



## 1. Selection Of Opportunities For Improvement

### 1.1 Introduction

Newborns particularly preterm newborns, are vulnerable to hypothermia when transitioning from birth to admission to the neonatal unit.<sup>1</sup> Significant morbidity and mortality are correlated with hypothermia.<sup>2</sup> The alarmingly high percentage of admission hypothermia (AH) among our newborns in Hospital Melaka (HM) has driven this audit.

### 1.2 Prioritization of Problem

Problems	S	M	A	R	T	Total
High number of default rate among paediatric patients in paediatric clinic	10	15	14	12	15	65
Increasing ESBL outbreak in NICU patients	19	14	16	15	16	80
High percentage of admission hypothermia among preterm newborns	19	20	19	19	18	95
Delayed severe neonatal jaundice admission	15	16	15	14	15	75
High percentage of thrombophlebitis and line related complications	17	12	14	16	16	75

4 Group Members	Score	1	2	3	4	5
	Indication	Very Low	Low	Fair	High	Very high

### 1.3 Reason for Selection

- S** Admission Hypothermia associated with severe hypoxia, respiratory distress syndrome, intraventricular hemorrhage, and mortality<sup>2</sup>
- M** Percentage of Admission Hypothermia can be measured
- A** Reducing mortality and adverse neurodevelopmental outcomes.<sup>2</sup> It also reduces intensive care duration and length of hospital stay.<sup>1,3</sup>
- R** Remedial measures can be taken to tackle the problems.
- T** This study can be completed within a short period of time

### 1.4 Problem Statement

Each 1°C drop in temperature associated with 28% increased risk of mortality and 11% increased risk of sepsis<sup>2</sup>

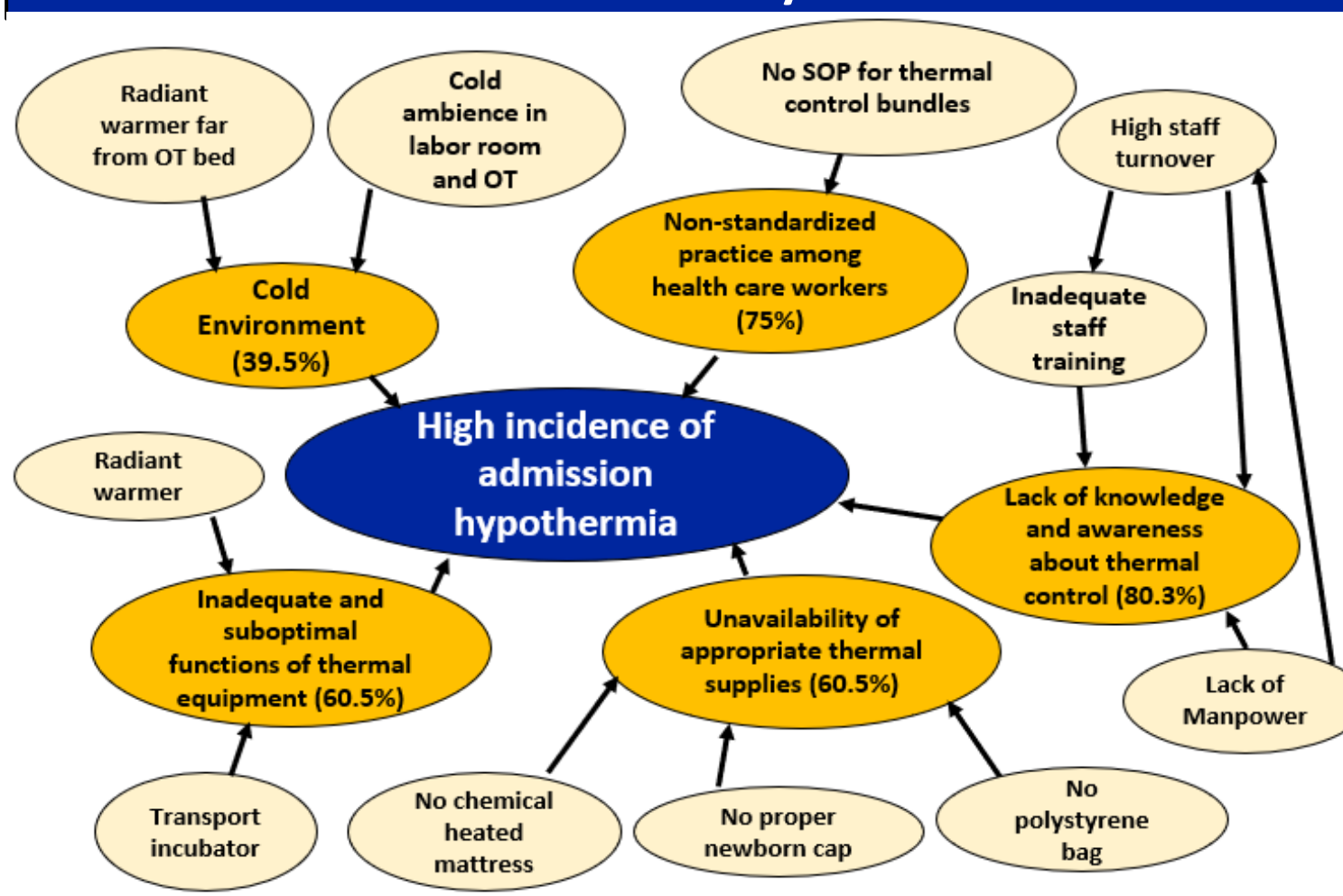
Higher risk of complications especially in preterm infants: hypoxia to brain, respiratory distress syndrome, intraventricular hemorrhage, patent ductus arteriosus, etc.<sup>1,2</sup>

