

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

**A Retrospective Study of Feeding Practices and
Growth of Preterm Infants Admitted to the Special
Care Baby Unit at Whangarei Hospital**

A thesis presented in partial fulfilment of requirements for the
degree of

Masters in Science

in

Nutrition and Dietetics

At Massey University, Albany

New Zealand

Ashleigh Nicole Share

2014

Abstract

Introduction: Being born preterm places an infant at increased risk of post-natal growth faltering. The immature development of the gastro-intestinal system often in conjunction with feeding difficulties can result in inadequate nutritional intake. Therefore, close monitoring of feeding and growth during hospital admission in preterm infants is important to enable the provision of adequate nutrition support, with early interventions recommended to support optimal growth.

Aim: To investigate feeding practices, monitoring and growth outcomes of preterm infants admitted to the Special Care Baby Unit (SCBU) at Whangarei Hospital, New Zealand.

Methods: Retrospective data on feeding and growth outcomes was collected from medical notes of preterm infants admitted to SCBU for a minimum of 3 days between January 2013 and March 2014. Data collection on feeding practices included mode, type and duration of feeding during admission and upon discharge. Growth outcomes included body weight, length, and head circumference which are expressed as Z-scores using UK-WHO data. Days to regain birth weight was a further measure of growth outcomes. Data was collected on the monitoring of feeding practices and growth parameters as well as any referrals to paediatric dietetic services during admission.

Results: One hundred infants were recruited, 57 of whom were male. The median age of the infants was 35 weeks (range 25-36 weeks). Fourteen infants were born extremely premature and 86 were of moderate to late prematurity. Median length of SCBU admission was 14 days. Breastfeeding was initiated by 83% of the mothers. Seventy-six infants received enteral feeding with 45 infants commenced on expressed breast milk. On a median day of 9, 54 infants reached full enteral feeding volumes. Of the 79 infants discharged home, 47 regained birth weight prior to discharge. The mean change in z-score between birth and discharge was -0.49 ± 0.16 with 19 infants decreasing by >1 z-score. During admission only 6/100 infants were referred to dietetic services. On

discharge, 73.1% were receiving some breast milk with 67.1% exclusively breastfeeding.

Conclusions: Preterm infants admitted to SCBU had high rates of breast feeding initiation and nearly 3 out of 4 infants were receiving some milk on discharge. However, prior to discharge nearly 20% could be identified at risk of growth faltering. This suggests that improvements could be made to the monitoring of feeding and growth of these infants prior to discharge and more referrals to dietetic services may be warranted.

Acknowledgements

I would like to express my deepest appreciation to all those who supported and contributed to the completion of my studies. Firstly I would like to thank my academic supervisor, Dr. Cathryn Conlon who has encouraged, motivated and provided a wealth of knowledge. I would also like to thank Mary McNab for assisting during data collection, providing extensive paediatric and dietetic knowledge, and her passion for paediatrics. Thank you also to Victoria Woolett who provided dietetic knowledge and also provided feedback on final thesis chapters. Dr. Cheryl Gammon, thank you for your advice and guidance during statistical analysis as well as your ongoing feedback during editing of final thesis chapters.

I would like to show my gratitude to all Whangarei Hospital staff involved within the study including the SCBU staff, ward clerks, the quality control nurses and the Whangarei dietitians. Without your support the research would not have been completed

Most importantly I would also like to acknowledge with much appreciation the support of family and friends.

Table of Contents

Abstract.....	ii
Acknowledgements	iv
Table of Contents.....	v
List of Figures.....	ix
List of Tables.....	x
Abbreviations	xi
Chapter 1: Introduction.....	2
1.1 Nutritional Support for Preterm Infants.....	4
1.1.1 Breastfeeding	4
1.1.2 Enteral Feeding	5
1.1.3 Growth	5
1.1.4 Dietetic Referral.....	6
1.2 Summary	6
1.3 Location and Situation Analysis	7
1.3.1 Current Nutrition Policies within SCBU	8
1.4 Purpose of this Study.....	9
1.5 Aims and Objectives	9
1.5.1 Aim	9
1.5.2 Objectives.....	10
1.6 Hypotheses.....	10
1.7 Thesis Structure.....	11
1.8 Contribution of Authors	12
Chapter 2: Literature Review.....	13
2.1 Preterm Birth: Definitions, Rates, Causes and Complications	13
2.1.1 Definition of Preterm Birth.....	13
2.1.2 Classification by Birth Weight	13
2.1.3 Global Rates of Premature Birth.....	13
2.1.4 New Zealand Rates of Premature Births	14
2.1.5 Causes of Preterm Birth	14
2.1.6 Complications Associated with Preterm Birth	17
2.2 Feeding the Preterm Infant: Breastfeeding	18

