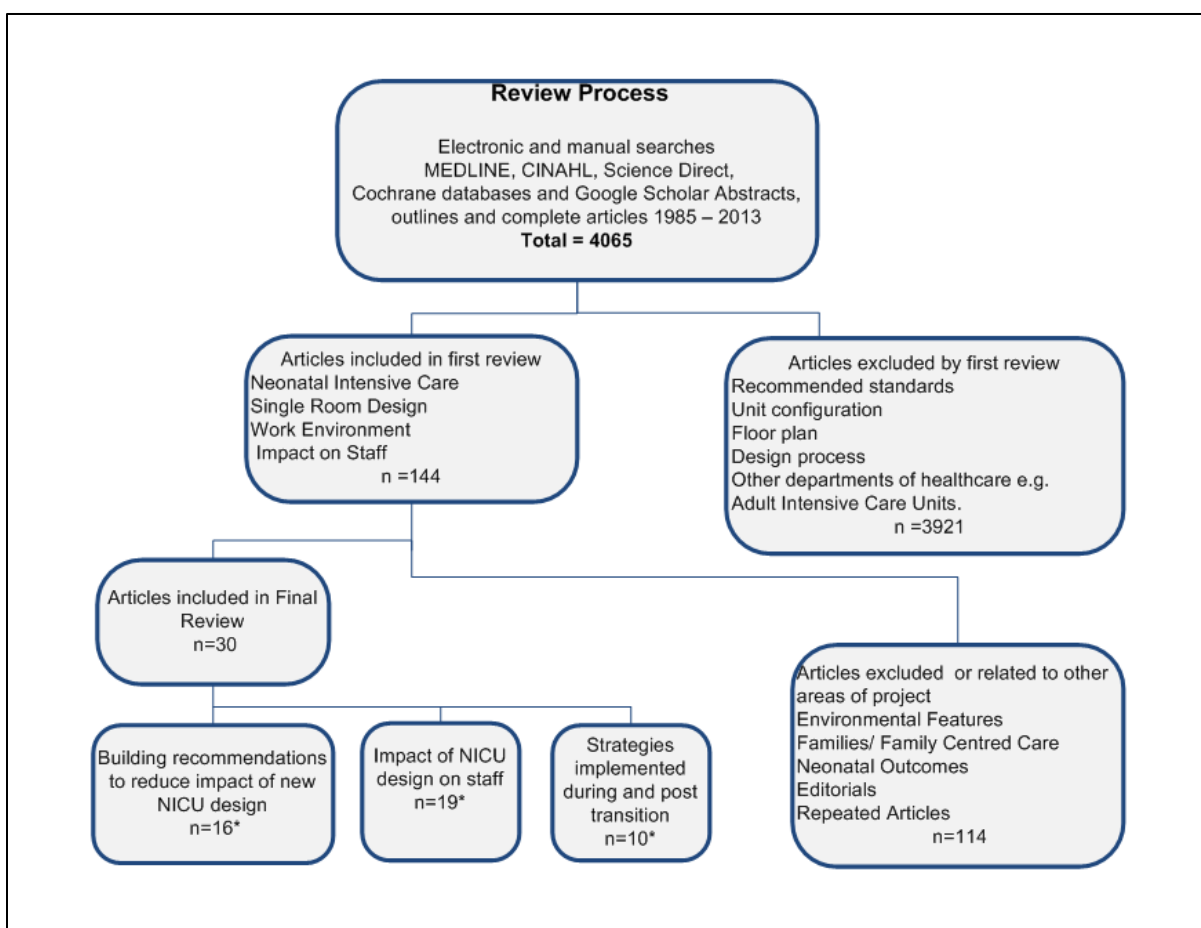
The review identified over 4000 articles that considered Neonatal Intensive Care Unit and hospital design and construction. To narrow the review, the search was refined to include additional themes: recommended standards, unit configuration, floor plans, the design process and information related to other departments of healthcare e.g. adult intensive care units.

This enquiry highlighted 144 articles for further review. Of these, the abstracts, outlines and complete articles that considered environmental features (light, noise), impact on families, family-centred care and neonatal outcomes were stored for consideration in relation to the areas of this project not reported in this thesis (i.e. environment and impacts on parents). Repetitions of the same articles found on different databases were also excluded.

The review was further refined by including the following key terms or statements:
recommendations to reduce impact of the new design on staff, impact of design on staff,

strategies implemented during and post-move to facilitate the transition to the new Neonatal Intensive Care Unit design. This resulted in 30 articles being considered in this literature review (Figure 2.1). The following review includes a summary of the methodologies employed by other researchers in this field and an analysis of publications related to the three key themes of:

- recommendations to reduce impact of the new design on staff
- impact of design on staff
- strategies implemented during and post-move to facilitate the transition to the new Neonatal Intensive Care Unit design.



Note: * Articles may have considered more than one of the three themes.

Figure 2.1: Literature review process

Table 2.1: List of articles included in the literature review

| | Author | Method | Brief Description | Design | Impact | Strategies During/Post |
|---|------------------------|--|--|---------------|---------------|-------------------------------|
| 1 | Bosch & Jenzarli, 2012 | Survey Longitudinal Pre n =82 Post n=40 | Evaluates staff perceptions of environmental quality before and after the renovation of an existing OP and the addition of 23 single-family rooms (SFR) | x | √* | x |
| 2 | Carlson et al., 2006 | Survey (no sample size) | Describes the design and transition from a OP to SFR and implementation of change model during design and transition | √ | √ | √ |
| 3 | Cone et al., 2010 | Survey Cross-sectional Post n=107 | Interdisciplinary staff perceptions one year after the move from an open plan to SFR | √ | √* | √ |
| 4 | Domanico et al., 2010 | Survey Longitudinal Pre n=48 Trans n =41 18 months n=56 | Prospective study of parents and staff perceptions of OP and SFR NICU environments | x | √ | x |
| 5 | France et al., 2005 | Survey Cross-sectional Total n= 264 NICU n= 99 | Staff impressions of the effects of family-centred Hospital design on job function, patient safety, and personal well-being | x | √ | x |
| 6 | Harris et al., 2006 | Survey Cross-sectional Multicentre Two sites Total n =75 SFD = 21 OP = 27 SFD =27 | Explores the implications of the SFR; family experience, neonate outcomes, staff perceptions, cost and environmental design. Outlines floor space in dual occupancy NICU | √ | √* | x |
| 7 | Hogan et al., 2015 | Survey Longitudinal OP n=22 SFR n= 29 Interviews =11 | Study examined the impact of SFR neonatal nursery design on nursing staff | x | √ | x |
| 8 | Milford et al., 2008 | Survey Longitudinal (6.12, 24 months (no sample size)) | Presents a NICU design process. Staff surveyed at three times periods during transition from OP to SFR | √ | x | √ |

Table 2.2: List of articles included in the literature review (continued)

| | Author | Method | Brief Description | Design | Impact | Strategies During/Post |
|-----------|----------------------------|---|---|---------------|---------------|-------------------------------|
| 9 | Shepley et al., 2008 | Survey Same study group as Harris et al, 2006 | Caregiver satisfaction and stress reports staff stress, satisfaction and perception of OP and SFR NICUs | x | √ * | x |
| 10 | Smith et al., 2009 | Survey Longitudinal Pre n=65 6 months n=65 22 months n=75 | Staff perceptions of work quality of a neonatal intensive care unit before and after transition from OP and SFR NICUs | x | √ | √ |
| 11 | Stevens et al., 2010 | Survey Longitudinal OP n= 96 SFR n=121 | Staff workplace quality perceptions assessed in OP and SFR NICU | x | √ | x |
| 12 | Swanson et al., 2013 | Survey Longitudinal Pre n=42 1month n=58 8 months n=51 | Attitudes and perceptions of parents and healthcare providers regarding the OP and SFR NICUs | x | √ | x |
| 13 | Walsh et al., 2006 | Survey post n=127 | Nurse's perceptions of providing care in a SFR | x | √ | √ |
| 14 | Watson et al., 2014 | Survey Longitudinal Pre n=47 6 months n=46 1 year n=15 | Comparison of staff quality of work life and parent satisfaction in open-bay design to a single-room model of care | x | √* | √ |
| 15 | Beck et al., 2009 | Grounded Methodology Focus Groups Parents= 5 Staff=11 | Experiment Staff and Families experienced and evaluated three room designs | x | √ | x |
| 16 | Broom et al., 2013 | World Café Methodology | Staff and families attended NICU Café identified a core group of requirements essential to creating a functional NICU | √ | x | x |
| 17 | Shahheidari & Homer., 2012 | Systematic Literature Review | Reports the impact of the design of neonatal intensive care units on neonates, staff, and families | x | √ | x |

Table 2.3: List of articles included in the literature review (continued)

| Author | Method | Brief Description | Design | Impact | Strategies During/Post |
|--------------------------------------|---------------|--|---------------|---------------|-------------------------------|
| 18 Bowie et al., 2003 | Descriptive | Descriptive article on phase of design development | √ | x | √ |
| 19 Brown et al., 2001 | Descriptive | Outlines NICU design phases | √ | x | √ |
| 20 Floyd, 2005 | Descriptive | Historical context of NICU design, the evidence and the operational issues considered in their NICU design | √ | x | x |
| 21 Goldschmidt & Gordin, 2007 | Descriptive | Reviews the development of a new model of nursing practice after moving to a large NICU | x | √ | √ |
| 22 Johnson et al., 2004 | Descriptive | Designing the neonatal intensive care unit for optimal family involvement | √ | x | x |
| 23 Shaver & Cone, 2012 | Expert | Recommendations; Staff orientation guidelines moving to SFR NICU | x | √ | √ |
| 24 Shepley, 2004 | Expert | Recommendations; Evidence-based design for infants and staff in the NICU | √ | x | x |
| 25 Shepley et al., 2014 | Expert | The business case for building better neonatal intensive care units | √ | x | x |
| 26 Stichler, 2012 | Expert | Recommendations; Nursing Leadership during hospital redesign | √ | x | √ |
| 27 White, 2003 | Expert | Individual rooms in a NICU - an evolving concept | √ | x | x |
| 28 White, 2007 | Expert | Recommended standards for the newborn. ICU | √ | x | x |
| 29 White, 2010 | Expert | Single-Family Room Challenges and Opportunities | √ | √ | x |
| 30 White, 2011 | Expert | Designing environments for developmental care | √ | √ | x |

* Impact of single family room design included improved staff satisfaction and/ or reduced stress

x Did not include topic, √ Included topic

Study Methodologies

Studies included in this review highlighted a variety of research and descriptive methodologies. To date, research undertaken has not included a randomised control trial to evaluate or compare the impact of different Neonatal Intensive Care Unit designs on staff. It is interesting that only one paper has described an experimental process where three designs were trialled by staff and parents; the staff and family focus groups were held to evaluate the room designs, but unfortunately no statistical evidence was recorded (Goldschmidt & Gordin, 2006). A systematic literature review was published in 2012 that discussed the impact of single family room design on neonates, families and staff (Shahheidari & Homer, 2012). However, this review only identified five studies that had examined the impact of single family room design on staff (Shahheidari & Homer, 2012).

Survey methods were used in fourteen of the articles reviewed. Questions in these surveys encompassed aspects of the physical environment, creation of a family-centred environment, creation of a supportive environment for families and the benefits and impact of design on staff. These articles range from detailed descriptions of a unit, with a short evaluation of the physical aspects of the environment post move, to longitudinal studies completed at different time periods pre and post-relocation to a new Neonatal Intensive Care Unit design (Bosch & Jenzarli, 2012; Carlson et al., 2006; Cone, Short & Gutcher, 2010; Domincio et al., 2010; France et al., 2005; Harris et al., 2006; Hogan, Jones, & Saul, 2015; Milford, Zapalo, & Davis, 2008; Shepley, Harris, & White, 2008; Smith, Schoenbeck, & Clayton, 2009; Stevens et al., 2010; Swanson, Peters, & Lee, 2013; Walsh, McCullough, & White, 2006; Watson et al., 2014).

Participant numbers in surveys ranged from 15-107, with response rates of 25 - 78%. The lowest response rates were most noticeable in the post-move groups (Watson et al., 2014; Bosch & Jenzarli, 2012). Two of the studies included staff interviews in their

methodology (Hogan et al., 2015; Smith et al., 2009). World Café methodology was used in one study to engage staff in choosing a Neonatal Intensive Care Unit design and outline stakeholder's requirements for creation of a functional Neonatal Intensive Care Unit (Broom et al., 2013).

Five studies described their new unit, outlining the measures they undertook to address one or more the following four factors: aspects of the physical environment, creating a family centred environment, creating a supportive environment for families and the benefits and impact of design on staff (Bowie et al., 2003; Brown, Lauren, & Taquino, 2001; Floyd, 2005; Goldschmidt & Gordin, 2006; Johnson, Abraham, & Parrish, 2004).

Eight articles were opinion papers written by leading researchers in the field of Neonatal Intensive Care Unit design, four of which were written by the same one author. These four papers made design recommendations for creating a functional Neonatal Intensive Care Unit and reducing the impact of single family room design on staff (White, 2003; 2007; 2010; 2011). Other expert's studies provide detailed outlines on education, training, cost and future research regarding Neonatal Intensive Care Unit design (Shepley, 2004; Shaver & Cone, 2010; Stichler, 2012; Shepley et al., 2014).

Study Themes

Articles included in the review (n=30) were appraised according to the three themes of relevance to this thesis:

1. Design: Building recommendations to reduce impact of the new design on staff

Sixteen of the reviewed articles discussed design recommendations to reduce the impact of the design on staff, including: layout of rooms; new technology such as pagers and intercom systems, centralised work stations and visibility for staff; with each article highlighting features to accommodate the needs of their Neonatal Intensive Care Unit community (Bowie et al., 2003; Broom et al., 2013; Brown et al., 2001; Carlson et al.,

2006; Cone et al., 2010; Floyd, 2005; Johnson et al., 2004; Harris et al., 2006; Milford, Zapalo & Davis, 2008; Shepley, 2004; Shepley et al., 2014; Stichler, 2012; White, 2003, 2007, 2010, 2011). Harris et al. (2006) described how the average floorspace varied depending on whether the configuration was combination, open plan, two cot (termed double occupancy in article) or single family room design. Unfortunately; the two cot Neonatal Intensive Care Unit included in the study, did not provide hospital records regarding patient outcomes nor participate in the site visits and survey process undertaken to evaluate staff perceptions of the two cot design (Harris et al., 2006).

2. Impact: The impact of Neonatal Intensive Care Unit design on staff

Every study reviewed described staff perceptions as positive regarding the improvement in the physical aspects post-modification or rebuild to small room design. Many articles documented in detail the staff's perceptions that single family room design facilitated a more family-centred environment than an open plan design (Beck et al., 2009; Bosch & Jenzarli, 2012; Cone et al., 2010; Hogan et al., 2015; Swanson et al., 2013).

Study results were divided on the impact of single family room design on staff workflow, practice and satisfaction. Five studies reported staff perceived improved job satisfaction and reduced stress levels post-move (Bosch & Jenzarli., 2012; Cone et al., 2010; Harris et al., 2006; Shepley et al., 2008, Watson, et al., 2014). Fourteen studies stated the new environment had a negative impact on aspects of clinical practice (Beck et al., 2009; Carlson et al., 2006; Domincio et al., 2010; France et al., 2005; Goldschmidt & Gordin, 2006; Hogan et al., 2015; Shahheidari & Homer, 2012; Shaver & Cone, 2010; Smith et al., 2009; Stevens et al., 2010; Swanson et al., 2013; Walsh et al., 2006; White, 2010, 2011). The more problematic aspects included: maintaining effective communication between staff, providing support and education opportunities and the isolation of staff working in single rooms (Bosch & Jenzarli, 2012; Stevens et al., 2010; Swanson, Peters & Lee, 2013; Walsh, McCullough & White, 2006). Others reported single rooms

increased staff walking distances, which staff perceive has led to an increase in their workload, and time away from the neonate's cot side (Bosch & Jenzarli, 2012; Cone et al., 2010; Smith et al., 2009).

Several studies reported on the changes to nurse's roles and the resultant need for more nurses to provide adequate staffing levels and the use of auxiliary staff to meet the demands of the new environment (Carlson et al., 2006; Shahheidari & Homer, 2012; Stevens et al., 2010, Walsh et al., 2006). Some studies reported staff perceptions that a single family room design had a negative impact on patient safety and nursing practices (Domincio et al., 2010; France et al., 2005; Swanson et al., 2013; Walsh, et al., 2006).

Studies also documented staff reports that the new design increased walking distances and workload (Beck et al., 2009; Domincio et al., 2010; Harris et al., 2006; Shahheidari & Homer, 2012; Swanson et al., 2013; Walsh et al.,2006).

Studies documented the difficulties in maintaining effective communication, education and providing support to staff caused by the isolative nature of the new designs (Beck et al., 2009; Bosch & Jenzarli, 2012; France et al., 2005; Hogan et al., 2015; Walsh et al., 2006). Whereas some studies showed improved job satisfaction (Bosch & Jenzarli, 2012; Cone, 2010) several studies cited nurse's reports of increased fatigue, work-related stress, isolation and reduced job satisfaction (Domincio et al., 2010; France et al., 2005; Goldschmidt & Gordin, 2006; Walsh et al., 2006). Notably, Walsh et al. (2006) provided a detailed account of lessons learnt post-move that summarised much of the other researchers' results.

Many of the studies included in this review provided overarching statements about the need for future research or the direction such research should take (Bosch & Jenzarli, 2012; Carlson et al., 2006; Hogan et al., 2015; Shahheidari & Homer, 2012). Research directions included consideration of single family room design impacts on staff turnover and burn out rates and evaluation of strategies to balance the needs of neonates and

staff (Walsh et al., 2006; Hogan et al., 2015). Other researchers suggested that it may take staff two years to assimilate to the new environment (Carlson et al., 2006; Milford, Zapalo & Davis, 2008), but to date no studies have been published reporting on assimilation outcomes after 24 months post-transition.

3. Strategies implemented during and post-transition to facilitate the transition to the new design

The final theme of the review was to retrieve studies that outlined strategies implemented during or after transition to assist staff with the physical and emotional impact of the new Neonatal Intensive Care Unit (Bowie et al., 2003; Brown et al., 2001; Carlson et al., 2006; Cone et al., 2010; Goldschmidt & Gordin, 2006; Milford et al., 2008; Shaver & Cone, 2010; Smith et al., 2009; Stichler, 2012; Walsh et al., 2006; Watson et al., 2014). During their transitions, these studies described strategies such as: including staff in the design process, maintaining clear communication and feedback processes with staff, setting up teams to work with staff on features of the new design that had been highlighted as of concern, acknowledging staff and the history of the unit they were leaving (Bowie et al., 2003; Brown et al., 2001; Carlson et al., 2006; Johnson et al., 2004; Milford et al., 2008; Cone et al., 2010, Shaver & Cone., 2010; Stichler, 2012; Walsh et al., 2006). Several articles described communication strategies they had implemented post-move; such as: regular meetings, surveys, staff problem boxes and posters to identify staff concerns and find solutions (Carlson et al., 2006; Johnson et al., 2004; Milford et al., 2008; Shaver & Cone., 2010; Smith et al., 2009; Walsh et al., 2006). Only two papers provided a detailed description of projects they had undertaken to reduce the negative impact of new design on nursing practice post transition (Goldschmidt & Gordin, 2006; Smith et al., 2009).

Summary

To meet the requirements of a doctoral thesis, this review undertook a wider enquiry than the published article (Article 1) included in this chapter. It has examined a longer time period and considered a wider scope of questioning. Thus the number of articles included in the literature review is larger than the number listed in the published article.

It is interesting to note that since Article 1 was published, more evidence regarding the impact on staff has become available. It is also of interest to note that staff issues remain the same as those previously identified and staff perceptions of single family room design remain divided.

This literature review has highlighted a number of studies that have reported on the measures they have undertaken during the design of their Neonatal Intensive Care Unit. Many have also reported on the impacts, both positive and negative, that the new design has had on their staff. These articles were of use in our design providing insight into how the new design might impact on staff. The article that follows outlines many of the strategies previously implemented to help staff pre- and post-transition to a new NICU design.

Reflection Box 2: Help I am lost!

‘The answers you get from literature depend on the questions you pose’

“Margaret Atwood”

I have been looking for articles that outline strategies to help staff move to the new NICU for what seems to be forever! I saw this quote the other day and thought it seemed appropriate to describing literature on NICU design.

I wonder if researchers are asking the right questions. Why am I seeing so many articles with similar conclusions, but still I am not finding the answers to staff issues in our new unit?

I also wonder if the readers are asking the right questions. Are their interpretations of results biased by the Unit they are working in and if they are happy with the new design? Are we looking too hard at perceptions when we should be looking at outcomes?

I am unsure if I will find any new answers in my research!!

Journal Notes October 2012

Article 1: How can we help staff transition to a new NICU design?

Broom M, Gardner A, Kecskes Z, & Kildea S. (2015).

Journal of Neonatal Nursing. 2015; 21(5):180-185. Scimago ranking: Q2

Abstract

Background: Research has highlighted transitioning to the new design may be challenging for staff. To facilitate the transition to a new NICU we have searched literature to find strategies other units have implemented during their transition.

Methodology: Literature was retrieved via electronic and manual searches of searches of MEDLINE, CINAHL, Science Direct and Cochrane databases. A list of keywords directed our search: Intensive Care Units, Neonatal, Hospital Design and Construction, Single Room Design, Change Management and Staff Attitude to Change.

Results: Seven articles provided detailed outlines of the strategies they implemented during transition to single room design. Our search has also highlighted the limited published work on solving staff issues post transition.

Conclusion: This review provides an outline of strategies to facilitate the transition when changing NICU design. Future research that specifically targets the issues highlighted by staff may assist in finding long term solutions for those transitioning to a new NICU design.

Introduction

Providing neonates who require hospitalisation a developmentally appropriate environment has become one of the foremost objectives in improving neonatal outcomes (White, 2003). As a consequence many Neonatal Intensive Care Units (NICUs) are in the process of changing their design from open plan (OP) to a single or small room design (SRD) catering for one to six neonates per room (Goldschmidt & Gordin, 2006). Research has shown SRD reduces infection rates, reduces length of hospital stay and facilitates an individualised approach in the care of neonates that improves the family's NICU experience (White, 2003).

While changing NICU design to improve neonatal outcomes is the main priority, studies have highlighted that staff will take two years or more to adjust to the change of design and subsequent model of care (Goldschmidt & Gordin, 2006). Nursing staff must not only familiarise themselves with new environment but also adjust to its impact on nursing practice and workflow. In OP environments several staff members work side by side sharing tasks and workload: they are able to assist each other in emergencies, relieve each other for breaks, and discuss their concerns or care plan throughout the shift (Beck et al., 2009). In stark contrast SRD requires staff to work independently with assistance available at the end of the phone or buzzer, causing many staff to feel unsafe in the new design (Shahheidari & Homer, 2012).

A systematic literature review on the impact of NICU design on infants, staff and families concurred with previous research in finding that SRD improves the physical aspects of the environment and short term neonatal outcomes (Shahheidari & Homer, 2012). The same review showed that when considering the impact on staff several issues of concern were raised. Shahheidari & Homer (2012) highlighted staff perceptions of SRD increasing staff walking distances, workload and the number of staff required to provide safe nursing care. Research findings included comment on the

difficulty in communicating effectively, supporting other staff members and in providing ongoing education: major concerns given that these are key aspects of effective nursing in a NICU (Shahheidari & Homer, 2012). The review discussed resolving these issues through centralising workspaces, and using interactive telecommunication devices; but, there was little discussion on how to assist staff to make the transition and adjust to the new environment (Shahheidari & Homer, 2012).

In 2009, a NICU (large tertiary referral hospital in Australia) started the process of building a new NICU. The concept for the new NICU was for neonates to be cared for in interlinking two cot (TC) rooms; the previous NICU was OP. Whilst the decision to build the new NICU in a TC format had been made, there was little detail on how the move would be accomplished and how nursing practices would change in the new NICU.

Staff were aware that previous research had highlighted the difficulties with the transition from an OP to a TC design and raised similar questions about how the TC would impact on safety of neonates and staff, staffing requirements and staff's ability to provide high quality nursing care in isolation from support (Shahheidari & Homer, 2012). Staff openly discussed the possibility that this new environment would cause them to seriously consider other areas for employment or retirement from the profession completely (Broom et al., 2013). Whilst the need to ensure the new NICU provided a developmental appropriate environment and met building standards was a forgone requirement, leading staff members were also keen to allay staff concerns and provide effective support for staff while negotiating the transition.

To achieve evidence based approach to find solutions to the issues was undertaken; which included a literature review to identify strategies implemented by other units that had undergone similar challenges.

Aim

To identify previously documented strategies implemented to assist staff throughout the transition to a new NICU design.

Methodology

Abstracts, outlines and complete articles published from 2000 - 2014 were retrieved via electronic and manual searches of MEDLINE, CINAHL, Science Direct and Cochrane databases. A list of keywords was developed from the review question themes to direct the search including: Intensive Care Units, Neonatal, Hospital Design and Construction, Single Room Design, Change Management and Staff Attitude to Change.

Results

The search identified over 1000 articles on NICU design and construction. Abstracts and titles were reviewed to assess if the article discussed strategies to facilitate staff transition to a SRD NICU. Literature concentrated on recommended standards, unit configuration, floor plans, the design process, practicalities of moving in and the physical features of each new NICU design. Only 29 articles provided an outline of the planning, construction and the actual move into a new neonatal unit with seven of these articles highlighting strategies during the transition to SRD.

An integrated analysis of these seven articles was undertaken to highlight common themes which were then systematically organised into two main categories:

- 1) Proposed strategies implemented during the transition to SRD.
- 2) Post transition issues and solutions.

Strategies to facilitate the transition to SRD

The review highlighted a variety of strategies implemented to facilitate the transition. These have been outlined under three main themes: Teamwork, Communication and Celebration.

Teamwork

The formation of a project team to lead the redevelopment was highlighted as essential in negotiating the transition to a new NICU (Brown et al., 2001; Carlson et al., 2006; Milford et al., 2008). The team should include representatives from management, nursing, medical and allied health staff, as well as members of the NICU parent community who together develop the philosophy, model of care and objectives that will structure the transition (Brown et al., 2001; Carlson et al., 2006; Milford et al., 2008). This will assist in leading the stakeholder's ideas as they consider what is most important in their new NICU (Carlson et al., 2006). It is also important for the team to maintain an overarching view of the design phases, thus allowing the team to oversee a project timeline and forecast the demands of building a NICU (Brown et al., 2001). One of the important roles of the team is to facilitate the inclusion of all staff affected by the transition. This can be achieved through staff participation in committees, staff meetings, surveys and site visits where they are encouraged to contribute and review the design (Brown et al., 2001; Carlson et al., 2006; Milford et al., 2008). Staff participation means that staff, by identifying what they see as essential to make the NICU function and by being involved in finding solutions to overcoming any problems as the NICU built and once opened will be more likely to take ownership of the new unit (Carlson et al., 2006). Several authors highlighted the development of transition teams as an effective strategy to engage staff in the transition process. Each team focussed on specific topics related to the move: move day, supplies, family centred care, communication, staffing and education. Transition teams took responsibility for what

needed to be done and reported back to the project team, thus dividing the workload whilst engaging staff in the transition (Carlson et al., 2006; Milford et al., 2008).

Transition teams were also cited as being effective in reviewing nursing practice and workflow patterns for their new NICUs (Carlson et al., 2006; Milford et al., 2008; Shaver & Cone, 2010). Carlson et al. (2006) described the implementation of '*Reddin's of Theory of Planned Change*' as a useful tool to direct the change management process during the transition to SRD NICU. By 'planning the change' transition teams were able to actively promote multidirectional communication and encourage stakeholders to voice concerns and participate in finding solutions to the fear of the change. The change model assisted the team in actively involving the most affected (nursing staff) through structured communication encouraging greater staff interaction (Carlson et al., 2006).

Communication

The development of a multifaceted organised communication plan to meet objectives such as to: inform, educate and orientate staff is crucial in negotiating the transition to a new NICU. Strategies implemented included to foster two-way communication included: staff meetings, surveys, staff problem boxes and posters (Carlson et al., 2006; Milford et al., 2008; Shaver & Cone, 2010).

Most of the strategies implemented were aimed to educate and orientate staff. It is crucial to educate staff about the benefits of the new design, the unit philosophy and the likely impact of the change in advance. This will assist in their understanding of the reasons underpinning the change and how it will affect staff (Carlson et al., 2006; Shaver & Cone, 2010). Milford et al. (2008) developed recommendations for developing a new NICU that may assist other units in educating staff about the process of building a new NICU. Recommendations included: development of mission statement and transition teams, follow a timeline, plan for move day, celebrate the past and the future.

Orientation should include information regarding unit layout, new equipment, changes in workflow and practice (Shaver & Cone, 2010). The dissemination of information regarding unit layout, new equipment, changes in workflow and practice (Shaver & Cone, 2010) needs to be included in the orientation program.

Celebration

Celebrating the time staff have spent in the old unit and NICU's history was highlighted as one of the more significant ways to facilitate the change. Strategies such as inviting former NICU families and staff to farewell parties as well as holding an open day in the new NICU hosted by current staff empowered staff to take ownership of their new NICU (Brown et al., 2001; Carlson et al., 2006; Milford et al., 2008).

Post transition Issues and Solutions

Whilst moving into a new NICU requires years of planning, the real impact of the new design cannot be fully evaluated until staff are working in the facility. Previous research has stated it may take two years for staff to be accustomed to working in the new environment (Carlson et al., 2006). To facilitate this stage of the transition we were interested in reviewing the issues previous NICUs had negotiated and the solutions they had undertaken. When reviewed many of the articles consider staff concerns post move. These included: the amount of information staff needed to assimilate in a short period, implications of the new design on practice and the unsettling effect of the move for many staff (Johnson et al., 2004; Stevens et al., 2010). Authors highlighted the fact that a SRD NICU impacts on nursing staff by increasing their workload, the distances walked, limiting communication with peers and education opportunities (Shahheidari & Homer, 2012).

While several articles articulated the need to maintain strong communication strategies such as meetings, surveys, staff problem boxes and posters to identify staff concerns

prior to the transition, only two authors provided a detailed description of the impact of new design on nursing practice post transition (Goldschmidt & Gordin, 2006; Smith et al., 2009).

Goldschmidt & Gordin (2006) documented the challenges they encountered: maintaining effective communication between staff members, continuity of care and the isolation of staff and families in the new design. To address these concerns a nursing taskforce was established to build a new model of nursing practice. Staff members were divided into smaller teams assigned to specific pods (Goldschmidt & Gordin, 2006). Fixed six week rostering cycles were devised to create consistency for staff and families. Additional staff members, such as respiratory therapists, were employed to assist nursing staff and to provide education (Goldschmidt & Gordin, 2006).

Smith et al. (2009) reported staff feedback from post move surveys that the SRD compromised the cohesion of patient care teams, created operational challenges, isolated staff and impacted on effective staff communication. Recommendations made by their team to resolve the impact of SRD on staff included implementing virtual technology to allow staff more contact with other staff and monitor neonates, a comprehensive macro ergonomic review to identify strategies to improve the organisational design and management of the unit and establishing a NICU occupancy quality management program to provide a framework for evaluating and addressing design issues and problems as they arise (Smith et al., 2009).

Discussion

An integrated literature review was undertaken to facilitate evidence based approach to facilitating the transition from OP to SRD. This review has highlighted that literature pertaining to transitioning to a new NICU design is rich in coverage of building and occupational health and safety standards, construction plans, physical attributes and the physical move to a new NICU but that there is a dearth of information relating to addressing staff needs and concerns.

This study is the first to review and detail strategies previously implemented to assist staff transitioning to SRD. Most of the strategies implemented aimed to educate and orientate staff to work effectively in the new building but did not consider the impact of the change on individual staff members both physically and emotionally.

Our review supports previous research regarding the impact of transitioning from OP to SRD. Authors discuss similar challenges post move: increased workload, distances walked, limiting communication with peers and reduced education opportunities (Shahheidari & Homer, 2012). Although it may take up to two years for staff to work effectively in the new environment there is only limited literature documenting research that has reviewed the impact on staff after two years (Goldschmidt & Gordin, 2006).

We have also shown that although NICU designs have been changing from OP to SRD for 20 years, the issues staff are confronted with have remained unchanged and unaddressed leaving several questions unanswered. Do staff just accept the difficulties of the new design in time or find new employment? What is the long term impact of SRD on staffing NICUs? Has there been an increase in staff resignations, higher staff turnover, increase in sick days or low morale? Has quantitative data that supports staff perceptions regarding increased workload, walking distance, reduced communication and limited education opportunities been collected? Our research team has implemented many of the strategies suggested by previous researchers; we have also

taken up the challenge to undertake a quantitative comparative study of the transition from OP and TC NICU to add to this evidence and encourage other researchers to take up the challenge as well.

Conclusion

This review provides an outline of strategies to facilitate the transition when changing a NICU design. To further facilitate the transition from OP to SRD, future research that considers the impact on staff is essential. Future research that specifically targets the issues highlighted by staff and provides quantitative data to back this issues may assist in finding long term solutions when transitioning to a new NICU design. While the physical environment is important, we should also consider building a strong cohesive staff as an essential part of constructing a new NICU. Any NICU redevelopment team should carefully consider the potential benefits of the suggested teamwork, communication and celebration strategies detailed by this review.

Main Findings

This Chapter has outlined current literature on the design, construction, transition and impact of a new Neonatal Intensive Care Unit design. A significant proportion of these articles discussed Neonatal Intensive Care Unit building standards, unit configuration, floor plans, the design process and the physical features of each new Neonatal Intensive Care Unit design, which, while useful, were not directly related to the thesis topic. When considering the impact of a new Neonatal Intensive Care Unit design, this review has shown there are considerably more published manuscripts that consider environmental features' (e.g. light, noise) impact on families and provision of family-centred care, than there are manuscripts assessing the impact on staff.

The articles included in the final review (n=30) were described under three themes: original research, descriptive studies and expert opinion. It revealed that the majority of the literature selected for final review reported on the first two of this review's three themes: building recommendations to reduce impact of the new design and the actual impact of the new design on staff. It is of interest that some manuscripts concluded with sentiments such as: *'if staff are willing to take up the challenge'* and that: *'increased workload is ameliorated by the improvements seen for families in single room design'* (Beck et al., 2006; Hogan et al., 2015). Many also discussed the need for future research on the impact of Neonatal Intensive Care Unit design on staff beyond two years, but no such studies have been published to date.

While many of the studies commented on the need to communicate and to include staff in the design and transition process, few actually documented what they had done or if they facilitated the transition. At the time of its publication, the manuscript included in this Chapter highlighted seven articles that detailed strategies implemented to facilitate staff transition to a new Neonatal Intensive Care Unit design. These strategies were reviewed under three main themes: teamwork, communication and celebration. After

increasing the search scope and review period (1985 – 2013) when updating the literature review, one further article was identified that considered nurse leaders' knowledge and competency in health facility design (Stichler, 2012).

Current Research Gaps

The majority of researchers have used survey methodology to gauge staff perceptions of the physical aspects of the Neonatal Intensive Care Unit environment. The survey methods ranged from short evaluations of the physical aspects of the environment post move, to longitudinal studies that considered caregiver satisfaction and stress as well as quality of work life. The high incidence of survey use highlighted a gap in the types of research methodologies used to assess the impact of Neonatal Intensive Care Unit design on staff and a void of quantitative data (empirical evidence) to support or refute staff perceptions. Notably, many of the researchers concluded that there was a need for future research to assess the long term impact on staff but there was no evidence of any such studies being undertaken beyond two years post-transition.

When considering Neonatal Intensive Care Unit designs, the majority of studies were completed at a single site with limited comparison of different designs. Current research has focussed on single family room design, with no articles found that considered two cot Neonatal Intensive Care Unit design. There is no research that has described transitioning to a two cot design, or evaluated its impact on staff workflow and practice. This underlines the need for future research to assess if two cot design ameliorates or exacerbates the staff concerns expressed in relation to single family room design.

There is also a significant gap in research that considers the impact of Neonatal Intensive Care Unit design in the Australian health care context; to assess the capacity for a public health care system such as Medicare, to support a model built to service private health care providers and users in the United States.

Summary

The published article's literature review showed that transitions to new Neonatal Intensive Care Unit designs, especially from open plan to single family or small rooms, had occurred all over the world over the last 20 years. It should also be noted that no research was available specifically on the impact of a two cot design to assist in determining if the same potential problems seen in single family rooms would become apparent in two cot design.

The reviewed literature highlighted difference between the American and Australian health systems, with previous studies discussing the requirement for higher staffing levels and more auxiliary staff than are currently employed in Australian Neonatal Intensive Care Units (Carlson et al., 2006). Articles describing the redesign of Neonatal Intensive Care Units in America cited the need to maintain market edge and increase revenue as core objectives when considering their new design (Carlson et al., 2006). Understandably the striking contrast of single family rooms to open plan Neonatal Intensive Care Units would attract more customers, but that is not something considered in the Australian public health care system, where Medicare funding provides comprehensive health care independent of an individual's means or private health care insurance (Leeder, 2003).

During the planning stage of the study Neonatal Intensive Care Unit; a multidisciplinary user group was formed to consider the design of the new unit, with membership including: nursing, medical and, allied health staff, ex- Neonatal Intensive Care Unit parents as well as Capital Asset and Development team members.

The foundation to the design was built from current literature, Neonatal Intensive Care Unit standards and guidelines, with the focus on developing a unit that provided a developmentally appropriate family centred environment that met the needs of neonates, families and staff. The next Chapter (Chapter 3) outlines a detailed summary of choosing the two cot Neonatal Intensive Care Unit design.

Chapter 3: Choosing a new Neonatal Intensive Care Unit Design

“A small group of thoughtful people could change the world.

Indeed, it's the only thing that ever has!”