A verification study conducted in June 2022 found that 70.4% of preterm newborns admitted to the neonatal unit of Hospital Melaka were hypothermic.

### 1.5 Literature Reviews

WHO 1997, 2003	Sprecher A et al. 2021	NemYB et al. 2013
Thermal control essential component of newborn care. A warm chain is a set of interlinked procedures to be performed at birth and after birth to minimize heat loss in all newborns.	The rate of admission hypothermia was 39.8% among all inborn neonates admitted to NICU in a tertiary hospital in US. Expanded use of polyethylene bags and chemical heat mattresses combined with staff education further reduces rate to 9.9%	64.8% of very low birth weight (VLBW) infants admitted to Malaysian NICUs were hypothermic; 58% from it were moderate hypothermia.

### 1.5 Problem Analysis Chart



### 1.6 Terms and Definitions

Terms	Definitions
Hypothermia	Core body temperature measuring < 36.5°C. Mild hypothermia measuring 36.0-36.4°C Moderate hypothermia measuring 32.0-35.9°C Severe hypothermia measuring <32.0°C
Preterm infants	Gestational age less than 37 weeks

## 2. Key Measures for Improvement

### 2.1 Objectives

#### General Objective

To reduce the percentage of AH in preterm newborns in Hospital Melaka

#### Specific Objectives

- To identify possible causes of AH in premature infants
- To formulate strategies and implement possible remedial measures
- To re-evaluate the effectiveness of the remedial intervention

