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# Early Discharge Study for Premature Infants: Singapore General Hospital

Yeo Cheo Lian, MD  
Selina Ho Kah Ying, MD  
Cheong Chiu Peng, RN  
Tay Yih Yann, RN

## Abstract

**Introduction:** At Singapore General Hospital, approximately 240 infants of the 1500 deliveries per annum are delivered preterm, many of very low birth weight—median of 1210 g—often have extended hospital stays, even after they are declared medically fit.

**Methods:** To better understand the discharge patterns of the preterm infants in the department, a team of two neonatologists and two nurses performed a retrospective review of 36 premature infants. The underlying causes leading to and the root causes of discharge delays were identified as:

1. Required goal weight of 2 kg, even when medically fit
2. Delivery of discharge plan to parents delayed
3. Discharge planning delayed
4. No ownership in discharge planning.

**Results/Conclusion:** The length of hospital stay was reduced 59.8%, primarily by improved discharge planning, revised guidelines (mean discharge at 1915 g), and nurses’ active preparation of parents psychologically and mentally for care of their babies at home.

## Introduction

Premature infants are born at less than 37 weeks gestational age. At the Department of Neonatal and Developmental Medicine, Singapore General Hospital, approximately 240 infants of the 1500 deliveries per annum are delivered preterm. Many preterm infants of very low birth weight (VLBW) often stay in the hospital for extended periods of time, even after the initial support required in the neonatal intensive care unit (NICU). In the department, it has traditionally been the practice to discharge premature low birth weight infants when they were medically fit and had attained a minimum weight of 2000 g (2 kg). With increasing recognition of the benefits of early discharge to the home environment, we explored

the feasibility of earlier discharge, without compromising care and outcome, of these preterm infants.

## Methods

### Evaluation

To better understand the discharge patterns of the preterm infants in the department, a team of two neonatologists and two nurses performed a *retrospective review* of 36 premature infants with birth weight less than 2000 g admitted to the NICU during the period May to September 2005. The median birth weight was 1210 g (range 540 g to 1920 g) with a median gestational age of 30 weeks (range 23 to 35) weeks. The median length of hospitalization was 58.2 (range 23 to 137) days (Table 1). *Reasons* for the delay in discharging the infants

**Table 1. Pre- and Postimplementation**

	Pre	Post
No. of infants	36	42
Birth weight	1210 (540-1920) g	1250 (535-1990) g
Age	30 weeks (23-35)	29 weeks (25-37)
Length of stay	58.2 (23-137) days	34.9 (22-44) days
Discharge weight	2055 (2000-3015) g	1915 (1840-1918) g

**Yeo Cheo Lian, MD**, (top, left) is a Senior Consultant in the Department of Neonatal and Developmental Medicine, Singapore General Hospital. E-mail: yeo.cheo.lian@sgh.com.sg.  
**Selina Ho Kah Ying, MD**, (top, right) is a Consultant in the Department of Neonatal and Developmental Medicine, Singapore General Hospital. E-mail: selina.ho.k.y@sgh.com.sg.  
**Cheong Chiu Peng, RN**, (bottom, left) is a Nurse Clinician in the Department of Neonatal and Developmental Medicine, Singapore General Hospital. E-mail: cheong.chiu.peng@sgh.com.sg.  
**Tay Yih Yann, RN**, (bottom, right) is a Staff Nurse in the Department of Neonatal and Developmental Medicine, Singapore General Hospital. E-mail: yih\_yann@yahoo.com.sg.



were evaluated. A discharge delay was defined as any delay in discharge not related to illness after the medical team had cleared the infant for discharge. There were 257 discharge delay days averaging seven days per infant. The reasons for the discharge delays are shown in Figure 1. The underlying causes leading to discharge delays were analyzed and the *root causes* were identified as:

1. Required minimum weight of 2 kg

2. Delayed delivery of discharge plan to parents
3. Delayed discharge planning
4. No ownership in discharge planning.

The root causes were plotted into a Pareto Diagram and the team aimed to solve the “Vital Few” causes, under Pareto principles (Figures 2 and 3). The most common reason identified for discharge delay in our center was waiting for the infant to attain

a weight of 2 kg, even if medically fit for discharge. A *literature review* was completed to assess criteria adopted by other neonatal units, locally and internationally, and to identify discharge program best practices. The literature did not support the practice of discharging premature infants only at a minimum weight of 2 kg.