2.2.1 Breastfeeding Recommendations.....	18
2.2.2 Benefits of Breastfeeding.....	18
2.2.3 Breast Milk: Meeting the Needs of the Preterm Infant	19
2.2.4 Factors Affecting Breastfeeding Initiation in Preterm Infants	20
2.2.5 Breastfeeding Initiation Rates during Hospital Admission.....	22
2.2.6 Breastfeeding in Preterm Infants at Discharge	26
2.3 Feeding the Premature Infant: Enteral Feeding:	27
2.3.1 Enteral Feeding	27
2.3.2 Early Initiation of Enteral Feeding	28
2.3.3 Risks Associated with Enteral Feeding.....	28
2.3.4 Days to Initiate Enteral Feeding.....	28
2.3.5 Achieving Full Enteral Feeds	32
2.3.6 Days to Reach Full Enteral Feeding	33
2.4 Growth	34
2.4.1 Recommendations for Growth in Preterm Infants	34
2.4.2 Achieving Growth Recommendations in Hospital	35
2.4.3 Days to Regain Birth Weight.....	35
2.4.4 Postnatal Growth of Preterm Infants Prior to Discharge	36
2.5 Monitoring and Dietitian Referral.....	37
2.6 Summary	37
Chapter 3: Methods.....	39
3.1 Study Design	39
3.2 Ethical Approval	39
3.2.1 Consultation.....	39
3.3 Study Population.....	40
3.3.1 Setting	40
3.3.2 Eligibility.....	40
3.3.3 Justification of Retrospective Study Period.....	40
3.3.4 Recruitment of Participants.....	40
3.4 Data Collection Procedure	41
3.5 Data Collection.....	42
3.5.1 Demographic Data Collection	42
3.5.2 Maternal Demographic and Health Status Information	42

3.6 Feeding Data	42
3.6.1 Breastfeeding	42
3.6.2 Enteral Feeding	43
3.6.3 Method of Feeding on Discharge.....	43
3.7 Growth Data.....	44
3.8 Medical History and Events during Admission	44
3.9 Standard Operating Procedure for Data Collection from Medical Notes .	44
3.10 Statistical Analysis	45
Chapter 4: Results	46
4.1 Description of Participants	46
4.2 Characteristics of Participants	47
4.2.1 Infants Age and Weight at Birth	48
4.2.2 Characteristics of Infants requiring Neonatal Intensive Level of Care	49
4.2.3 Length of Stay in Hospital.....	49
4.2.4 Discharge Location	49
4.2.5 Maternal Demographics.....	49
4.3 Types and Mode of Feeding during SCBU Admission	50
4.4 Breastfeeding.....	50
4.4.1 Breastfeeding Initiation during SCBU Admission	50
4.4.2 Days to Initiate Breastfeeding	51
4.5 Types and Modes of Feeding at Discharge	51
4.5.1 Breastfeeding and Mode of Feeding at Discharge.....	51
4.5.2 Breastfeeding Codes at Discharge	52
4.6 Enteral Feeding.....	52
4.6.1 Types of Enteral Feeds.....	52
4.6.2 Days to Reach Full Enteral Feeding Volumes	53
4.7 Growth	53
4.7.1 Days to Regain Birth Weight.....	53
4.7.2 Postnatal Growth of Preterm Infants Prior to Discharge	54
4.7.3 Head Circumference and Length Z-Scores	56
4.7.4 Z- Scores for Head Circumference and Length	58
4.8 Monitoring and Referral	58
4.8.1 Monitoring of Feeding.....	58