## 2.2 Indicator And Standard

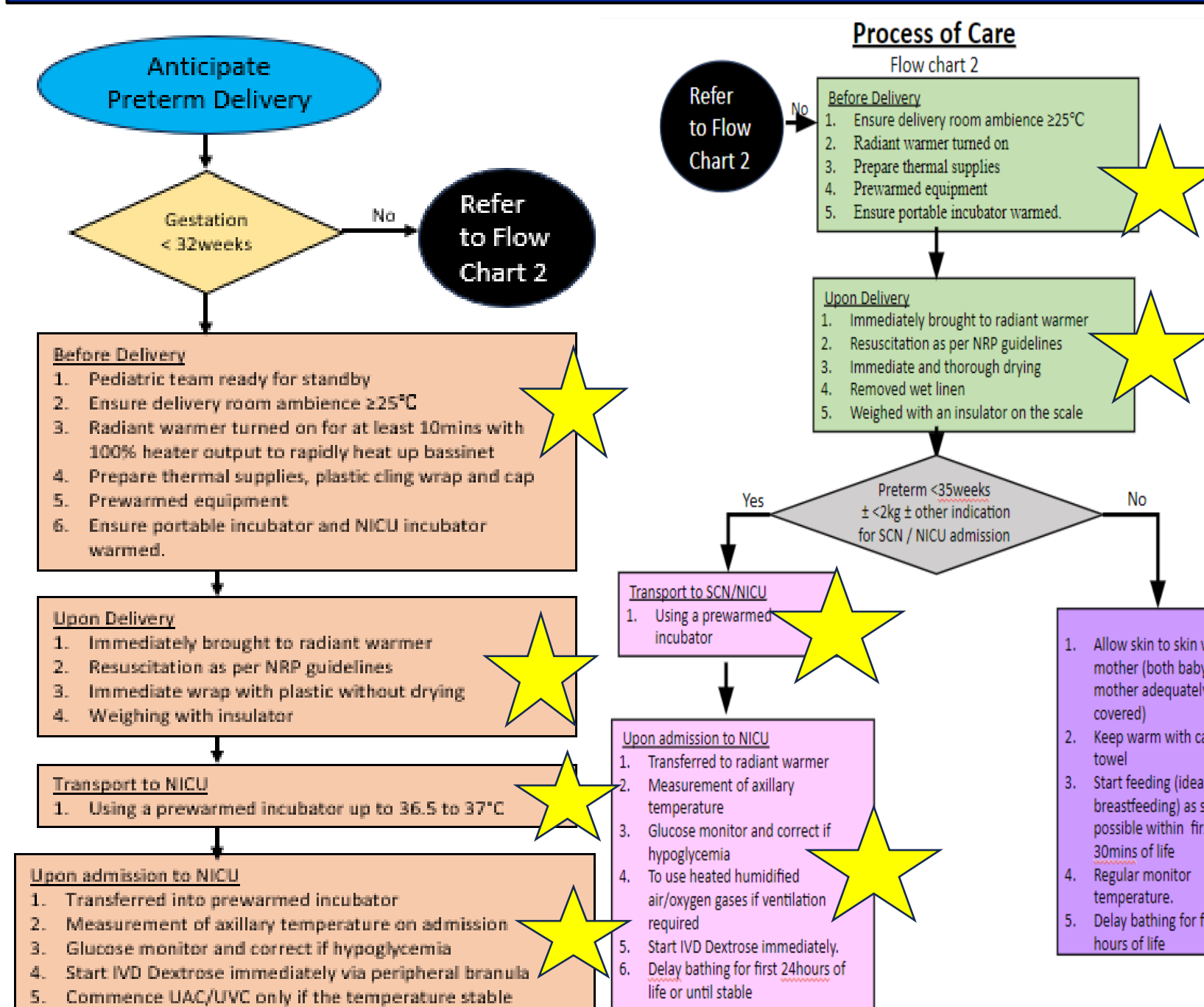
### Indicator

Percentage of AH in preterm infants in Neonatal Unit, HM

Total admission hypothermia in preterm infant X 100% **Standard** ≤40%<sup>3</sup>