**Objective**

Our objective was to develop strategies to reduce the length of hospital stay for premature infants by 30% without compromising the quality of care. Our goal was to accomplish this objective within six months.

**Strategies  
New Discharge Guidelines  
for Premature Babies**

A new set of discharge guidelines for premature neonates was developed. Infants were deemed fit for discharge once they met the following criteria:

1. Medically stable with no apnoeic or cyanotic episodes for one week: feeding well on “full feeds” with no feeding-related problems like apnoea, cyanosis, or vomiting
2. Able to maintain body temperature independently
3. Satisfactory weight gain during the five to seven day period preceding discharge and weight  $\geq 1800$  g at discharge
4. No outstanding medical or social issues
5. Parents had completed parent education and were capable and confident to care for their infants. Parents must be committed to early discharge and to follow-up review by the neonatologist one week from the time of discharge and, thereafter, as often as deemed necessary.

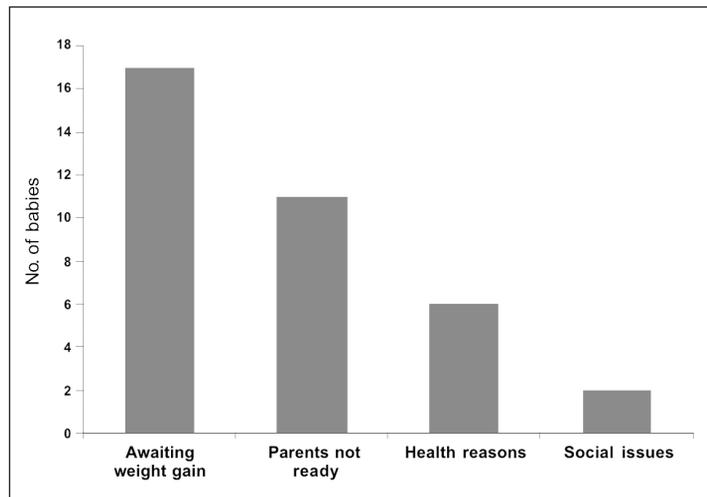


Figure 1. Reasons for prolonged length of hospital stay of 36 infants.

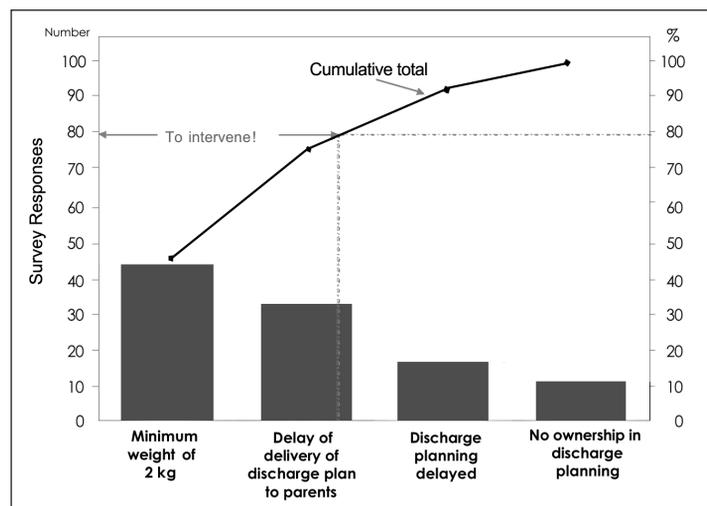


Figure 2. Root causes of discharge delays—not related to illness. Based on a survey of all Ward 54 neonatology staff.

### Standardized Early Discharge Planning and Early Discharge Education to Parents

When the infants were medically stable, home assessments were performed and caregiving skills were taught. The multidisciplinary team in the department provided the structured teaching program, including:

- Infant bathing
- Care of infant
- Cardiopulmonary resuscitation
- Infant massage, positioning, and stimulation.