Margaret Mead

Prologue

This Chapter outlines the process undertaken to choose the design of the new Canberra Hospital Neonatal Intensive Care Unit. It commences with background information, including the main factors that led to the transition from open plan to single family room design: environmental theories, Neonatal Intensive Care Unit building standards and the development of a family-centred model of care. The background provides the context of and the setting for this study, including a detailed description of previous and new unit designs. This section includes a reflection box to describe my role during the design process. The manuscript that follows (*World Café Methodology an Innovative method to engage stakeholders in designing a Neonatal Intensive Care Unit*); describes the World Café methodology as applied to the Neonatal Intensive Care Unit redevelopment, detailing the methodology and results of the study. The phrase single room design (SDR) has been used in the manuscript included in this Chapter. The Chapter concludes with the main findings and summary.

Background

Environmental Theories

It has been shown that the environment to which an individual is exposed may have both positive and negative effects on their physical and emotional well-being (Ulrich,

1984). Design teams acknowledge the need to provide a healing environment for patients who may be physically unwell or unable to care for themselves (Ulrich, 1984). This is particularly important in a Neonatal Intensive Care Unit, where one of the most vulnerable groups of patients (neonates) are provided with intensive care treatment at a time when they are undergoing important development of their brain. The more vulnerable the individual, the more susceptible they will be to a challenging environment. Shepley (2004) discussed the importance of addressing the impact of environment, not only for the benefit of the neonates cared for in a Neonatal Intensive Care Unit but also for the Neonatal Intensive Care Unit staff, as staff working in such health care settings are often placed under high levels of stress. This may be exacerbated by an inappropriate environment, which may contribute to high levels of staff attrition.

Sentinel work by Appleton (1975) in early environmental psychology theory suggests that an ideal environment has a balance between new information (prospect) and the ability to control inappropriate input (refuge). Such a balance is applicable to both neonates and staff in a Neonatal Intensive Care Unit. To satisfy neonates' needs, it is essential that the environment allows for stimulation, e.g. Kangaroo Care (i.e. placing the baby skin-to-skin with the mother for long periods of time) while also providing quiet rest time for the neonate, which is important for their growth and development (Shepley, 2004). It is also important to consider the need for staff to experience both prospect and refuge by offering them a variety of job tasks and educational opportunities, while also acknowledging the high levels of stress and overload of information to which they are exposed (Shepley, 2004). It is important that the Neonatal Intensive Care Unit environment balances the staff's need for stimulation with opportunities to occasionally withdraw and regroup (e.g. staff tea room/ desk away from bedside) during the working day (Shepley, 2004).

More recently researchers have discussed the impact of Neonatal Intensive Care Unit design on the wellbeing of health care workers, especially those exposed to shift work. Studies have associated shift work with an increased risk of diabetes, cardiovascular disease and cancer (Figueiro & White, 2013). The circadian needs of shift workers differ from those of neonates. To provide a developmentally appropriate environment for neonates, where room light is dim for long periods, staff need to have a space away from the cot side to complete charting and tasks with sufficient lighting (Figueiro & White, 2013). Most notably, night shift workers are exposed to long periods of dim light, which has been suggested may impact on work performance and fatigue levels (Figueiro & White, 2013).

Neonatal Intensive Care Unit Building Standards

The first published standards for Neonatal Intensive Care Units: *Toward Improving the Outcome of Pregnancy*, were written by a multidisciplinary committee and published by the March of Dimes in 1976 (Little & Merenstein, 1993), with two follow up papers published in 1993 and 2010. Many international and regional standards for design have followed, including the first edition of the: *Recommended standards for neonatal ICUs*, published in 1992 and revised most recently in 2013. These standards provide hospital administrators and clinicians involved in designing or modifying a Neonatal Intensive Care Unit with recommendations based on clinical experience and evolving evidence highlighted by researchers (White, 2007).

Kuschel & Roy (2005) surveyed 29 neonatal units in the Australia and New Zealand Neonatal Network. Twenty six Neonatal Intensive Care Unit directors participated in the survey, with a majority stating their units had inadequate space and environmental control. The directors reported that the lack of space impacted on infection control, parental privacy and the ability to participate in their babies care, and staff satisfaction.

Study results reported many of the Neonatal Intensive Care Units did not meet recommendations related to environmental features, space nor safety and security requirements. Survey results confirmed the need to further develop recommendations for NICU design that provide a safe and functional space for families, neonates and staff (Kuschel & Roy, 2005). Since the release of the Australasian Health Facility Guidelines in 2009, unit design has become a major consideration for Neonatal Intensive Care Units throughout Australasia.

Family Centred Model of Care

Neonatal Intensive Care Units were introduced during the 1950's as new medical technology and knowledge enabled the survival of premature neonates (Reedy, 2003). The first neonatal units followed a medical model of care, a traditional approach in which care is based around the diagnosis and treatment of illness. During this period; the role of the nurse and the level of family involvement, was determined by the neonatologist in charge or senior nursing staff and depended on their particular approach to caring for the neonate (Thomas, 2008). Families were only allowed in the unit at organised times and at the discretion of the medical team; even well babies were bottle fed overnight to allow their mothers to rest (Thomas, 2008). Through 1980-1990, neonatal care began to evolve to be formulated on the basis of a holistic assessment of neonate needs. Gradually, mothers were allowed to feed and see their babies, but still this contact was controlled by nursing staff (Thomas, 2008).

Over the past 20 years the focus in Neonatal Intensive Care Units has continued to change and a new model of care has evolved called 'Family Centred Care'. This model identifies the family as central to the care provided for their babies (Griffin, 2006). Previously most Neonatal Units built were open plan; with 20-100 neonates in close proximity to each other, but over the past 20 years Neonatal Units have progressively changed their design to single family rooms or larger rooms accommodating 2-6

neonates. The new designs aim to facilitate Family Centred Care through providing a dedicated space for the family in addition to the clinical space occupied by the neonates and staff (White, 2010). Many units have taken the next step of including parents in their care teams, with parents invited to spend between 8-24 hours each day personally involved in the care their baby receives (Bracht et al., 2013). This philosophy of care requires structural changes to the NICU environment to provide areas for parents to sleep, eat and rest during their baby's admission.

Original Open Plan Neonatal Intensive Care Unit Design

The original open plan Neonatal Intensive Care Unit at the Canberra Hospital comprised 24 cots in four bays (Figure 3.1) which were divided by shoulder-high walls and perspex (Figure 3.2). The open plan design limited the staff's ability to adapt the environment to meet each baby's individual sensory and developmental needs (Figure 3.3). Infants were frequently moved to accommodate new admissions and staffing levels. Staff 'created' bed spaces, causing neonates to be placed out of staff view or in high traffic areas. It was necessary for staff to leave their assigned work area to get milk or supplies for the infants in their care; as the milk and main storage rooms were outside the clinical area and shared by staff working in all four bays. As part of their daily duties, staff were expected to move recliners and other pieces of equipment (e.g. recliners, blinds, ventilators and isolettes) to create space for families to spend time with their babies. Groups of 2-4 staff worked in each bay, depending on the acuity of each neonate. In each bay, the nursing, medical and allied health staff shared a desk, chairs and one computer, working closely together to provide each other space to complete their tasks. The positive impact of this environment was that staff were always visible to each other and available to assist in an emergency. In the open plan unit, parents were expected to leave during clinical rounds or medical emergencies so as to maintain privacy and confidentiality for other families. Due to the limited space and equipment,

recliner chairs were shared by families, which limited their capacity to participate in Kangaroo Care or spend quiet time with their baby. There were no mobile breast pumps available; so mothers were unable to express milk next to their baby's cot, instead needing to go into a small expressing room to use stationary pumps.

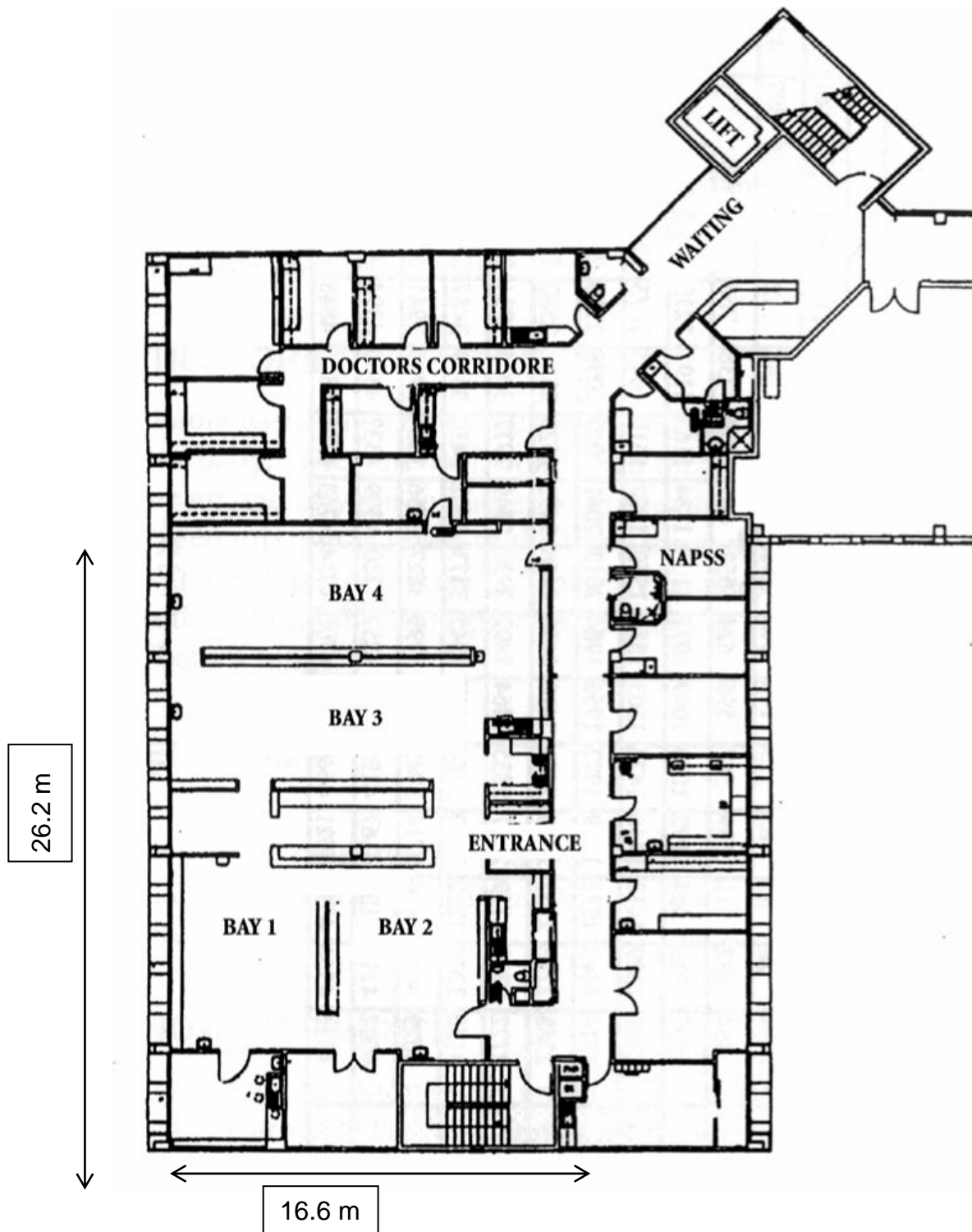


Figure 3.1: Open Plan Neonatal Intensive Care Unit floorplan



Figure 3.2: Open plan Special Care Nursery room (Photo 1)



Figure 3.3: Open plan Neonatal Intensive Care room (Photo 2)

Rationale for Building a New Neonatal Intensive Care Unit

Environmental theories, building standards and developing a family-centred model of care were core reasons why it was considered necessary to redevelop the open plan Neonatal Intensive Care Unit at the Canberra Hospital. The reality was that the unit no longer met Australasian Health Facility Guidelines for acceptable space and physical attributes (i.e. noise, lighting) (Horwitz-Bennett, 2010). The unit was unable to cater for the number and acuity of neonates admitted. The open plan design provided limited space or equipment (e.g. recliner chairs, storage space and breakaway areas) to accommodate the needs of parents while participating in their babies' care. Staff needs had also outgrown the unit, with education and staff workrooms becoming overcrowded due to the increase in staff numbers required in the unit. Additionally, issues regarding privacy, confidentiality and security were identified by staff and parents in the first redevelopment survey conducted in 2010 (Broom & Kecskes, 2011).

Table 3.1: Key milestones of the Neonatal Intensive Care Unit redevelopment

| Key Milestones | Completion Dates |
|---|-------------------------|
| Feasibility study | February 2008 |
| Neonatal User Group | May 2008 |
| NICU Design Seminar | September 2008 |
| Preliminary Model of Care | January 2009 |
| NICU World Café | January 2009 |
| CAN Group formed | April 2009 |
| Leighton's awarded contract | April 2010 |
| Construction commenced | July 2010 |
| Staff survey open plan | September 2011 |
| Stage 1 Completion | June 2012 |
| Comparative Design Studies Open Plan | May-July 2012 |
| Training and Orientation Program | July 2012 |
| Move In | August 2012 |
| Staff Survey (6 months) | February 2013 |
| CAN Group Closed | September 2013 |
| Comparative Design Studies | July 2014 |
| Staff Survey (24 months) | September 2014 |

Note: Bolded Key Milestones form part of this Thesis

Choosing the new Neonatal Intensive Care Unit Design

While all stakeholders understood that the new Neonatal Intensive Care Unit would be different to the original open plan design, it was unclear exactly how different the design would be, with three designs considered. Designing the Neonatal Intensive Care Unit meant considering the current needs of neonates, staff and families while trying to foresee changes in neonatal care and practice for the next 15-25 years.

Staff had attended a Neonatal Intensive Care Unit design workshop where guest speakers were invited to talk about aspects of building a new Neonatal Intensive Care Unit, covering topics such as design, families and staff. These guest speakers included a neonatologist who had been involved in the redesign of their Neonatal Intensive Care in an Australian hospital, parents who had babies admitted to the unit and developmental paediatricians. Staff meetings and in-services were held to inform staff about the new Neonatal Intensive Care Unit; however, each in-service raised more questions and expectations and revealed the weaknesses of each design. Until staff in-

services commenced, many staff had no idea that a redevelopment was imminent, so these activities created greater awareness of the project's complexities in meeting stakeholder's needs.

The decision was made to hold a Neonatal Intensive Care Unit World Café and for many of the stakeholders attending the World Café: Neonatal Intensive Care Unit staff, ex- Neonatal Intensive Care Unit families, allied health staff and community paediatricians, this was their first opportunity to discuss a new design. The Neonatal Intensive Care Unit World Café (January 2009) highlighted the importance of choosing a design that would both improve the long-term outcomes of neonates admitted to the Neonatal Intensive Care Unit and fulfil staff requirements. World Café stakeholders stated their preference for a Neonatal Intensive Care Unit design that featured two cot or single cot. The recommendations of the stakeholders were presented to hospital management who made the decision to build the new Neonatal Intensive Care Unit based on a two cot design.

Reflection Box 3: NICU World Café

I had only been in the research nurse position for a short period 15 months prior to the NICU World Café. In the period leading up to the World Café I had been focussing on learning about the practicalities of organising and coordinating research studies in the unit. This had mainly involved staff education and data collection. I had also attended the NICU Design Day and staff meetings on the NICU redevelopment.

The NICU World Café was the first time I had been involved in a working group with an expert role. Given I had undertaken to research the methodology and single room design I was subsequently requested to host a table at the café that covered those topics. Staff moved around tables to talk to the experts these included parents, allied health staff and many others. Staff were able to talk freely with the topic experts about the pros and cons of different designs, their experience and what they wanted in the new NICU.

This was a great experience I have never really been asked to do anything like this before I had played a part of the team working towards a great new unit.

When I enrolled in the Master's program at ACU I decided to take the opportunity to write an article on the NICU World Café.

June 2010 notes on NICU World Café

Two Cot Neonatal Intensive Care Unit

In March 2009, the first draft of the two cot Neonatal Intensive Care Unit floorplan was released. This caused a dilemma; as staff recognised the potential for the two cot design to deliver a family-centred and developmentally appropriate facility, but also the potential negative impact of the new design on clinical practice. Issues revolved around the capacity to provide safe, quality care to neonates and the daily organisation and

functionality of the new Neonatal Intensive Care Unit. Factors included staffing the unit, access to assistance, and supporting and educating junior staff. Staff also identified fears of isolation and anxiety related to working in a small room design Neonatal Intensive Care Unit.

These reservations were further amplified when the first floorplan was released, which featured only one staff tearoom on the second floor. The expectation that staff on other floors would make the trip up or downstairs for a break seemed untenable for staff working in an intensive care environment, as they are often required to return to the unit during their breaks to assist in emergencies or provide clinical support to junior or new staff.

Formation of the Change and Networking Group

Staff concerns and fears made the importance of engaging staff in a constructive change process even more apparent. A meeting was held for staff (n=10) who had shown an interest in the redevelopment. Meeting participants decided to form a group to work with staff throughout the move, resulting in the formation of the *Change and Networking Group* (CAN Group). Members included nursing, medical and allied health staff as well as a member of the hospital redevelopment team. Although most of the group members had limited experience or knowledge regarding NICU design, project management or large scale change management, the group set about working together to create a philosophy and terms of reference. The terms of reference described the functions of the Change and Networking Group as:

1. Provide a forum for discussion relating to the design and building of the new Woman and Children's Hospital, including models of care
2. Network between the Neonatal User Group and neonatal staff of the Neonatal Department

3. Ensure all intercepting stakeholder groups, and co-dependencies of those groups, are considered
4. To learn about, facilitate and implement models of change within the Department
5. To support staff through the transition into the new Woman and Children's Hospital building
6. To meet and or exceed the Occupational Health & Safety, Injury Prevention and Infection Control Requirements
7. The Group will exist during the CADP process of the Woman and Children's Hospital as well as for 12 months following move into the new building.

The CAN Group operated from 2009-2013. Chapter 4 provides an overview of the group methodology and projects (Appendix A).

Two Cot Neonatal Intensive Care Unit Design

The new two cot Neonatal Intensive Care Unit is triple the size of the previous open plan Neonatal Intensive Care Unit, with the layout divided into Intensive Care/High Dependency (Intensive Care Unit, 20 neonates) and Special Care Nursery (14 neonates) across two wings. The equipment and stores have been decentralised with a storeroom, pharmacy and staff workroom located centrally within each wing. Due to the design of the new unit an assist/emergency call system has been installed to enable staff to obtain clinical support when needed.

The Neonatal Intensive Care Unit layout is comprised of between 2-4 inter-connected rooms, each of which can accommodate two neonates (Figure 3.4). The inter-connecting room design allows staff to move between rooms to check drugs and assist each other in providing care for neonates.

The unit has been designed to allow natural light into every clinical room with a designated space for the neonate, family and staff (Figure 3.5). To enable staff to

function independently in the two cot design, each room layout includes a desk, computer, a supply cupboard and fridge. Beside each cot space there is a recliner, second chair and locker for the family. Parents are encouraged to attend clinical rounds and spend long periods participating in Kangaroo Care. Mothers are able to express next to their baby using mobile expressing pumps.

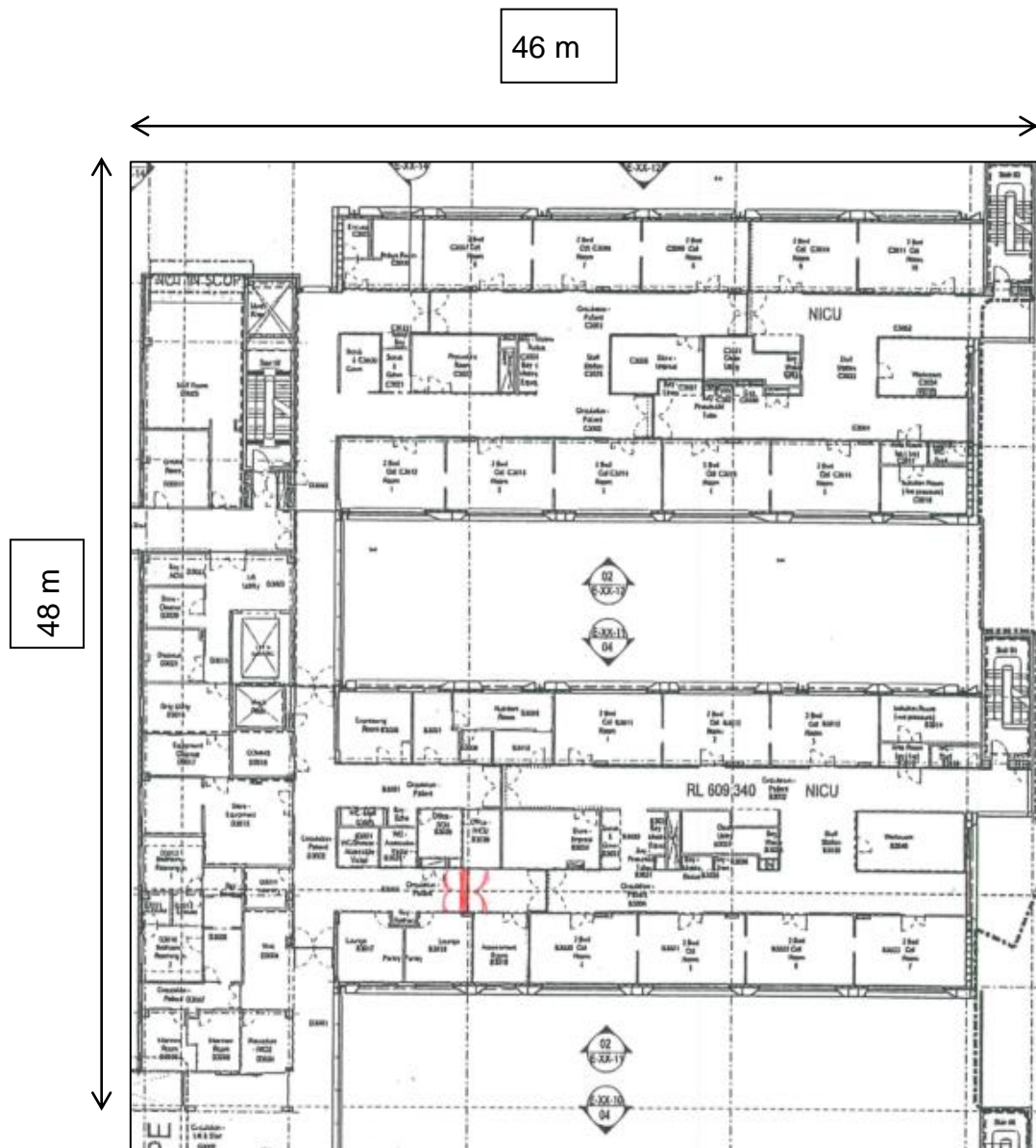


Figure 3.4: Floorplan of the two cot Neonatal Intensive Care Unit



Figure 3.5: Two cot Special Care Nursery room (Photo 3)



Figure 3.6: Two cot Neonatal Intensive Care room (Photo 4)

The manuscript that follows provides a description of the NICU World Café methodology and group recommendations that resulted in the two cot design.

Article 2: World Café Methodology an Innovative method to engage stakeholders in designing a Neonatal Intensive Care Unit

Broom M, Brady B, Kecskes Z, & Kildea S. (2013)

Journal of Neonatal Nursing October Vol. 19, Issue 5, Pages 253-258.

Abstract

Background: This paper discusses engaging World Café Methodology (WCM) during the design process when building a world class Neonatal Intensive Care Unit (NICU). The NICU World Café was held to consider the requirements needed to support a philosophy of family centred care acknowledging the needs of neonates, families and staff.

Method: A NICU World Café was conducted with the aim to engage stakeholders in the design of a new NICU. World Café Methodology is an integrated set of principles for hosting conversations that matter. Stakeholders converse with Café experts regarding the question of the Café from which a collective knowledge evolves to answer the Café question.

Results: The NICU World Café stakeholders identified a core group of requirements essential to creating a functional NICU: flexibility, visibility, privacy, skills, safety and sense of community. Stakeholders resolved these requirements could be applied most effectively in both two and single cot rooms, detailing their recommendations for the architects.

Conclusion: World Café Methodology facilitated stakeholders' exposure to a variety of opinions and new information regarding the NICU's new design. Applying World Café Methodology principles allowed stakeholders to focus on the key issues and find answers to their question.

Introduction

The first Neonatal Intensive Care Units (NICU) were adult wards, modified by removing walls to construct open planned (OP) neonatal units, that generally catered for twenty to fifty neonates (Harris et al, 2006). These wards were functional for staff; however, recent knowledge about neonates' brain development has increased and current research has identified single room design (SRD) as ideal in facilitating individualised developmental care for neonates. Staff members have the ability to modify temperature, light and noise to the neonates' needs. Studies have also shown that SRD encourages more participation of the families in the baby's care and greater privacy to spend quality time with the baby (Harris et al, 2006). Infection rates have been shown to be significantly reduced in NICUs that have implemented SRD (Walsh et al, 2006).

However, studies have also identified negative aspects of SRD for both families and staff. Families identified feelings of isolation, reduced family to family interaction and lack of continuity of care, as their babies may be moved between areas to match the staff skill mix on a day to day basis (Goldschmidt & Gordin, 2006). Staff in SRD neonatal units acknowledged the benefits for neonates and families, but also outlined their concerns. Beck et al. (2009) undertook a study where the participants experienced three interior design layouts. In this study nurses highlighted concerns with SRD; these related to: safety of the neonates as staff felt that it was difficult to care for babies when they were located in different rooms; and increased staff workload in SRD, as often there were not enough hands to carry out tasks or do tasks simultaneously as they had been able to the OP setting such as checking medications. Staff also expressed feelings of isolation in the SRDs and how this impacted on their ability to communicate with and learn from, other staff (Domanico et al., 2010).

Setting

In 2008, Australian Capital Territory (ACT) Health Directorate announced the construction of a Women and Children's Hospital, which was to include a complete rebuild of the existing NICU. The current NICU has an open plan design; it was designed in the 1980's to accommodate 24 neonates in eight intensive care, high dependency and special care cots. Currently the NICU averages 110% occupancy often providing treatment for 24-30 neonates in the current building.

A collaborative of stakeholders encompassing the Capital Asset Development and Planning and a Neonatal User Group, consisting of NICU staff, families, allied health, aboriginal liaison officer, infectious disease representative and biomedical technical officer, joined forces to develop a Centre of Excellence for neonatal care in the ACT. Throughout 2008-2009 different strategies were engaged to assess the positive and negative aspects of recently built NICUs and consider the design for the new NICU. Nursing staff willingly carried out a literature review on current trends in NICU design and they visited recently built NICUs in Australia and overseas. A NICU design meeting was held to provide nursing staff with detailed information on recommended standards for NICU design. Weekly staff meetings were held where information was presented regarding the positive and negative aspects of different NICU designs, where staff members actively debated the impact of each design on staffing, workflow and nursing practice.

The group's research identified three room designs for consideration: open plan, two cot rooms and single rooms. World Café Methodology was used to facilitate the process of making the final design choice (Berglund et al., 1999).

Methods

World Café methodology is a creative methodology for hosting authentic conversations around questions that matter (Brown & Isaacs, 2005). It is a method utilised to create collaborative discussion on real life questions (Brown, 2002). Participants join together at Café style tables where they hold conversations exploring the question of the Café (Brown & Isaacs, 2005). The tables are led by experts who have an opinion or view about the Café question. At the start of the Café participants are invited to join one of the experts' tables for a conversation regarding the question, in which the expert talks about their experience or ideas. Then at designated time intervals the participants split up and choose another table they would like to join. This is how this method facilitates the collection of diverse information, cross pollination of ideas and growth of insight. The participants develop a collective knowledge that grows and evolves, guiding the group to answer the Café question together based on their learning and insight (Brown & Isaacs, 2005). World Café format is flexible and adaptable with its uses limited only by imagination (Brown & Isaacs, 1999).

Six key principles have been outlined to guide Café organisers through the process (Brown & Isaacs, 1999) (table 1).

World Café principles

Create a hospitable space

Explore questions that matter

Encourage everyone's contribution

Connect diverse people and ideas

Listen together for insights, patterns and deeper questions

Make collective knowledge visible

(Brown, 2002). A Resource Guide for Hosting Conversations That Matter at the World Café Whole Systems Associates. <http://www.theworldcafe.com>

Figure 3.7: Six key principles for hosting a World Café

In preparation for the NICU World Café at the Canberra Hospital, ten people were asked to be an expert (host a table) at the three hour workshop. Experts included nurses, developmental paediatricians, allied health staff and parents who had previously experienced their baby being admitted to the NICU. An expert at the NICU World Café was defined as someone with specific knowledge related to the NICU. Their knowledge included topics such as: the three different NICU designs under consideration, parental experience in the current NICU or a member of the multidisciplinary team that support families during their transition through the NICU. The experts were encouraged to talk to Café participants about their particular area of expertise, experience, knowledge and opinions regarding the best use of functional space for the new NICU. To assist the experts with their task they were emailed information and guidelines on World Café Methodology (Brown, 2002). The Clinical Director of the NICU also spoke to each expert about the methodology and outline of the workshop beforehand.

Since the beginning of the redevelopment project, members from the Access Improvement Program had worked alongside the Neonatal User Group in the development of the model of care and facilitated discussions on the new design. A staff member from Access Improvement Program, who has significant experience in overseeing meetings and patient centred care, took on the role of Café moderator. Other Access Improvement Program staff facilitated the NICU World Café by welcoming participants, serving lunch and assisting with the overall organisation of the Café.

An open invitation to the NICU World Café was conveyed to all NICU staff. Participants (n=55) included members from all the groups working on the new NICU design.

The room was set up to resemble a Café with tablecloths, glasses and water placed on tables set up to accommodate six to eight participants. The organising group welcomed the stakeholders to the Café, creating friendly relaxed atmosphere where participants were encouraged to chat and enjoy their lunch at the tables before the session began.

The workshop moderator firstly related the Café question to the attendees:

What would be the best use of functional space for the new NICU design?

The Café moderator then gave a short presentation on current NICU designs that included the following topics:

- Current research in NICU design.
- Nurturing environments for neonates, families and staff.
- Impact of the NICU environment on neonates and families.
- NICU environment's impact on staff members' health and the benefits of an appropriate environment to work in.

To guide the workshop Café participants were then given a short overview of World Café Principles:

- Every voice counts – encourage other people at your table to contribute.
- Listen respectfully to the person who is speaking.
- A different opinion does not mean a wrong opinion – explore the differences.
- Stop to consider the patterns, insights and deeper questions you encounter during the Café (Brown, 2002).

Under the direction of the Café facilitators participants chose a table to join; they rotated to a different table every 20-30 minutes with most participants joining four or five tables during the Café. They held conversations with different members of staff and the experts hosting the tables, expressing and listening to different viewpoints on the design for the future NICU. As participants moved around the tables they were given the opportunity to pass critical ideas from one table group to the next, trading ideas and opinions. Participants were encouraged by the experts to express their concerns and questions allowing them to gather new information that would assist in the final decision making process.

During the Café experts made notes of ideas, questions and suggestions provided by the participants. They then went on to discuss with new participants who joined their table, thus adding and refining the information. Participants' differing opinions were acknowledged with the expert giving the participant more information about the concerns and then listing their point for discussion during the close of the workshop. In addition, throughout the running of the Café, five members of the organising group mingled with the various groups gathering key information on the question. At the end of the Café; guided by the moderator who transcribed the ideas onto a white board, the participants joined as a collective to review their findings.

Results

To finalise the Café experts and participants joined together to review viewpoints and concepts generated by the group. Participants of the Café identified two main topics and underlying themes that outlined their requirements to facilitate the best use of functional space for the new NICU design: The three design choices were reviewed on how each could meet these requirements. These requirements are outlined below:

Operational requirements

In moments of crisis in the NICU it is essential that staff are available to help out quickly; this was highlighted as a major challenge at the Café when considering small room design. In the current design senior staff are close by at all times but this would change in a unit composed of smaller rooms. This has the potential to create anxiety for staff and parents regarding the possible time delay in gaining support in an emergency. Café attendees identified the need for a detailed emergency response system and dedicated staff members to provide timely response on all shifts.

Changing the NICU design generates an operational challenge when considering staffing as considerable investment in training will be necessary to facilitate the new

model of care. Whereas in the current OP design staff are able to help each to cover breaks, check drugs and take on the extra load of busy staff, supernumerary staff will be essential to take up these roles in a NICU design that involved a SRD.

Functional requirements

Collectively the stakeholders identified six key functional requirements that should be considered in the development of the design for the new NICU:

Safety

Participants acknowledged the new design should assist in maintaining safety in the NICU. Safety involves many factors that impact on neonates, families and staff and include a design that facilitates secure access via swipe cards with one main entrance and reception, cameras and an intercom system to view and talk to families and visitors as they enter the unit. The NICU also needs to be functional providing space for the secure storage of personal belonging for families and staff.

Flexibility

The rooms should be able to meet the needs of a dynamic work environment, based on the clinical condition of the babies, staff availability and skill mix. Unlike the current unit where neonates are moved between bays based on acuity and staffing; Café participants identified each bedspace in the new unit should be able to be modified to accommodate all neonates needs, ranging from intensive to intermediate care. In addition, parents of healthier babies should not have to walk past sick babies, requiring the new NICU to be split into different areas with different access: a high and a low acuity area. The design should also be flexible and able to accommodate the families' needs. Each bedspace should have dedicated family space that includes seating suitable for breastfeeding and spending quiet time with their baby, a cupboard to lock

away private belongings and access to the internet, as parents are often in the NICU for long periods, often doing work at the cot side.

Visibility

Good visibility of the neonates at all times was considered essential. Staff should be able to visualise the neonates in their care and have the ability to remotely monitor their patients when they step out of the room. Café participants also thought the design should allow staff to maintain visual access to staff in other rooms next to them and to a central staff station to reduce the feeling of isolation commonly identified in small room design. This set up should also facilitate the support of junior nursing staff.

Privacy

It was agreed the new unit should provide privacy for all the members of the NICU community. Procedures (e.g. insertion of a cannula) should be able to be done in a quiet, private environment. There should be adequate space where families and staff can discuss the neonate's condition and care requirements without being overheard or interrupted. Privacy for parent education, breast feeding, kangaroo care and expression of breast milk to allow families to spend quality time and bond with their baby. Staff members also require privacy to consult with other team members on issues that may arise in caring for neonates in the NICU.

Skill mix

Participants were uncertain how small room design would impact on the skill mix. Current NICU staffing provides a diverse skill mix from senior staff with twenty years' experience to junior staff with limited neonatal experience. The current OP design allows more experienced staff to lend a hand to less experienced staff, while still being able to see the baby they are providing care for. A single or two cot design would make

it impossible for one staff member helping a staff member in another room to still observe their own patient, remote monitoring would be essential in such a design.

In addition, a question that arose was: would extra senior staff be required to facilitate junior staff's learning and provide technical and emotional support necessary in the development of a skilled, experienced and competent workforce for the NICU? The need for a succession plan was also acknowledged at the Café, with many staff being close to retirement, it was felt that it would be essential to promote and actively recruit new staff to work in the NICU.

Community

The current NICU has a strong community where staff value the relationships they have within the multidisciplinary team. Many Café participants felt this was due to the current design where different staff members, nursing, medical or allied health, are easily accessible and available, allowing staff to work more effectively as an integrated team. Participants would like this to continue in the new unit and new design support the current NICU community.

Stakeholder's Decision

On reviewing the three design choices stakeholders agreed that either single or two cot rooms best met the requirements they had outlined to produce a functional space for the new NICU. The Café moderator and Clinical Director took responsibility to inform the design team and architects of the Cafes' participant's choice and requirements. They also undertook to write a report on the Café to be circulated and reviewed by Café attendees.

After further consultation and collaboration with the design team, a two cot room design was formalised for the new unit. The new unit has two wings: Intensive Care/High Dependency (20 cots) and Special Care (14 cots) interlinked in sets of two, three and

four rooms with a doorway and large window between each room. This allows staff to see the neonates and communicate with staff in the adjoining rooms.

Conclusion

Designing a new NICU is a significant investment of capital, time and infrastructure; but often one of the biggest challenges is finding a strategy to engage and include stakeholders in the design process. World Café Methodology proved to be an innovative and exciting method to engage and involve the NICU community. Utilising World Café principles allowed staff to focus and engage on the key issue of the new NICU design, exploring new information and a variety of opinions that allowed the group to generate key recommendations for the design of the new NICU.

Main Findings

This article is the first to describe use of the World Café methodology for engaging staff in the choice a new Neonatal Intensive Care Unit design. World Café methodology facilitated a decision-making process from which stakeholders recommended a single family or two cot Neonatal Intensive Care Unit design for the new facility. Findings outlined that the final choice should be based on operational requirements that included: access to senior staff, increased staff support, detailed emergency response system and staff training on the new model of care prior to the transition. Stakeholders also recommended six functional requirements: safety, flexibility, visibility, privacy, skill mix and community for consideration in the design. These requirements guided senior management when reporting to the Capital Asset Planning and Development Team and the architects, thus enabling drafting of the first plan for the new Neonatal Intensive Care Unit as one section of the Women and Children's hospital. After further discussion and collaboration with other departments in the new hospital, it was decided the Neonatal Intensive Care Unit would be composed of a two cot design.

Summary

This study has outlined the benefits of World Café methodology when undertaking a decision that has consequences on health care workers' work conditions and future practice. The informal and welcoming environment encouraged participants to consider new ideas and concepts; through engaging in meaningful conversations the participants were able to formulate and build group solutions to the Café question. In this study's case the main objective of the Neonatal Intensive Care Unit World Café; to make recommendations regarding the Neonatal Intensive Care Unit design, came to a successful conclusion with the decision to construct a two cot Neonatal Intensive Care Unit.

Engaging staff at the World Café increased their awareness of the benefits and challenges of different Neonatal Intensive Care Unit designs. Staff requested more information about changes needed to transition to the new design and the impact on nursing practice and workflow. The excitement of building a new Neonatal Intensive Care Unit was subjugated by staff apprehension, with conversations about the new design highlighting safety, staffing, support, education and isolation as areas of concern (Broom et al., 2013).