Total admission of Preterm infant

## 2.3 Process Of Care



## 2.4 Model of Good Care

No	Process	Criteria	Standard	Pre-Remedial	Remedial 1	Remedial 2	Remedial 3
1.	Preparation of resuscitation equipment before delivery	- Prewarmed radiant warmer - Prewarmed thermal supplies - Prewarmed transport incubator	100%	60%	72%	85%	90%
2.	Resuscitation upon delivery	- Immediate brought to radiant warmer - Immediate dry and remove wet linen - To apply plastic cap and polystyrene bag for preterm <32weeks or EFW <1.5kg	100%	30%	50%	88%	100%
3.	Transfer to neonatal unit	- Transport newborns in prewarmed transport incubator	100%	0%	30%	75%	80%
4.	Assessment upon admission	- Vital signs measured - Temperature - Glucose monitoring	100%	70%	85%	100%	100%

## 3. Process Of Gathering Information

### 3.1 Methodology

Study Design	Prospective
Study Setting	Neonatal Unit, Hospital Melaka
Sampling Technique	Universal Sampling
Study Period	Pre-Remedial: June 2022 Remedial phase 1: July 2022 Remedial phase 2: August – October 2022 Remedial phase 3: November – December 2022
Inclusion Criteria	Gestation 25 weeks to 36 weeks 6 days live birth in Hospital Melaka required admission to SCN
Exclusion Criteria	Admitted after 4 hours of life Any major congenital malformation

### 3.2 Data Collection Tool

No.	Tool	Aim	Subject
1.	Hypothermia Audit Checklist	To determine the compliance to model of good care and incidence of admission hypothermia	336 preterm newborns included
2.	Self Administered Questionnaire	To assess • The knowledge regarding newborn thermal control • Contributing factors of AH • Measures to prevent AH	76 respondents 50 doctors, 22 staff nurses

## 4. Key Measures for Improvement

### 4.1 Methodology

#### Audit Forms

70.4% of preterm newborns admitted are hypothermic!
More than 1/3 of admission hypothermia are moderate severity
NONE of the standby for preterm newborns fulfil the hypothermia checklist

#### Self-Administered Questionnaire

Only 20% of respondents had scored ≥75% with a mean score of 49.5%	9.2% of respondents about the hypothermia checklist
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#### References

- Thermal protection of newborns by WHO, 1997 and 2003
- Laptook AR, Salhab W, Bhaskar B; Neonatal Research Network. Admission temperature of low birth weight infants: predictors and associated morbidities. Pediatrics. 2007 Mar;119(3):e643-9.
- Alicia S, Kathryn M, Deanna F; Quality Improvement Approach to Reducing Admission Hypothermia Among Preterm and Term Infants. AAP. 2021.
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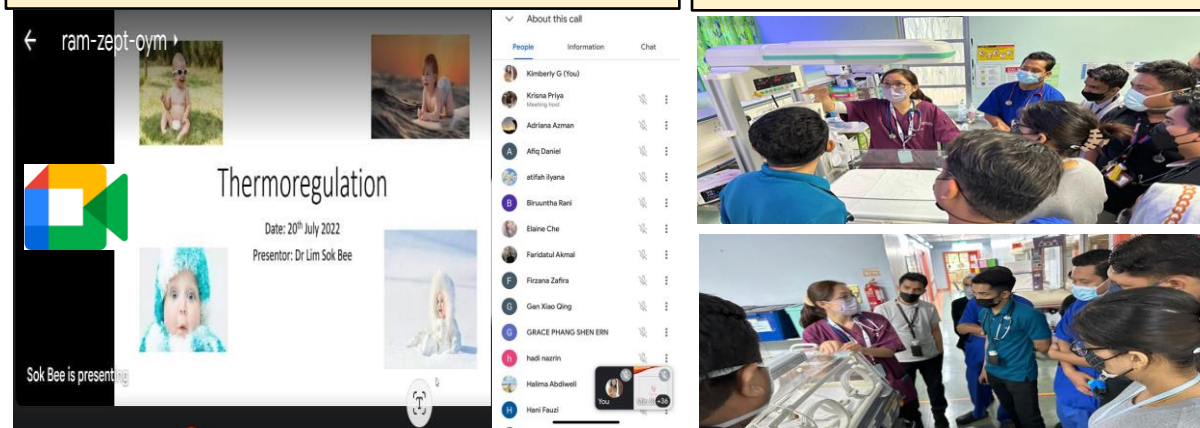
## 5. Strategy For Change