### Printed Discharge Checklist and Booklet on Parenting Skills

An *Early Discharge Checklist* for the nursing team was designed to facilitate planning for early discharge. The nursing team was actively involved in the coordination and implementation of the discharge planning. A printed booklet on parenting skills was also given to each parent detailing the required home care skills.

### Expansion of Nursing Role

The nurses commenced discharge planning according to the new guideline. With the process being more structured and systematic, staff were aware of their roles in performing discharge planning. The nurses felt empowered as they adopted the role of an educator, advisor, facilitator, and coordinator. The nurses also had a sense of ownership of the discharge education and planning process.

### Follow-up

The designated primary care nurse made follow-up telephone calls to parents one day after discharge to ensure that parents were coping well. It also provided an opportunity for parents to raise questions, to

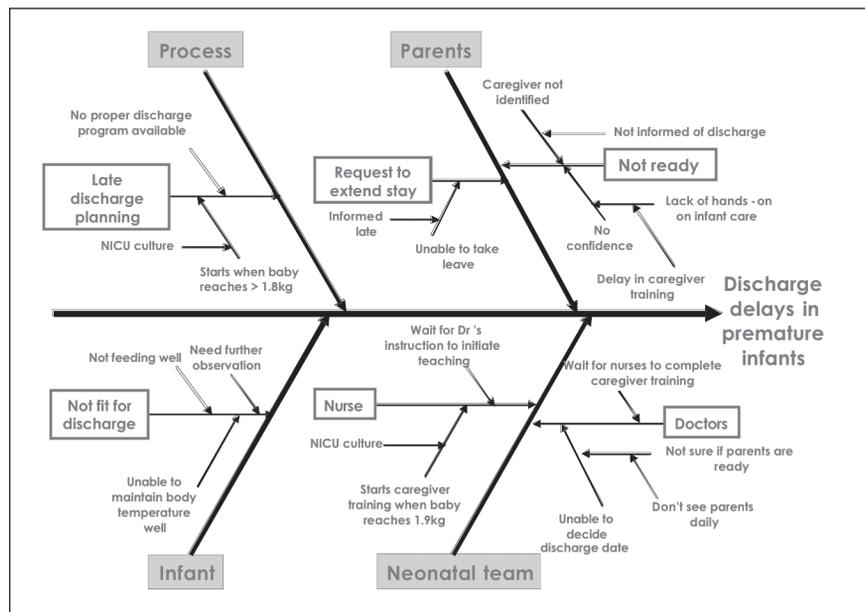


Figure 3. Discharge delay—root cause analysis.

clarify, and to discuss any issues of concern. Some home visits were arranged to assess the family's progress in making adjustment to the home care routine.

### Measures

Following implementation of the strategies, the following measures were evaluated: length of hospital stay; the need for outpatient medical consultation; Emergency Department attendance or readmission within two weeks of discharge. In addition, projected monetary cost savings were calculated.

### Results

The strategies developed were implemented in January 2006. Between January and August 2006, there were 42 premature neonates discharged at a weight less than 2000 g; a median weight of 1915 g and mean post-menstrual age of 35 weeks. All the infants had a first week appointment with our neonatologist and visits continued until the infant weighed  $\geq 2$  kg. The re-admission rate was

zero (0%). The median duration of hospitalization was reduced by 23.3 days (from 58.2 days to 34.9 days) (Figure 4) resulting in a cost savings of \$6174 per infant.

### Discussion

At Singapore General Hospital's Department of Neonatal and Developmental Medicine, care of the premature infant previously required prolonged stay in the hospital, thus the medical care is expensive. Formerly, low birth weight premature infants would only be deemed fit for discharge when they had attained a minimum weight of 2 kg.