As described previously in this Chapter, members of staff formed the CAN Group to facilitate a successful transition to the new Neonatal Intensive Care Unit. The Participatory Action Research project described in Chapter 4 evolved from this point of the Neonatal Intensive Care Unit redevelopment.

Chapter 4: Methodology

“Action research is learning by doing: a group of people identify a problem, do something to resolve it, see how successful their efforts were, and if not satisfied, try again”

O’Brien, 1998

Prologue

This Chapter begins with a background to action research methodology that provides an overview of the benefits, ethics, rigour and quality of action research methodology. It continues with a description of participatory action research and the unique characteristics of using participatory action research to coordinate a change management project in a large organisation. A rationale then details the process leading up to formalising this study.

Chapter 4 includes a journal manuscript: *‘Transitioning from an open plan to a two cot Neonatal Intensive Care Unit design: A Participatory Action Research Approach’* that provides a detailed description of the participatory action research project that underpins my thesis. It concludes with the main findings and summary of the Chapter, including the rationale for Chapter 5.

Background

Historical Perspective

Kurt Lewin has been acknowledged as the first theorist to convey the concept of action research. Lewin (1946:165-6) discusses how a person, once they recognise that their fate is dependent on the fate of the group, will take individual responsibility for the group’s success. He contended that *‘if the group’s task is such that members of the group are dependent on each other for achievement, then a powerful dynamic is*

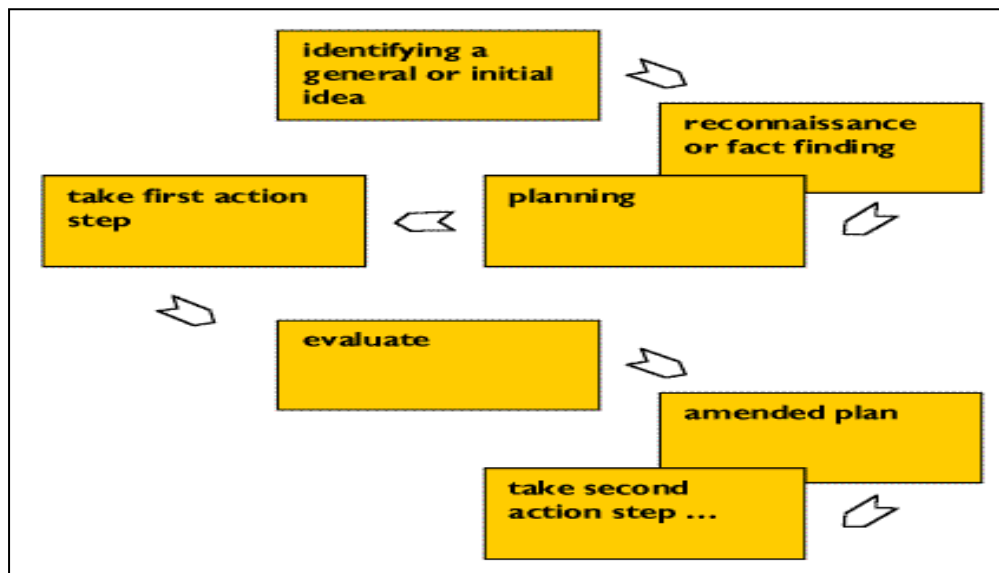
created' (Smith, 2001). He also argued that people may come to a group with very different views but if they share a common goal they will work together to accomplish it: postulating the first basic tenets of action research (Smith, 2001).

Lewin (1946) suggested that prior to 1946 the most common method used to collect information by organisations, when aiming to improve group relations, had been surveys. He suggested that although surveys were an important research tool, the data collected by them was often superficial and didn't give insight into the motivation of the sentiments expressed within the surveys. He outlined two key facts that surfaced from his work (Lewin, 1946, p156-6):

'There exists a great amount of good-will, of readiness to face the problem squarely and really to do something about it.'

'If this amount of serious good-will could be transformed into organized, efficient action, there would be no danger for intergroup relations in the United States. But exactly here lies the difficulty'.

Lewin believed that by providing groups with an organised process the goodwill could be harnessed to improve group relations in organisations (Lewin, 1946, p165-6). His approach involved a repeated cycle of planning, executing and reconnaissance (Figure 4.1); allowing each step to be assessed and thus determining the next step. Lewin stated that the knowledge generated by action research methodology via the involvement of study participants could create effective change (Lewin, 1946).



Sourced from: Smith, M. (2001). 'Kurt Lewin, groups, experiential learning and action research.'

Figure 4.1: Lewin's origin cycle

As reported by Argyris (1993), the four core themes of Lewin's work included:

- linking practice with theory through framing social science studies with real life problems
- connecting the problems to theory and designing research by framing the whole and subsequently distinguishing the parts
- developing concepts that then be used to understand a particular problem
- changing the role of those being studied from subjects to participants creating effective creating effective solutions improve their quality of life and further create well-founded knowledge.

Contemporary Action Research

Action research has taken a diverse course since Lewin's work, with various authors adding to Lewin's original themes and cycle, with an assortment of definitions now forming the basis of contemporary action research methodologies (Taylor, Kermode & Roberts, 2007). While the wording of the two action research definitions presented below have various nuances, the basic action research principles of democracy and participation are evident:

‘action research is a social process of collaborative learning for the sake of individual and collective self-formation, realised by groups of people who join together in changing the practices through which they interact in a shared social world—a shared social world in which, for better or for worse, we live with the consequences of one another’s actions’

Kemmis & McTaggart, 1999, p 20

‘action research is a participative and democratic process that seeks to do research with, for, and by people; to redress the balance of power in knowledge creation; and to do this in an educative manner that increases participants’ capacity to engage in inquiring’

Reason, 2001, p 189

In essence, action research refers to a family of activities and methods whose research approach involves action and research occurring simultaneously in a collaborative context (Coghlan & Brannick, 2009). Action research always involves two goals: to solve a problem and contribute to science (Gummesson, 2000). It is based in real life experience where the results will affect the lives of the participants (Gummesson, 2000).

Action research in its simplest form is commonly described as a sequence of steps (Kemmis & Taggart, 1999) or as a repeated cycle of planning, action and evaluation (Taylor, Kermode & Roberts, 2007). This involves exploring the background and purpose of the project, the issues underlying the research and developing strategies and interventions. The plans are developed and implemented collaboratively by the research group. Data is presented back to the stakeholders, who then jointly evaluate the outcomes and effectiveness of the action to formulate what action should occur next, thus creating a continuous cycle of action (Taylor et al., 2007).

The benefits of action research include the capacity to use a variety of research methods to collect information. The collection of information is not restricted to using traditional methods such as interviews or surveys; it encourages the use of creative

methods of data collection that will engage the participants on a problem central to the group (Morton-Cooper, 2000).

Action research methodology is designed to empower the participants through constructing and creating knowledge, thus motivating individuals to work collectively and negotiate through changes that directly impact on their lives and how they practice (Reason, 2006). The methodology promotes reflection and self-assessment, through which the participants become more aware of the issues, which in turn further enhances the group decision-making process and the group's commitment to continuous improvement (Morton-Cooper, 2000; Reason & Bradbury, 2008; Smith, 2001; Stringer, 2007).

Action Research in Health Care

Action research in health care has been more specifically defined as a cyclical process; where staff are presented with a clinical problem and by working together the group aims to find ways to reduce or solve the problem (Morton-Cooper, 2000). Action research is viewed as a real-world intervention in a real life situation, using a variety of research methods to find solutions to the group's question (Morton-Cooper, 2000). In relation to action research in health care, the suggestion was that action research most importantly involves real situations where the main endeavour is to resolve issues by people who wish to improve their situation or practice (Morton-Cooper, 2000).

Ethics, Rigour and Quality in Action Research

Like any research methodology, ethics form an essential, underlying and formative part of the research. All researchers have a *duty of care* to the participants engaging in research (Stringer, 2007). When planning a study, the researcher needs to take steps to ensure the participants come to no harm as a result of their participation. Participants should be informed about the aims and requirements of the study; told that their

participation is voluntary; and made cognisant of the fact that they may withdraw from the study at any time if they choose to do so (Stringer, 2007).

Due to the participatory nature of action research, the researcher's ethical responsibilities also include the responsibilities of continually updating the participants on the progress of the project and making the project processes transparent to all. It is essential to remember that participants in action research projects are co-researchers because, in partnership with the research coordinator, they have set the aims and goals and determined how the project will be conducted (Stringer, 2007).

Gellerman et al. (1990) outlines four basic ethical principles for conducting action research:

- find solutions that best meet the needs of the whole group
- treat members of the group just as we want to be treated
- always respect group members rights; treating them as equals not as a means to get results
- be fair and impartial considering each stakeholder, so as not to increase the control of the most influential stakeholders over other stakeholders.

Rigour in action research is based on checks to ensure the outcomes of the research are truthful and that they reflect the views of the participants, not the researcher. These checks are designed to ensure that the researchers have thoroughly ascertained the correctness and validity of the information that has emerged from the research process (Stringer, 2007). Rigour in action research is also maintained through questioning project events and how they were interpreted using multiple action cycles, and questioning how data is generated, gathered, explored and evaluated.

Coghlan & Brannick (2009) state that to maintain rigour in an action research project, researchers should engage in the steps of multiple and repetitious action research

cycles to give a true representation of what has been done. Researchers should challenge and test their ideas and interpretations continuously throughout the project. They should also consider if their interpretations are grounded and supported by scholarly theory (Stringer, 2007).

In ensuring the quality of an action research project it is important to critique the study based on action research quality criteria, not by the criteria of positivist science. Reason (2006, p 189) summarises five key criteria that should be followed to guide the quality of an action research project:

- Does the action research reflect cooperation between the action researcher and the participants of the project?
- Is the action project governed by constant and iterative reflection as part of the process of organisational change or improvement?
- Was the action research inclusive of practical, propositional, presentational and experiential knowing and so, as a methodology, is it appropriate to furthering knowledge on different levels?
- Does the action research project engage in significant work?
- Does the action research project result in new and enduring change?

Participatory Action Research

Participatory action research is grounded in a qualitative research paradigm, but often both qualitative and quantitative methods are used to collect data (Stringer, 2007). This methodology enables a research group to use a variety of methods to collect data and modify the research to meet the needs of the group (McIntyre, 2008). Two well-known theorists have identified five characteristics that distinguish participatory action research from other research methodologies (Koch & Kralik, 2006, p 23):

-
-
- Participatory research involves participation by the people involved in the research at all stages of the research process. The issue being researched originates with the individual or the community. Participants may be involved in developing the research design, generation of data and analysis, and then participate in the dissemination of the research findings. The nature of participatory research suggests that there exists a partnership between the researcher and research participants.
 - Ways of knowing are valued in participatory research as theory is generated from the experiences, lives and understandings of all participants. Theorising helps individuals explain their lives by exposing false ideologies. The act of theorising may create opportunities for change in the lives of those individuals participating and can lead to a wider scale social transformation in collective lives.
 - There is a focus on empowerment and power relations in participatory research. People's awareness of their own capabilities and capacity is strengthened by their participation in the research process. Empowerment is incorporated into the process of the research by identifying the potential for imbalance of power in the research relationship and seeking to take action to address or prevent such inequity. By acknowledging the power imbalance in the researcher/participant relationship, the process can be empowering for those involved and allows the imbalance to be investigated as a part of the research process.
 - Participatory research views consciousness-raising as the core of this approach. The research process may be educative for both the researcher and the participants because together they generate data. All people involved are researchers and committed learners.

-
-
- The aim of participatory research is to create social change, which addresses the inequality of power distribution. It aims to affect the lives of those who participate in the research (including the researcher) in ways that the participants see as being beneficial to their lives. The goal is to improve the lives of those participating in the research. The social change begins with the participants (including the researcher) and may often end there as well. It is recognised that change may be limited to consciousness-raising or behaviour changes in the individuals who participated in the research.

Foundation of Participatory Action Research

The foundation of participatory action research requires a collaborative cyclic process (Figure 4.2) of constructing change about a situation or problem through planning, gathering data, taking action, and reviewing the results of the action in order to plan the next action (Coghlan & Brannick, 2009). Participatory action research uses a scientific approach to examine the resolution of social or organisational matters. It is based on four main principles; democracy, justice, freedom and participation (Coghlan & Brannick, 2009). It provides a method in which the people who are effected by an issue can work together to develop an understanding of the problem, and use their collective knowledge to create solutions to their problem (Stringer, 2007).

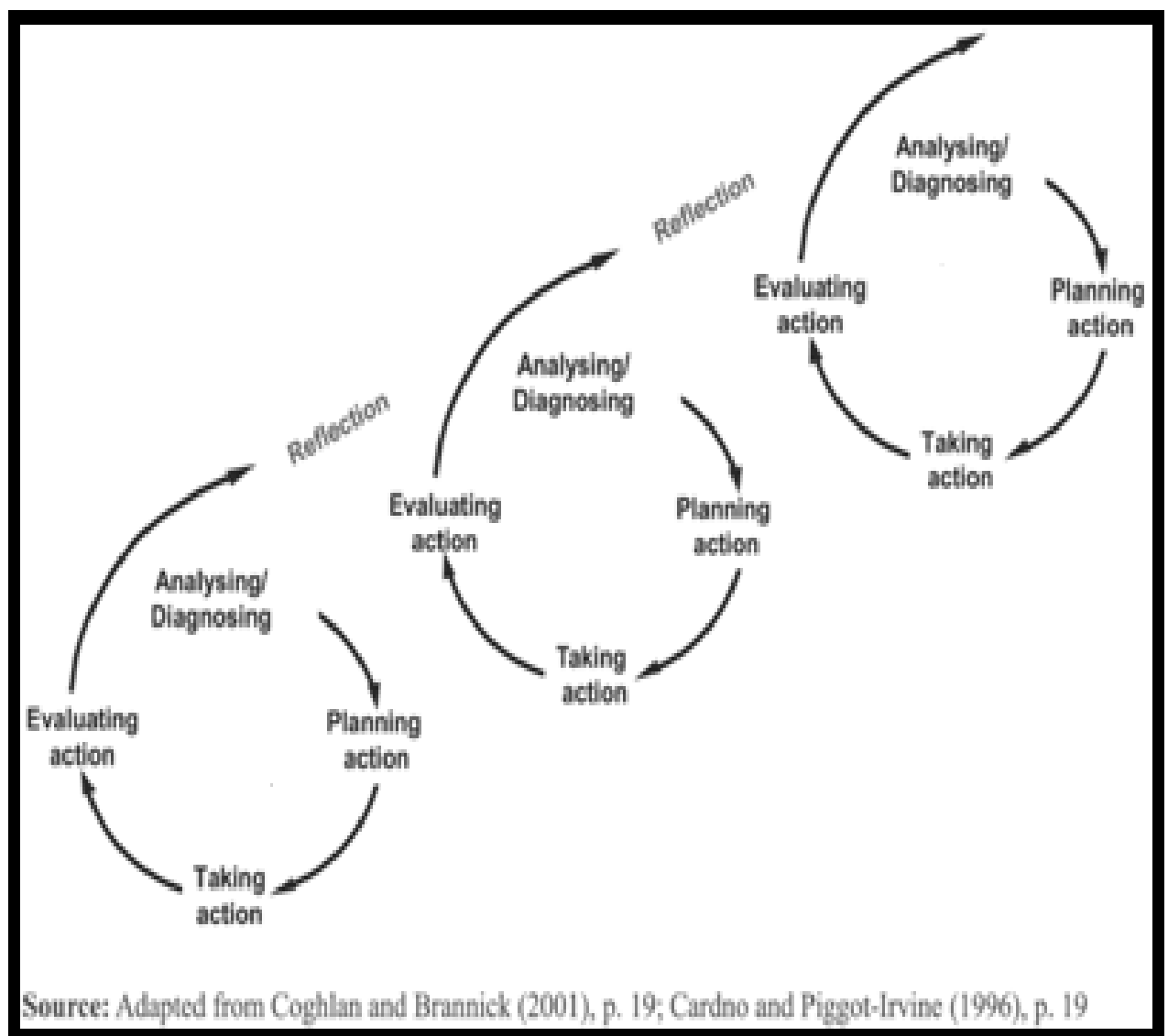


Figure 4.2: Participatory action research cycle

Conducting a Participatory Action Research Project within an Organisation

The type of research carried out on any given project will differ due to its context. An action research project conducted in a small community group will be significantly different and have a very different sense of collaboration than an action research project conducted in a large organisation, such as the hospital where this thesis research was based.

The project reported in this thesis was conducted in a large organisation, such as that described by Coghlan & Brannick (2009). They identified Shani & Passmore's (1985: p

439) definition of action research as being most suited when conducted in large organisations:

‘an emergent inquiry process in which applied behavioural science knowledge is integrated with the existing organisational knowledge and applied to solve real organisational problems. It is systematically concerned with bringing about change in organisations, in developing self-help competencies in the organisational members and adding to scientific knowledge. Finally it is an evolving process that is undertaken in a spirit of collaboration and co-inquiry.’

It has also been recognised that conducting a participatory action research project in the researchers’ organisation adds additional considerations to negotiate (Coghlan & Brannick, 2009). Being aware of the political dynamics of the organisation and recognising how the ‘political players’ value the research may create obstacles to facilitating the inquiry process and implementation of research outcomes (Coghlan & Brannick, 2009).

Several factors set the context of the project, whether the project goals are individual or shared, in supporting a collaborative process. Organisational characteristics such as resources, history, the experience of stakeholders from all levels of the organisation and their willingness to participate in the action research are very important considerations (Coghlan & Brannick, 2009).

Rationale for the Participatory Action Research Project

This participatory action research project started with a group of staff keen to inform and support staff about the new Neonatal Intensive Care Unit and to find solutions to their concerns about changing from an open plan to a two cot design. Before the formation of the group, staff had attended an in-service where the benefits of single family rooms or larger rooms, was vigorously discussed. In most workplaces, the move to a new

building is associated with an acknowledged period of reduced productivity and performance while staff adjust to the new design. In this case the staff were aware that, no matter what the final design of the Neonatal Intensive Care Unit, they would be required to consistently provide high-quality care in order to maintain positive short- and long-term outcomes for the neonates in their care.

The Change and Networking (CAN) Group was established as staff recognised the importance of assessing and developing strategies to support the staff's transition to the two cot Neonatal Intensive Care Unit. Members included nursing, medical and allied health staff as well as a member of the hospital redevelopment team. The Group was co-chaired by a medical and nursing lead; whereas roles in the group were related to the project in progress e.g. CAN Group members each coordinated a staff focus group.

Utilising Participatory Action Research enabled the group to develop a variety of methods (questionnaires, surveys, question boards, workshops) to engage staff in finding solutions, throughout the transition to the two cot design.

Very quickly it became apparent to the group that the challenge they had taken on was much larger than imagined. In the early stages, group members were unsure about the group's role and how to facilitate the transition, but we were all keen to learn about the new design and feed information back to staff. All at once, we were researching how to manage change, choosing features and fittings for the new Neonatal Intensive Care Unit, surveying staff and parents to assess their needs as well as organising staff meetings and workshops to involve staff in the process. In June 2010, the group took the next step. Given the size and complexity of the project and interest from outside groups we created an organised structure, wrote terms of reference and appointed co-chairs for the group.

Reflection Box 4: Forming the CAN Group

In 2009, we organised a meeting with staff members who had previously shown interest in the impact the new design would have on staff. The group discussed how we could help them. Together the group decided on its name: Change and Networking (CAN) and wrote the aims of the group. We created posters to put up in the unit to tell staff about the group (Appendix A). Started our own newsletter, noticeboard, question box and, as the first draft of the plan was presented to us, asked staff what questions they had about the new unit. They could ask about design or anything that they wanted. The group plans to have a weekly meeting and look at any issues about the new unit.

CAN Group Notes August 2009

My reading had highlighted the benefits of the participatory action research methodology as a means of providing structure to the growing number of projects that the CAN Group and staff had outlined as necessary to support transition to the two cot design. The manuscript that follows (Article 3) outlines the participatory action research project undertaken between 2009-2013.

Reflection Box 5: Enrolling in my Masters

When I enrolled in my Masters I thought I might survey staff and parents and find out what they would like in the new unit. But since talking to my supervisor I am interested in looking at how we can make our group more effective by following the principles of Action Research.

Action Research generally starts with a problem, which motivates action and leads into starting an action research project (Coghlan & Brannick, 2009). This is exactly where I started last year as our unit redevelopment started to take shape. Now here I am completing a Masters and reading about action research methodology.

As I read and talk to my supervisor I am starting to understand how our group aligns with a participatory action group. I am eager to see how this will go! How are participants co-researchers? Will group members take on leadership roles? This is gradually starting in my project but it has been a slow process it is important not to give up and if one way doesn't work try something different.

ACU Masters Journal October 2010

Article 3: Facilitating staff transition from an open plan to a two cot neonatal intensive care unit: A participatory action research approach

Broom M, Gardner A, Kecskes Z, & Kildea S. (2015).

Journal of Clinical Nursing, Submitted Dec 2015, Reference: JCN-2015-1263

Journal of Clinical Nursing review submitted 14/3/2016. Resubmitted with revisions 29/05/2016. Accepted for publication 07/08/16.

Abstract

Study Objective: To facilitate the transition from an open plan to a two cot Neonatal Intensive Care Unit (NICU) design using a participatory action research approach.

Background: In 2012 an Australian regional NICU transitioned from an open plan to a two cot NICU design. During the planning stage of the redevelopment staff expressed concerns regarding the impact of the two cot design. Research has highlighted small room NICU design may have a negative impact on clinical practice. As the floorplan and size of NICUs increases research has suggested the distances nurses need to walk has increased, reducing the time they spend providing direct neonatal care. Studies have also reported nurse's feel isolated and need additional support and education in small room NICUs.

Design: Participatory Action Research

Methods: A Participatory action group titled the Change and Networking Group (CAN) collaborated with staff over a four year period (2009-2013) to facilitate a smooth transition. This study has utilised both qualitative and quantitative methods. Data collection has involved a continuous process of reviewing CAN Group work undertaken over the four years. Data Sources included: meeting and workshop minutes,

newsletters, feedback boards, focus group reports, field notes and a staff satisfaction survey.

Results: This paper provides an overview of the CAN Groups work over the four year period from 2009-2013 and includes: 1) Group formation; process and change model; 2) Projects undertaken by the CAN Group and NICU staff; 3) Staff evaluation of the CAN Group; and 4) CAN Group member's feedback on the Participatory action research methodology and the role of CAN Group.

Conclusion: The participatory action research approach was a valuable method to find solutions to clinical practice adjustments needed in the two cot design.

What does this paper contribute to the wider global clinical community?

- Participatory action research provides structure and direction when engaging in organisational change such as a NICU redevelopment.
- Reducing the negative impact of a new work environment on clinical practice is critical in providing high quality health care.
- It is astute to collaborate with nursing staff during a transition to a new work environment.

Keywords: Intensive Care, Neonatal, Participatory action research, Work environment, Clinical practice.

Acknowledgements: We would like to acknowledge and express our deepest thanks to the members of the CAN Group for their participation and dedication over the four years throughout the transition to the two cot NICU. We would also like to thank the NICU staff and management for participating in and supporting the projects undertaken by the CAN Group.

Introduction

The work environment has been described as the backbone to facilitating a nurse providing clinical care (Hendrich et al., 2009). “A supportive nurse work environment should enhance the efficiency of nurses while limiting the stress and physical burdens of nursing practice, thereby fostering nurse satisfaction and retention” (Hendrich et al., 2009). To foster a developmentally appropriate family centred approach to neonatal care, many Neonatal Intensive Care Units (NICU) are modifying open plan units to family or small room designs (White, 2003, 2007, 2011). Changes in NICU design aim to improve neonatal outcomes, but it is also important to consider the impact of NICU design on nursing staffs’ ability to provide safe, high quality care in a new environment.

In open plan NICUs, nursing staff work side by side sharing tasks and workload: they are able to assist each other in emergencies or with complex tasks, relieve each other for breaks and discuss their concerns or care plans. Whereas in single family room NICUs nurses are required to work independently, often with assistance only available at the end of the phone or buzzer (Broom et al., 2015). Moving from an open plan to single family room NICU requires nurses to develop new models and strategies to provide clinical care (Shahheidari & Homer, 2012). Until now there has been limited published research regarding the impact the NICU design has on clinical nursing practice.

Background

The environment an individual is exposed to has both positive and negative effects on both their physical and emotional wellbeing (Ulrich, 1984). Providing a healing environment is particularly important in NICUs where one of the most vulnerable population groups; neonates are admitted (Cooper et al., 2007; Shepley, Harris & White, 2008). Whilst open plan design provides direct visibility of the neonates and

immediate access to assistance in emergencies (Domincio et al. 2010), various studies have shown specific features of this traditional design such as the confined space, high noise and light levels may negatively impact on neonatal developmental outcomes (Blackburn, 1998; Graven & Browne, 2006, 2008). Other research has reported single family room design reduces infection rates, length of hospital stay and facilitates an individualised approach in the care of neonates; improving neonatal outcomes and parental experiences (Harris et al., 2006; Walsh et al., 2006; White 2003, 2011). Given the research findings many NICUs undergoing renovation or a rebuild, are choosing family or small rooms catering for 2-6 neonates as the design of choice (White, 2003). Nurses surveyed in previous studies have acknowledged the benefits of the physical aspects of the family rooms, recognising improvements in their ability to provide a developmentally appropriate environment and facilitate a family centre approach in their unit (Broom et al. 2013; Carlson et al., 2006; Cone et al., 2010; Smith et al., 2009). When considering the impact of single family room NICU design on staff, a systematic literature review reported an increase in staff walking distance, workload and staffing requirements (Shahheidari & Homer, 2012). Previous studies also highlighted the need to provide additional support and education, difficulties in team communication and the isolation staff are exposed to in such NICUs (Bosch et al., 2012; Stevens et al., 2010; Swanson et al., 2013; Walsh et al., 2006).

Study Setting

This study was undertaken in an Australian regional NICU that provides intensive and special care for 700 neonates per annum, born between 24-44 weeks gestation. In 2009, funding was allocated to rebuild the open plan to a two cot NICU design as part of the first stage of the building a new Women and Children's Hospital. The two cot NICU is composed of interlinked rooms that accommodate two neonates and is triple the size of the previous open plan NICU. The layout of the new facility has also been divided into

across 2 wings: Intensive Care/High Dependency (NICU, 20 neonates) and Special Care Nursery (SCN, 14 neonates).

The two cot design and increased occupancy created the need for extra staff as well a change in unit workflows, practice and culture. While nurses acknowledged the benefits of the new design for neonates and their families, similar to previous research, they also voiced concerns about the potential impact of the new design on providing safe clinical care (Broom et al., 2013). The nurses working in the open plan NICU posed questions about: the safety of the new design, ability to provide quality care for neonates and the daily organisation of the new NICU. They also identified fears of isolation and anxiety related to working in two cot design (Broom et al., 2013).

Study Aim

To facilitate staff transition from an open plan to a two cot Neonatal Intensive Care Unit (NICU) design using a participatory action research (PAR) approach.

Ethics

Ethical approval was obtained from the ACT Human Ethics Committee in 2011.

ETHLR.11.046 Band the Australian Catholic University Ethics Committee: 2013 1888QC (Appendix B & C).

Methodology

Participatory Action Research

This project used PAR as the overarching methodology. Like many action research projects, it started with a group of people who recognised a problem and collectively decided to take action to identify solutions (Coghlan & Brannick, 2009). Our study has undergone an evolutionary process where a problem was highlighted by a group, action commenced which subsequently developed into a PAR project (Coghlan & Brannick,

2009). Lewin believed the collective knowledge generated from action research methodology could create effective change (Lewin, 1946). The foundation of PAR is based on a collaborative cyclic process that involves; planning, gathering data, taking action, evaluating the results of the action to then formulating the next action.

Participatory Action Research uses a scientific approach to resolve important social or organisational issues and is grounded in principles of democracy, justice, freedom and participation (Coghlan & Brannick, 2009).

Formation of the Change and Networking (CAN) Group

It was acknowledged in the planning stage of the redevelopment that in order to make a successful move to the new unit it was important to engage staff in a constructive change process. A group of 10 staff members (who had previously shown interest in the NICU redevelopment) were invited to attend a meeting where the Clinical Director, Clinical Nurse Consultant and Research Nurse asked the group for opinions on engaging staff in the redevelopment. Meeting participants identified the need to work with staff throughout the transition to the new NICU which led to the formation of the CAN Group (Broom et al., 2013). Members included nursing, medical and allied health staff as well as a member of the hospital redevelopment team.

As the Group members were mostly neonatal clinicians with limited knowledge on designing or constructing a NICU, we invited experts in change management, human resources, equipment and NICU design to attend some CAN meetings to collaborate with, and inform Group members about their specialty. Through engaging with these experts CAN members gained an understanding of the redevelopment process and its impact on staff. The CAN Group worked together to develop terms of reference, a mission statement, a group philosophy and aims to assist the group in developing strategies to facilitate the transition.

The CAN Group aims included the following:

- inform and support staff about the NICU design plan
- liaise between the redevelopment stakeholders and NICU staff
- facilitate a successful transition to the new NICU
- assess impact of two cot design.

CAN Group Processes

The CAN Group held weekly meetings at which Group members discussed: projects, staff needs, as well as addressing questions from the Hospital Redevelopment Team related to planning, construction and fit out of the NICU. Due to the size of the project the NICU Research Nurse who was also the Co-Chair of the CAN Group, coordinated the group's activities which included: provision of a weekly agenda and establishment of an expansive excel spreadsheet that outlined the progress of each project undertaken by the Group. The Group meetings were guided by PAR methodology principles utilising collaborative cyclic process: where members met to plan strategies to engage and collaborate with staff, gather staff feedback and formulate ideas to find solutions to a diverse range of topics (e.g. design modifications, staff education and move plan).

The main aim of the Group was to inform and support staff through the transition to the two cot NICU. Very quickly it became apparent the CAN Group would be asked to be involved in every aspect of the design, construction and transition to the new NICU. Members of the Group were asked to collaborate with several departments and levels of hospital and redevelopment administration. The Group were encouraged to present the staff ideas, feedback and develop solutions to facilitate the redevelopment. Throughout this process the CAN Group continued to implement a PAR approach: identifying staff needs and issues, planning and undertake action then evaluated the results to formulate the Groups next action. Figure 4.3 provides a diagrammatical presentation detailing the sectors of hospital the CAN Group worked with during the transition and the PAR approach undertaken.

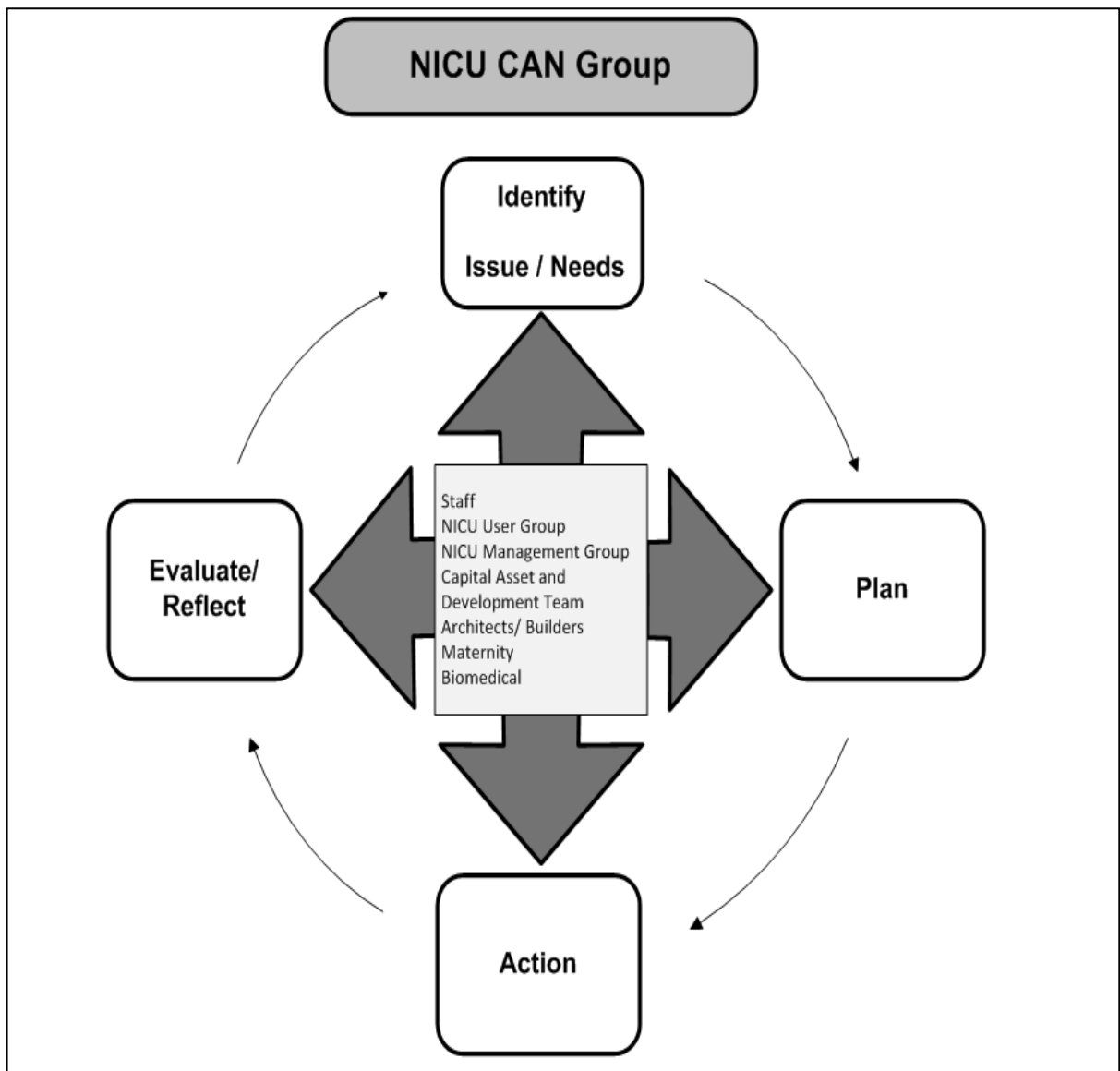


Figure 4.3: PAR approach undertaken by the NICU CAN Group

To assist in planning and providing direction for the transition the Group developed the NICU Change model. As part of developing the model we undertook a fishbone analysis as described by Phillips & Simmonds (2013). The problem identified by Staff and CAN Group members was what was needed in the NICU design to meet neonates, staff and family needs.

The fish bone analysis tool was built using the NICU Mission Statement as a reference, with the main bones categorised according to the Mission Statement features. The fishbone analysis tool provided a logical method of organising staff meetings and

workshops based around each of the six requirements: developmentally appropriate; babies sensory environment, functional and safe, layout and plan, technologically up to date, clinical space, and parent's needs.

The fishbone analysis tool provided a visual diagram that allowed us to explore the potential issues of the two cot design in detail with staff and together brainstorm solutions (Phillips & Simmonds, 2013). At each meeting Staff and the CAN Group worked together to identify what they perceived should to be considered or added to the design to meet neonates, staff and family needs.

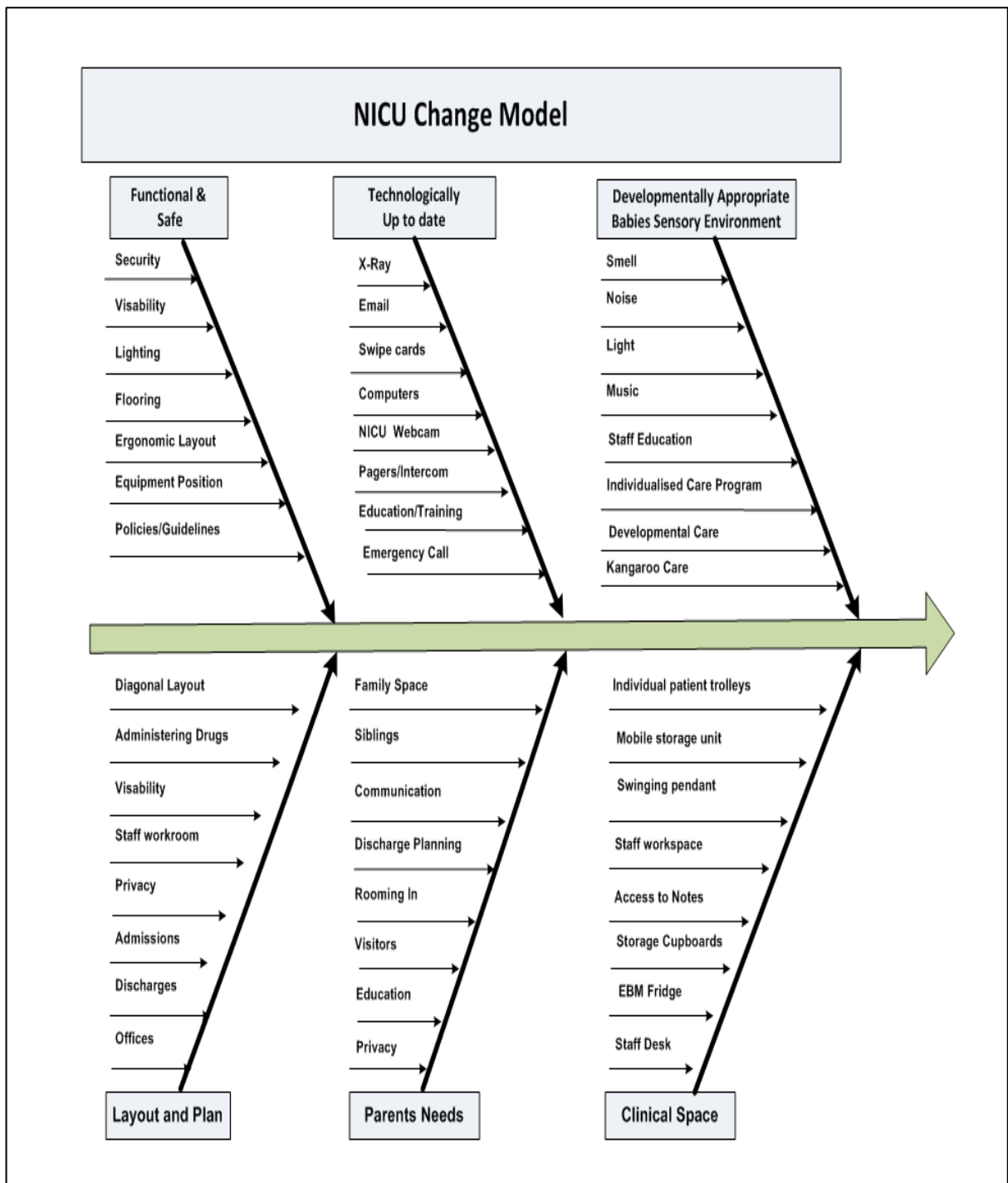


Figure 4.4: Fishbone analysis of neonates, staff and family needs

During various stages of the project the CAN Group met to evaluate and analyse the project, highlighting themes, ideas and questions to identify the future direction of the project. By integrating this process of continuous evaluation at each stage the CAN Group was able to maintain authenticity and add rigour to the overall project. Nurses

were included in these discussions and formal evaluations of the Group and PAR methodology are detailed in the results of this paper.