4.8.2 Growth Monitoring	58
4.8.3 Referral to Dietetic Services during Admission	59
Chapter 5: Discussion	60
5.1 Study Population Characteristics	60
5.2 Types and Mode of Feeding during SCBU Admission	61
5.2.1 Breastfeeding Initiation	61
5.3 Types and Mode of Feeding at SCBU Discharge	63
5.3.1 Breastfeeding and Modes of Feeding at Discharge	63
5.4 Enteral Feeding.....	65
5.5 Growth	66
5.5.1 Day's to Regain Birth Weight.....	67
5.5.2 Postnatal Growth of Preterm Infants Prior to Discharge	67
5.5.3 Head Circumference and Length: Z-Score Analysis	68
5.6 Dietetic Referrals	69
Chapter 6: Conclusions	71
6.1 Summary of the Study	71
6.2 Conclusion	73
6.3 Strengths	73
6.4 Limitations.....	74
6.5 Recommendations for SCBU.....	76
6.6 Recommendations for Future Research	76
References List	78
Appendices	88
Appendix A	89
Human Disability Ethics Committee (HDEC) Letter of Approval	89
Appendix B	92
Letter of Approval by NDHB Chief Medical Officer: Dr. Michael Roberts...	92
Appendix C	93
SCBU Growth Grid	93
Appendix D	94
Demographic Questionnaire	94
Appendix E	100
Daily Feeding Monitoring Charts	100

List of Figures

Chapter 1	2
<i>Figure 1.1: Preterm Births within New Zealand DHBs Categorised by Gestational Age</i>	2
<i>Figure 1.2: Travel Distance Between Towns in Northland</i>	7
Chapter 2	13
<i>Figure 2.1: Factors Impacting on Late Preterm Breastfeeding Initiation</i>	27
Chapter 4	45
<i>Figure 4.1: Flow Diagram Displaying the Final Participant Numbers included in the Study</i>	46
<i>Figure 4.2: Z-score for Weight at Birth and Discharge</i>	54
<i>Figure 4.3: Z-score for HC at Birth and Discharge</i>	58
<i>Figure 4.4: Z-score for Lengths at Birth and Discharge</i>	58

List of Tables

Chapter 1	2
<i>Table 1.1: Researchers Contribution to the Study</i>	12
 Chapter 2	 13
<i>Table 2.1: Summary of International Studies Reporting on Initiation and Discharge Breastfeeding Rates for Preterm Infants</i>	25
<i>Table 2.2: Summary of Initiation of Enteral Feeding and Days to Reach Full Feeding Volumes in Studies</i>	30
<i>Table 2.3: Target Full Enteral Feeding Volumes within Studies</i>	33
 Chapter 4	 45
<i>Table 4.1: Characteristics of Preterm (<37 weeks gestation) Infants included in the Study</i>	47
<i>Table 4.2: Maternal Characteristics for the Infants included in the Study</i>	50
<i>Table 4.3: Breastfeeding Initiation and Days to Initiate Breastfeeding during SCBU Admission</i>	51
<i>Table 4.4: Number of Days Preterm Infants Received Enteral Feeding</i>	52
<i>Table 4.5: Type of Feeding used for Initiation of Enteral Feeding</i>	53
<i>Table 4.6: Median Days to Reach Full Enteral Feeding Volumes</i>	53
<i>Table 4.7: Comparison of Characteristics between Infants who Decreased ≥ 1 Z-score with infants who increased in Z-scores between Birth and Discharge</i>	55
<i>Table 4.8: Characteristics of Infants Included into Head Circumference and Length Z-score Analysis</i>	57

Abbreviations

BMI	Body Mass Index
BPD	Broncopulmonary Dysplasia
CRP	C Reactive Protein
DHB	District Health Board
EBM	Expressed Breast Milk
ELBW	Extremely Low Birth Weight
ESPGHAN	European Society of Paediatric Gastroenterology, Hepatology and Nutrition
GDM	Gestational Diabetes Mellitus
GI	Gastrointestinal
LBW	Low Birth Weight
NDHB	Northern District Health Board
NEC	Necrotising Enterocolitis
PNGF	Post Natal Growth Faltering
PPROM	Preterm Premature Rupture of Membranes
RDS	Respiratory Distress Syndrome
SCBU	Special Care Baby Unit
VLBW	Very Low Birth Weight