In addition, most parents had not anticipated a premature delivery; therefore the arrival of a premature baby is a stressful period for the parents. Parents must cope with a new baby, the unfamiliar environment of the NICU, and an unfamiliar team of physicians and nurses. With the introduction of the teams' improved care process, the clinicians looked

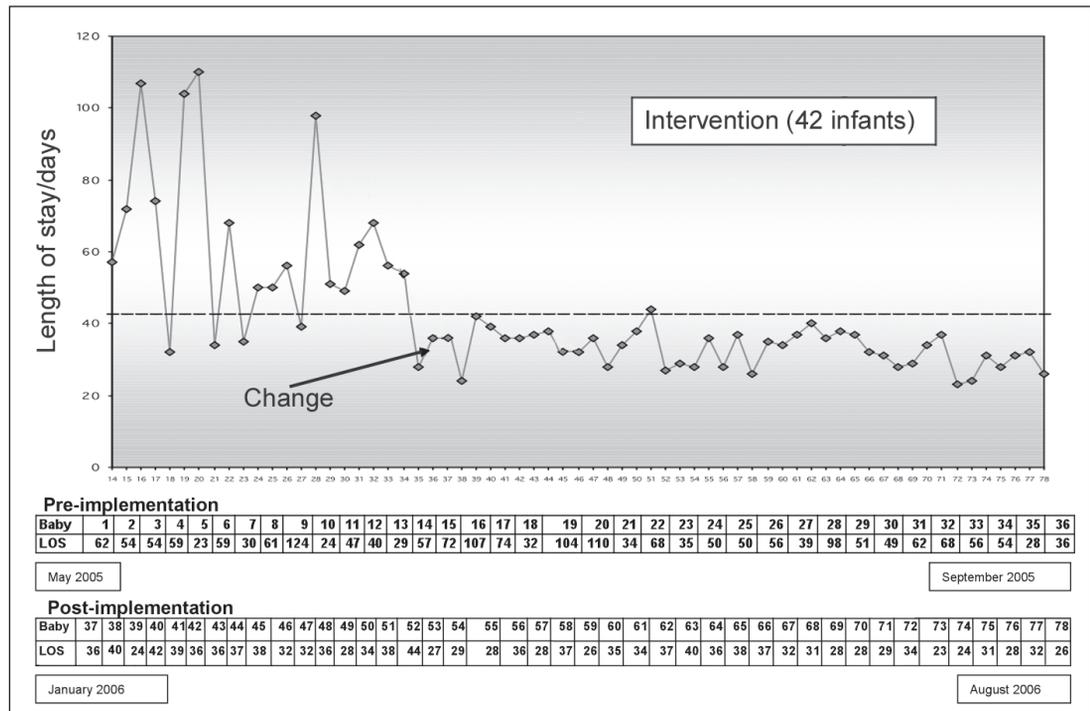


Figure 4. Evaluation of new discharge strategies from January 2006 to August 2006 (compared to baseline May 2005 to September 2005).

LOS = Length of stay.

**Parents must be coached by nurses to prepare them psychologically and mentally for the care of their babies. This communication is the key to success in the program.**

for ways to shorten hospital stay without compromising the care of the neonates. Our department reduced the length of hospital stay for premature neonates by 59.8% primarily by implementing processes to improve discharge planning and the revised discharge guidelines. Parents were enthusiastic about the education/training component and delighted with the revised process that allowed them to bring their baby home earlier.

Early discharge of the neonates has reduced risks of nosocomial infection and promoted mother and child bonding. Parents reported feeling that they had active and meaningful participation in care.

The team, briefed on the new guidelines and process, conducted audits on full compliance of the program. The primary care nurse followed-up with telephone calls

to parents a day after discharge to ensure that parents were coping well. The nurse clinician made a follow-up call to the parents on the fourth day after discharge. The readmission rate of the babies was also monitored. Regular feedback was collected from the parents on the coping skills at home and advice was given appropriately.

**Conclusion**

Nurses must understand the importance of early discharge of premature infants and motivate parents to participate early in the care of the infant. Discharge planning has to be initiated as soon as the baby is admitted into the hospital. Parents must be coached by nurses to prepare them psychologically and mentally for the care of their babies. This communication is the key to success in the program.

We continue to monitor results and obtain feedback from parents, nurses, and physicians. With the revision of the protocol by the medical team, the baby is ready for discharge at 1800 g and when parents are confident to care for the baby in the home setting. We propose this system as a model for improving the quality of care for neonates and simultaneously decreasing the cost of care for the premature infant. ❖

**Disclosure Statement**

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