Role of the Researcher

In collaboration with the CAN Group the research nurse (Author) agreed to coordinate and document the project from 2009-2013. The role was dynamic and usually defined by the CAN Group and the projects being undertaken. These roles included planner, leader, facilitator, teacher or listener (O'Brien, 1998). The research nurse was a member of the Group and has taken an insider approach in documenting the Groups work (Coghlan & Brannick, 2009). A key aspect of the role was working with CAN Group members and staff; encouraging them to take up leadership roles, fostering Group discussion on the key elements and reflecting on the outcomes to plan next action (Coghlan & Brannick, 2009). The Group oversaw the transition to the NICU reporting to NICU and Redevelopment Management Committees.

Participants

Nurses employed during the transition period from the open plan to the two cot NICU (2009-2013) were invited to participate in different segments the study. Participation was voluntary in all of the research undertaken. Flyers and emails were circulated to publicise the projects being undertaken by the CAN group and staff were invited to attend study information sessions. Staff members who participated in the surveys were given an information form on the study and return of the survey was seen as inferred consent. Participants were seen as core to this project and were engaged at every stage of data generation and analysis (McIntyre, 2008).

Data Collection

Data collection involved a continuous process of reviewing the CAN Group work undertaken over the four years the Group was active. Sources of data for this paper

included: meeting and workshop minutes, newsletters, feedback boards, focus group reports and field notes. To evaluate the effectiveness of the CAN Group staff were invited to complete a satisfaction survey. Survey questions aimed to evaluate the effectiveness of the CAN Group in: informing and supporting staff, staff being included and involved in the process and CAN Group's success at facilitating the transition, e.g.: *'The CAN Group has provided staff with education and updates on the new NICU and I have been well supported by the CAN Group as the redevelopment has progressed'*. Staff responded to questions on a 5 point Likert scale. A final CAN Group meeting was held November 2013 where 12 past and current members attended to evaluate the Group's role and PAR methodology in the context of the NICU redevelopment.

Data Analysis

Surveys responses were analysed using simple descriptive statistics to analysis frequencies and group percentages (SPSS 18). Thematic analysis of staff meeting and workshops minutes, newsletters and project notes was undertaken with an emergent theoretical perspective where data was continuously collected (literature, group feedback, survey response) from which the Group tested previous results and underlying presumptions with a dual focus to resolve issues in our project as well as build current research evidence to clinical practice adjustments needed when transition to a new work environment.

Study Findings

Study findings provide a description of the CAN Group over a four year period (2009-13) with a particular emphasis on the working of the group, the group processes and outcomes. Findings have been described under three main headings:

1. Outline of CAN Group Projects

The CAN Group was active from April 2009 to November 2013. During this time we held over one hundred CAN meetings and coordinated over twenty five meetings and workshops for staff. These included information sessions on family centred and developmental care, creating mock-up rooms (patient, procedure and family) with staff and families, as well as workshops to develop our new model of care and plan the move day. The Group worked with staff to consider how the two cot design would impact on every aspect of clinical practice. Members of the Group worked directly with the architects providing staff feedback on modifications to meet clinical needs. Nursing staff constructed a layout template for each room that included: neonatal, staff and parent spaces, stock cupboard, milk fridge and mobile equipment trolleys.

Throughout the redevelopment CAN Group members coordinated focus groups in which nursing staff worked on five different aspects they highlighted as core to the transition of the new design: Education, Model of Care, Workforce, Workflow and Practice and Move planning. Focus groups reported to the CAN Group who assisted with information or practical support to complete group projects. Forty two projects were included on the CAN Group project excel spreadsheet by the researcher (MB). Figure 4.5 details the aims and resultant strategies of the CAN Group along with the related projects and outcomes of the Group's work.

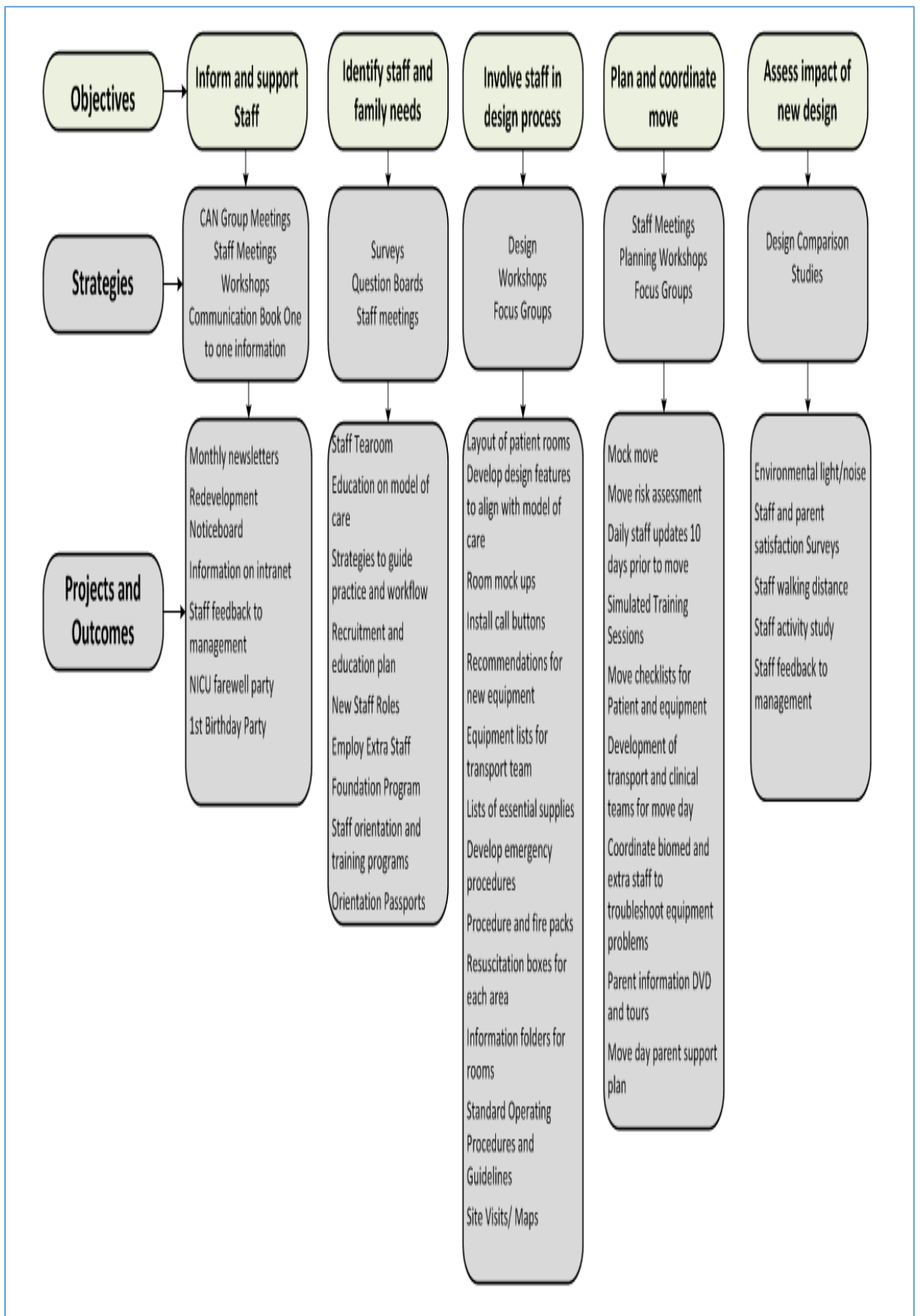


Figure 4.5: Overview of projects undertaken by the CAN Group and staff

2. Staff evaluation of the CAN Group

Surveys were completed by 86/108 (79.6%) of NICU staff. Results highlighted staff supported the work undertaken by the CAN Group with over 75% of the survey respondents agreeing or strongly agreeing that the CAN Group process had been an effective way to engage staff in the transition (Table 4.1). Over 85% of staff agreed or strongly agreed the CAN Group has provided staff with education and updates on the new NICU, with 73% of respondents responding that they were well supported by the CAN Group.

Table 4.1: Staff evaluation of the CAN Group

| Survey Question | Strongly Disagree | Disagree | Not Sure | Agree | Strongly Agree |
|--|--------------------------|-----------------|-----------------|--------------|-----------------------|
| The CAN Group has provided staff with education and updates on the new NICU | 0% | 5% | 9% | 56% | 30% |
| I have been able to openly and honestly communicate my ideas and concerns about the new NICU | 2% | 17% | 18% | 45% | 18% |
| I have been included and involved in the changes needed to transition to the new NICU | 2% | 6% | 17% | 50% | 25% |
| I have been well supported by the CAN Group as the redevelopment has progressed | 2% | 6% | 20% | 52% | 20% |
| The CAN Group has facilitated a collaborative approach while working towards the move to the new NICU | 2% | 10% | 17% | 47% | 24% |
| The CAN Group has facilitated an effective change process to engage staff in the transition to the new NICU | 2% | 7% | 12% | 55% | 24% |

3. CAN Group members evaluation on PAR methodology and the Group's role

This section has three major themes: creation of a structured approach for the transition; increasing the staff engagement in transition; and analysis of the challenges faced during the transition which are described below.

Creating a structured approach for the transition

Upon reflection participants thought the PAR methodology allowed quick evaluation of what needed to be done and by whom, legitimised Group members roles and enabled team members to provide support for each other. It provided a structured process to facilitate the communication of staff feedback and enable negotiation with the redevelopment team. By using the methodology we were able to achieve: important design changes (i.e. staff tea room, interlinking rooms) and better address staff needs (i.e. store cupboards, procedure packs, resuscitation packs).

Participants also described how the CAN Group provided a channel for management to bring questions related to the NICU design to staff and encouraged open discussion about concerns, ideas and potential solutions. Feedback from management included the statement: *'It was great to have an expert group to take questions about the new design and planning the move.'*

Increased staff engagement in transition

Participants identified PAR as a very effective method to get staff involved and thinking about the transition to the new NICU, highlighting the continual process of staff meetings, education sessions, staff workshops, site visits, focus groups and staff newsletter as effective strategies to engage staff in the transition. Participant feedback included: *'Having lots of different ways made it easy for staff to get information and be involved.'*

The newsletter and focus groups were identified as the most successful engagement strategies, as they gave all staff the opportunity to learn about and participate in different aspects of the project: *'The newsletter did a fantastic job..... staff not able to participate at meetings were able to learn through reading the newsletter.'*

Participants at the final CAN Group meeting stated the workshops and focus groups coordinated by the Group increased feelings of involvement and empowered staff to

take on new roles: *Focus groups allowed staff to choose what they thought was important in the NICU.....they look at a diverse range of issues.....'*

Members also discussed the benefits of the comprehensive staff orientation program compiled from staff survey feedback, and the impact of holding staff workshops to discuss and organise the move day, with everyone agreeing the move day was an overwhelmingly success. Comment included: *'I thought the move day was a positive experience... it all went so smoothly.'*

Challenges during the transition

When reviewing challenges during the transition, attendees discussed how they had not anticipated the ever increasing expectations placed on the CAN members throughout design, construction and move process. In such a large project we relied on key driving personnel to facilitate and maintain the Group momentum and this was not always possible as members were all still carrying a full clinical load: *'The most difficult part was finding time to work on the project.....lack of resources created the need for Group members to work in own time.'*

Although this was reported as one of the most significant problems, CAN members recognised having the group allowed the tasks to be divided up whereas if the CAN Group had not been active much of the work the group accomplished would not have occurred or be the responsibility of senior nursing staff:

Participants at the final CAN Group meeting highlighted the complexity of communicating with hospital and redevelopment administration throughout the transition, due to diverse agendas, various levels of project knowledge, different personal situations and aspirations combined within a framework of changing political and budgetary constraints (Coghlan & Brannick, 2009):*'We outlined the staff requirements four years before we moved...but things were left till the last minute.'*

Participants commented that the first three months in the new unit was complicated by the necessity to make the move into an active and ongoing building site, as our unit was only the first of three stages opened in the new Women and Children's Hospital: *'It was frustrating to have to continually remind the builders of faults and wait till the building was completed till they resolved the problems.'*

Discussion

Clinical Practice

Previous researchers have outlined recommended standards, unit configuration, floor plans and the practicalities of moving in to the new NICU (Kuschel et al. 2005; Shepley et al. 2008; White, 2007). Several authors have since published recommendations on design processes and standards to inform the NICU community (Milford et al., 2008; Walsh et al. 2006; White, 2007). This study and one other carried out by Carlson et al, 2006; who describe implementing Reddin's Change Theory to promote multidirectional communication during a NICU redevelopment, are the first to acknowledge the benefits of using a research methodology to engage staff to construct solutions to practising in a new work environment. We have added to the current evidence by exploring PAR methodology in the context of transitioning from open plan to a two cot NICU. These results highlight the importance of including clinical staff during the transition to a new work environment and utilising their knowledge develop solutions to reduce the impact on clinical practice.

It is of interest to note Hospital management endorsed and collaborated with the CAN Group, and have subsequently implemented a similar process to facilitate the move of maternity and paediatrics into our new hospital. The information and documentation has also been presented to several NICUs in Australia undertaking redevelopment and at national and international conferences.

Participatory Action Research

The project adds to current evidence supporting Lewin's belief that PAR methodology stimulates knowledge generation through groups such as ours by exploring their experience and constructing solutions to facilitate effective change (Stringer, 2007). The collaborative cyclic process of planning, gathering data, taking action, reviewing the results of the action in order to plan the next action enabled the CAN Group to take on a variety of different projects and evaluate each project's progress in an organised timely manner. Group member stated *'It provided a structure to review all the projects, quickly see what had been done and evaluate what we should do next...'*

Engaging a structured process as outlined in PAR methodology legitimised the CAN Group's role, enabling members to collaborate with all levels of management, provide solutions and filter information to staff in an inclusive and supportive manner. This was done by inviting stakeholders to come to CAN meetings to inform and collaborate with the CAN Group, emailing newsletters and flyers to managers and inviting all stakeholders to meetings and workshops on specific aspects of the transition. This was confirmed at the final CAN meeting where one participant commented: *'I felt it legitimised my role... when other staff asked why I was doing something I could say it was for the CAN Group.'*

Undertaking Participatory Action Research in an Organisation

While we were successful in many of our undertakings, we were only able to predict future needs (staffing, equipment, and impact of design) and in some cases the eventual reality meant there was no ready solution to problems as they arose. *'Prior to move the Group predicted most of the problems we have come up against since moving in; due to financial and organisational constraints we were not able to solve everything.'*

In a project such as this not everything will go your way; you will not be able to meet all your staff needs. Group members will encounter rigorous discussion and disagreements

so they need to be prepared and supported when these occur (Coghlan & Brannick, 2009). The need to build team and individual resilience was identified by group members in the early stages of the transition. Group members organised and participated in a change management education program facilitated by Hospital Human Resource Staff. The group process also provided members with an avenue to debrief that fostered the development of support and communication strategies members could apply when engaging in difficult conversations.

It is important not to underestimate the difficulties that will be faced when people with diverse agendas, various levels of project knowledge, different personal situations and aspirations combined within a framework of changing political and budgetary constraints need to collaborate (Coghlan & Brannick, 2009). It was necessary at different stages of the project to draw together the personnel as a team, addressing their disparate needs, drawing out solutions and working within the project constraints to obtain, deliver or recommend the best possible outcomes (Coghlan & Brannick, 2009).

While outlining the challenges of this project it is important it should not oversee the positive impact the CAN Group had on finding solutions to clinical questions regarding the two cot NICU design. The Group has led to the development of a Family Centred Care Group and Development Care Team in the unit. Many of the strategies implemented by the CAN Group (newsletter, notice boards, staff workshops, parent feedback) have continued since the relocation.

Conclusion

We have described the benefits of Participatory action research in finding solutions to reduce the impact of NICU design on clinical practice. This study has added new evidence to the current literature regarding PAR methodology outlining: group formation, a process and model that have been successfully translated into other

situations and groups undergoing remodelling or restructure. It also provides insight into the highlights and challenges NICU redevelopment teams will be confronted aligning clinical practice with NICU design.

Main Findings

Facilitating staff transition from an open plan to a two cot neonatal intensive care unit: A participatory action research approach; is the first article to describe participatory action research in the context of transitioning from an open plan to a two cot Neonatal Intensive Care Unit design. The project was underpinned by a participatory action research methodology that focussed on the Change and Networking Group and its work with staff during the transition to the two cot Neonatal Intensive Care Unit, particularly in trying to understand the impact of the new design and find solutions (Stringer, 2007).

The study described the current perception that single family room design increased staff walking distance, workload and staffing requirements (Shahheidari & Homer, 2012) and discussed the need to provide additional support and education for staff, in order to overcome difficulties in team communication and the isolation to which staff are exposed in family room Neonatal Intensive Care Units (Bosch & Jenzarli, 2012; Stevens et al., 2010; Swanson et al., 2013; Walsh et al., 2006). We have added to this evidence by describing similar concerns voiced by staff working in the two cot Neonatal Intensive Care Unit. The most intricate of these concerns was the impact of the two cot design on providing safe high-quality clinical care in a new environment.

The manuscript:

- describes the formation of the Change and Networking Group, the development of the Neonatal Intensive Care Unit change model and the processes underlining the Group's structure and functionality
- provides an outline of projects and strategies implemented by the Change and Networking Group

-
-
- highlights the effectiveness; through staff and Change and Networking Group evaluations, of the Change and Networking Group and its implementation of Participatory Action Research methodology.

The manuscript also considers the successes and challenges of undertaking a Participatory Action Research project in a large organisation. The positive impact that the Change and Networking Group had on finding solutions to clinical questions highlighted the need to continue to assess staff needs and resolve issues following transition to the two cot Neonatal Intensive Care Unit.

Summary

This project describes a ground-up approach to managing the transition from an open planned to a two cot Neonatal Intensive Care Unit, outlining the benefits of participatory action research methodology in achieving change through research and action in unison (Reason & Bradbury, 2008). Researchers were able to connect their questions to theory and then design a specific research framework aligned with project goals (Argyris, 1993). The capacity to use different methods to collect data enabled group members to be involved in the organisation and coordination of research (e.g. workshops, surveys, question boxes) in groups or as an individual, to add to evidence that was built into strategies to facilitate the change (McIntyre, 2008). The use of participatory action research encouraged early career researchers to gradually develop their research skills and enabled them to take on high quality research as the project progressed.

When undertaking a significant change, the principles of participatory action research (i.e. democracy, justice, freedom and participation) are the essence of its success (Reason & Bradbury, 2008). By including staff affected by the transition at an early stage in the enquiry process, many were encouraged to become engaged in the process and joined the group to find solutions to particular aspects of the transition

(Coghlan & Brannick, 2009). In our particular project, Change and Networking Group members led staff focus groups, who then researched relevant aspects of the transition (e.g. family centred care, move day, staff training and education). Through their very effective and engaged participation, staff have improved the environment for neonates, staff and families, resolving many of the issues highlighted prior to the transition (Coghlan & Brannick, 2009).

This project is an example of how participatory action research methodology can provide structure when undertaking research in a large organisation. Via the cyclic approach that is the core of participatory action research methodology; several projects may run consecutively, but be at different stages. Following this cyclic approach allowed each project to be evaluated and decisions made in time to keep the project moving forward or be highlighted as completed by the Change and Networking Group. While based on distinct experience, participatory action research methodology enables the generalisation of process, models and strategies to similar health care situations, as further researchers can choose to implement whatever methods they identify as useful in their project.

An important part of the action research cycle is the evaluation process (Stringer, 2007). Throughout the redevelopment of the Neonatal Intensive Care Unit, we undertook a longitudinal evaluation of the project and the impact of the two cot design. This Chapter has reported on the process undertaken to evaluate the Change and Networking Group and implementation of the participatory action research methodology (Article 3). We have also completed comparative design studies to assess the impact of the two cot design on the environment (noise, light), and staff and parent behaviour. The research studies undertaken to evaluate the impact of two cot design on staff are the basis of Chapter 5.

Chapter 5: Measuring the Impact of Two Cot Neonatal Intensive Care Unit Design

“Extraordinary claims require extraordinary evidence.”

Carl Sagan

Prologue

Chapter 5 commences with a background to the project rationale, context of research studies undertaken and a reflection box to describe my role during the design process. This leads to the manuscript included in this Chapter (Article 4). The manuscript: *A comparative prospective longitudinal study of staff walking distances, behaviour, and perceptions of open plan and two cot NICU design*, provides a detailed description of the comparative design studies of staff walking distances, behaviour and staff perceptions undertaken in the open plan and two cot Neonatal Intensive Care Units over a three year period from 2011 - 2014. The manuscript also summarises previous literature on the impact of single family room design on staff activity and their perceptions of single family room design. It then provides a detailed description of the three studies undertaken: 1) staff walking distance; 2) behavioural mapping study; and 3) staff satisfaction surveys to compare the open plan and two cot Neonatal Intensive Care Unit designs. This is followed by study results, a discussion and the project conclusion. The Chapter concludes with the main findings and a summary.

Project Rationale

Early in the planning of the project we had decided to survey staff to assess their needs and ideas for the new unit. Throughout the design and construction process, the Change and Networking Group and staff reviewed the two cot design and fixtures in the

new facility with the aim of reducing the potential negative impact of the increased building size and the new floor plan. A further logical step was to develop and conduct quantitative studies to assess the impact of two cot design on staff work practices.

Research Context

This project used the Participatory Action Research methodology outlined in the Chapter 4. In the initial phase of developing the methodology for the comparative design studies, I read and evaluated previous studies. The main outcome of this review was to reveal the lack of studies available to consider; the few relevant papers provided themes that related to our question of whether we would see the same impact of single family rooms in two cot design.

One study mapped staff activity and walking distance before and after the remodelling of an open plan neonatal intensive care unit and although the results were limited, the methodology provided a basis for my behavioural mapping study (Shepley, 2002). Due to equipment failure, the source study did not have any walking distance results to publish, but provided insight into the complexities of coordinating research in a clinical setting, which increased my awareness of the time and organisation needed to collect results.

Members of the Change and Networking Group and I reviewed articles to find solutions regarding the transition. We found some of the surveys primarily considered the physical aspects of the new environment (Cone et al., 2010; Milford et al., 2008; Walsh, et al., 2006). Others considered the different aspects (stress, communication, quality of patient care, job satisfaction) to evaluate the impact of the new environment on staff design (Domincio, et al., 2010; Smith et al., 2009; Stevens et al., 2010).

We presumed that the physical aspects of the two cot design would be much better than the open plan design. In Change and Networking Group meetings members stated they

wanted the survey to assess the impact of the two cot design on creating a developmental appropriate environment, clinical practice and parental involvement. They also thought the survey should take staff no longer than 15 minutes to complete, as the demands of the busy unit and preparations for transition meant that staff had limited time to spare.

I worked with the Change and Networking Group to build the survey, focusing on four main themes:

- providing a developmentally appropriate and safe environment
- delivery of care
- communication
- parental involvement.

The comparative design studies undertaken to assess the impact of two cot design on staff are presented in Article 4. The surveys were developed and evaluated with the support of the Change and Networking Group and Neonatal Intensive Care Unit management, and submitted to the Survey Resource Group (ACTH-HEC Subcommittee) for review at each stage of the project.

Reflection Box 6: CAN Group Role 2012

Since February 2012, the role of the group has become acutely focused on the move into the building, whereas in previous years we have focused on getting staff involved and providing staff with information. This year we are focussing on what is needed to facilitate a smooth transition to the new building. Nursing staff still have reservations about how the new unit will be staffed and about working under the new model of care, but what is important to us as a group is to make the new unit as functional as possible.

Where will all the equipment be kept?

How will staff get help?

What will be different in our daily practices?

What about the need for signage, lists of information, phone number lists?

We have surveyed staff on what they think they will need to practice in the new unit; we will survey staff again after a settling in period.

Journal notes July 2012

Article 4: A comparative prospective longitudinal study of staff walking distances, behaviour, and perceptions of open plan and two cot NICU design.

Broom M, Kildea S, Kecskes Z, & Gardner A. (2016).

Draft Article under final review prior to submission to Environment and Behaviour,

Scimago ranking: Q1

Abstract

This study explored the difference in staff walking distances, behaviour and perceptions when moving from an open plan (OP) to a double occupancy (DO) Neonatal Intensive Care Unit (NICU).

A prospective longitudinal study was undertaken from 2011-2014, using time and motion, behavioural mapping and surveys methods. There was no difference in the distances clinical nurses walked, or the time spent providing direct clinical care. Staff perceived the DO design provided a significantly improved, developmentally appropriate, family centred environment that facilitated communication and collaboration between staff and families. Participants reported challenges associated with the new environment included: facilitating effective communication between staff, providing educational opportunities to staff and reducing the isolation of staff and families.

Keywords: NICU design; Behavioural mapping study; NICU surveys; staff satisfaction; open plan, double occupancy.

Introduction

The complexities of working in a neonatal intensive care unit (NICU) providing high quality intensive care for extremely preterm and critically ill neonates are challenging and dynamic (Jones & Cheek, 2003). Neonatal staff are required to simultaneously: undertake complex care practices, provide support and educate parents, whilst also enabling a developmentally appropriate environment for the neonates under their care (Rogowski, Staiger, Patrick, Horbar, Kenny & Lake, 2013).

To address these requirements, NICU designs have significantly changed over the past 20 years. In most cases NICU floor plans have been modified from open plan (OP) to single family rooms (SFR) specifically designed to accommodate neonates and their families, or larger rooms that accommodate 2-6 neonates (Blackburn, 1998; Brown, Lauren & Taquino, 2001; Cone, Short & Gutcher, 2010; White, 2011). The first published standards for NICUs: *Toward Improving the Outcome of Pregnancy*, were written by a multidisciplinary committee and published by the March of Dimes in 1976 (Little & Merenstein, 1993). Many international and regional standards for design have followed, including *Recommended standards for neonatal ICUs*, published in 1992 and revised most recently in 2013 (White, Smith & Shepley, 2013).

These standards provide hospital administrators and clinicians designing or modifying a NICU with guidelines on functional aspects of design such as: unit configuration, room fixtures, security features, and space allocation. The standards suggest design teams should consider the recommendations based on clinical experience and evolving evidence to build a NICU that meets the needs of their NICU community (White, Smith, & Shepley, 2013; Shepley, 2014; White, 2014). Thus the design of a NICU is often based on these standards as well as each NICU's design team's philosophy, financial constraints and operational requirements, leading to various configurations such as: OP, SFR, double occupancy (DO) and rooms catering for 3-6 neonates.

To date there remains limited evidence comparing different NICUs designs with much of the research being conducted in a single site reviewing the impact of SFR design compared to their previous design (Milford, Zapalo & Davis, 2008; Hogan, Jones & Saul, 2015; Watson, Deland, Gibbins, Macmillan York, & Robson, 2014). Almost all the research undertaken to date has evaluated the impact of SFR design with limited evidence that considers units that have chosen a small room design that caters for 2-6 neonates. The research that has been conducted has outlined the significant benefits of SFR including lower infection rates and reduced length of their hospitalisation for neonates cared for in this environment (White, 2003, 2007). Previous studies have also described the positive affect of SFR in providing an environment that facilitates family bonding, breastfeeding prior to discharge and an improved NICU experience for families (Carlson, Walsh, Wergin, Schwarzkopf, & Ecklund, 2006; Cone et al., 2010; Smith, Schoenbeck & Clayton, 2009).

One study discussed the average floorspace of a combination unit, open-bay, dual occupancy (i.e. double occupancy) and SFR NICU. Analysis of the architectural plans and specifications for the units highlighted SFR as having the largest space dedicated to families with an average 86 Average Square Feet (ASF) as well as staff and support space, with the SFR allocating 66 ASF, the Open-bay 40 ASF, the double-occupancy unit configuration 39 ASF, and the Combination unit 36 ASF (Harris, Shepley, White, Kolberg, & Harrell, 2006). Unfortunately the DO NICU included in the study did not provide hospital records regarding patient outcomes, participate in site visits nor survey processes undertaken to evaluate staff perceptions of the DO design (Harris et al., 2006).

To assess the impact of NICU design on staff, many researchers have used survey methodology, which have considered the physical features (lighting, noise, privacy), and/or the new designs impact on staff stress and satisfaction (Carlson et al., 2006,

Shepley, Harris, & White, 2008). There remains a lack of empirical evidence to support or refute staff perceptions. When surveyed NICU staff acknowledged the many positive aspects of SFR design in facilitating a developmental appropriate and family-centred environment (Shahheidari & Homer, 2012). Current opinion remains divided on the impact of design on staff workflow, practice and satisfaction, with some studies suggesting SFR improved job satisfaction and reduced stress levels (Bosch & Jenzarli, 2012; Cone et al., 2010; Watson, et al., 2014; Shahheidari & Homer, 2012; Stevens, Helseth, Khan, Munson, & Smith, 2010). The more problematic aspects included: communication between staff, providing support and education opportunities and the isolation of staff working in SFR (Bosch & Jenzarli, 2012; Stevens et al., 2010; Swanson, Peters & Lee, 2013; Walsh, McCullough & White, 2006). Others reported SFR increased staff walking distances which they perceive has led to an increase in their workload, and time away from the neonate's cot side (Bosch & Jenzarli, 2012; Cone et al., 2010; Smith et al., 2009). We designed a study to compare the impact of the DO design on staff workflow and their perceptions of the new environment.

Setting

This study was undertaken in an Australian regional NICU that provides intensive and special care for 700 neonates per annum, born between 24-44 weeks gestation. The catchment area of the NICU is approximately 6,840 square kilometres encompassing the Australian Capital Territory (ACT) as well as areas of the adjacent jurisdiction that borders the ACT. In 2012, the NICU relocated from an OP unit to one with a DO design. The original OP NICU held 24 cots in four bays which were divided by shoulder-high walls and perspex (Figure 1). The OP design limited the staff's ability to adapt the environment to meet each baby's individual sensory and developmental needs. Infants were frequently moved to accommodate new admissions and staffing levels. It was necessary for staff to leave their assigned work area to get milk or supplies for the

infants in their care; as the milk and main storage rooms were outside the clinical area. Depending on the acuity of each neonate, 2-4 staff worked in each bay, sharing a desk, chairs and one computer, working closely together to provide each other space to complete their tasks. The positive impact of this environment was that staff members were always visible to each other and available to assist in an emergency. In the OP unit, parents were expected to leave during clinical rounds or medical emergencies so as to maintain privacy and confidentiality for other families. Due to the limited space and equipment, recliner chairs were shared by families, which limited their capacity to participate in Kangaroo Care or spend quiet time with their baby. There were no mobile breast pumps available; mothers went to a small expressing room to use stationary pumps. See Figure 1

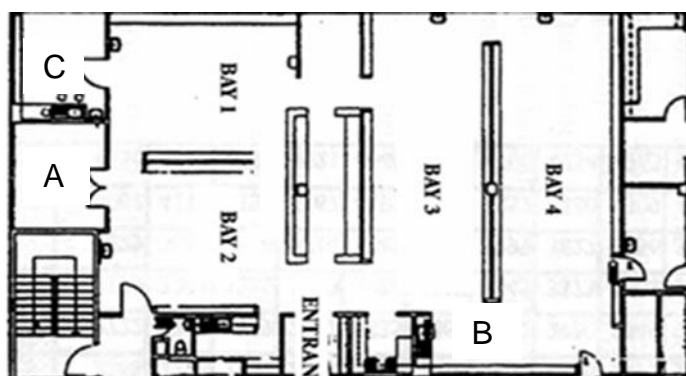


Figure 5.1 Floorplan of Open Plan NICU

Double Occupancy NICU Design

Over a four year period a stakeholder group that included: staff, families, architects, builders and the hospital redevelopment team worked together to construct a developmental appropriate family centred DO NICU. The DO NICU is divided into an Intensive Care/High Dependency (NICU, 20 cots) and a Special Care Nursery (SCN, 14 cots) wing that have similar layouts of interconnected rooms on the external walls to allow natural light into each bedspace. Every cot space has a designated area for the neonate, staff and family allowing for interaction but also allowing staff to step away

from the cot to enable parents to spend quality time with their babies. To reduce the impact of the DO design the equipment storeroom, pharmacy and staff workroom were centrally located in both wings. In addition each room has a store cupboard and fridge to allow staff easy access to supplies, several extra mobile stock and procedure trolleys were purchased.

Room Layout

Whilst the intensive and special care wings are similar in layout, the patient rooms have been modified to meet the needs of the neonates cared for in each wing. The intensive care rooms have double armed pendants to support the medical equipment required (Figure 2). The each intensive care room is approximately 301 ASF (150.5 ASF per baby) shared equally between each infant station area. The infant space per infant station is 39 ASF (including pendant behind neonate). The family space per infant care station is 37 ASF. The staff and support space is 74.5 ASF per infant which includes a 47 ASF dedicated staff bench/writing area shared between the two infant stations (Figure 2).

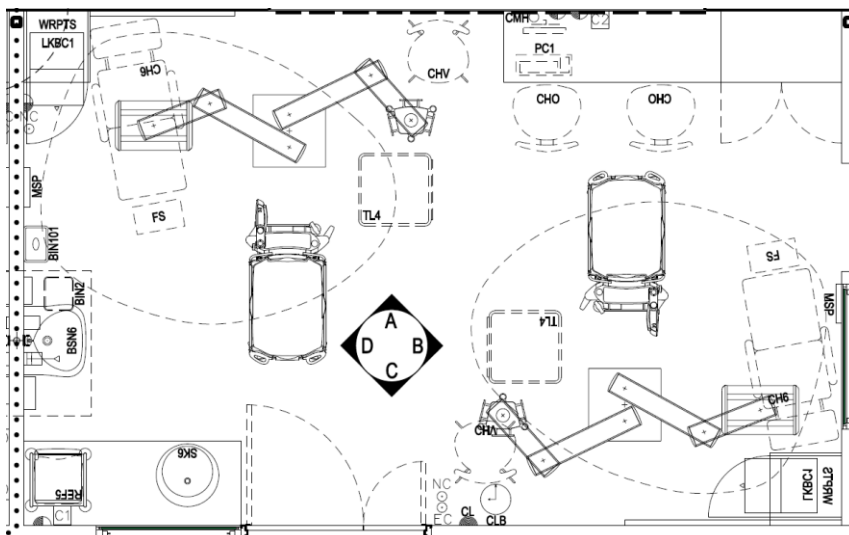


Figure 5.2 Floorplan of Intensive Care room

In the SCN, there is less need for medical equipment so the space has been dedicated to families with a larger area next to their baby and a shared area in the middle of each

to participate were provided with an information sheet and asked to sign a written consent.

Study Procedures

Staff Walking Distance

Staff walking distances were recorded over a four week period in both NICU designs. Walking distance was defined as the distance a staff member walked from the start to finish time of their shift. Pedometers (model HC-PO70 GAIAM) were allocated by the study coordinator using quota sampling to gain an overview of the distance walked by staff across all geographical areas, shift times and clinical roles. A study data sheet was completed by the study coordinator for each participant. Data collected included clinical role, area allocated (NICU, SCN), shift time and duration (6, 8, 10, 12 hours). To assist with the analysis staff walking distance was calculated in metres per hour (m/hr.)

Behavioural Mapping

Time and motion observational methodology was used to observe nursing activity in the two NICU designs (Benjamin, 1993). The observational studies were carried out over a four week period in both units in blocks of 180 minutes between 0700-2100 hours. Prior to the study commencing, the research coordinator observed staff activity and created a matrix of staff activities that were then coded according to seven different categories: neonatal care, parent interaction, procedures, staff communication, setting up and cleaning equipment, paperwork and miscellaneous activities. The data sheet and categories were trialled to established inter-rater reliability between the two observers in both study periods. In the OP design five nurses caring for Intensive Care, High Dependency and Special Care neonates were observed (n=15). A member of the study team watched, timed using a stopwatch (minutes) and recorded each activity undertaken by the nurse on the study data form. Data recorded included: participant's

name, start and finish time and acuity of neonates in the participants' care. Participants in the DO NICU were matched with OP participants according to the time of day, patient acuity and nursing skill levels for data collection.

Staff Surveys

A longitudinal study of staff perceptions was completed over a three year period pre and post transition from the OP to DO NICU. Staff surveys were undertaken at three time points: 12 months' pre-occupancy in the OP NICU (September 2011), 6 months (March 2013) and 24 months (September 2014) post -occupancy of the DO NICU. The survey was developed in consultation with senior NICU staff, a Change and Networking (CAN) Group and the results of an earlier staff survey (Broom & Kecskes, 2011). The CAN Group was formed in 2009 and worked with staff throughout the transition to a new NICU with the aim of understanding the impact of the change and find solutions to their problems.