### Remedial 1 5.1 Staff Education

Problem: Lack of knowledge of thermal control bundles

Virtual CMEs via Google Meet platform to doctors and nurses

Practical teaching sessions in groups

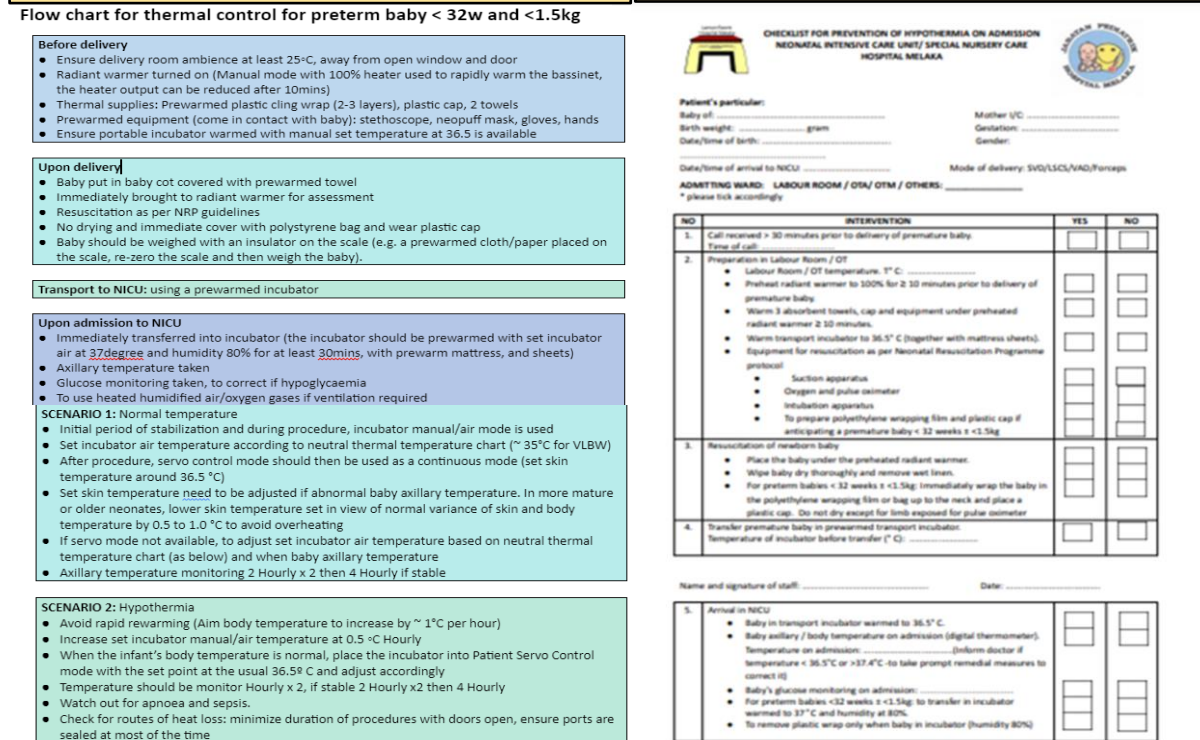


### Remedial 2 5.2 Establishment of SOP

Problem: Non-standardized practice among staff

Thermal control bundle SOP for preterm neonates

Hypothermia checklist for preterm delivery

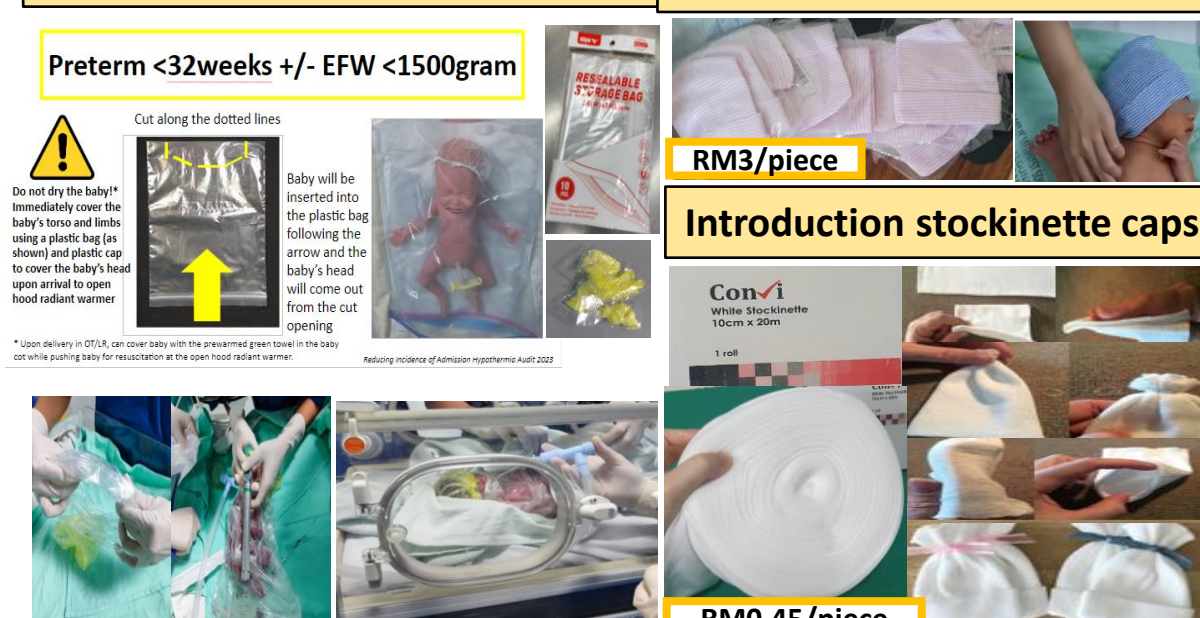


### Remedial 2 5.3 Thermal Supplies

Problem: No appropriate cap and plastic bag

Introduction of plastic caps and modified plastic ziplock bags

Introduction ready-made cloth caps

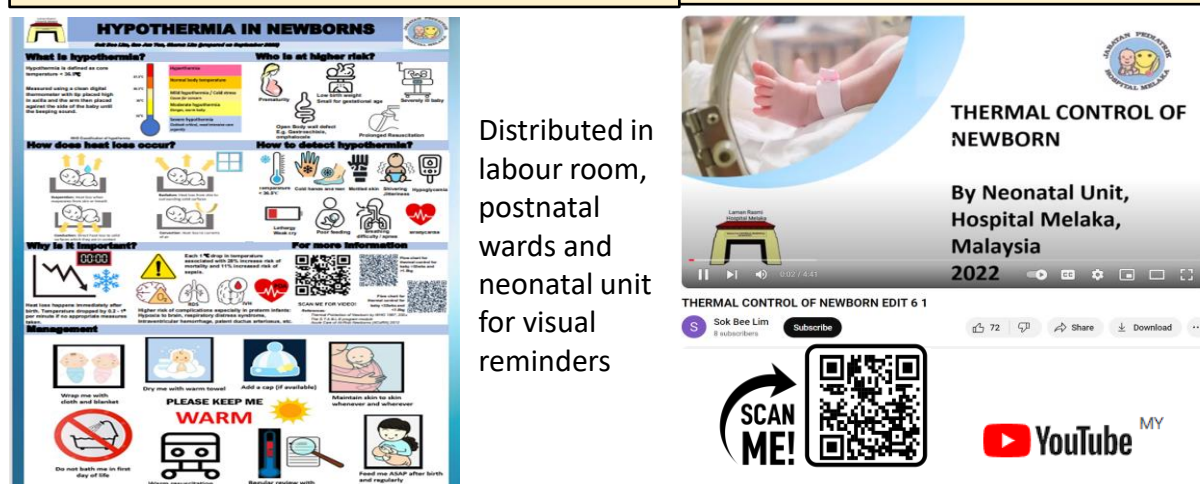