Stakeholders presumed that the physical aspects of the DO design would be much better than the OP design and did not think these aspects were of value surveying but were interested in investigating how staff perceived the two designs compared in four categories highlighted previously by researchers and the NICUs staff. The four categories included: 1) provision of a developmentally appropriate safe environment; 2) delivery of care; 3) communication; and 4) parental involvement; with five questions in each category. CAN Group members also thought the survey should take staff no longer than 15 minutes to complete, as the demands of the busy unit and preparations for transition meant that staff had limited time to spare. The pre and post occupancy surveys maintained a similar format of a five point Likert scale and comment section following each category of questions. The survey was reviewed by an independent survey and ethics committee (Australian Capital Territory Health-Human Research Ethics Committee: ETHLR.11.046).

Data Analysis

Data were entered into Microsoft Excel 2010 then transferred electronically to Statistical Package for the Social Sciences, Version 20.0. Descriptive and multivariate analyses using one-way ANOVA testing were completed to calculate estimated marginal means, standard deviation and 95% confidence intervals (CI). A p-value of < 0.05 was considered statistically significant. Survey results were compared at the three time periods. Survey results report estimated marginal means and percentage % of staff that agreed or strongly agreed with each question (m [%]).

Study Results

Walking Distance

Data were analysed on 156/163 (96%) participants, 62/65 (95%) OP and 94/98 (96%) DO NICU. The remaining seven datasets were excluded as they were incomplete. Analysis showed no significant difference in the total participant group's hourly walking distance in metres when comparing the OP to the DO design (445[398-501], 450[402-498], $p=0.86$ respectively). Study results indicated that clinical nurses walked less than support nurses in both OP and DO NICUs (Table 5.1). As expected, technical support staff walked further than the other three groups in both designs (Table 5.1).

Table 5.1: Comparison of Distance Walked by Clinical Groups

| Clinical Group | No of participants (OP/DO) | NICU Design | | <i>p value</i> |
|-------------------------|----------------------------|----------------------|-------------------------|----------------|
| | | <i>Open Plan</i> | <i>Double occupancy</i> | |
| Clinical Nurses | 35/41 | 362 (298-427) | 358 (299-418) | 0.923 |
| Support Nurses | 17/37 | 446 (352-538) | 450 (387-513) | 0.938 |
| Medical Staff | 5/10 | 411 (241-582) | 393 (272-513) | 0.862 |
| Technical Support Staff | 5/6 | 527 (356-697) | 633 (477-788) | 0.366 |
| | 62/94 | 445 (398-501) | 450 (402-498) | 0.864 |

Staff Behaviour

In total, thirty nursing staff were observed in the time and motion study (OP=15, DO=15) (Table 5.2). To analyse the time staff spent in direct and indirect neonatal care, three activity categories were grouped as direct care (neonatal care, procedures and time spent educating/assisting parents) and two categories as indirect care (equipment, paperwork). Study results showed no significant difference in the time nurses spent providing direct care to the neonates when comparing the OP and DO NICU (95[80-109], 96[82-110], $p=0.885$, respectively). On reviewing the categories listed as indirect care in the OP and DO there was a significant increase paperwork in the DO NICU (16[8-23], 27[20-33], $P=0.026$) (Table 5. 2). The most significant change in staff behaviour was the increased time staff spent communicating with other staff in the DO design (21[10-32], 38 [28-48], $p=0.018$, respectively) during a 180 min period. Comparison of total activity times for the two designs showed an increase in the activity recorded of 21 minutes for the DO design from (166[145-184], 187[171-201], $p=0.078$, respectively).

Table 5.2: Comparison of time spent by staff in seven activity categories

| Staff Activity Categories | <i>Mean time spent on each activity in minutes (± 95% CI)</i> | | | | <i>p value</i> |
|----------------------------------|---|-----------|-------------------------|-----------|----------------|
| | <i>Open Plan</i> | | <i>Double occupancy</i> | | |
| Neonatal Care* | 67 | (53-83) | 68 | (56-80) | 0.982 |
| Procedures* | 10 | (2-20) | 9 | (0-19) | 0.938 |
| Parent* | 18 | (10-26) | 19 | (10-26) | 0.902 |
| Staff Communication | 21 | (10-32) | 38 | (28-48) | 0.018 |
| Equipment° | 10 | (7-13) | 7 | (4-11) | 0.394 |
| Paperwork° | 16 | (8-23) | 27 | (20-33) | 0.026 |
| Miscellaneous | 24 | (15-32) | 19 | (12-26) | 0.357 |
| Total Activity Times | 166 | (145-184) | 187 | (171-201) | 0.078 |
| Types of Care | | | | | |
| Direct Care | 95 | (80-109) | 96 | (82-110) | 0.885 |
| Indirect Care | 26 | (17- 34) | 34 | (26- 42) | 0.011 |

*Direct Care Categories

°Indirect Care Categories

Staff Satisfaction Surveys

Survey participation rates were: OP NICU 84/102 (82%), DO (6 months post) 62/89 (70%) and DO (24 months post) 68/94 (72%). In each survey participants comprised 80% nursing, 10% medical, 10% allied and support staff. Survey results report estimated marginal means and percentage % of staff that agreed or strongly agreed with each question (m [%]). Results are outlined below under four categories:

Provides a developmentally appropriate, safe environment

Participant responses rated the DO NICU significantly higher in relation to the provision of a developmentally appropriate, safe environment highlighting improvements in noise, lighting, space and foot traffic around the neonates' cot side (Table 5.3). When questioned regarding the safety and security of the DO environment, survey results showed a reduction in mean at six months post occupancy, but by the 24 months it had returned to the same level as pre occupation [3.31 (56), 2.97 (42), 3.44 (59)] Table 5.3. Physical aspects such as the placement of double arm pendants, position of emergency buttons, the need to standardise the setup of cupboards and the need for additional

signage were identified as features that needed to improve to make the DO NICU more functional. Survey participants also highlighted that adequate staffing and access to senior staff were essential to maintaining safe work practices and reduce the impact of the DO design.

Delivery of Care

Delivery of care questions covered three main areas: 1) caring for neonates 2) gaining assistance; and 3) learning new skills. Survey results highlighted a significant improvement in ability to provide individualised developmental care independently without interruptions [3.20 (55), 4.14 (94), 4.16 (72)] (Table 3). Staff responses to gaining assistance and learning new skills showed an improvement at 24 months; however, the scores in the DO NICU remained below the level reported for the OP NICU (Table 3). Many staff commented that the reduced visibility of other staff in the DO NICU limited education opportunities.

Communication

Questions in the communication category reviewed staff perceptions related to communication between: 1) staff and families; 2) staff members; and 3) families. The results demonstrated that the new environment supported more effective communication between staff and families [3.31 (55), 4.15 (94), 4.09 (88)] (Table 3); whereas staff reported the new environment did not foster two way communications between staff members nor between families as effectively as the OP design [3.55 (65), 2.41 (25), 2.81 (35)] (Table 3). One staff member commented “*I think it is easy to communicate with parents and families but more difficult to communicate with staff.*”

Parental Involvement

Respondents reported DO design enabled staff to organise and involve parents in their baby's cares at the best times for the family [2.27 (18), 3.73 (78), 3.66 (65)] (Table 3).

The DO design allowed parents to discuss their baby's condition with staff and enabled families to spend quality time with their babies as they prepared to take their baby home. Results also demonstrated a negative impact of the DO design on parent to parent interaction and the need to create opportunities for parents to meet other parents. Staff suggested that parent information sessions and morning teas might assist parents to meet and support each other.

Table 5.3: Staff Satisfaction Survey

| Survey Questions | Open Plan (n=84) | Double occupancy 6 month (n=62) | Double occupancy 24 month (n=68) | P value |
|--|---------------------|---------------------------------------|--|---------|
| Mean(% staff agree or strongly agree) | | | | |
| Comparison of environmental features | | | | |
| Noise level does disturb neonates | 4.25 (89) | 1.72 (3) | 2.30 (12)* | 0.001 |
| Lighting can be altered to suit each neonate | 1.99 (13) | 3.55 (65) | 3.93 (79)* | 0.001 |
| Foot traffic does disturb neonates | 4.06 (88) | 2.47 (38) | 2.46 (31)* | 0.001 |
| NICU provides a safe and secure environment for staff | 3.31 (56) | 2.97 (42) | 3.44 (59) * | 0.088 |
| NICU provides adequate space to allow privacy for staff | 1.96 (07) | 3.37 (57) | 3.55 (68) * | 0.001 |
| Delivery of Care | | | | |
| I able to provide individualised developmental care for Neonates | 3.20 (55) | 4.14 (94) | 4.16 (72) * | 0.001 |
| I am often interrupted when caring for neonates independently | 4.32 (69) | 2.86 (25) | 3.31 (18) * | 0.001 |
| I am able to get help when a neonate needs emergency care | 4.17 (94) | 2.43 (76) | 2.94 (77) # | 0.001 |
| Experienced staff are available to assist me with procedures | 4.40 (94) | 3.65 (39) | 3.82 (42) # | 0.001 |
| At times learning new skills and knowledge in the NICU is difficult | 2.40 (09) | 3.68 (17) | 3.81 (39) # | 0.001 |
| Communication | | | | |
| The NICU environment provides for effective communication between staff | 3.55 (65) | 2.41 (25) | 2.81 (35) # | 0.001 |
| The NICU environment supports effective communication between staff and families | 3.13 (46) | 3.86 (86) | 3.87 (88) * | 0.001 |
| I am able to communicate effectively with families in the current NICU | 3.31 (55) | 4.15 (94) | 4.09 (88) * | 0.001 |
| I am able to maintain patient confidentiality in the current NICU | 2.27 (18) | 3.73 (78) | 3.66 (65) * | 0.001 |
| The NICU layout allows families to communicate with each other | 3.15 (45) | 2.70 (21) | 2.74 (31) # | 0.015 |
| Parental Involvement | | | | |
| I am able to involve parents in the care of their baby | 4.04 (94) | 4.25 (96) | 4.27 (97) * | 0.005 |
| The NICU environment allows parents to discuss their baby's condition with staff | 3.57 (56) | 4.05 (94) | 4.07 (87) * | 0.001 |
| I am able to organise baby's cares at times best for the family | 3.18 (65) | 4.11 (89) | 4.09 (87) * | 0.001 |
| The NICU environment enables families to spend quality time with their babies | 2.93 (40) | 4.13 (88) | 4.24 (90) * | 0.001 |
| Parents leave the NICU prepared to care for their baby | 3.33 (49) | 3.55 (58) | 3.70 (68) * | 0.033 |

* means (%) staff satisfaction was higher in DO NICU

means (%) staff satisfaction was higher in OP NICU

Post transition

Undertaking a longitudinal study of this depth has provided staff feedback to the NICU management team throughout the transition from OP to the DO NICU. Over the past three years post transition, NICU management and staff have taken a multipronged

approach to create a functional NICU environment that meets the needs of neonates, staff and families as described below:

1. Physical Environment

To support nursing practice the setup of pendants and cupboards were standardised throughout unit. Respiratory equipment previously housed in a storeroom was relocated to an equipment bay centrally located in the NICU to enable staff easy access. Blinds were installed in all patient rooms to support staff in providing a developmentally appropriate environment. Minor modifications in a variety of physical aspects that impact on clinical practice have been addressed such as; trolley and room set ups, purchase of extra equipment and extra signage/noticeboards through the NICU.

It was also requested by staff to make the NICU less clinical in appearance and more appealing for families. This was completed by adding comfortable furniture to the expressing room, breakaway areas and placing a children's play board in family lounge. The unit has also been decorated in family friendly friezes and a welcoming frieze on the NICU front door.

2. Organisational development

Organisational Development Workshops were held to review survey feedback and engage staff in finding solutions. Nursing managers developed a cascading management program with the aim to support to all levels of nursing staff. Nursing managers have also formalised meeting structure to coordinate staffing, education, policy development and communication with staff. To foster a positive culture in the DO NICU management have made changes to nursing handover process, increased the frequency of staff meetings and foster regular social events to celebrate milestones and staff achievements.

3. Staff

Strategies to improve the work environment for staff have included rostering an additional senior nurse for evening and night shifts to improve staff access to a skilled staff member. In addition, clinical nurse educator hours were increased from one to two full time positions to increase staff learning opportunities and educational support. Staff in-services that simulated emergency situations and procedures were held to familiarise staff with the new environment. The education team developed online education packages and a manual handling video to support clinical practice in the DO NICU. To improve communication between staff and reduce the sense of isolation, staff were encouraged to engage the new technology (call and emergency bells, VOIP phones and email) in the new unit to call for support and maintain contact with other staff.

4. Families

To cultivate communication and supportive opportunities for parents, education sessions and morning teas held by Miracle Babies Volunteers (Australian organisation of parents who have had a NICU experience) occur weekly in the unit. In the past the Lactation Consultant was shared with other departments but we are currently in the process of employing one specifically for the unit.

Discussion

This is the first prospective comparative study undertaken to examine the impact of DO design on NICU staff: 1) walking distance, 2) activity, and 3) perceptions. The lack of empirical evidence on DO design has meant we have had to compare our findings to SFR design NICUs. Study findings have reported that DO design had an immediate impact on improving the environment for neonates and their families. The DO design created a developmentally appropriate environment that provided each neonate and their family with their own space. Neonates are no longer exposed to noise from

surroundings, the DO design enabling staff to create an individualised space according to each baby's gestational requirements. Parents also have their own space to spend time with their baby. Similar to what has been described in studies of SFR NICUs, staff working in the DO environment perceived the new design also supported more effective communication between staff and families and enabled parents to participate more in their baby's care (Cone et al., 2010; Smith et al., 2009; Watson et al., 2014).

Providing a supportive environment for staff has been highlighted to be the most challenging aspect of transitioning from an OP to DO design in this study. We have demonstrated that by undertaking simple modifications such as: interlinking rooms, centralising equipment, adding milk fridges and storage cupboards to the fitout of each room the larger floorplan has had no significant effect on the distance walked by clinical nurses. Whereas results indicated that DO design impacts most significantly on the support nurses (clinical educators, managers and retrieval nurses) and technical support staff by increasing the distance they walk to support and educate staff. Similar to other studies we found that changing the NICU design requires increased flexibility in the role of support and education staff (Goldschmidt & Gordin, 2006; Smith et al., 2009; Shahheidari & Homer, 2012; Stevens et al., 2010). While we acknowledge comparing DO and SFR results has its limitations it is of note that staff in the DO design reported similar concerns such as: difficulties maintaining effective staff communication, providing educational opportunities and the isolative effect of the new design on staff and families as staff surveyed in SFR NICUs (Domanico et al., 2010; Smith et al., 2009, Watson et al., 2014).

This is the first project to complete a behaviour mapping study to compare staff activity in two designs. Participant responses to surveys in previous studies have reported increased walking distances that may reduce time dedicated to patient care in SRD (Shahheidari & Homer, 2012, et al., 2010). This study reported the DO design did not

increase walking distances nor reduce time dedicated to patient care, highlighting the disparity between staff perceptions and quantitative data as requiring further investigation.

The main effect of the DO design on staff activity was an increase in time spent in communicating with other staff. Similar to previous research on SFR design, to maintain effective communication in the new design staff spent increased time communicating with other staff (Smith et al., 2009; Cone et al, 2010; Domancio, Davis, Coleman & Davis, 2010). We suggest the reason for the increase in time staff spent communicating in the DO NICU is multifactorial: (1) Clinical nurses spent more time updating support nurses on neonate's condition and their clinical needs; (2) DO design provides an environment that fosters staff communication (clinical rounds, nursing handover) in contrast with the constrained space in the OP design; and in addition, (3) since the NICU relocation and as part of a family centred care approach, parents are now welcomed at clinical rounds, which may also be a factor in the increased time recorded.

Conducting a longitudinal study over four years has added to the current evidence that like SFR, NICU staff need at least two years to assimilate to the DO NICU design (Carlson et al., 2006; Goldschmidt & Gordin, 2006). Undertaking a longitudinal assessment of staff perceptions has shown the concerns identified by staff at six months emphasised the need to continue to work with staff post transition. In each NICU redevelopment teams will need to assess what is required to support staff, with each team developing their own strategies to resolve their issues. Strategies implemented previously included: a nursing taskforce to build a new model of nursing practice post transition (Beck et al., 2009), and establishing a NICU occupancy quality management team to improve cohesion of patient care teams, promote effective communication and resolve operational challenges (Smith et al., 2009). While each NICU redevelopment will differ depending on the size, funding and philosophy of the

project team, the core components of supporting staff communication, education and reducing the impact of staff isolation will be factors each team will need to build solutions depending on staffing, acuity and managerial philosophy of that specific unit. This study has highlighted the lack of research undertaken in NICUs with larger rooms that accommodate 2-6 neonates. Researchers have suggested it may take two years after transition for staff to adjust to a new design and currently there is limited longitudinal evidence to indicate that staff satisfaction on communication and educational opportunities ever returns to the pre-transition levels recorded for OP design. While we acknowledge that NICUs are built to improve neonate outcomes, we should not be complacent about the impact the environment may have on staff retention and maintaining workforce given the worldwide shortage of nurses (Shepley,2014). More detailed research comparing staff activity in a variety of NICU designs may give a deeper understanding regarding the impact of NICU design on workflow and practice.

Conclusion

This is the first study to undertake a longitudinal review of the impact of DO NICU design. Staff perceived DO design provided a significantly improved developmentally appropriate family centred environment that facilitates communication and collaboration between staff and families. This study has highlighted the need for further research to facilitate a supportive environment for staff highlighting moving into the new NICU is just the start of the journey a continual process of improvement post move is essential to assess and reduce impact NICU design on staff workflow and practice.

Acknowledgements

We would like to acknowledge and express our deepest thanks to the NICU staff and management for participating in and supporting the design impact studies undertaken during the transition to the DO NICU.

Reflection Box 7: First twelve weeks

Since the move we have been very busy keeping on top of all the infrastructure problems in the new building: phones, water, buzzers, pendants, pumps, water, etc. Staff have also had to work out where and how much equipment they should have in each room.

In the first few weeks a book for staff to document building issues was made available, management reviewed at an 1100 am meeting every morning. Limited support was allocated to take these issues off clinical teams' hands so they had to manage this as well as coordinating and staffing the new unit. Very stressful for management!!

The main aim in the first 12 weeks has been to provide a safe place for neonates, families and staff. How do we get help, how do we get staff to assist us, where is the equipment I need, getting staff to breaks and in-service. At first staff were hesitant to leave rooms doors shut and it must have felt very isolating. As time has gone on staff move around the unit more freely, leaving other staff to watch alarms.

Staffing has been the biggest functional concern now we are in two cot rooms.

Making sure there is a senior staff member to support junior and new staff.

Gradually the NICU team is putting solutions in to resolve these issues.

Non-clinical staff attached to the NICU have also found the change difficult. We have all had to work out new ways to get our job done—before we just walked into the old unit and staff told us about new babies, who was being discharged, research/ follow up/ webcam/ NAPSS. Now staff need to contact us or we need to go up to the unit. Often this means going to the desk, finding the list, finding the room of baby, talking to staff and then working out what is going on.

Reflection Box 7: First twelve weeks (continued)

The babies are much more stable; staff do not need to turn buzzers off continuously, the babies sleep longer and staff are already talking about how much faster they come off CPAP and move from isolettes to open cots.

As anyone can imagine, we haven't had much time for CAN meetings, the group members have been on the ground talking to staff, supporting staff, making mistakes and trying new ideas. We have had a few meetings where we have identified all these concerns, but what has been brilliant is our nursing management team, they have travelled the road with all the staff—no hiding in offices and ignoring the problems—leading by example boots and all. I am sure many other units have not had this support.

This move has been momentous; it has changed so many factors on how we practice, it has not been easy, staff are still angry about the change and how much of what we told the design team was ignored. Some simple things would have made such a difference to staff. Overall, with the right amount of staff the unit functions well. The staff are amazing; they get on with everything, try new ways and help each other. I am proud to have been part of a fantastic team!

Journal Notes November 2012

Main Findings

This study describes the first prospective comparative design study undertaken to assess the impact of two cot design on staff walking distance, staff activity and staff perceptions. The main findings of the completed project have shown that two cot design had no significant impact on staff walking distance for clinical (bedside) nurses, with the main impact being on nursing staff employed in education and retrieval positions, where they move from room to room to assist clinical nurses. These findings support previous research that minor modifications to the layout through consultation with staff prior to the change in design, can minimise the impact on staff workflow and clinical practice (Shepley & Davies, 2003). It is the first study to undertake such a detailed measurement of staff activity and highlights the lack of empirical evidence available to compare differing Neonatal Intensive Care Unit designs impact on staff activity.

The behavioural mapping study undertaken to assess staff activity highlighted that staff do not spend less time providing direct clinical care in the two cot design, as suggested by participants surveyed by previous researchers (Shahheidari & Homer, 2012). In addition, the study showed during the 180 minute observational period, there was no significant difference in the time nurses spend in providing direct care to the neonates in their care when comparing the open plan and two cot design. The most significant change in staff behaviour was the increased time staff spent communication with other staff in the two cot design, increasing from 21 to 38 mins. Comparison of total activity times for the two designs showed an increase in the activity recorded of 21 minutes in the two cot design, during the 180 min study period. While this was not statistically significant in this study it is acknowledged any increase in staff workload in a busy Neonatal Intensive Care Unit is clinically significant. This highlights the need to consider both statistical and clinical significance when an intervention: such as changing the

Neonatal Intensive Care Unit design; has a potential effect on the study population (LeFort, 1993).

The prospective longitudinal survey process has highlighted staff perceptions of how effectively the two cot design has improved physical aspects of the environment such as: noise level in the neonate's cot space and the capacity to altered lighting to suit each neonate's individual needs. Results also provided evidence that two cot design supports parent/baby interactions, by providing an environment that fosters parental participation and allows parents to spend quality time bonding with their babies. This study is also first to describe the benefits of two cot design in providing an environment that supports effective communication between staff and families.

Staff surveys have also outlined the complexities of staff communication and educational opportunities in the two cot Neonatal Intensive Care Unit. Of particular note were survey participants' reports about the limited access to senior staff and concern about the impact of the two cot design on junior staff. Findings have outlined the importance of a continuous improvement process post-transition to the two cot design.

Summary

This study summarises the approach undertaken to assess staff needs and formulate solutions during the first two years post-transition to a two cot neonatal intensive care unit. This Chapter has outlined the context and rationale of the research undertaken using a participatory action approach. This study has linked theory with practice by applying Lewin's theory to a real-life issue to that of transitioning to a new Neonatal Intensive Care Unit design (Argyris, 1993). Stakeholders directly affected by the redevelopment of the Neonatal Intensive Care Unit were able to investigate their experience, expand their knowledge of the problem and use this collective knowledge to develop solutions to their problems (Reason, 2006). It provides empirical evidence that

supports Lewin's theory that through the implementation of an organised process (action research cycle) that provides structure; groups can find solutions to improve their quality of life and create knowledge (Lewin, 1946). The evaluation process outlined in this Chapter completes the participatory action cycle undertaken in this thesis, providing evidence of the quality and rigour of the study through:

- a detailed outline of the research process, describing how the methodology and outcomes have been transferred to other situations
- the development of further knowledge regarding the transition to a new Neonatal Intensive Care Unit design.

This Chapter also outlines the development of the methodology for the three studies and the reasoning behind the four survey themes (developmentally appropriate and safe environment; delivery of care; communication; and parental involvement).

This Chapter has focussed on reporting the results of changing the Neonatal Intensive Care Unit design from an open plan to two cot design, providing new evidence to add to current literature. It has also highlighted the need for further research that assesses the impact of different Neonatal Intensive Care Unit designs foremost on neonatal outcomes, but also considers development of a supportive work environment and the long-term impact of the design on staff.

Chapter 5 is the final Chapter that reports on the research projects included in this participatory action research thesis. Chapter 6 reports on the second, or thesis cycle, of this participatory action research study. When writing a doctoral thesis, documenting the research project is only the first part of the overall methodology. The second, or thesis, cycle enables action research to be more than everyday problem-solving as it documents meta-learning (i.e. learning about learning) (Zuber-Skerritt and Perry, 2002). Chapter 6 thus describes the thesis cycle of my doctoral journey.

Chapter 6: Learning in Action

“Develop a spirit of inquiry where you look deeper into things that you have previously taken for granted or made assumptions on! Develop collaborative inquiry and action with your colleagues!”

Unknown Author

Prologue

Throughout the previous Chapters in my thesis I have reported the transition from an open plan to a two cot Neonatal Intensive Care Unit as a member of the Change and Networking Group. I have collaborated with members of the Group to present a report on the Group’s methodology, results and conclusions related to the project. The reader will see a change to the style of writing as I explore my learning journey throughout the transition.

Coughlan & Brannick (2009) outlined this as the second cycle or thesis cycle of an action research project. It takes the research to the next echelon launching it to the academic level and is accomplished through a process of action and reflection (Herr & Anderson, 2005). While the action research project is in progress; the researcher is engaged in planning, taking action and evaluating what is going on and what they have learnt (Coughlan & Brannick, 2009). Literature highlights the second cycle or thesis cycle of undertaking an action research project as being very significant within a doctoral dissertation, especially in understanding this method of enquiry, both to build individual knowledge as well as to answer the research question under investigation (Herr & Anderson, 2005).

This Chapter reports on my learning which has involved an emergent process of exploration: reading and analysing journals, notes, meeting reports, articles and

literature. The result is a thematic description of my journey. This Chapter includes: a short personal profile, my role as an insider researcher, theoretical premise and the enquiry - reflection process of learning applied during the transition from student to practitioner (Coghlan & Brannick, 2009).

Personal Profile

In 2009, when the Change and Networking Group was formed, I was only starting my career as a researcher. I only had a basic understanding of research methodologies. As the Research Nurse for a busy Neonatal Intensive Care Unit, I was process driven, focussed and highly organised in coordinating several research trials in the Neonatal Intensive Care Unit. Prior to taking this position I had worked clinically in the Neonatal Intensive Care Unit for 14 years so I had an understanding of the impact the new design would have on staff and their needs. At this stage I didn't see myself as a researcher, as realistically the extent of my participation in the research was being in charge of recruitment and data collection.

As a neonatal nurse I had witnessed dynamic changes in the care practices leading to improved outcomes of seriously ill and premature infants. Having seen the results of research being applied to improve outcomes, I started to think that I could give more to nursing via research than by providing personal care. I am also the mother of a baby born prematurely and seriously ill, which has driven my '*never-give-up*' philosophy to life. It has been stated that action research will ideally intersect with one's own growth, values and beliefs (Herr & Anderson, 2005). That statement strongly gels with my own outlook.

When I undertook this project my aim was to represent the opinions and needs staff and family needs to the hospital management. At the time I only had limited knowledge about working on such a project in a large organisation. I had no understanding of how

this project would impact on me personally, but I knew I wanted to help in delivering the most positive outcomes possible, for staff and families. This was the beginning of my career as a researcher developing questions, gaining ethics approvals, collecting data and completing data analysis.

Reflection Box 8: Surveying staff and parents

After reading lots of articles on new units I have noticed only a few of the authors have actually surveyed their staff or families about the current unit or the design of the new unit. I would like to look at doing a survey and plan on talking to Zsuzsoka about this. It would be interesting to look at the current design, how staff and families think it impacts on safety, security, workload, getting help in an emergency etc.

Journal notes August 2009

Role as a Researcher

My role in this project was not of an expert, but as a facilitator to assist the group in identifying problems and support a process in which stakeholders engage to find solutions (Stringer, 2007). The roles I undertook were defined by the Change and Networking Group and were dynamic and often interchangeable depending on the needs of the group and the project. Roles included: planner, leader, facilitator, teacher and listener (O'Brien, 1998). The key to my role during this study was providing structure through embedding a cyclic process that would engage group members, encouraging them to take up leadership roles, fostering group discussion, taking action, evaluating the work and defining the next step.

As an insider action researcher the role duality was complex with role boundaries dependent on the group, management team and the project in progress. As discussed

by Roth, Sandberg & Svensson, (2004); I carried out roles in both the hospital and academic settings, creating knowledge useful to both settings. Conducting a research project in the organisation in which I work presented its own unwritten guidelines, as whilst I was invested in presenting the group's perspective it was also necessary to engage with all levels of staff in the Neonatal Intensive Care Unit and hospital management throughout the process. In this case Neonatal Intensive Care Unit management engaged fully with the group, but at times external pressures created divergent opinions and conflicts.

This project involved transformational change within an organisation where redesigning the Neonatal Intensive Care Unit facilitated the implementation of a new model of care, that touched every aspect of delivering high quality neonatal care. As an insider researcher, this was a demanding and complex process, in which it was necessary to negotiate between the two settings, engaging in all aspects of research endeavour from traditional research, to classical action research while also engaging in a reflective process of both the organisation and my individual learning.

Theoretical Premise

Literature suggests that what is often missing from action research is theory, whether that be its extension or development (Coghlan & Brannick, 2009). As stated by previous researchers, I believe action research is a style of research, or as Stringer, (2007) suggests, action research is a theory of method, that provides clarity and understanding about the way participants enact processes of inquiry in order to achieve the practical and effective outcomes.

Engaging participatory action research methodology allows the people most affected by a large scale change to consider the change and find solutions to their needs (O'Brien, 1998). It also allowed us to induct an emergent theoretical perspective where data was

continuously collected (literature, group feedback, survey response) and from which we tested previous results and underlying presumptions with a dual focus to resolve issues in our project as well as build current research evident on the impact of Neonatal Intensive Care Unit design on staff. While the study used an action research methodology in reviewing the: literature, data and conclusions of the study, it was undertaken from an emergent theoretical perspective (Dick, 2001).

Methods of Learning

Throughout the project I have participated in my own process of learning as described by (Coghlan & Brannick, 2009; Herr & Anderson, 2005; Reason, & Bradbury, 2008; Stringer, 2007). This has been a process where as new questions have evolved I have searched literature, employed new methods and then evaluated the results (Herr & Anderson, 2005). I have also immersed myself in different aspects and topics that have been discussed or highlighted at conferences or discussed with my supervisors or researchers I have had the privilege to meet and work with over the past six years. Further examples from minutes and my reflective journal are presented throughout the thesis, in particular this Chapter.

Learning about Action Research Methodology

In 2010, when I enrolled in the Master's program at the Australian Catholic University, I was invited to talk to Professor Sue Kildea regarding supervision of my project. After a lengthy discussion covering topics such as the aims and projects that were being completed by the Change and Networking Group and my intent to survey staff and families regarding their needs and ideas for the two cot Neonatal Intensive Care Unit; Sue suggested the process we were engaged in was similar to participatory action research methodology. I had attended conferences and presentations on action

research but in the medicalised world such as a Neonatal Intensive Care Unit, I noted that action research was not commonly undertaken by neonatal researchers.

Reflection Box 9: Enrolling for MNR

So I have spoken to the Sue today and told her what I would like to do as my project for my MNR: surveying staff about the current and future unit design.

I also told her about the CAN Group. She suggested the CAN group was similar to an action research group and this is what I should keep working on for my Masters. I am once more terrified and go off to research action research because this is something new to me. I am concerned, I don't know enough about what this means and if I will be able to do this.

Journal notes May 2011

Upgrading to a Doctoral Candidature

As the redevelopment progressed I decided it was important to evaluate the impact of the new design. In collaboration with NICU management and staff I developed a series of design impact studies that considered the effect of the two cot design on the environment, families and staff. In discussion with my supervisors I decided to upgrade from the Masters of Nursing program to undertake a Doctoral Candidature.

Where to next?

This led me on a road of inquiry reading books, articles and attending education seminars on quantitative and qualitative research methodologies. I was provided the opportunity to attend a workshop conducted at the Australian Catholic University by Professor David Coughlan. I didn't know that when I got there I would fundamentally

change my philosophy as a researcher. His workshop and book: “Doing action research in your organisation” (I am sure I was the only person at the seminar who had read it) provided me with a structured approach to self-reflecting and learning throughout my Doctoral Candidature. As I look back now I am able to see how much this has changed. Since this project I have worked with several researchers in the hospital community to run qualitative studies such as the ones included in this project.

Reflection Box 10: Action research workshop

I have had the most amazing experience, this week I attended an action research workshop held by Professor David Coughlan at ACU. David has opened my eyes to what I need to do to not only run the CAN Group, but how to look at what I am doing and think about how I can improve the process using the action research cycle and what I should do to record what I have learnt.

Journal notes May 2012

Learning through Literature

Prior to the redevelopment of the Neonatal Intensive Care Unit I had never considered what was involved in building and transitioning to a new Neonatal Intensive Care Unit design. When reviewing nursing handbooks much of current literature has focussed on creating a developmentally appropriate environment; but, it remains limited when considering that Neonatal Intensive Care Unit designs impacts on nursing practice or staff and family’s needs, with few recommendations or guidelines to facilitate the process. This led me to undertake a continuous literature review previously outlined in Chapter 2. I have learnt aspects of project management, design and construction, managing change and groups from previous research. I have learnt how to critically

analyse previous studies, using many of the strategies implemented by previous researchers. I have also been disappointed, after the initial excitement of finding a new article on staff perceptions had been published; to then find that the article has only discussed staff perceptions, without then reporting what the researchers have done to resolve staff issues in their unit.

Learning from Mentors

During the past four years I have been fortunate to have had three supervisors who have assisted me in learning the many aspects of undertaking such an extraordinary project. This learning can be outlined as three stages linked to the key supervisor for that period: 1) learning about the redevelopment and the organisation; 2) learning about action research; and 3) measuring the impact. Not only have I learnt research and writing skills from them; in addition I have learnt patience and resilience, which are essential attributes when involved in a participatory action research project.

I have also had the opportunity to work with the project team, builders, human resources, workplace health and safety and hospital administration. This has given me the opportunity to learn different aspects of redevelopment and managing change.

I have also had the privilege of being a member of the Change and Networking Group where I have learnt from each member and their previous experience they brought to the group. Each member shared their talents and enthusiasm to help me learn about different aspects of the redevelopment such as change and holding difficult conversations as shown in Reflection Box 11:

Reflection Box 11: CAN Group learning together

Many of the CAN Group have come back to meetings and talked about what other staff members are talking about and how difficult it can be if they are upset about what is going on. One of the CAN Group thinks we should learn more about having difficult conversations and change. We have invited a Human Resources staff member to come and talk to our Group. We have also invited the project manager to come and give the Group more information about the project. It is important to listen and support the members, as this is the first time they have had to have these sorts of conversations with staff.

CAN Group Minutes August 2009

Journaling as a learning tool

“Academic Integrity on action research depends both on the capability to solve problems and at the same time rigorously scrutinise the experiences” (Kerr & Anderson, 2005).

Argyris (2003) also states the inquiry into the process or steps is central to the development of knowledge. This is achieved through a process of action and reflection. Mezirow (1991) describes three forms of reflection, context, process and premise when applied to the Meta cycle of inquiry such as the one I have described in this Chapter.

I have undertaken a reflective process through writing a journal about projects, relationships and action research methodology, referring back to book Chapters and seeking out other literature to reflect on the complexities of being an “insider” conducting research in the organisation you are employed. This allowed me to step back (from what was often an emotionally charged portion of a situation or project stage) to reflect on how it happened, how could I have done it in a different way and think about possible strategies for the future. This is displayed throughout the

manuscript in reflection boxes and discussion of how action research methodology has been intertwined in this project.

Writing a journal has transported me into a world where time disappears and life goes on hold. Now as I review my years of work I can reflect on how journaling has engaged me in a learning process (Snowball, Ross, & Murphy, 1994). When I first started it was all about what we needed to do (action). Gradually as I learnt more I added more details describing who was there and how we were going to do the project at hand. This eventually evolved into a process where I then also considered the context of the event, questioned other's behaviour, my behaviour and tested new ways to work with the Group, to improve the Group, the project and my role in the Group (Snowball, Ross, & Murphy, 1994).

While much of this was trial and error "Action research is a messy process", I have tried to create order and give the reader a clearer picture by giving examples throughout this thesis (Primavera & Brodsky, 2004). I have used the three stages to illustrate how my reflective process developed as is shown in the text boxes. I have aligned them with the three forms of reflection, context, process and premise outlined by Mezirow (1991) as seen below:

Reflection Box 12: Stage 1: Context

The Capital Asset Development and Planning team has asked the NICU team to decide if we will have pendants. What type in the new unit? The CAN Group organised meetings with staff to consider what is best:

Space/flexibility/movability/cost. Pendants are really important in the new unit they will impact on how we can equip and how the rooms will function. They are very expensive, it is important we choose the right type and fit them out properly.

Journal notes April 2010

Reflection Box 13: Stage 2: Process

The CAN Group had organised a staff meeting to discuss the layout and clinical space of the two cot pods. Fortunately that week the NICU was very quiet and we were able to use Bay 1 to mark out the area of the new pods.

Over the course of the next three days, and at the allocated meeting time, staff were able to assess the pod and consider which layout would be best for babies, families and staff. The CAN Group then put up posters with pictures of the 4 room layouts staff had created and space for staff to make comment. Staff Feedback was then reviewed at a staff meeting where recommendations for the project team were listed.

Journal notes June 2010

Reflection Box 14: Stage 3: Premise

Redevelopment meeting

The CAN Group ran a staff meeting to update all NICU staff about the progress of the redevelopment. We talked about the NICU's communication needs and gave staff an update on the redevelopment. The Focus Group Facilitators updated staff on what their group are working on.

Reflection

The Focus Group Facilitators were great, this has been fantastic to watch as it has evolved the change in them from being passive members of the CAN Group to active assertive members communicating to the rest of the NICU Staff.

The cyclic process is repetitive so I often feel I am relaying the same information over and over but understand this is essential to keep all the staff members informed, and maintain group structure.

There weren't enough seats and this meant staff mostly nurses chose to sit on the floor at the back, they then alienated themselves from the group. Why does this happen? How come nurses don't see themselves as equals? How can I help to make them feel like an important part of the team? I will try and talk to all the people who came and didn't put their name down. I felt sad that they would not use extra seats and did not want to come down the front and was very frustrated by staff behaviour at first, but then realised you just have to get on with things.