### Remedial 3 5.4 Educational Video and Poster

Problem: Lack of compliance with protocol

Educational posters with QR codes of thermal control guidelines and video

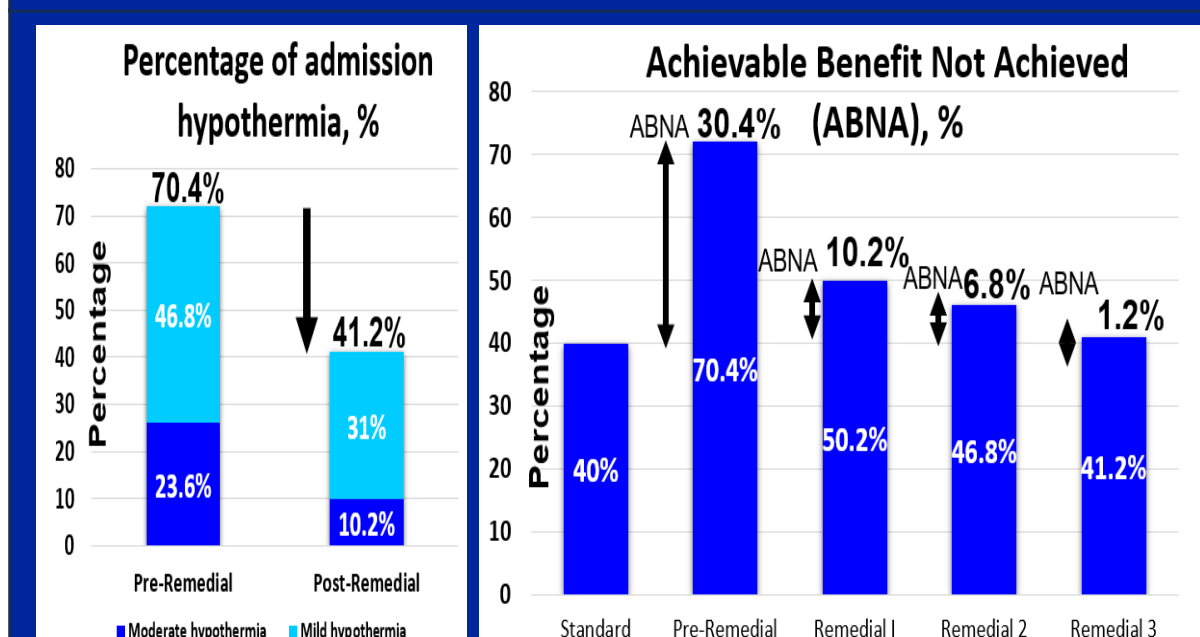
An educational video on the steps of thermal control



- Presentation of the monthly percentage of admission hypothermia reduction in department meeting during the remedial period
- New staff briefing with practical sessions (5 sessions)

## 6. Effect of Changes

### 6.1 Achievements



- Reduction of the percentage of total AH by 29.2%
- 85% of staff scored ≥75% with the mean score of knowledge improved from 49.5% to 80%
- Awareness of hypothermia checklists increased from 9.2% to 93.3%
- In VLBW neonates, those without AH had a shorter length of stay by 14.6 days as compared to those with AH.

### 6.2 Lesson Learnt

- Implementing thermal control care bundles reduces the AH percentage in premature infants.
- Compliance with thermal control care SOP is paramount to ensure the sustainability of this reduction.

## 7. Next Steps

- Continuous education with hands-on training
- To perform regular audit cycles to ensure sustainability
- Implementation of chemical thermal mattresses
- To expand the implementation of thermal control bundles nationwide

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