Reflection Box 14: Stage 3: Premise (continued)

Conceptualisation/ Generalising

Participatory Action research provides the means by which stakeholders centrally affected by the issue can explore their experience, gain clarity or understanding of events and activities, and use those extended understandings to construct effective solutions to the problem on which the study has focused (Stringer, 2007). The CAN group exemplifies this principle of PAR.

If staff are engaged in the process they increase their understanding in the redevelopment process and effectiveness in creating solutions. PAR is about research and learning happening simultaneously and this is definitely happening in the CAN group.

Experimentation/ Applying

Encourage group members to take on stronger roles.

Give members more information and tasks to learn more about the project.

Comment

I need to read more about group dynamics, AR principles.

Journal notes Jan 2012

What I have learned

Throughout this project I have acquired a vast array of skills related to: project management, Neonatal Intensive Care Unit design, workplace health and safety; that necessarily have involved education and training on administration, equipment and policy development. Upon review there are three main themes that present what I consider are the most important factors I have learnt.

Learning as a member of a group

As an early researcher I have learnt from working with and as part of a group. I have learnt about group dynamics, working within a team to achieve positive outcomes and the essential elements to responsible leadership. This project has allowed me to witness and develop leadership characteristics from which I have embedded transformational leadership principles in my own philosophy of practice. Leading by example, to be authentic and valuing other's views and suggestions as necessary when considering factors that will impact on their practice and work life.

One of the main groups I have had to learn to work with has been the various levels of management within the organisation. Prior to undertaking this project my role was confined to working in the Neonatal Intensive Care Unit with staff and families. Learning the complexities of a large organisation, members of the organisations and differing agendas, politics and financial constraints was a new phase in my learning. Trying to negotiate with different levels of management was not always a positive experience, but it has certainly been a lesson in maintaining documentation and integrity during complex negotiations. I have also learnt how important it is to filter information through the right channels and provide management reports that meet management's needs and highlight the benefits of your involvement.

It is important to recognise that groups are made up of individuals who all come with past experience, which should be considered and respected when analysing the impact of the change and their response. Sharing the success and supporting those who are struggling is essential when undertaking such transformational change as described in this project.

Reflection Box 15: The rollercoaster ride

Being involved in the transition to a new NICU design provides many of the same feelings as riding a roller coaster, the experience will be different for every person on the ride, for some it will elicit extreme fear from which they will need time and support to recovery, while others will meet the challenge with excitement embarking on each turn as a new adventure.

Like a rollercoaster, the project often takes time to gather momentum but from then on takes up a pace all of its own depending on the urgency and unpredictability of the turns, that can be varied by the rider or management controlling the ride. It is important to advise caution as you may come very close to falling off or stopping the ride before completing the project.

Journal notes June 2012

Becoming a researcher

As previously noted before starting this project as I have previously stated I was in charge of recruitment and data collection but not a true researcher. During this project I have undertaken a journey in many different facets of research methodology, data analysis and reporting results. I have undertaken both quantitative and qualitative studies.

This project has increased my research knowledge exponentially, you don't do action research you become an action researcher (Dick, 2001). Irrespective of whether I am conducting a quantitative and qualitative study, it is a priority to assess the benefits of the study to the group you aim to research and the implications of your work, creating a link between generating knowledge and improving outcomes for the group. I have also been given the opportunity to lead a variety of projects in the hospital and mentor staff working with me to complete data collection and report on projects.

Reflection Box 16: Becoming a researcher

This has been the hardest task so far, I am overwhelmed, I read sections in 10 books and reviewed about 20 articles then decided to go back to the beginning and keep it simple. In my search I found an article by Berglund et al., (1999) who stated "the initial data often appeared puzzling and challenging in nature". Lofland, (1971) suggests that investigator has to spend as much time recording notes as was spent in observing the events that took place. I plan on using several strategies to collect and analyse my data. I think one of my main concerns is the amount of data that will be generated, sorting and storing it.

Journal notes Nov 2011

Learning about myself

I have no hesitation in stating my role in the Change and Networking Group was fraught with complex decisions and relationships. That often meant I was left with finishing whatever hadn't been completed and that my personal life was overwhelmed for the six months prior to the transition. At the same time, I take full responsibility, learning resilience and developing skills to articulate a group's needs when they may not be

seen as important to an organisation is a complex challenge of negotiation which is only gained through experience.

A primary role in action research practice is to be aware of the choices one is making and the consequences of those choices. As the project developed I became aware of the importance of considering my choices and how they impacted on other members of the group and the project in general. Small choices such as stepping back from the decision making process, providing factual accounts of projects undertaken disregarding any emotional response I may have personally had about the result, to maintain focus and remain the researcher, not the activist (Snowball, Ross, & Murphy, 1994).

Learning that I could not change everything, but knowing that together as a team we could assist staff to transition to the new Neonatal Intensive Care Unit design, was an important lesson to learn. In addition, I found that passion builds strength and the passion I have developed for research in the course of completing my PhD, has put me on a far different path in life than the one I was taking just five years ago. I am highly resilient and hope to meet new challenges every day through which I will foster innovation and improvement for neonates, staff and families.

Final Thoughts

As I complete a final review of my manuscript I cannot help but reflect on the experiences and challenges of the past five years, most importantly the people. I can never thank everyone I have learnt from and worked with during my candidature and I am humbled to have had such a wonderful research and working opportunity.

Throughout this process I have made a concerted effort to present everyone's ideas and thoughts on the Neonatal Intensive Care Unit redevelopment. If I have not,

I apologise. I know that with this thesis I have only provided an overview and that it would be impossible to describe and analyse every aspect of such a vast project.

What will be my next challenge? How will completing this type of project impact on my future? Has the research I have done been worthwhile? All these are questions I debate every day! I invite you to read Chapter 7; the final Chapter of my thesis, which outlines the main findings of this work and the future research I propose is necessary to take the next step in facilitating staff transition to a new Neonatal Intensive Care Unit design.

Chapter 7: Summary and Conclusions

Introduction

Chapter 7 has been designed to synthesise the findings from the previous Chapters. The Chapter will firstly provide an overview of the context, research gap and rationale guiding this project, as previously described in Chapter 1. It then outlines the main findings of each Chapter and concludes with an overview of this study's contribution to knowledge, recommendations for future research and thesis conclusion.

Overview

This study was undertaken in an Australian regional Neonatal Intensive Care Unit that provides intensive and special care for 700 neonates per annum, born between 24-44 weeks gestation. In 2012, the Neonatal Intensive Care Unit relocated from an open plan unit to one with a two cot design. The two cot design Neonatal Intensive Care Unit is triple the size of the previous open plan Neonatal Intensive Care Unit, with each bedspace increasing from approximately 7 m² to 12 m². The new Neonatal Intensive Care Unit is divided between an Intensive Care/High Dependency (Neonatal Intensive Care Unit, 20 cots) area and a Special Care (Special Care Nursery, 14 cots) wing, with both areas having a similar layout of interconnected rooms situated on the external walls (to allow natural light into each bedspace).

In many countries across the world, Neonatal Intensive Care Units are changing their design from open plan to single family room design with the aim of improving neonatal outcomes (White, 2011). While research has shown that single family room design has a positive effect for neonates and families, it has also highlighted single family room design impacts on staff workflow and practice: increased staff walking distances, workload and the number of staff required to provide safe nursing care (Stevens et al.,

2010). Research findings included comment on the difficulty of communicating effectively, supporting all staff members and in providing ongoing education in single family room Neonatal Intensive Care Units (Shahheidari & Homer, 2012).

Current evidence on the impact of, and methods implemented to assist staff with, the transition to a new Neonatal Intensive Care Unit design is limited as was outlined in Chapter 2, highlighting a gap in current research. During our transition from an open plan to a two cot design we undertook a participatory action research project to: 1) find solutions to the problems that were identified in our context, and 2) generate evidence that may be translated into a broader context. Table 7.1 provides an overview of the major findings presented in this thesis.

Table 7.1: Summary of main findings

| Objective | Methodology | Main Findings |
|--|------------------------------|---|
| To review current literature on transitioning from open plan to two cot Neonatal Intensive Care Unit design | Integrated literature review | <p>No published research on two cot NICU design.</p> <p>Much of the previous literature used survey methodology that highlighted impact of single family/small room design on staff: increased workload, increased distances walked, limited communication with peers and reduced education opportunities.</p> <p>Staff may take up to two years to adjust to new unit.</p> <p>Limited documentation of strategies to facilitate staff transition to a new NICU design.</p> <p>Limited empirical evidence on the impact of NICU design on staff.</p> <p>Study findings support the need for further research.</p> |

Table 7.2: Summary of main findings (continued)

| Objective | Methodology | Main Findings |
|---|--------------------------------------|--|
| <p>To engage stakeholders in the Neonatal Intensive Care Unit design process.</p> | <p>World Café methodology</p> | <p>World Café Methodology is an effective methodology to facilitate stakeholders' exposure to a variety of opinions and involvement in a decision making process.</p> <p>The design of a NICU needs to incorporate operational and functional components, dependent on the needs of the stakeholders.</p> <p>Operational components will include safe staffing levels, emergency response systems, education and orientation to the new design.</p> <p>The NICU World Café stakeholders identified a core group of requirements essential to creating a functional NICU: flexibility, visibility, privacy, skills, safety and sense of community.</p> <p>Stakeholders resolved that these requirements could be applied most effectively in both two and single cot rooms, detailing their recommendations for the architects.</p> |
| <p>To explore participatory action research (PAR) as methodology to facilitate the change of NICU design from open plan to two cot</p> | <p>Participatory action research</p> | <p>PAR is an effective methodology to provide structure and engage staff in finding solutions when transitioning to a new NICU design.</p> <p>PAR methodology allowed the use of a variety of different methods to collect data, encouraging group members to be involved in the organisation and coordination of research.</p> <p>PAR methodology encouraged early researchers to gradually develop their research skills and enabled them to take on high quality research as the project progressed.</p> <p>PAR methodology fostered staff inclusion in finding solutions to NICU design issues.</p> |

Table 7.3: Summary of main findings (continued)

| Objective | Methodology | Main Findings |
|---|---|--|
| | | Produced an outline of the processes undertaken to facilitate the transition: formation of the CAN Group, the NICU change model and group process as well as outlining projects and strategies implemented by the Group. |
| | | Staff and Change and Networking Group evaluations highlighted the effectiveness of the Change and Networking Group and the implementation of PAR methodology. |
| To evaluate the impact of two cot design on staff walking distance, activity and perceptions | Prospective comparative design impact studies | <p>First study to evaluate the impact of two cot design on staff.</p> <p>This study provides empirical evidence to support simple design modifications that can reduce the impact of new NICU design on staff.</p> <p>This study provides empirical evidence that two cot design increases the time required by staff to effectively communicate, gain assistance and support other staff.</p> <p>A process of continual improvement post-transition, in consultation with staff, is needed to assess and reduce the impact of two cot design on communication, educational opportunities and isolation.</p> |

Contribution to Current Knowledge

The research undertaken in this project has made a significant contribution to current knowledge as described in the three main themes: research methodology, neonatal intensive care design and Australian healthcare context.

Research Methodology

World Café Methodology

This is the first study to describe and provide evidence that supports use of the World Café methodology to enable stakeholders' exposure to a variety of opinions and involvement in a decision-making process; in this case, the design of a Neonatal

Intensive Care Unit. The World Café methodology described in Chapter 2 provides a process that could be transcribed to other situations and context, or repeatedly used to facilitate change being undertaken in an organisation or explore staff needs and challenges in response to the change.

Participatory Action Research

This study has added to current evidence supporting the positive impact of participatory action research and the effect of groups working together to resolve problems. The study has also contributed to evidence supporting Lewin's findings on group dynamics 'that people may come to a group with very different views but if they share a common goal they will work together to accomplish it: postulating the first basic tenets of action research' (Lewin, 1946). This study has described participatory action research methodology in a new context, the redesign of a Neonatal Intensive Care Unit. It outlines a process that could be used by other researchers to facilitate change or a decision-making process in a diverse range of situations and contexts.

Assessing Clinical Significance

This study has highlighted the need to assess the clinical significance of an intervention that affects nursing staff workflow and practice. A point of debate arises when statistical significance does not match the interpretation of the clinical effect of an intervention, in this case changing the Neonatal Intensive Care Unit design (LeFort, 1993). Literature suggests that the observation/recording of a statistically significant difference is more likely to be real than chance, whereas clinical significance relates more to the actual effect of the change on the study population (LeFort, 1993).

It is interesting to note that while clinical significance seems to be an essential element of nursing (clinical) research, only very limited literature has been published that includes a measure of clinical significance. This study has highlighted the difference

between the factors that a researcher may find statistically significant and the clinical significance or effect of those factors (i.e. changes in design) on clinicians. When clinical significance has been assessed, interventions can be designed to minimise any predicted undesirable effects of the change.

Neonatal Intensive Care Design

Transition to a New Neonatal Intensive Care Unit Design

This is the first study to explore, trial and document use of participatory action research methodology to facilitate the transition to a new Neonatal Intensive Care Unit design, as described in Chapter 4. The action research cyclic approach created a structural process to review several different projects at different phases in a timely and fluid manner. This study has highlighted the benefits of employing participatory action research methodology to explore staff needs and engage their experience and knowledge of clinical practice. We have described the change model and process used by the Change and Networking Group to encourage and support staff participation. Staff engagement has improved the environment for neonates, staff and families and has accounted for resolution of many of the issues highlighted prior to the transition.

Once staff had settled in the new design, the challenge of fostering a family-centred and developmentally appropriate model of care continued through several phases:

- the development of unit policy and guidelines
- staff education and awareness of changes
- a process of continual evaluation to assess neonatal, staff and family needs as clinical practice and culture change to facilitate high quality neonatal care in the new facility.

Staff Requirements in Two Cot Neonatal Intensive Care Unit Design

This is the first study to consider staff requirements for a two cot neonatal intensive care unit design. It has documented what staff members perceive they need in order to provide safe, high quality neonatal care in a two cot neonatal intensive care unit (Chapter 3). The project also details a ground-up approach to identifying staff needs and engaging staff in finding solutions. It outlines the process, model, projects and outcomes of the study, allowing translation to other situations and groups undergoing remodelling or restructure (Chapters 4, 5).

Staff perceptions of the Neonatal Intensive Care Unit Design's Impact on Neonates and Families

The study's exploration of staff perceptions of two cot neonatal intensive care unit design has highlighted the benefits of two cot design in creating a developmentally appropriate environment, with the design enabling staff to change physical aspects (i.e. light, temperature, noise) to meet each neonate's gestational and medical needs. Results of the behavioural mapping study have shown that the two cot design has not reduced the time staff spend providing direct clinical care to neonates, as suggested by previous researchers (Shahheidari & Homer, 2012).

Survey participants also commented on the positive impact of the two cot design on parent participation in caring for and the quality time they spend with their baby. The study provides new evidence that the two cot design improves communication between staff and families and facilitates a family-centred approach to neonatal care. It also reported similar results of reduced parent-to-parent interaction, as highlighted in previous research on family room design.

Impact of Two Cot Neonatal Intensive Care Unit on Staff Workflow and Practice

This is the first set of comparative design studies to investigate if previous research suggestions that single family room design increases staff walking distances, workload and time away from the neonate's cot side, are similar in a two cot design (Bosch & Jenzarli, 2012; Cone et al., 2010; Smith et al., 2009). Through the longitudinal prospective comparative studies designed to investigate the impact of two cot design on staff workflow and practice, we have added a higher level of evidence to that reported in previous studies.

This study has undertaken a comprehensive investigation using a variety of methodologies, with the intention of not only to evaluating the two cot design but engaging staff in finding solutions. Study results have shown that staff concerns related to the increased walking distance and workload can be minimised through minor adjustments to the physical layout, placement of stores and equipment, and purchase of suitable equipment, as documented in previous studies (Carlson et al., 2006; Smith et al., 2009; Swanson et al., 2013).

This study has identified that staff perceive similar communication and educational issues in two cot room as reported with single family room design (Shahheidari & Homer, 2012). The two cot room design does not protect staff from the isolation described by nurses working in single family room neonatal intensive care units (Domincio et al., 2010). Even though two cot rooms allow a staff member to work with another colleague, staff still described feelings of being '*isolated from the team*' and '*not knowing what was happen in other parts of the Neonatal Intensive Care Unit*'; providing some insight into the reasons why nurses find the transition to small room design unsettling and demonstrate low morale levels during the transition period. This study has proposed several methods to help staff to adjust to the requirements of the two cot

design. It highlights the importance of continually reviewing staff needs, providing further evidence that it takes two years or more to adjust to the new design.

Study results provided statistical evidence that the two cot design increases the time that staff spend to communicate effectively with other members of the care team. It has also detailed the complexities of educating and supporting staff about the two cot design, describing the post-transition improvement process undertaken in consultation with staff to assess and reduce the impact of two cot design on communication, educational opportunities and isolation. It also provides insight into the highlights and challenges that may confront neonatal intensive care unit redevelopment teams during the transition to a new design.

Unique needs of Neonatal Intensive Care Unit Community

This study has demonstrated how planning the design of a neonatal intensive care unit is different than other buildings, where people working in the facility only need a workspace, computer and a tearoom to provide an effective workplace. Building a Neonatal Intensive Care Unit presents a set of unique circumstances: The design needs to meet the needs of three distinct users (neonates, staff and families) requiring a continual process of negotiation and understanding. Such hospital redevelopments will be subject to the continual questioning and raising of issues expected with any large redevelopment, with differing agendas, financial constraints and political pressures all having some impact on the new design.

A new design is only one part of the foundation on which an exceptional Neonatal Intensive Care Unit is built; additional support structures must be put in place from the beginning to facilitate the transition to the new design. This requires a dedicated team to work with the builders, with the aim of resolving problems in the fit out of the unit; otherwise such problems will quickly increase staff frustrations as they care for critically ill neonates while at the same time needing to adjust to a new environment.

Australian Research

As discussed in Chapter 5, this is the first study undertaken to record and test the impact of changing a neonatal intensive care unit design in Australia. The study has provided evidence that two cot design is both realistic and effective in a public health care system, where market edge (as discussed by Carlson et al., 2006) is not a consideration. This study also provides evidence that, while most publications on Neonatal Intensive Care Unit design have been provided by American sources, the impact of Neonatal Intensive Care Unit design is a priority worldwide.

Recommendations for Future Research

This study has explored the effect of two cot Neonatal Intensive Care Unit design on staff workflow and practice and has highlighted that there are still gaps in current research. Further research is needed to assess the impact of design on neonatal outcomes, research methodologies, comparison of Neonatal Intensive Care Unit designs, staff adjustment beyond two years post-transition and recruitment/retention of the nursing workforce.

Neonatal outcomes

The main objective of changing the Neonatal Intensive Care Unit design was to improve neonatal outcomes. Although Neonatal Intensive Care Units have been altering their designs for over 20 years, there is still only limited evidence to support or refute the impact of design on short- and long-term neonatal outcomes. Until evidence on the impact of unit design on neonatal outcomes is available, design choice will be based on the philosophy and economics of individual neonatal intensive care units, rather than evidence-based practice. It is essential for units undertaking redevelopment to evaluate the impact of the unit design on both short- and long-term neonatal outcomes.

A research team, including the thesis author, is currently undertaking further research to assess the impact of the two cot design on neonatal outcomes.

Research Methodologies

This study has also highlighted the limited range of methods that have been used by researchers to assess staff perceptions of the impact of changing from an open plan to a single family room design. Survey methodology has been used in fourteen of the studies reviewed, many reporting the same concerns as documented by other research teams. Staff opinion should be part of investigating the impact of a new design on staff workflow and practice (LeFort, 1993) and the resultant evidence used to justify designs that considers staff impacts. The increased workload and time away from bedside is at the moment acceptable to many researchers not engaged in the direct care of intensive care neonates (Beck et al., 2009; Hogan et al. 2015). As suggested by Shepley 2014, rather than surveys, empirical data obtained through observational studies and high quality quantitative studies are required to provide evidence to support or negate staff perceptions.

Comparison of Neonatal Intensive Care Unit designs

This study has highlighted the limited amount of research undertaken in Neonatal Intensive Care Units with larger rooms that accommodate 2-6 neonates. Further research using a variety of methodologies is needed to compare the different Neonatal Intensive Care Unit designs as this will aid future redevelopment teams when deliberating the cost of the new design and the impact of the choice.

Impact of Neonatal Intensive Care Unit design on staff post two years

Researchers have suggested it may take two years after transition for staff to adjust to a new design (Carlson et al., 2006; Goldschmidt & Gordin, 2006). Several factors need to be considered in further research on this subject, in order to substantiate these findings.

There is lack of evidence to qualify this commonly used statement, accompanied by a lack of reporting on what has been done post-transition to help staff to adjust to a new Neonatal Intensive Care Unit design. Further research is also needed to assess whether staff needs have been met two years post-transition, as there is no longitudinal evidence to indicate that staff satisfaction on communication and educational opportunities ever returns to the pre-transition levels recorded for open plan design.

Future Workforce

This study has added to the knowledge of the impact of Neonatal Intensive Care Unit design on the day-to-day practice of staff. One of the most challenging aspects of single family room design is the isolation and increased workload it imposes on nursing staff and further research is needed to assess the physical and psychological impact of Neonatal Intensive Care Unit design on the nursing staff and to develop strategies to ensure a supportive environment. While all staff acknowledge that Neonatal Intensive Care Units are built to improve neonate outcomes, we should not be complacent about the impact the environment may have on the workforce given the worldwide shortage of nurses.

Study Conclusion

Building a new Neonatal Intensive Care Unit is a significant investment of capital, time and infrastructure, but often one of the biggest challenges is building a strong, cohesive group of staff to facilitate and undertake the transition to a new design. The design chosen will be driven by unit philosophy, vision, financial/political considerations and the managerial policy of the institution. It requires a diligent and dedicated team to guide the process, and that requires a significant investment in time.

The inclusion of staff in the design and decision-making process will foster staff engagement and participation, thus gaining staff ownership of the new Neonatal

Intensive Care Unit. While concerns about physical aspects of the new design may be resolved by simple modifications and staff adapting to the new environment, the development of a new culture that promotes effective communication and educational opportunities in the Neonatal Intensive Care Unit will be a continuous process of assessing staff needs and collaboration to find solutions.

The exploration of the use of participatory action research methodology has facilitated an all-encompassing presentation of the transition to and the impact of, two cot Neonatal Intensive Care Unit design. As a thesis by publication, which has used a variety of methodologies, this manuscript has presented knowledge not previously available about transitioning to a two cot design and the impact of this transition on staff activity and their perceptions of the design. The recommendations on future research outlined in this manuscript will be presented for peer review at national and international conferences during 2016.

Chapter 8: References

- Appleton, J. T. (1975). *The Experience of Landscape* (revised ed.) New York: Wiley.
- Argyris, C. (1993). *Knowledge for action: A guide to overcoming barriers to organizational change*. San Francisco: Jossey-Bass.
- Beck, S. A., Weis, J., Greisen, G., Andersen, M., & Zoffmann, V. (2009). Room for family-centered care – a qualitative evaluation of a neonatal intensive care unit remodeling project. *Journal of Neonatal Nursing*, 15(3), 88-99.
- Benjamin, W. N. (1993). *Motion and time study*. Homewood: Irwin.
- Berglund, B., Schwela, D. H., & Goh, K. T. (1999). "Guidelines for community noise". Technical Report, World Health Organization.
- Blackburn, S. (1998). Environmental impact of the NICU on developmental outcomes. *Journal of Pediatric Nursing*, 13(5), 279-289.
- Bosch, S., Bledsoe, T., & Jenzarli, A. (2012). Staff Perceptions Before and After Adding Single-Family Rooms in the NICU. *Health Environments Research & Design Journal*, 5(4), 64-75.
- Bowie, B. H., Hall, R. B., Faulkner, J., & Anderson, B. (2003). Single-room infant care: future trends in special care nursery planning and design. *Neonatal Network*, 22(4), 27-34.
- Bracht, M., O'Leary, L., Lee, S. K., & O'Brien, K. (2013). Implementing Family-Integrated Care in the NICU: A Parent Education and Support Program, *Advances in Neonatal Care*, 13(2), 115-126.
- Broom, M., & Kecskes, Z. (2011). Staff and parent perceptions of an open plan intensive care environment. *Journal of Paediatrics and Child Health*, 47 (Suppl. 1), 60-116.

- Broom, M., Brady, B., Kecskes, K., & Kildea, S. (2013). World Café Methodology engages stakeholders in designing a Neonatal Intensive Care Unit. *Journal of Neonatal Nursing*, 19(5), 253-258.
- Broom, M., Gardner, A., Kecskes, Z., & Kildea, S. (2015). How can we help staff transition to a new NICU design? *Journal of Neonatal Nursing*, 21(5), 180-185.
- Brown, J. (2002). A resource guide for hosting conversations that matter at the world Café, <http://www.theworldcafe.com>.
- Brown, J., & Isaacs, D. (1999). The World Café: Catalysing large-scale collective learning. *Leverage*, 33, 1-2.
- Brown, J., & Isaacs, D. (2005). *The World Café: shaping our futures through conversations that matter*. San Francisco, CA: Berrett-Koehler.
- Brown, P., & Taquino, L. (2001). Designing and delivering neonatal care in single rooms. *Journal of Perinatal & Neonatal Nursing*, 15(1) 68-83.
- Canberra Hospital, Neonatal Intensive Care, (1996). Annual report of the Canberra Hospital Neonatal Intensive Care.
- Carlson, B., Walsh, S., Wergin, T., Schwarzkopf, K., & Ecklund, S. (2006). Challenges in design and transition to a private room model in the neonatal intensive care unit. *Advances in Neonatal Care*, 6(5), 271-280.
- Chow, S.S.W. (2013). Report of the Australian and New Zealand Neonatal Network. Sydney: ANZNN.
- Coghlan, D., & Brannick, T. (2009). *Doing Action Research in Your Own Organization*. London, UK: SAGE.
- Cone, S. (2010). NICU Design: An opportunity for change. *Newborn and Infant Nursing Reviews*, 10(2), 68-69.

- Cone, S., Short, S., & Gutchner, G. (2010). From "Baby Barn" to the "Single Family Room Designed NICU": A Report of Staff Perceptions One Year Post Occupancy. *Newborn and Infant Nursing Reviews*, 10(2), 97-103.
- Cooper, L.G., Gooding, J.S., Gallagher, J., Sternesky, L., Ledsky, R., & Berns, S.D. (2007). Impact of a family-centered care initiative on NICU care, staff and families. *Journal of Perinatology*, 27, 32-37.
- Dick, B. (2001). Making the most of emergent methodologies: a critical choice in qualitative research design. Paper presented at the Association for Qualitative Research Conference, Melbourne.
- Domanico, R., Davis, D., Coleman, B., & Davis, B. (2010) Documenting the NICU design dilemma: comparative patient progress in open-ward and single family room units. *Journal of perinatology*, 31(4), 281-288 8.
- Figueiro, M. G., & White, R. D. (2013). Health consequences of shift work and implications for structural design. *Journal Of Perinatology*, 33(S1), S17-23 1p.
- Floyd, A. (2005). Challenging Designs of Neonatal Intensive Care Units. *Critical Care Nurse*, 25(5), 59-66.
- France, D. J., Throop, P., Walczyk, B., Allen, L., Parekh, A. D., Parsons, A., & Deshpande, J. K. (2005). Does patient-centered design guarantee patient safety? Using human factors engineering to find a balance between provider and patient needs. *Journal of Patient Safety*, 1(3), 145-153.
- Goldschmidt, A. K., & Gordin, A. P. (2006). A model of nursing care microsystems for a large neonatal intensive care unit. *Advances in Neonatal Care*, 6(2), 81-88.
- Graven, S. N., & Browne, J. V. (2006). Sensory development in the fetus, neonate, and infant: Introductions and overview. *Newborn and Infant Nursing Reviews*, 8(4), 169-172.
- Graven, S. N., & Browne, J. V. (2008). Auditory development in the fetus and infant. *Newborn and Infant Nursing Reviews*, 8(4), 187-193.

Gellermann, W., Frankel, M.S., & Ladenson, R.F. (1990). Values and ethics in organization and human systems development : responding to dilemmas in professional life. 1st ed. San Francisco: Jossey-Bass.

Griffin, T. (2006). Family-centered Care in the NICU. *The Journal of Perinatal & Neonatal Nursing*, 20(1), 98–102.

Gummesson, E. (2000). *Qualitative methods in management research*. London: SAGE.

Harris, D., Shepley, M., White, R., Kolberg, S., & Harrell, W. (2006). The impact of single family room design on patients and caregivers: executive summary. *Journal of Perinatology*, 26(S3), 38-48.

Hendrich, F., Chow, F., Bafna, S. P., Choudhary, R. P., Heo, Y., & Skierczynski, P. (2009). Unit-Related Factors That Affect Nursing Time with Patients: Spatial Analysis of the Time and Motion Study. *HERD: Health Environments Research & Design Journal*, 2(2), 5-20.

Herr, K., & Anderson, G. (2005). *The Action Research Dissertation: A Guide for Students and Faculty*. Thousand Oaks, CA: SAGE.

Hogan, C., Jones, L., & Saul, J. (2016). The impact of special care nursery design on neonatal nurses. *Journal of Neonatal Nursing*, 22(2), 74-80.

Horwitz-Bennett, B. (2010). 2010 Health Guidelines: new and improved: incorporating the latest research and in-the-field expertise, the 2010 Guidelines include new design criteria for patient handling, bariatrics, acoustics, telecommunications, and a number of healthcare facility types. *Healthcare Design*, 10(9), 36.

Johnson, B. H., Abraham, M. R., & Parrish, R. N. (2004). Designing the neonatal intensive care unit for optimal family involvement. *Clinics in Perinatology*, 31(2), 353-382.

- Jones, J., & Cheek, J. (2003). The scope of nursing in Australia: a snapshot of the challenges and skills needed. *Journal of Nursing Management*, 11(2), 121-129.
- Kemmis, S., & McTaggart, R. (1999). *The action research planner* (3rd ed.). Geelong: Deakin University.
- Koch, T., & Kralik, D. (2006). *Participatory Action Research in Health Care*, Oxford: Wiley-Blackwell.
- Kuschel, C., & Roy, R. (2005). Who's got what? A benchmarking exercise for tertiary neonatal units. *Journal of Paediatric Child Health*, 41(12), 635-639.
- Leeder, S. (2003). Achieving equity in the Australian healthcare system. *Medical Journal of Australia*, 179(9), 475-478.
- LeFort, S. M. (1993). The Statistical versus Clinical Significance Debate. *The Journal of Nursing Scholarship*, 25(1), 57-62.
- Lewin, K. (1946). Action Research and Minority Problems. *Journal of Social Issues*, 2(4), 34-46.
- Little, G. A., & Merenstein, G. B. (1993). Toward Improving the Outcome of Pregnancy: Perinatal Regionalization Revisited. *Pediatrics*, 92(4), 6-11.
- Lofland, J. (1971). *Analyzing social settings: A guide to qualitative observation and analysis*. Belmont, CA: Wadsworth.
- McIntyre, A. (2008). *Participatory Action Research* (Vol. 52): Thousand Oaks, CA: SAGE.
- Mezirow, J. (1991). *Transformative Dimensions of Adult Learning*. San Francisco: Jossey-Bass.
- Milford, C. A., Zapalo, B. J., & Davis, G. (2008). Transition to an individual-room NICU design: process and outcome measures. *Neonatal Network*, 27(5), 299-304.
- Morton-Cooper, A. (2000). *Action Research in Health Care*. Oxford: Blackwell Science.

NSW Pregnancy and Newborn Services Network Neonatal Intensive Care Units,' Data Collection. (2011). Neonatal Admissions Canberra Hospital. Retrieved from <http://www.psn.org.au>.

NSW Pregnancy and Newborn Services Network Neonatal Intensive Care Units,' Data Collection. (2015). Neonatal Admissions Canberra Hospital. Retrieved from <http://www.psn.org.au>.

O'Brien, R. (2001). An Overview of the Methodological Approach of Action Research. Practice. Retrieved from <http://www.web.ca/~robrien/papers/arfinal.html>.

Phillips, J., & Simmonds, L. (2013). Using fishbone analysis to investigate problems. *Nursing Times*, 109(15), 17-20.

Pineda, R.G., Stansky, K.E., Rogers, C., Duncan, M.H., Smith, G.C., & Neil, J. (2012). The single-patient room in the NICU: maternal and family effects. *Journal of Perinatology*, 32(7), 545-51.

Pineda, R.G., Neil, J., Dierker, D., Smyser, C.D., Wallendorf, M., Kidokoro, H. (2014) Alterations in Brain Structure and Neurodevelopmental Outcome in Preterm Infants Hospitalized in Different Neonatal Intensive Care Unit Environments. *The Journal of pediatrics*, 164(1), 52-60.

Primavera, J., & Brodsky, A. E. (2004). Introduction to the Special Issue on the Process of Community Research and Action. *American Journal of Community Psychology*, 33(3/4), 177.

Reason, P. (2001). Learning and change through action research, in Henry, J. (eds.), *Creative Management*. (2nd edition). London: SAGE, pp. 182–194.

Reason, P. (2006). Choice and Quality in Action Research Practice. *Journal of Management Inquiry*, 15(2), 187-203.

- Reason, P., & Bradbury, H. (2008). Sage Handbook of Action Research: Participative inquiry and practice London: SAGE.
- Reedy, E. A. (2003). Infant incubators turned 'weaklings' into 'fighters': a sensational invention helped change the chances of premature infants. *American Journal of Nursing*, 103(9), 64.
- Rogowski, J. A., Staiger, D., Patrick, T., Horbar, J., Kenny, M., & Lake, E. T. (2013). Nurse staffing and NICU infection rates. *JAMA Pediatrics*, 167(5), 444-450.
- Roth, J., Sandberg, R., & Svensson, C. (2004). The dual role of the insider action researcher, in Adler, N., Shani (Rami), A.B., and Styhre, A. (eds.), *Collaborative Research in Organizations*. Thousand Oaks, CA: SAGE, pp. 117–134.
- Shahheidari, M. & Homer, C. (2012). Impact of the design of neonatal intensive care units on neonates, staff, and families: a systematic literature review. *Journal of Perinatal & Neonatal Nursing*, 26(3), 260-266.
- Shani, A. B., & Pasmore, W. A. (1985). Organization inquiry: Towards a new model of the action research process, *Contemporary Organization Development: Current Thinking and Applications*. Glenview, IL: Scott, Foresman, pp. 438–448.
- Shaver, L. F., & Cone, S. K. (2010). Designing an Orientation for Staff Moving to a Single Family Room Newborn Intensive Care Unit. *Newborn and Infant Nursing Reviews*, 10(2), 87-91.
- Shepley, M. M. (2002). Predesign and Post occupancy Analysis of Staff Behavior in a Neonatal Intensive Care Unit *Children's Health Care*, 31(3), 237–253.
- Shepley, M. M. (2004). Evidence-based design for infants and staff in the neonatal intensive care unit. *Clinics in Perinatology*, 31, 299-311.
- Shepley, M. M. *Design for pediatric and neonatal critical care*. (2014). New York: Routledge.

-
-
- Shepley, M. M., & Davies, K. (2003). Nursing unit configuration and its relationship to noise and nurse walking behavior: An AIDS/HIV unit case study. *AIA Academy Journal*, 6, 12-14.
- Shepley, M. M., Harris, D., & White, R. (2008). Open-bay and single-family room neonatal intensive care units - caregiver satisfaction and stress. *Environment and Behaviour*, 40, 249-268.
- Shepley, M. M., Smith, J. A., Sadler, B. L., & White, R. D. (2014). The business case for building better neonatal intensive care units. *Journal of Perinatology*, 34(11), 811-815.
- Smith, M. (2001). 'Kurt Lewin, groups, experiential learning and action research'. *The encyclopedia of informal education*, London: SAGE.
- Smith, T., Schoenbeck, K., & Clayton, S. (2009). Staff perceptions of work quality of a neonatal intensive care unit before and after transition from an open bay to a private room design. *Work: A Journal of Prevention, Assessment and Rehabilitation*, 33(2), 211-227.
- Snowball, J., Ross, K., & Murphy, K. (1994). Illuminating dissertation supervision through reflection. *Journal of Advanced Nursing*, 19(6), 1234-1240.
- Stevens, D., Helseth, C., Khan, M., Munson, B., & Smith, T. (2010). Neonatal intensive care nursery staff perceive enhanced workplace quality with the single-family room design. *Journal of Perinatology*, (30), 352-358.
- Stevens, D.C., Thompson, P. A., Helseth, C.C., Hsu, B., Khan, M. A., Munson, D. P. (2014). A comparison of the direct cost of care in an open-bay and single-family room NICU. *Journal of Perinatology*, 34(11):830-5.
- Stichler, J. F. (2012). The new standard: single family room design. *Journal of Nursing Administration*, 42(10), 447-450.
- Stringer, E. (2007). *Action Research* (3rd ed.). London: Sage.

- Swanson, J. R., Peters, C., & Lee, B. H. (2013). NICU redesign from open ward to private room: a longitudinal study of parent and staff perceptions. *Journal of Perinatology*, (33), 466–469.
- Taylor, B., Kermode, S., & Roberts, K. (2007). *Research in nursing and health care: evidence for practice* (3rd ed.). Australia: Thompson.
- Thomas, L. M. (2008). The changing role of parents in neonatal care: a historical review. *Neonatal Network*, 27(2), 91-100.
- Timmins, F., & McCabe, C. (2005). How to conduct an effective literature search. *Nursing Standard*, 20(11), 41-47.
- Ulrich, R. S. (1984). View through a window may influence recovery from surgery. *Science*, 224(4647), 420-421.
- Walsh, W.F., McCullough, K. L., & White, R.D. (2006). Room for Improvement: Nurse's perceptions of providing care in a single room newborn intensive care. *Advances in Neonatal Care*, 6(5), 261-270.
- Watson, J., Deland, M., Gibbins, S., Macmillan York, E., & Robson, K. (2014). Improvements in Staff Quality of Work Life and Family Satisfaction Following the Move to Single-Family Room NICU Design. *Advances in Neonatal Care*, 14(2), 129-136.
- Wishart, A. A. (2011). *The Price of Life*, [17th October], Four Corners: Sydney, New South Wales channel: Australian Broadcasting Commission.
- White, R. D. (2003). Individual rooms in a NICU- an evolving concept. *Journal of Perinatology*, (23), 22-24.
- White, R. D. (2010). Single-Family Room Design in the Neonatal Intensive Care Unit—Challenges and Opportunities. *Newborn and Infant Nursing Reviews*, 10(2), 83-86.
- White, R. D. (2011). The newborn intensive care unit environment of care: how we got here, where we're headed, and why. *Seminars in Perinatology*, Feb (35), 2-7.

White, R. D. (2014). Development of care in the NICU. *Journal of Perinatology*, 34(3), 174-175.

White, R. D., Smith, J. A., & Shepley, M. M. (2013). Recommended standards for newborn ICU design, eighth edition. *Journal of Perinatology*, 33(S1), 2-16.

Zuber-Skerritt, O., & Perry, C. (2002). Action research within organisations and university thesis writing. *The Learning Organization*, 9(3), 171-179.

Appendices

Appendix A: Examples of Change and Networking Group Newsletter and Poster

CENTRE FOR NEWBORN CARE

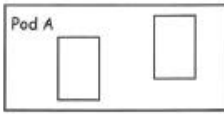
CHANGING ROOMS


NICU Layout and Clinical Space

On January 6th 2010 the CAN Group had organised a staff meeting to discuss the layout and clinical space of the two cot pods in the new NICU. Fortunately that week the NICU was very quiet and the CAN Group were able to use Bay 1 to mark out the area of the new pods. Over the course of the next three days and at the allocated meeting time; staff were able to assess the pod size, shape and consider which layout would be best for babies, families and staff. Staff decided there were 4 pod configurations to consider. The CAN group then put up posters with pictures of the 4 pod layouts for staff to make comment. Staff feedback is discussed below.

POD A with the neonates' cots on opposite walls was overwhelmingly the design of choice.

Pod A





Reasons for Staff 's choice included:

- More usable space in the layout; there seemed to be a lot of dead space in the other designs
- Pod A provided a better working space for staff
- Pod A allowed a better private space for families
- Staff thought pod A would allow more flexible positioning of cots
- It would be easier in pod A to manoeuvre a bed close to an isolette

Factors that staff also believed should be considered in the design included:

- The position of the doors linking the pods should use the space efficiently and not impinge on family privacy.
- Mobile storage units might increase the flexibility of space.
- Lockers that double as storage and a work space would be more efficient.
- Swinging pendulums create a more flexible space, providing more options in the positioning of babies and staff; but as they are very expensive buying these should not impact on the purchase of other important equipment.

Launching into 2010 !

Thursday 6th May 10am - 1pm

Where: L5 PatCH Meeting Room

All Staff are welcome our new NICU needs your Ideas!

At this meeting we will discuss

Final Design Fitting out Patient Rooms

Survey Results Changing Practice

Pizza and Drinks provided!

Volume 1 Issue 5

APRIL 2010

INSIDE THIS ISSUE

Layout & Clinical Space P1

Safe, Functional and Technologically Up-to-Date NICU P2

Change And Networking Group

Lucy Conron

Judith Smith

Susan Arney

Lori Grlj

Melanie Rosin

Alison Moore

Jeni Williams

Marg Broom

Hazel Carlisle

April CAN Update

Safe, Functional, and Technologically up to date NICU!

During February and March the CAN group has been working with staff to find out what is needed to facilitate these factors in the new NICU. Here are the items staff thought were needed to create a fantastic working environment.

SAFE

1. Occupational Health and Safety
 - Positioning of equipment
 - Lighting/Flooring/Storage
 - Visibility/access to staff to double check/ support junior
2. Easy access to protocols/guidelines/emergency equipment
3. Security
 - 24 hour security
 - Monitor/cameras/secure equipment
 - Swipe cards/staff/ to parent areas
 - Emergency buttons
 - Evacuation
4. Training

FUNCTIONAL

1. Set-up/Ergonomic design
 - Review nurses practices to plan where equipment should be located.
 - Design should reduce noise.
 - Adequate amount of equipment and mobile furniture
 - Assist mothers to breast feed and families spend time with their babies
2. Staff Skill Mix/ Mentors & Educators
 - Role of supernumerary staff
 - Assistant to stock & clean
3. Organised/ Coordinated system to access help
 - Staff trained in new roles/ set procedures/ pagers
4. Better and more accessible storage areas
 - Mobile lockers/ and trolleys with stock
 - Parent lockers/swipe card and key

TECHNOLOGY

1. Computer for each pod/ staff member
Paper free/ Screen size/lighting
2. Access to X-rays in each pod
3. Pharmacy and impress system
4. Pagers/ Swipe cards/intercoms/ Phone (Hands free)
5. Photos/email

Which System is best?

The CAN Group, NICU Staff and the user group all thought the swinging pendant would work best in intensive care. Everyone is still considering if the Gemini system or a horizontal wall mount with a shelf above similar to what is in the unit now would be best for Special Care. We will make the final decision for this on May 6th, please come along and give us your ideas.

Report Back to User Group

The CAN Group reported all this information back to the user group, the members of the user group were very excited about all great work the NICU staff are involved in. They suggested we also review:

1. Flooring to reduce long term injuries and noise
2. Storage that is mobile, easy to clean, and tagging equipment



Swinging Pendant

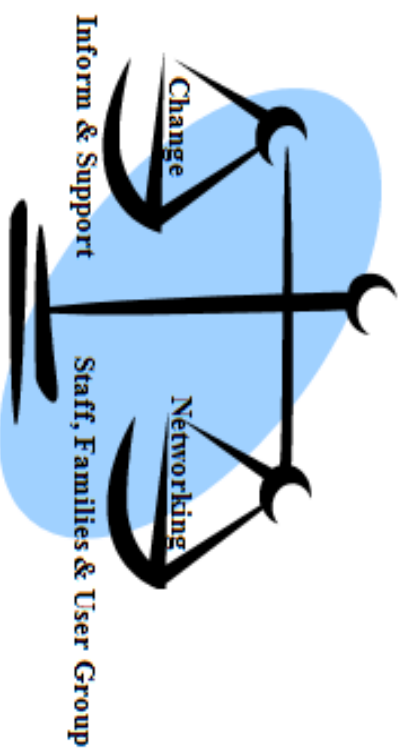
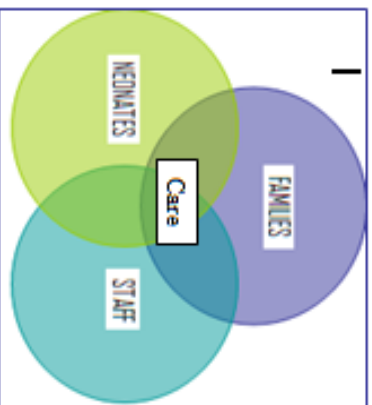


Gemini



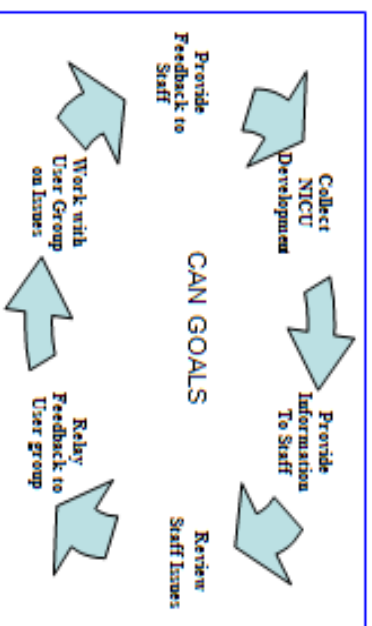
Shelf and Wall mount

Change **CAN** Networking Group



Who you can talk to!

- Susan Arney
- Melanie Rosin
- Allison Moore
- Jeni Williams
- Marg Broom
- Hazel Carlisle
- Carolyn Bartholomew
- Zsuzsoka Keeskes
- Lori Grj



What you can do!

- Read the Newsletter/Noticeboard/Article Folder
- Write ideas/ suggestions/ comments in Redevelopment Book
- Investigate Information about Model of Care/ Design Plan on the Intranet
- Attend Information Sessions

Appendix B: Australian Catholic University Ethics Committee Approval

ACU Ethics Extension 2012

> Dear Sue and Margaret,
>
> Q2011 40
> Facilitating Change during a Neonatal Intensive Care Redevelopment Project:
> Using a Participatory Action Research Approach. (Facilitating Change
> during a Neonatal Intensive Care Redevelopment Project)
>
> Thank you for returning the Ethics Progress Report for your project Q2011
> 40 Facilitating Change during a Neonatal Intensive Care Redevelopment
> Project: Using a Participatory Action Research Approach. (Facilitating
> Change during a Neonatal Intensive Care Redevelopment Project)
>
> The Deputy Chair of the Human Research Ethics Committee has approved your
> request to extend the period of data collection. The new expiry date for
> data collection is the .
>
> We wish you well in this ongoing project.
>
> Kind regards,
> Kylie Pashley
>
> Ethics Officer | Research Services
> Office of the Deputy Vice Chancellor (Research)
> Australian Catholic University
> PO Box 456, Virginia, QLD, 4014
> T: 07 3623 7429 F: 07 3623 7328
>
> THIS IS AN AUTOMATICALLY GENERATED RESEARCHMASTER EMAIL
>
>

From: Kylie Pashley <Kylie.Pashley@acu.edu.au>
Sent: Monday, 25 November 2013 2:52 PM
To: Prof Sue Kildea; Margaret Broom
Cc: Kylie Pashley
Subject: Q,2011 40 Final Report Approved

Dear Susan Verlie,

We wish you well in future research projects.

Kind regards,
Kylie Pashley

Ethics Officer | Research Services
Office of the Deputy Vice Chancellor (Research)
Australian Catholic University
PO Box 456, Virginia, QLD, 4014
T: 07 3623 7429 F: 07 3623 7328

Subject: Re: 2013 188Q (ETHLR.11.046) Modification

To: Prof Anne Gardner; Margaret Broom
Cc: Ms Kylie Pashley
Subject: 2013 188Q (ETHLR.11.046) Modification

Dear Margaret,

Ethics Register Number : 2013 188Q
Project Title : Facilitating Change in a Neonatal Intensive Care
Redevelopment
(A Participatory Action Research Project)
End Date : 30/04/2017

Thank you for submitting the request to modify form for the above project.

The Chair of the Human Research Ethics Committee has noted the
modifications reviewed and approved by ACT Health HREC:

1. Extension to 30/04/2017
2. Change to Principal Supervisor.
3. Amend ACU recorded title to accurately reflect ACT Health HREC records.

We wish you well in this ongoing research project.

Kind regards,
Ms Kylie Pashley

Ethics Officer | Research Services
Office of the Deputy Vice Chancellor (Research)
Australian Catholic University
PO Box 456, Virginia, QLD, 4014
T: 07 3623 7429 F: 07 3623 7328

Broom, Margaret (Health)

From: Kylie Pashley [Kylie.Pashley@acu.edu.au] on behalf of Res Ethics [Res.Ethics@acu.edu.au]
Sent: Thursday, 11 July 2013 14:25
To: Sue Kildea; Broom, Margaret
Subject: 2013 188Q Registration of External Ethics Approval

Dear Sue and Margaret,

Principal Investigator: Prof Sue Kildea
Student Researcher: Ms Margaret Broom
Ethics Register Number: 2013 188Q
Project Title: Facilitating Change and Evaluating Impact During a Neonatal Intensive Care Redevelopment
Risk Level: Multi Site Date Approved: 11/07/2013 Ethics Clearance End Date: 17/07/2015

The ACU HREC has considered your application for ethics approval 2013 188Q Facilitating Change and Evaluating Impact During a Neonatal Intensive Care Redevelopment.

As this application already has ethics approval from ACT Health Human Ethics Committee (ACTH-HREC) 11.046 and 12.086, ACU HREC accepts the approval with no additional requirements, save that ACU HREC is informed of any modifications of the research proposal and that copies of all progress reports and any other documents be forwarded to it. Any complaints involving ACU staff must also be notified to ACU HREC (National Statement 5.3.3)

We wish you well in this research project.

Regards,

Kylie Pashley
Ethics Officer | Research Services
Office of the Deputy Vice Chancellor (Research) res.ethics@acu.edu.au

Appendix C: Change and Networking Group

ACTH-HEC approvals, Information and Consent Forms



ACT Health Human Research Ethics Committee

Level 6 Building 10, The ACT Health Research Office, Canberra Hospital ACT 2605

PO Box 11 Woden ACT 2606

Phone: 02 6205 0846 Fax: 02 62443092

Website: www.health.act.gov.au

ABN: 82 049 056 234

Ms Margaret Broom
Department of Neonatology
Building 11 Level 3
Canberra Hospital
Garran ACT 2605

Dear Ms Broom,

Re: ETHLR.11.046

The ACT Health Human Research Ethics Committee's Low Risk Sub-Committee received notification of the proposed study:

Facilitating change in a neonatal intensive care redevelopment: a participatory action research project at its meeting of 6 April 2011.

I am pleased to inform you that your application has been approved.

The Sub-Committee agreed that the application is for low risk research and determined that the research meets the requirements of the National Statement on Ethical Conduct in Human Research and is ethically acceptable.

I attach for your records an Outcome of Consideration of Protocol form.

I confirm that the ACT Health Human Research Ethics Committee is constituted according to the National Health and Medical Research Council Guidelines and operates in compliance with applicable regulatory requirements and the International Conference on Harmonization Guidelines on Good Clinical Practice.

Yours sincerely

A handwritten signature in black ink that reads 'John Biggs'.

Professor John SG Biggs MA MD
FRCOG FRANZCOG DHMSA
Chairman
ACT Health Human Research Ethics Committee

8 April 2011



ACT Health
Human Research Ethics Committee
Low Risk Sub-Committee

Ms Margaret Broom
Research Nurse
Neonatal Department
Building 11, Level 2
The Canberra Hospital
Garran ACT 2605

Dear Ms Broom

ETHLR.11.046

Facilitating change in a neonatal intensive care redevelopment: a participatory action research project

Thank you for your Project Progress Report for the above study dated 4 June 2015.

The Committee noted the report at its meeting of 14 July 2015.

This information is now recorded on the study file.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Geoff Farrell'.

Professor Geoff Farrell
A/g Chair
ACT Health Human Research Ethics Committee
Low Risk Sub-Committee

14 July 2015



ACT Health
Human Research Ethics Committee
Low Risk Sub-Committee

Ms Margaret Broom
Neonatal Department
Women's and Children's Hospital
Building 11, Level 2
The Canberra Hospital
Garran ACT 2605

Dear Ms Broom

ETHLR.11.046

Thank you for your letter dated 4 June 2014, providing a progress report and extension request for:

Facilitating change in a neonatal intensive care redevelopment: a participatory action research project

At its meeting of 25 June 2014, the Committee noted the report and approved an extension of the study for three (3) years to April 2017.

The approval has been recorded on the Committee's files.

Yours sincerely

A handwritten signature in blue ink that reads 'Louise Morauta'.

Louise Morauta PSM PhD
Chair
ACT Health Human Research Ethics Committee
Low Risk Sub Committee

9 July 2014

Information Sheet

Facilitating Change during a Neonatal Intensive Care Redevelopment Project: Using a Participatory Action Research Approach

Purpose

To seek your assist in collecting information about how to inform and support staff during a redevelopment.

Background

During the redevelopment of the Neonatal Intensive Care Unit (NICU) you have been a member of the Neonatal Intensive Care's Change and Networking (CAN) Group. The CAN group has been meeting for 2 years with the aim to provide a forum for discussion relating to the design and building of the new W&CH, including models of care, to network between the Neonatal User Group and Neonatal staff of the Neonatal Department, to ensure all intercepting stakeholder groups, and co-dependencies of those groups, are considered, to learn about, facilitate and implement models of change within the Department, and to support staff through the transition into the new W&CH building

I am currently enrolled in a Masters of Nursing Research at the Australian Catholic University (Brisbane, Queensland). The aim of my masters is to utilise participatory action research (PAR) methodology to successfully achieve the changes required to prepare nurses for the transition from an open plan NICU design to two cot pods.

I want to collect information from CAN Group minutes and field notes as part of my thesis. I will be gathering information about ways the CAN Group has informed and supported staff during the redevelopment. This project will in no way change the way the CAN Group operates or the work of the group, as the project is all about assisting the group to function and documenting the results of the CAN group.

All CAN Group information used will be de-identified during collation of the work, no names or personal details will be recorded. The results will be discussed thematically maintaining group members' privacy and anonymity. CAN Group members will be given the opportunity to review the results before they are released. Data will be stored in a locked filing cabinet within the Department of Neonatology; transcribed data will be kept on a password secured computer, only accessible by the researcher and supervisor and kept for 15 years.

Thank you for your support

If you have any questions please feel free to ask me or one of my supervisors listed below

| | | |
|---|---|--------------------------------|
| Margaret Broom | Associate Professor Zsuzsoka Kecskes | Professor Sue Kildea |
| Dept. of Neonatology Canberra Hospital | Dept. of Neonatology Canberra Hospital | Mater Health Services Brisbane |
| 02 62443111 | 02 6244 4056 | 07 31636388 |
| Margaret.broom@act.gov.au | zsuzsoka.kecsek@act.gov.au | Sue.kildea@acu.edu.au |

If you have any concerns or issues about the way in which this study has been carried out and you do not feel comfortable communicating with the staff conducting this study, please contact:

The Health Research Office, Building 10, Level 6 Canberra Hospital,
Telephone (02) 6244 4043



Centre for Newborn Care

Yamba Drive, Garran ACT 2605
PO Box 11 Woden ACT 2608
Phone: (02) 6244 4056 Fax: (02) 6244 3112
Website: www.health.act.gov.au
ABN: 82 049 056 234

Consent Form

Project Title: "Facilitating Change during a Neonatal Intensive Care Redevelopment Project: Using a Participatory Action Research Approach."

I _____ am a member of the CAN Group at the Canberra Neonatal Intensive Care Unit.

I have been contributing to CAN Group's work regarding the redevelopment of the neonatal unit. During CAN Group meetings Margaret Broom has provided the group with information about PAR Methodology and her thesis.

Margaret Broom has explained to me that she would like to use the minutes and field notes related to the CAN Group for her Masters of Nursing Research thesis.

She has also explained how the data will be de-identified during collation and written up thematically to protect the confidentiality and anonymity of group members. As a group member I will also have the opportunity to review the study results before they are released.

I am also aware I am free to withdraw from the project at any time.

The ACT Health Human Research Ethics Committee has approved this study.

Should I have any problems or queries about the way in which the study is conducted, and I do not feel comfortable contacting the research staff, I am aware that I can discuss any concerns with the ACT Health Human Research Ethics Committee 02 62050846.

I understand that if I have any complaints or concerns about this research I can contact:

ACT Health Human Research Ethics Committee

Building 10, Level 6 Canberra Hospital

Phone: (02) 62050846

Signed by: _____

Date: _____

You may also contact any of the researchers below:

| | |
|---|---|
| Marg Broom Research Nurse Centre for Newborn Care Ph. 62443111 | Dr Zsuzsoka Kecskes Associate Professor/ Clinical Director Centre for Newborn Care 6244 4056 |
|---|---|

Appendix D: Staff Surveys

ACTH-HEC approvals, Pre and Post move surveys



ACT Government Health Directorate
Survey Resource and Approval Sub-Committee

Ms Margaret Broom
Neonatology Department
Building 11 Level 3
Canberra Hospital
Garran ACT 2605

RE: ETHLR.11.159

Dear Ms Broom,

The ACT Health Human Research Ethics Committee's Survey Resource and Approval Sub-Committee received notification of the proposed:

NICU Staff and Parent Pre Move Surveys at its meeting of 20 July 2011.

I am pleased to inform you that your application has been approved out of session.

The Sub-Committee agreed that the application of for low risk survey based study and determined that it meets the requirements of exiting departmental policies governing survey proposals.

Please notify the Committee of any changes you make to your survey during the course of this study.

Approval is current for three years from the date of this letter.

On behalf the Committee, I wish you all the best with your study.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Zsuzsoka Kecskes'.

Associate Professor Zsuzsoka Kecskes Dr med FRACP PhD
Chair
Survey Resource and Approval Sub-Committee

2 August 2011



ACT Government Health Directorate
Human Research Ethics Committee

Ms Margaret Broom
Research Nurse
Neonatal Department
Building 12, Level 3
The Canberra Hospital
Garran ACT 2605

Dear Ms Broom,

ETHLR.11.046

Thank you for your Letter February 2012 requesting an amendment to the previously approved project:

Facilitating change in a neonatal intensive care redevelopment: a participatory action research project

At its meeting of 7 March 2012, the Committee approved the following:

- Survey Amendment – dated February 2012

The approval has been recorded on the Committee's files.

Yours sincerely

A handwritten signature in cursive script that reads 'John Biggs'.

Professor John SG Biggs MA MD
FRCOG FRANZCOG DHMSA
Chairman
ACT Health Human Research Ethics Committee
Low Risk Sub Committee

18 April 2012

NICU Staff Pre-move Survey

Dear Staff Member,

In 2012 the Canberra Centre for Newborn Care (CNC) will move from the current open planned unit to a new Neonatal Intensive Care Unit (NICU) that will have two babies in each room. As we prepare to move into the new NICU we are keen to survey staff about the current open planned NICU and the Change and Networking Group (CAN) that was formed to inform and support staff during the redevelopment. The information gained will form a baseline to compare the current and future NICU designs.

The purpose of this survey is to:

1. assess the physical aspects and impact of the current open planned NICU; and
2. evaluate the effectiveness of the CAN group in informing and supporting staff throughout the development.

All staff currently employed in the NICU between October and December 2011 are invited and encouraged to participate in the survey. The survey is short and should only require 20 minutes of your time.

Participants are asked to:


- complete the attached survey
- place the survey in the box provided in the Handover Room in the CNC.

Survey Information:

- the survey is completely voluntary
- the surveys will be collected from the box provided during October and December 2011 while the survey is in progress
- the survey is anonymous
- all data collected will be identified and grouped for analysis
- the completed surveys will be accessible only to the Research team and
- completed surveys will be filed in a locked filing cabinet and kept for a period of 7 years.


If you have any problems or queries about the way in which this survey has been carried out and you do not feel comfortable communicating with the staff conducting this survey please contact:

ACT Health – Human Research Ethics Committee,
ACT Health Research Office, Building 10, Level 6,
Canberra Hospital, Yamba Drive, Garran Canberra 2605,
Telephone (02) 6205 0846.



ACT Health

**Endorsed by
The ACT Health
Survey Approval
Sub-Committee**

Signed: 
Date 4/8/11

You may also contact any of the researchers below:

| | |
|---|---|
| <p>Marg Broom Research Nurse Centre for Newborn Care Ph. 62443111</p> | <p>Associate Professor Zsuzsoka Kecskes Clinical Director Centre for Newborn Care 6244 4056</p> |
|---|---|

NICU Staff Pre-move Survey

For the following questions please circle your answer on a scale from 1 to 5
1 = Strongly Disagree; 2 = Disagree; 3 = Not Sure; 4 = Agree; 5 = Strongly Agree

| SECTION 1: CURRENT OPEN PLANNED NICU | | | | | | |
|--------------------------------------|---|-------------------|----------|----------|-------|----------------|
| | | Strongly Disagree | Disagree | Not Sure | Agree | Strongly Agree |
| 1 | The noise level in the NICU disturbs the neonates | 1 | 2 | 3 | 4 | 5 |
| 2 | The NICU allows lighting to be altered individually to cater for each neonate | 1 | 2 | 3 | 4 | 5 |
| 3 | Foot traffic around the neonatal cots in the NICU is a problem | 1 | 2 | 3 | 4 | 5 |
| 4 | The equipment and supplies I need to do my job well are readily available | 1 | 2 | 3 | 4 | 5 |
| 5 | The NICU provides a safe and secure environment for staff | 1 | 2 | 3 | 4 | 5 |
| 6 | The NICU provides adequate space to allow privacy for staff | 1 | 2 | 3 | 4 | 5 |

For the following questions please circle your answer on a scale from 1 to 5
1 = Strongly Disagree; 2 = Disagree; 3 = Not Sure; 4 = Agree; 5 = Strongly Agree

| SECTION 2: DELIVERY OF CARE IN AN OPEN PLANNED ENVIRONMENT | | | | | | |
|--|---|-------------------|----------|----------|-------|----------------|
| | | Strongly Disagree | Disagree | Not Sure | Agree | Strongly Agree |
| 7 | I am able to provide individual developmental care for neonates in the current NICU | 1 | 2 | 3 | 4 | 5 |
| 8 | I am able to care for neonates independently without interruption in the current NICU | 1 | 2 | 3 | 4 | 5 |
| 9 | I am able to get medical help when a neonate needs emergency care | 1 | 2 | 3 | 4 | 5 |
| 10 | Experienced staff are available to assist me with difficult or unfamiliar procedures | 1 | 2 | 3 | 4 | 5 |
| 11 | I am able to learn new skills and knowledge in the NICU | 1 | 2 | 3 | 4 | 5 |

Endorsed by
The ACT Health
Survey Approval
Sub-Committee
Signed: [Signature]
Date 4/8/11

NICU Staff Pre-move Survey

For the following questions please circle your answer on a scale from 1 to 5

1 = Strongly Disagree; 2 = Disagree; 3 = Not Sure; 4 = Agree; 5 = Strongly Agree

| SECTION 3: COMMUNICATION IN THE CURRENT OPEN PLANNED NICU | | | | | | |
|---|--|-------------------|----------|----------|-------|----------------|
| | | Strongly Disagree | Disagree | Not Sure | Agree | Strongly Agree |
| 12 | The NICU environment provides for effective communication between staff members | 1 | 2 | 3 | 4 | 5 |
| 13 | The NICU environment supports effective communication between staff and families | 1 | 2 | 3 | 4 | 5 |
| 14 | I am able to communicate effectively with families in the current NICU | 1 | 2 | 3 | 4 | 5 |
| 15 | I am able to maintain patient confidentiality in the NICU | 1 | 2 | 3 | 4 | 5 |
| 16 | The NICU layout supports families to communicate with each other | 1 | 2 | 3 | 4 | 5 |

For the following questions please circle your answer on a scale from 1 to 5
1 = Strongly Disagree; 2 = Disagree; 3 = Not Sure; 4 = Agree; 5 = Strongly Agree

| SECTION 4: PARENTAL INVOLVEMENT IN AN OPEN PLANNED ENVIRONMENT | | | | | | |
|--|---|-------------------|----------|----------|-------|----------------|
| | | Strongly Disagree | Disagree | Not Sure | Agree | Strongly Agree |
| 17 | I am able to involve parents in the care of their baby while in the NICU | 1 | 2 | 3 | 4 | 5 |
| 18 | The NICU environment allows parents to discuss their baby's condition and medical procedures with staff | 1 | 2 | 3 | 4 | 5 |
| 19 | I am able to organise baby's cares at times that are best for the family | 1 | 2 | 3 | 4 | 5 |
| 10 | The NICU environment enables families to spend quality time with their babies | 1 | 2 | 3 | 4 | 5 |
| 21 | Parents leave the NICU adequately prepared to care for their baby after discharge | 1 | 2 | 3 | 4 | 5 |

NICU Staff Pre-move Survey

For the following questions, please circle your answer on a scale from 1 to 5
1 = Strongly Disagree; 2 = Disagree; 3 = Not Sure; 4 = Agree; 5 = Strongly Agree

SECTION 5: FACILITATING CHANGE DURING THE REDEVELOPMENT

| | | Strongly Disagree | Disagree | Not Sure | Agree | Strongly Agree |
|----|---|-------------------|----------|----------|-------|----------------|
| 22 | The CAN Group has provided staff with education and updates on the new NICU | 1 | 2 | 3 | 4 | 5 |
| 23 | I have been able to openly and honestly communicate my ideas and concerns about the new NICU | 1 | 2 | 3 | 4 | 5 |
| 24 | I have been included and involved in the changes needed to transition to the new NICU | 1 | 2 | 3 | 4 | 5 |
| 25 | I have been well supported by the CAN group as the redevelopment has progressed | 1 | 2 | 3 | 4 | 5 |
| 26 | The CAN group has facilitated a collaborative approach while working towards the move to the new NICU | 1 | 2 | 3 | 4 | 5 |
| 27 | The CAN Group has facilitated an effective change process to engage staff in the transition to the new NICU | 1 | 2 | 3 | 4 | 5 |

SECTION 4: STRATEGIES IMPLEMENTED BY THE CAN GROUP

The most effective strategies implemented by the CAN group to inform and support staff are:

28. Please rate the strategies in order of preference 1- 6 with 1 as the most effective.

- _____ Workshops
- _____ Meetings
- _____ Newsletter
- _____ One on one information from CAN group members
- _____ Noticeboard
- _____ Communication Book



Centre for Newborn Care

Yamba Drive, Garran ACT 2605
PO Box 11 Woden ACT 2606
Phone: (02) 6244 4056 Fax: (02) 6244 3112

NICU Staff Pre-move Survey

Please write what you think the CAN group should focus on in the six months before we move to assist:

29. You as an individual

a. _____

b. _____

30. The NICU staff as a team

a. _____

b. _____

We would like your comments and feedback about the questions.

Please place the survey in the box provided in the Handover Room in the NICU. Thank you for completing the survey.



ACT Health
Human Research Ethics Committee
Low Risk Sub-Committee

Ms Margaret Broom
Research Nurse
Neonatal Department
Building 11, Level 2
The Canberra Hospital
Garran ACT 2605

Dear Ms Broom,

Re: ETHLR.11.046

Thank you for your recent letter, providing updated information for:

Facilitating change in a neonatal intensive care redevelopment: a participatory action research project

At its meeting of 25 June 2014, and following further correspondence, the Committee noted:

- Updated parent and staff information sheet
- Amended staff survey
- Amended parent survey

This information is now recorded on the Committee's files

Yours sincerely,

A handwritten signature in cursive script that reads 'Louise Morauta'.

Louise Morauta PSM PhD
Chair
ACT Health Human Research Ethics Committee
Low Risk Sub Committee

9 July 2014



Neonatal Intensive Care Unit
 Yamba Drive, Garran ACT 2605
 PO Box 11 Woden ACT 2606
 Phone: (02) 6174 7570

NICU Staff post-move Survey 2014

Dear Staff Member,

In 2012 the Neonatal Intensive Care Unit moved from an open plan to a two cot design and prior to relocating we surveyed staff members on the open plan design. To assist us in comparing the two units we would like to invite you to complete the same survey on the two cot design of the current Neonatal Intensive Care Unit.

Why are we doing this survey?

The purpose of this survey is to collect data to compare the physical aspects of the previous and current environments and their impact on communication, delivery of care and, parental involvement.

What you need to do to participate

- Complete the attached survey; which should only require 20 minutes of your time.
- Place it in one of the boxes provided at the staff workstations in NICU and SCN.

What will happen to the information?

- Completed surveys will kept in a locked filing cabinet for a period of 7 years; the data will only be accessible to the research team.
- All data collected will be de-identified prior to being analysed.
- A report on the study's results will be given to the NICU/SCN Management Group.
- We will be submitting an article to a peer reviewed journal.

If you have any concerns

- The survey is voluntary and you can withdraw from the study at any time.
- If you have any problems or queries about the way in which this survey has been carried out and you do not feel comfortable communicating with the staff conducting this survey please contact:

ACT Health – Human Research Ethics Committee,
 ACT Health Research Office, Building 10, Level 6,
 Canberra Hospital, Yamba Drive, Garran Canberra 2605,
 Telephone 02 6174 7968 or via acthealth-hrec@act.gov.au

If you have any questions or concerns please contact one of the researchers below:

| | |
|---|--|
| Marg Broom Research Nurse Neonatal Intensive Care Unit Ph. 6174 7570 | Associate Professor Zsuzsoka Kecskes Clinical Director Neonatal Intensive Care Unit 6174 7565 |
|---|--|

Canberra Hospital is a teaching hospital of the Australian National University (ANU) Medical School

Page 1 of 7

NICU Staff Post-move Survey

Please answer the following questions by circling the number that best represents your opinion.

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Not Sure
- 4 = Agree
- 5 = Strongly Agree

| SECTION 1: Physical aspects of the Two Cot NICU/SCN | | | | | | |
|---|---|-------------------|----------|----------|-------|----------------|
| | | Strongly Disagree | Disagree | Not Sure | Agree | Strongly Agree |
| 1 | The noise level in the NICU disturbs the neonates | 1 | 2 | 3 | 4 | 5 |
| 2 | The NICU allows lighting to be altered individually to cater for each neonate | 1 | 2 | 3 | 4 | 5 |
| 3 | Foot traffic around the neonatal cots in the NICU is a problem | 1 | 2 | 3 | 4 | 5 |
| 4 | The equipment and supplies I need to do my job well are readily available | 1 | 2 | 3 | 4 | 5 |
| 5 | The NICU provides a safe and secure environment for staff | 1 | 2 | 3 | 4 | 5 |
| 6 | The NICU provides adequate space to allow privacy for staff | 1 | 2 | 3 | 4 | 5 |

Comments

NICU Staff Post-move Survey

Please answer the following questions by circling the number that best represents your opinion.

- 1 = Strongly disagree
- 2 = Disagree
- 3 = Not Sure
- 4 = Agree
- 5 = Strongly Agree

| SECTION 2: Delivery of Care in the Two Cot NICU/SCN | | | | | | |
|---|--|-------------------|----------|----------|-------|----------------|
| | | Strongly Disagree | Disagree | Not Sure | Agree | Strongly Agree |
| 7 | I am able to provide individual developmental care for neonates in the two cot NICU | 1 | 2 | 3 | 4 | 5 |
| 8 | I am able to care for neonates independently without interruption in the two cot NICU | 1 | 2 | 3 | 4 | 5 |
| 9 | I am able to get medical help when a neonate needs emergency care in the two cot NICU | 1 | 2 | 3 | 4 | 5 |
| 10 | Experienced staff are available to assist me with difficult or unfamiliar procedures in the two cot NICU | 1 | 2 | 3 | 4 | 5 |
| 11 | I am able to learn new skills and knowledge in the in the two cot NICU | 1 | 2 | 3 | 4 | 5 |

Comments

NICU Staff Post-move Survey

Please answer the following questions by circling the number that best represents your opinion.

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Not Sure
- 4 = Agree
- 5 = Strongly Agree

| SECTION 3: Communication in the Two Cot NICU/SCN | | | | | | |
|--|--|-------------------|----------|----------|-------|----------------|
| | | Strongly Disagree | Disagree | Not Sure | Agree | Strongly Agree |
| 12 | The NICU environment provides for effective communication between staff members | 1 | 2 | 3 | 4 | 5 |
| 13 | The NICU environment supports effective communication between staff and families | 1 | 2 | 3 | 4 | 5 |
| 14 | I am able to communicate effectively with families in the two cot NICU | 1 | 2 | 3 | 4 | 5 |
| 15 | I am able to maintain patient confidentiality in the two cot NICU | 1 | 2 | 3 | 4 | 5 |
| 16 | The two cot layout supports families in communicating with each other | 1 | 2 | 3 | 4 | 5 |

Comments

NICU Staff Post-move Survey

Please answer the following questions by circling the number that best represents your opinion.

1 = Strongly Disagree

2 = Disagree

3 = Not Sure

4 = Agree

5 = Strongly Agree

| SECTION 4: Parent Involvement the Two Cot NICU/SCN | | | | | | |
|--|---|-------------------|----------|----------|-------|----------------|
| | | Strongly Disagree | Disagree | Not Sure | Agree | Strongly Agree |
| 17 | I am able to involve parents in the care of their baby the two cot NICU | 1 | 2 | 3 | 4 | 5 |
| 18 | The NICU environment allows parents to discuss their baby's condition and medical procedures with staff | 1 | 2 | 3 | 4 | 5 |
| 19 | I am able to organise baby's cares at times that are best for the family the two cot NICU | 1 | 2 | 3 | 4 | 5 |
| 10 | The NICU environment enables families to spend quality time with their babies | 1 | 2 | 3 | 4 | 5 |
| 21 | Parents leave the NICU adequately prepared to care for their baby after discharge | 1 | 2 | 3 | 4 | 5 |

Comments

NICU Staff Post-move Survey

Please answer the following questions by circling the number that best represents your opinion.

1 = Strongly disagree

2 = Disagree

3 = Not Sure

4 = Agree

5 = Strongly Agree

SECTION 5: Educating and Supporting Staff in the Two Cot NICU/SCN

| | | Strongly Disagree | Disagree | Not Sure | Agree | Strongly Agree |
|----|--|-------------------|----------|----------|-------|----------------|
| 23 | I have been able to openly and honestly communicate my ideas and concerns about the two cot NICU | 1 | 2 | 3 | 4 | 5 |
| 24 | I have been included and involved in the changes needed to transition to the two cot NICU | 1 | 2 | 3 | 4 | 5 |
| 25 | I have received education on the new equipment in the two cot NICU | 1 | 2 | 3 | 4 | 5 |
| 26 | I have received education on emergency procedures relating to the two cot NICU | 1 | 2 | 3 | 4 | 5 |
| 26 | I have been well supported during the transition to the two cot NICU | 1 | 2 | 3 | 4 | 5 |

Comments

NICU Staff Post-move Survey

27. Did you work in the open plan unit prior to the move?

| | |
|-----|----|
| Yes | No |
|-----|----|

We would appreciate your feedback on the two cot design

Thank you for completing the survey! Please place the completed survey in one of the boxes provided at the NICU and SCN staff stations.

Appendix E: Walking Distance and Behaviour Mapping

ACTH-HEC approval, Information and Consent Forms



ACT Government Health Directorate
Human Research Ethics Committee
Low Risk Sub-Committee

Ms Margaret Broom
Neonatology Department
Building 12, Level 3
Canberra Hospital
Garran ACT 2605

Dear Ms Broom

Re: **ETHLR.12.086**

The ACT Health Directorate Human Research Ethics Committee's Low Risk Sub-Committee received notification of the proposed study:

Snapshot of the Current and Future NICU Designs impact on workflow and practice at its meeting of 18 April 2012

I am pleased to inform you that, following further correspondence, your application has been approved.

The Sub-Committee agreed that the application is for low risk research and determined that the research meets the requirements of the National Statement on Ethical Conduct in Human Research and is ethically acceptable.

I attach for your records an Outcome of Consideration of Protocol form.

I confirm that the ACT Health Human Research Ethics Committee is constituted according to the National Health and Medical Research Council Guidelines and operates in compliance with applicable regulatory requirements and the International Conference on Harmonization Guidelines on Good Clinical Practice.

Yours sincerely

A handwritten signature in black ink that reads 'John Biggs'.

Professor John SG Biggs MA MD
FRCOG FRANZCOG DHMSA
Chairman
ACT Health Human Research Ethics Committee
Low Risk Sub Committee

30 May 2012



ACT Health
Human Research Ethics Committee
Low Risk Sub-Committee

Ms Margaret Broom
Neonatal Department
Women's and Children's Hospital
Building 11, Level 2
Canberra Hospital
Garran ACT 2605

Dear Ms Broom

ETHLR.12.086

Snapshot of the Current and Future NICU Designs impact on workflow and practice

Thank you for your Project Progress Report for the above study dated 4 June 2014.

The Committee noted the report at its meeting of 25 June 2014.

This information is now recorded on the study file.

Yours sincerely

A handwritten signature in cursive script, appearing to read 'August Marchesi'.

August Marchesi
Manager
Research Ethics and Governance

25 June 2014



ACT Health
Human Research Ethics Committee
Low Risk Sub-Committee

Ms Margaret Broom
Neonatal Department
Women's and Children's Hospital
Building 11, Level 2
The Canberra Hospital
Garran ACT 2605

Dear Ms Broom

ETHLR.12.086

Thank you for your letter dated 4 June 2015, providing a progress report and extension request for:

Snapshot of the Current and Future NICU Designs impact on workflow and practice

At its meeting of 14 July 2015, the Committee noted the report and approved an extension of the study for two (2) years to May 2017.

The approval has been recorded on the Committee's files.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Geoff Farrell'.

Professor Geoff Farrell
A/g Chair
ACT Health Human Research Ethics Committee
Low Risk Sub-Committee

14 July 2015



Centre for Newborn Care
Yamba Drive, Garran ACT 2605
PO Box 11 Woden ACT 2606
Phone: (02) 6244 4056
Fax: (02) 6244 3112
Website: www.health.act.gov.au
ABN: 82 049 056 234

Information Sheet

Snapshot of the Current and Future NICU Designs impact on workflow and practice Total distance staff walk in a shift

Background

In June 2012 the Canberra NICU will relocate to the new Women and Children's Hospital. The NICU design will change from the current open plan design, housing 24 cots divided into four bays, to a new design of 34 cots in two bed rooms divided into two wings: Intensive Care/High Dependency (20 cots) and Special Care (14 cots).

The Canberra NICU re-development has afforded the NICU with an opportunity to add to the body of knowledge regarding the impact of SRD on workflow and practice. This study has therefore been designed to compare the impact of the change in design in the Canberra NICU.

Invitation to Participate

The study team would like to invite you to participate in a project to compare the distance staff walk in the current NICU with the new NICU we will move into in June 2012. This project is completely voluntary

Study Method

Staff volunteers will be randomly allocated a pedometer to measure how far they walk during a shift. At the start of their shift the participant will be given a pedometer by the study team. A member of the study team will collect from you once the shift is completed. Together you and the research team member will check the distance recorded on the pedometer. Distance walked on the pedometer will be checked with the volunteer and the research team member collecting the pedometer. The distance will be recorded on a worksheet and both parties will sign to show agreement. Distance measured will be transcribed onto an Excel spread sheet.

All data will be de-identified during collation to protect the confidentiality and anonymity of all participants. Volunteers are free to withdraw from the project at any time.

Thank you for your support

If you have any questions you may contact any of the researchers below.

Dr Zsuzsoka Kecskes
Associate Professor/ Clinical Director
Centre for Newborn Care
6244 4056

Margaret Broom
Research Nurse
Centre for Newborn Care
Ph. 62443111



Neonatal Intensive Care Unit
Yamba Drive, Garran ACT 2605
PO Box 11 Woden ACT 2606
Phone: (02) 6244 4056
Fax: (02) 6244 3112

Staff Information Sheet

Impact of Neonatal Intensive Care Unit (NICU) design on workflow and practice Total distance staff walk in a shift

Background

In August 2012 the Canberra NICU relocated to the new Women and Children's Hospital. The NICU design changed from open plan, housing 24 cots divided into four bays, to the current design of 34 cots in two bed rooms: Intensive Care/High Dependency (20 cots) and Special Care (14 cots). This study aims to compare impact of the change in design on the total distance staff walk in a shift.

Invitation to Participate

The study team would like to invite staff members to participate in this project to compare the total distance staff walk in the current two cot room NICU. This project is completely voluntary

Study Method

Staff volunteers will be randomly allocated a pedometer to measure how far they walk during a shift. At the start of their shift the participant will be given a pedometer by the study team. A member of the study team will collect from you once the shift is completed. Together you and the research team member will check the distance recorded on the pedometer. Distance walked on the pedometer will be checked with the volunteer and the research team member collecting the pedometer. The distance will be recorded on a worksheet and both parties will sign to show agreement. Distance measured will be transcribed onto an Excel spread sheet. All data will be de-identified during collation to protect the confidentiality and anonymity of all participants. Volunteers are free to withdraw from the project at any time.

Thank you for your support

If you have any questions please contact the researchers listed below.

Margaret Broom
Research Nurse
Neonatal Intensive Care Unit
6174 7570

Zsuzsoka Kecskes
Associate Professor
Clinical Director
Neonatal Intensive Care Unit
6174 7565



Centre for Newborn Care
Yamba Drive, Garran ACT 2605
PO Box 11 Woden ACT 2606
Phone: (02) 6244 4056 Fax: (02) 6244 3112
Website: www.health.act.gov.au

Consent Form
Snapshot of the Current and Future NICU Designs impact on workflow and practice:
Total distance staff walk in a shift

Understand the aim of this study is to compare the distance walked by staff in the current Canberra NICU with the new NICU we will move to in June 2012. I also understand this project is completely voluntary .

- I will be allocated a pedometer by the study team at the start of my shift and will return it at the end of my shift.
- The distance will be recorded on a worksheet and both parties will sign to show agreement.
- Research team will then transcribe the distance measured onto an Excel spread sheet

It has been explained that all data will be de-identified during collation to protect the confidentiality and anonymity of all participants. I am also aware I am free to withdraw from the project at any time.

The ACT Health Human Research Ethics Committee has approved this study.

Should I have any problems or queries about the way in which the study is conducted, and I do not feel comfortable contacting the research staff, I am aware that I can discuss any concerns with the ACT Health Human Research Ethics Committee 02 62050846.

After considering all these points, I accept the invitation to participate in this project

Signed by: _____ Witness _____

Date: _____ Date _____

I understand that if I have any complaints or concerns about this research I can contact:
ACT Health Human Research Ethics Committee Building 10, Level 6 Canberra Hospital
Phone: (02) 62050846

You may also contact any of the researchers below:

| | |
|--|--|
| Margaret Broom Research Nurse Centre for Newborn Care 6244 3111 | Zsuzsoka Kecskes Associate Professor Clinical Director Centre for Newborn Care 6244 4056 |
|--|--|



Neonatal Intensive Care Unit
 Yamba Drive, Garran ACT 2605
 PO Box 11 Woden ACT 2606
 Phone: (02) 61747565 Fax: (02) 6244 3112
 Website: www.health.act.gov.au

Staff Consent Form
Impact of Neonatal Intensive Care Unit (NICU) design on workflow and practice
Total distance staff walk in a shift

Understand the aim of this study is to compare the distance walked by staff in the open plan NICU and the current two cot room NICU. I also understand this project is completely voluntary .

- I will be allocated a pedometer by the study team at the start of my shift and will return it at the end of my shift.
- The distance will be recorded on a worksheet and both parties will sign to show agreement.
- Research team will then transcribe the distance measured onto an Excel spread sheet

It has been explained that all data will be de-identified during collation to protect the confidentiality and anonymity of all participants. I am also aware I am free to withdraw from the project at any time.

The ACT Health Human Research Ethics Committee has approved this study.

Should I have any problems or queries about the way in which the study is conducted, and I do not feel comfortable contacting the research staff, I am aware that I can discuss any concerns with the ACT Health Human Research Ethics Committee 02 62050846.

After considering all these points, I accept the invitation to participate in this project

Signed by: _____ Witness _____

Date: _____ Date _____

You may also contact any of the researchers below:

| | |
|---|---|
| Margaret Broom Research Nurse Neonatal Intensive Care Unit 6174 7570 | Zsuzsoka Kecskes Associate Professor Clinical Director Neonatal Intensive Care Unit 6174 7565 |
|---|---|

Staff Activity Data Sheet

| | | |
|----------------------|--|--|
| Recruit Number | | |
| Bay | | |
| Number of Neonates | | |
| Staff Communication | | |
| Neonatal Care | | |
| Equipment | | |
| Parents | | |
| Procedures | | |
| Charting / Paperwork | | |
| Miscellaneous | | |
| Total | | |

Answering Alarms

| | | |
|-------------------------|--|--|
| Own Alarm | | |
| Other staffs Alarm | | |
| Call for emergency help | | |

Phone Calls

| | | |
|-------------------------|--|--|
| Parents | | |
| Staff/ Pathology/ X ray | | |
| Other | | |

Staff Activity Index

| No | Category | Items |
|----|----------------------|--|
| 1 | Staff Communication | Handover/ Updating Information Rounds Talk to Medical/ Nursing staff Member Allied Health/ Phone call to/ from staff member |
| 2 | Neonatal Care | Checking Lines Cares Feeds/ Preparing Feeds Observations Drugs/ Drug Check Suction Alarms own/other staff |
| 3 | Equipment | Setting Up Taking away Changing Cleaning Restocking |
| 4 | Parents | Conversation Phone call Education/ Update Information Assist with Cares Assist with Feed Assist Parents |
| 5 | Procedures | Admission/ Discharge(Organisation) IVT UVC UAC Blood Gas/ Taking/Sending Bloods Chest Drain |
| 6 | Charting / Paperwork | Paperwork/ Getting/Putting Away Checking/ Charting Results |
| 7 | Miscellaneous | Hand washing/ Pink Rub Staff Breaks/ Toilet Break |



ORIGINAL ARTICLE

How can we help staff transition to a new NICU design?

Margaret Broom, BaN, RN, RM, Neonatal Research Nurse^{a,*},
Anne Gardner, PhD, Professor, Director of Research^b,
Zsuzsoka Kecskes, MD, PhD, Professor, Clinical Director^{c,d},
Sue Kildea, PhD, Professor, Director of Research^e

^a Neonatal Intensive Care Unit, Department of Neonatology, Centenary Hospital for Women and Children, Australian Catholic University, Canberra, Australia

^b School of Nursing, Midwifery and Paramedicine (Signadou Campus), Canberra, Australia

^c Neonatal Intensive Care Unit, Department of Neonatology, Canberra Hospital, Yamba Drive, Garran, ACT, 2606, Australia

^d Australian National University, Canberra, ACT, Australia

^e Midwifery Research Unit, University of Queensland (UQ), School of Nursing and Midwifery and Mater Health Service, Australia

Available online ■ ■ ■

KEYWORDS

Neonatal;
Intensive care;
Hospital design;
Change;
Staff attitudes

Abstract *Background:* Research has highlighted transitioning to the new design may be challenging for staff. To facilitate the transition to a new NICU we have searched literature to find strategies other units have implemented during their transition.

Methodology: Literature was retrieved via electronic and manual searches of MEDLINE, CINAHL, Science Direct and Cochrane databases. A list of keywords directed our search: Intensive Care Units, Neonatal, Hospital Design and Construction, Single Room Design (SRD), Change Management and Staff Attitude to Change.

Results: Seven articles provided detailed outlines of the strategies they implemented during transition to SRD. Our search has also highlighted the limited published work on solving staff issues post transition.

* Corresponding author. Department of Neonatology, Centenary Hospital for Women and Children, PO Box 11, Woden ACT 2606, Australia. Tel: +61 (0)11612 61747570.

E-mail address: Margaret.Broom@act.gov.au (M. Broom).

<http://dx.doi.org/10.1016/j.jnn.2015.05.004>

1355-1841/© 2015 Published by Elsevier Ltd on behalf of Neonatal Nurses Association.

Please cite this article in press as: Broom, M., et al., How can we help staff transition to a new NICU design?, Journal of Neonatal Nursing (2015), <http://dx.doi.org/10.1016/j.jnn.2015.05.004>

Conclusion: This review provides an outline of strategies to facilitate the transition when changing NICU design. Future research that specifically targets the issues highlighted by staff may assist in finding long term solutions for those transitioning to a new NICU design.

© 2015 Published by Elsevier Ltd on behalf of Neonatal Nurses Association.

Introduction

Providing neonates who require hospitalisation a developmentally appropriate environment has become one of the foremost objectives in improving neonatal outcomes (White, 2003). As a consequence many Neonatal Intensive Care Units (NICUs) are in the process of changing their design from open plan (OP) to a single or small room design (SRD) catering for one to six neonates per room (Goldschmidt and Gordin, 2006). Research has shown SRD reduces infection rates, reduces length of hospital stay and facilitates an individualised approach in the care of neonates that improves the family's NICU experience (White, 2003).

While changing NICU design to improve neonatal outcomes is the priority, studies have highlighted that staff will take two years or more to adjust to the change of design and subsequent model of care (Goldschmidt and Gordin, 2006). Nursing staff must not only familiarise themselves with new environment but also adjust to its impact on nursing practice and workflow. In OP environments several staff members work side by side sharing tasks and workload: they are able to assist each other in emergencies, relieve each other for breaks, and discuss their concerns or care plan throughout the shift (Beck et al., 2009). In contrast SRD requires staff to work independently with assistance available at the end of the phone or buzzer, causing many staff to feel insecure in the new design (Shahheidari and Homer, 2012).

A systematic literature review on the impact of NICU design on infants, staff and families concurred with previous research in finding that SRD improves the physical aspects of the environment and short term neonatal outcomes (Shahheidari and Homer, 2012). The same review showed that when considering the impact on staff several issues of concern were raised. Shahheidari and Homer (2012) highlighted staff perceptions of SRD increasing staff walking distances, workload and the number of staff required to provide safe nursing care. Research findings included comment

on the difficulty in communicating effectively, supporting other staff members and in providing ongoing education: major concerns given that these are key aspects of effective nursing in a NICU (Shahheidari and Homer, 2012). The review discussed solutions to the challenges in the new physical environment; such as centralised workspaces, using interactive media such as video or instant messages systems and changing management systems to reduce the size of the functional unit; but there was little discussion on how to assist staff to make the transition and adjust to the new environment (Shahheidari and Homer, 2012).

In 2009 a NICU (large tertiary referral hospital in Australia) started the process of building a new NICU. The concept for the new NICU was for neonates to be cared for in interlinking two cot (TC) rooms; the previous NICU was OP. Whilst the decision to build the new NICU in an TC format had been made, there was little detail on how the move would be accomplished and how nursing practices would change in the new NICU.

Staff were aware that previous research had highlighted the difficulties with the transition from an OP to a TC design and raised similar questions about how the new design would impact on safety of neonates and staff, staffing requirements and staff's ability to provide high quality nursing care in isolation from support (Shahheidari and Homer, 2012). Staff openly discussed the possibility that this new environment would cause them to seriously consider other areas for employment or retirement from the profession completely (Broom et al., 2012). Whilst the need to ensure the new NICU provided a developmental appropriate environment and met building standards was a forgone requirement, leading staff members were also keen to allay staff concerns and provide effective support to staff negotiating the transition.

To achieve this an evidence based approach to find solutions to the issues was undertaken, which included a literature review to identify strategies implemented by other units that had undergone similar challenges.

Aim

To identify previously documented strategies implemented to assist staff throughout the transition to a new NICU design.

Methodology

Abstracts, outlines and complete articles published from 2000–2014 were retrieved via electronic and manual searches of MEDLINE, CINAHL, Science Direct and Cochrane databases. A list of keywords was developed from the review question themes to direct the search including: Intensive Care Units, Neonatal, Hospital Design and Construction, Single Room Design, Change Management and Staff Attitude to Change.

Results

The search identified over 1000 articles on NICU design and construction. Abstracts and titles were reviewed to assess if the article discussed strategies to facilitate staff transition to an SRD NICU. Literature concentrated on recommended standards, unit configuration, floor plans, the design process, practicalities of moving in and the physical features of each new NICU design. Only 29 articles provided an outline of the planning, construction and the actual move into a new neonatal unit with seven of these articles highlighting strategies during the transition to SDR.

An integrated analysis of these seven articles was undertaken to highlight common themes which were then systematically organised into two main categories:

- 1) Proposed strategies implemented during the transition to SDR.
- 2) Post transition issues and solutions.

Strategies to facilitate the transition to SRD

The review highlighted a variety of strategies implemented to facilitate the transition. These have been outlined under three main themes: Teamwork, Communication and Celebration.

Teamwork

The formation of a project team to lead the redevelopment was highlighted as essential in negotiating the transition to new NICU (Brown et al., 2001; Carlson et al., 2006; Milford and Zapalo, 2008). The team should include representatives from management, nursing, medical and allied health staff, as well as members of the NICU parent community who together develop the philosophy, model of care and objectives that will structure the transition (Brown et al., 2001; Carlson et al., 2006; Milford and Zapalo, 2008). This will assist in leading the stakeholder's ideas as they consider what is most important in their new NICU (Carlson et al., 2006). It is also important for the team to maintain an overarching view of the design phases, thus allowing the team to oversee a project timeline and forecast the demands of building a NICU (Brown et al., 2001).

One of the important roles of the team is to facilitate the inclusion of all staff affected by the transition. This can be achieved through staff participation in committees, staff meetings, surveys and site visits where they are encouraged to contribute and review the design (Brown et al., 2001; Carlson et al., 2006; Milford and Zapalo, 2008). Staff participation means that staff, by identifying what they see as essential to make the NICU function and by being involved in finding solutions to overcoming any problems as the NICU built and once opened, will be more likely to take ownership of the new unit (Carlson et al., 2006). Several authors highlighted the development of transition teams as an effective strategy to engage staff in the transition process. Each team focussed on specific topics related to the move: move day, supplies, family centred care, communication, staffing and education. Transition teams took responsibility for what needed to be done and reported back to the project team, thus dividing the workload whilst engaging staff in the transition (Carlson et al., 2006; Milford and Zapalo, 2008).

Transition teams were also cited as being effective in reviewing nursing practice and workflow patterns for their new NICUs (Carlson et al., 2006; Milford and Zapalo, 2008; Shaver and Cone, 2010). Carlson et al. (2006) described the implementation of 'Reddin's of Theory of Planned Change' as a useful tool to direct the change management process during the transition to SRD NICU. By 'planning the change' transition teams were able to actively promote multidirectional communication and encourage stakeholders to

voice concerns and participate in finding solutions to the fear of the change. The change model assisted the team in actively involving the most affected (nursing staff) through structured communication encouraging greater staff interaction (Carlson et al., 2006).

Communication

The development of a multifaceted organised communication plan to meet objectives such as to: inform, educate and orientate staff; is crucial in negotiating the transition to a new NICU. Strategies implemented to foster two-way communication included: staff meetings, surveys, staff problem boxes and posters (Carlson et al., 2006; Milford and Zapalo, 2008; Shaver and Cone, 2010). Most of the strategies implemented were aimed to educate and orientate staff.

It is crucial to educate staff about the benefits of the new design, the unit philosophy and the likely impact of the change in advance. This will assist in their understanding of the reasons underpinning the change and how it will affect staff (Carlson et al., 2006; Shaver and Cone, 2010). Milford and Zapalo (2008) provided recommendations for developing a new NICU that may assist other units in educating staff about the process. Recommendations included: develop mission statement and transition teams, follow a timeline, plan for move day, celebrate the past and the future (Milford and Zapalo, 2008).

Orientation should include information regarding unit layout, new equipment, changes in workflow and practice (Shaver and Cone, 2010). The dissemination of information regarding unit layout, new equipment, changes in workflow and practice (Shaver and Cone, 2010) needs to be included in the orientation program.

Celebration

Celebrating the time staff have spent in the old unit and reflecting on the NICU's history were highlighted as a successful way to assist staff in transitioning to a new NICU design. Strategies such as inviting former NICU families and staff to farewell parties, as well as holding an open day in the new NICU hosted by current staff, empowered staff to take ownership of their new NICU (Brown et al., 2001; Carlson et al., 2006; Milford and Zapalo, 2008).

Post transition issues and solutions

Whilst moving into a new NICU requires years of planning, the real impact of the new design cannot be fully evaluated until staff are working in the facility. Previous research has stated it may take two years for staff to become accustomed to working in the new environment (Carlson et al., 2006). To facilitate this stage of the transition we were interested in reviewing the issues previous NICUs had negotiated and the solutions they had undertaken. When reviewed many of the articles consider staff concerns post move. These included: the amount of information staff needed to assimilate in a short period, implications of the new design on practice and the unsettling effect of the move for many staff (Johnson et al., 2004; Stevens et al., 2010). Authors highlighted the fact that an SRD NICU impacts on nursing staff by increasing their workload, the distances walked, limiting communication with peers and education opportunities (Shahheidari and Homer, 2012).

While several articles articulated the need to maintain strong communication strategies such as meetings, surveys, staff problem boxes and posters to identify staff concerns prior to the transition, only two authors provided a detailed description of the impact of new design on nursing practice post transition (Beck et al., 2009; Smith et al., 2009).

Beck et al., 2009 documented the challenges they encountered: maintaining effective communication between staff members, continuity of care and the isolation of staff and families in the new design (Beck et al., 2009). To address these concerns a nursing taskforce was established to build a new model of nursing practice. Staff members were divided into smaller teams assigned to specific pods (Beck et al., 2009). Fixed six week rostering cycles were devised to create consistency for staff and families. Additional staff members, such as respiratory therapists, were employed to assist nursing staff and to provide education (Beck et al., 2009).

Smith et al. (2009) reported staff feedback from post move surveys that the SRD compromised the cohesion of patient care teams, created operational challenges, isolated staff and impacted on effective staff communication. Recommendations made by their team to resolve the impact of SRD on staff included implementing virtual technology to allow staff more contact with other staff and monitor neonates, a comprehensive macro ergonomic review to identify strategies to improve the

organisational design and management of the unit and establishing a NICU occupancy quality management program to provide a framework for evaluating and addressing design issues and problems as they arise (Smith et al., 2009).

Discussion

An integrated literature review was undertaken to facilitate an evidence based approach to facilitating the transition from OP to SRD. This review has highlighted that literature pertaining to transitioning to a new NICU design is rich in coverage of building and occupational health and safety standards, construction plans, physical attributes and the physical move to a new NICU but that there is only minimal information relating to addressing staff needs and concerns.

This study is the first to review and detail strategies previously implemented to assist staff transitioning to SRD. Most of the strategies implemented aimed to educate and orientate staff to work effectively in the new building but did not consider the impact of the change on individual staff members both physically and emotionally.

Our review supports previous research regarding the impact of transitioning from OP to SRD. Authors discuss similar challenges post move: increased workload, distances walked, limiting communication with peers and reduced education opportunities (Shahheidari and Homer, 2012). Although it may take up to two years for staff to work effectively in the new environment there is only limited literature documenting research that has reviewed the impact on staff after two years (Goldschmidt and Gordin, 2006).

We have also shown that although NICU designs have been changing from OP to SRD for 20 years, the issues staff are confronted with have remained unchanged and unaddressed leaving several questions unanswered. Do staff just accept the difficulties of the new design in time or find new employment? What is the long term impact of SRD on staffing NICUs? Has there been an increase in staff resignations, staff turnover, sick days or low morale? Has quantitative data that supports staff perceptions regarding increased workload, walking distance, reduced communication and limited education opportunities been collected? Our research team has implemented many of the strategies suggested by previous researchers; we have also taken up the challenge to undertake a quantitative comparative study of the transition from OP and TC NICU

to add to this evidence. We encourage other researchers to take up the challenge as well.

Conclusion

This review provides an outline of strategies to facilitate the transition when changing a NICU design. To further facilitate the transition from OP to SRD, future research that considers the impact on staff is essential. Future research that specifically targets the issues highlighted by staff and provides supporting quantitative data, may assist in finding long term solutions when transitioning to a new NICU design. While the physical environment is important, we should also consider building a strong cohesive staff as an essential part of constructing a new NICU. NICU redevelopment teams should carefully consider the potential benefits of the suggested teamwork, communication and celebration strategies detailed by this review.

Funding

No funding was provided for this project.

Conflict of interest

The authors have no conflict of interest to disclose.

References

- Beck, S., Weis, J., Greisen, G., Andersen, M., Zoffmann, V., 2009. Room for family-centered care; a qualitative evaluation of a neonatal intensive care unit remodelling project. *J. Neonatal Nurs.* 15, 88–99.
- Broom, M., Brady, B., Kecskes, Z., Kildea, S., 2012. World Cafe' methodology engages stakeholders in designing a Neonatal Intensive Care Unit. *J. Neonatal Nurs.* <http://dx.doi.org/10.1016/j.jnn.2012.12.002>.
- Brown, P., Lauren, R., Taquino, T., 2001. Designing and delivering neonatal care in single rooms. *Perinatal Neonatal Nurs.* 5, 68–83.
- Carlson, B., Walsh, S., Wergin, T., et al., 2006. Challenges in design and transition to a private room model in the neonatal intensive care unit. *Adv. Neonatal Care* 6, 271–280.
- Goldschmidt, K., Gordin, P., 2006. A model of nursing care microsystems for a large neonatal intensive care unit. *Adv. Neonatal Care* 6, 81–88.
- Johnson, B.H., Abraham, M.R., Parrish, R., 2004. Designing the neonatal intensive care unit for optimal family involvement. *Clin Perinatol* 31 (2), 353–382.



ORIGINAL ARTICLE

World Café Methodology engages stakeholders in designing a Neonatal Intensive Care Unit

Margaret Broom^{a,d,*}, Bernadette Brady^b, Zsuzsoka Kecskes^{a,c},
Sue Kildea^{d,e}

^aNeonatal Intensive Care, Canberra Hospital, Yamba Drive, Garran, Canberra ACT 2606, Australia

^bAustralian Primary Health Care Research Institute, Australian National University, Canberra ACT 0200, Australia

^cAustralian National University Medical School, Linnaeus Way, Canberra ACT 0200, Australia

^dAustralian Catholic University, Nudgee Road, Banyo, Qld 4014, Australia

^eMater Medical Research Institute, Aubigny Place, Raymond Terrace, South Brisbane Qld 4101, Australia

Available online 15 February 2013

KEYWORDS

Infant, newborn;
Intensive care;
World Café Methodology;
Room design;
Engaging stakeholders

Abstract *Background:* This paper discusses engaging World Café Methodology (WCM) during the design process when building a world class Neonatal Intensive Care Unit (NICU). The NICU World Café was held to consider the requirements needed to support a philosophy of family centred care acknowledging the needs of neonates, families and staff.

Method: A NICU World Café was conducted with the aim to engage stakeholders in the design of a new NICU. World Café Methodology is an integrated set of principles for hosting conversations that matter. Stakeholders converse with Café experts regarding the question of the Café from which a collective knowledge evolves to answer the Café question.

Results: The NICU World Café stakeholders identified a core group of requirements essential to creating a functional NICU: flexibility, visibility, privacy, skills, safety and sense of community. Stakeholders resolved these requirements could be applied most effectively in both two and single cot rooms, detailing their recommendations for the architects.

Conclusion: World Café Methodology facilitated stakeholders' exposure to a variety of opinions and new information regarding the NICU's new design. Applying WCM

* Corresponding author. Neonatal Intensive Care, Canberra Hospital, Yamba Drive, Garran, Canberra ACT 2606, Australia. Tel: +61 2 61747570; fax: +61 2 62443422.

E-mail address: Margaret.Broom@act.gov.au (M. Broom).

another table they would like to join. This is how this method facilitates the collection of diverse information, cross pollination of ideas and growth of insight. The participants develop a collective knowledge that grows and evolves, guiding the group to answer the Café question together based on their learning and insight (Brown and Isaacs, 2005). World Café format is flexible and adaptable with its uses limited only by imagination (Brown and Isaacs, 1999).

Six key principles have been outlined to guide Café organisers through the process (Brown and Isaacs, 1999) (Table 1).

In preparation for the NICU World Café, ten people were asked to be an expert (host a table) at the 3 hour workshop. Experts included nurses, developmental paediatricians, allied health staff and parents who had previously experienced their baby being admitted to the NICU. An expert at the NICU World Café was defined as someone with specific knowledge related to the NICU. Their knowledge included topics such as: the three different NICU designs under consideration, parental experience in the current NICU or a member of the multidisciplinary team that support families during their transition through the NICU. The experts were encouraged to talk to Café participants about their particular area of expertise, experience, knowledge and opinions regarding the best use of functional space for the new NICU. To assist the experts with their task they were emailed information and guidelines on World Café Methodology (Brown, 2002). The Clinical Director of the NICU also spoke to each expert about the methodology and outline of the workshop beforehand.

Since the beginning of the redevelopment project, members from Access Improvement Program (AIP) had worked alongside the Neonatal User Group in the development of the model of care and facilitated discussions on the new design. A staff member from AIP, who has significant experience in overseeing meetings and patient centred care, took on the role of Café moderator. Other AIP staff facilitated the

NICU World Café by welcoming participants, serving lunch and assisting with the overall organisation of the Café.

An open invitation to the NICU World Café was conveyed to all NICU staff. Participants ($n = 55$) included members from all the groups working on the new NICU design.

The room was set up to resemble a Café with tablecloths, glasses and water placed on tables set up to accommodate six to eight participants. The organising group welcomed the stakeholders to the Café, creating friendly relaxed atmosphere where participants were encouraged to chat and enjoy their lunch at the tables before the session began.

The workshop moderator firstly related the Café question to the attendees:

What would be the best use of functional space for the new NICU design?

The Café moderator then gave a short presentation on current NICU designs that included the following topics:

1. Current research in NICU design.
2. Nurturing environments for neonates, families and staff.
3. Impact of the NICU environment on neonates and families.
4. NICU environment's impact on staff members' health and the benefits of an appropriate environment to work in.

To guide the workshop Café participants were then given a short overview of World Café Principles:

1. Every voice counts – encourage other people at your table to contribute.
2. Listen respectfully to the person who is speaking.
3. A different opinion does not mean a wrong opinion – explore the differences.
4. Stop to consider the patterns, insights and deeper questions you encounter during the Café (Brown, 2002).

Under the direction of the Café facilitators participants chose a table to join; they rotated to a different table every 20–30 min with most participants joining four or five tables during the Café. They held conversations with different members of staff and the experts hosting the tables, expressing and listening to different viewpoints on the design for the future NICU. As participants moved around the tables they were given the opportunity to pass critical ideas from one table group to the next, trading ideas and opinions. Participants were encouraged by the

Table 1 Six key principles for hosting a World Café.

- Create a hospitable space
- Explore questions that matter
- Encourage everyone's contribution
- Connect diverse people and ideas
- Listen together for insights, patterns and deeper questions
- Make collective knowledge visible

(Brown, 2002) A resource guide for hosting conversations that matter at The World Café Whole Systems Associates. <http://www.theworldcafe.com>

experts to express their concerns and questions allowing them to gather new information that would assist in the final decision making process.

During the Café experts made notes of ideas, questions and suggestions provided by the participants. They then went on to discuss with new participants who joined their table, thus adding and refining the information. Participants' differing opinions were acknowledged with the expert giving the participant more information about the concerns and then listing their point for discussion during the close of the workshop. In addition, throughout the running of the Café, members of the organising group mingled with the various groups gathering key information on the question. At the end of the Café; guided by the moderator who transcribed the ideas onto a white board, the participants joined as a collective to review their findings.

Results

To finalise the Café experts and participants joined to review viewpoints and concepts generated by the group. Participants of the Café identified two main topics and underlying themes that outlined their requirements to facilitate the best use of functional space for the new NICU design: The three design choices were reviewed on how each could meet these requirements. These requirements are outlined below:

Operational requirements

In moments of crisis in the NICU it is essential that staff are available to help out quickly; this was highlighted as a major challenge at the Café when considering small room design. In the current design senior staff are close by at all times but this would change in a unit composed of smaller rooms. This has the potential to create anxiety for staff and parents regarding the possible time delay in gaining support in an emergency. Café attendees identified the need for a detailed emergency response system and dedicated staff members to provide timely response on all shifts.

Changing the NICU design generates an operational challenge when considering staffing as considerable investment in training will be necessary to facilitate the new model of care. Whereas in the current OP design staff are able to help each to cover breaks, check drugs and take on the extra load of busy staff, supernumerary staff will be essential to take up these roles in a NICU design that involved a SRD.

Functional requirements

Collectively the stakeholders identified six key functional requirements that should be considered in the development of the design for the new NICU:

Safety

Participants acknowledged the new design should assist in maintaining safety in the NICU. Safety involves many factors that impact on neonates, families and staff and include a design that facilitates secure access via swipe cards with one main entrance and reception, cameras and an intercom system to view and talk to families and visitors as they enter the unit. The NICU also needs to be functional providing space for the secure storage of personal belonging for families and staff.

Flexibility

The rooms should be able to meet the needs of a dynamic work environment, based on the clinical condition of the babies, staff availability and skill mix. Unlike the current unit where neonates are moved between bays based on acuity and staffing; Café participants identified each bedspace in the new unit should be able to be modified to accommodate all neonates needs, ranging from intensive to intermediate care. In addition, parents of healthier babies should not have to walk past sick babies, requiring the new NICU to be split into different areas with different access: a high and a low acuity area. The design should also be flexible and able to accommodate the families' needs. Each bedspace should have dedicated family space that includes seating suitable for breastfeeding and spending quiet time with their baby, a cupboard to lock away private belongings and access to the internet, as parents are often in the NICU for long periods, often doing work at the cot side.

Visibility

Good visibility of the neonates at all times was considered essential. Staff should be able to visualise the neonates in their care and have the ability to remotely monitor their patients when they step out of the room. Café participants also thought the design should allow staff to maintain visual access to staff in other rooms next to them to reduce the feeling of isolation commonly identified in small room design. This set up should also facilitate the support of junior nursing staff.

Privacy

It was agreed the new unit should provide privacy for all the members of the NICU community. Procedures (e.g. insertion of a cannula) should be able to be done in a quiet, private environment. There should be adequate space where families and staff can discuss the neonate's condition and care requirements without being overheard or interrupted. Privacy for parent education, breastfeeding, kangaroo care and expression of breast milk to allow families to spend quality time and bond with their baby. Staff members also require privacy to consult with other team members on issues that may arise in caring for neonates in the NICU.

Skill mix

Participants were uncertain how small room design would impact on the skill mix. Current NICU staffing provides a diverse skill mix from senior staff with twenty years' experience to junior staff with limited neonatal experience. The current OP design allows more experienced staff to lend a hand to less experienced staff, while still being able to see the baby they are providing care for. A single or double room design would make it impossible for one staff member helping a staff member in another room to still observe their own patient, remote monitoring would be essential in such a design.

In addition, a question that arose was: *would extra senior staff be required to facilitate junior staff's learning and provide technical and emotional support necessary in the development of a skilled, experienced and competent workforce for the NICU?* The need for a succession plan was also acknowledged at the Café, with many staff being close to retirement, it was felt that it would be essential to promote and actively recruit new staff to work in the NICU.

Community

The current NICU has a strong community where staff value the relationships they have within the multidisciplinary team. Many Café participants felt this was due to the current design where different staff members, nursing, medical or allied health, are easily accessible and available, allowing staff to work more effectively as an integrated team. Participants would like this to continue in the new unit and new design support the current NICU community.

On reviewing the three design choices stakeholders agreed that either single or two cot rooms

best met the requirements they had outlined to produce a functional space for the new NICU. The Café moderator and Clinical Director took responsibility to inform the design team and architects of the Cafes' participant's choice and requirements. They also undertook to write a report on the Café to be circulated and reviewed by Café attendees.

After further consultation and collaboration with the design team, a two cot room design was formalised for the new unit. The new unit has two wings: Intensive Care/High Dependency (20 cots) and Special Care (14 cots) interlinked in sets of two, three and four rooms with a doorway and large window between each room. This allows staff to visually monitor neonates and communicate with staff in the adjoining rooms.

Conclusion

Designing a new NICU is a significant investment of capital, time and infrastructure; but often one of the biggest challenges is finding a strategy to engage and include stakeholders in the design process. World Café Methodology proved to be an innovative and exciting method to engage and involve the NICU community. Utilising World Café principles allowed staff to focus and engage on the key issue of the new NICU design, exploring new information and a variety of opinions that allowed the group to generate key recommendations for the design of the new NICU.

Acknowledgements

Sincere Thanks to: NICU World Café Participants, Access Improvement Program (AIP), ACT Health, Management team of the Centenary Hospital for Women and Children, ACT Health Directorate

References

- Beck, S., Weis, J., Greisen, G., Andersen, M., Zoffmann, V., 2009. Room for family-centred care a qualitative evaluation of a neonatal intensive care unit remodelling project. *J. Neonatal Nurs.* 15, 88–99.
- Brown, J., 2002. A Resource Guide for Hosting Conversations that Matter at the World Café. ©2002 Whole Systems Associates. <http://www.theworldcafe.com>.
- Brown, J., Isaacs, D., 1999. The World Café: catalysing large-scale collective learning. *Leverage* 33, 1–2.
- Brown, J., Isaacs, D., 2005. *The World Café: Shaping our Futures through Conversations that Matter*. Berrett-Koehler.
- Goldschmidt, K., Gordin, P., 2006. A model of nursing care microsystems for a large neonatal intensive care unit. *Adv. Neonatal Care* 6 (2), 81–88.