



REDUCING ADMISSION HYPOTHERMIA IN NEWBORNS USING SIMPLE THERMOREGULATION MEASURES: A QUALITY IMPROVEMENT STUDY

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Abstract

Background: Admission hypothermia is a common yet preventable problem in newborns and is associated with increased morbidity and mortality, particularly among preterm and low-birth-weight infants.

Aim: To reduce the incidence of admission hypothermia in newborns through implementation of simple, low-cost thermoregulation measures.

Methods: A pre- and post-intervention quality improvement study was conducted in a tertiary care hospital over a 6-month period. A total of 52 neonates were included, comprising 29 inborn and 23 outborn babies. Baseline (pre-PDSA) data were collected from 20 neonates, followed by sequential Plan–Do–Study–Act (PDSA) cycles, after which 32 neonates were evaluated. Interventions included staff sensitization, optimization of delivery room temperature, use of pre-warmed linen and head caps, application of plastic wrap in eligible preterm infants, reduction of delivery room-to-NICU shifting time to less than 30 minutes, and standardized transport practices. The primary outcome was the proportion of newborns with normothermia on admission.

Results: Admission hypothermia decreased from 50% (10/20) in the pre-intervention phase to 28.1% (9/32) post-intervention ($p < 0.05$). Improvements were observed in both inborn and outborn neonates. Mean delivery room-to-NICU transfer time for inborn neonates decreased significantly.

Conclusion: Simple thermoregulation practices combined with timely transfer significantly reduce admission hypothermia in both inborn and outborn neonates. These low-cost interventions are feasible and sustainable in routine neonatal care, even in resource-limited settings.

Keywords: Neonatal hypothermia, thermoregulation, inborn, outborn, transfer time, quality improvement, newborn

Introduction

Neonatal hypothermia remains a major contributor to neonatal morbidity and mortality, particularly in low- and middle-income countries. Newborns are vulnerable to heat loss due to a large body surface area, limited subcutaneous fat, and immature thermoregulatory mechanisms. Outborn neonates are at an even higher risk because of delays in transport, inadequate thermal protection during transfer, and suboptimal pre-referral stabilization.

The World Health Organization defines neonatal hypothermia as a body temperature below 36.5°C and emphasizes maintenance of the warm chain from birth through transport and admission. Despite

well-defined preventive strategies, admission hypothermia continues to occur frequently, indicating gaps in delivery room practices and neonatal transport processes. This quality improvement study aimed to address these gaps using feasible, low-cost interventions applicable to both inborn and outborn neonates.

Aim

To reduce the proportion of newborns with admission hypothermia among both inborn and outborn neonates.

Objectives

1. To determine baseline rates of admission hypothermia
2. To assess delivery room-to-NICU transfer times for inborn neonates
3. To identify gaps in thermoregulation and transport practices
4. To implement standardized thermoregulation and transport interventions
5. To evaluate the impact of these interventions on admission temperature

Methods

Study Design

A pre- and post-intervention quality improvement study using sequential Plan–Do–Study–Act (PDSA) cycles conducted over a 6-month period.

Study Setting

Delivery rooms, operating theatres, neonatal transport reception area, and neonatal nursery or NICU of a tertiary care hospital.

Study Population

A total of 52 neonates were included during the study period, comprising 29 inborn neonates delivered within the hospital and 23 outborn neonates referred from peripheral health facilities.

Inclusion criteria

- All inborn and outborn neonates admitted to the nursery or NICU

Exclusion criteria

- Major congenital anomalies
- Neonates with incomplete temperature or transfer time records

Baseline Measurement (Pre-PDSA Phase)

Baseline data were collected from 20 neonates prior to initiation of the PDSA cycles. Axillary temperature was recorded within 10 minutes of admission to the nursery or NICU using a calibrated digital thermometer. Admission hypothermia was defined as a temperature $<36.5^{\circ}\text{C}$.

For inborn neonates, delivery room-to-NICU shifting time was recorded from birth to admission. For outborn neonates, time from hospital arrival to NICU admission was documented.

Post-Intervention Phase

Following implementation of the PDSA cycles, 32 neonates were evaluated using the same definitions and measurement methods.

Problem Analysis

Baseline assessment identified:

- Suboptimal delivery room and operating theatre temperature
- Delayed drying and wrapping
- Inconsistent use of head caps

- Non-use of plastic wrap in eligible preterm infants
- Prolonged transfer and admission delays, especially in outborn neonates

Interventions

Interventions were introduced sequentially through PDSA cycles and included:

- Staff education on neonatal thermoregulation and WHO warm chain
- Maintenance of delivery room and OT temperature $\geq 26^{\circ}\text{C}$
- Immediate drying and wrapping with pre-warmed linen and universal use of head caps
- Use of plastic wrap for preterm infants <34 weeks' gestation
- Targeted delivery room-to-NICU shifting time <30 minutes
- Standardized thermal protection during transport

Outcome Measures

Primary Outcome

- Proportion of neonates with normothermia ($36.5\text{--}37.5^{\circ}\text{C}$) on admission

Secondary Outcomes

- Proportion of inborn neonates shifted to NICU within 30 minutes
- Mean delivery room-to-NICU transfer time

Process Measures

- Compliance with thermoregulation practices

Balancing Measures

- Hyperthermia ($>37.5^{\circ}\text{C}$)
- Workflow disruption

Data Analysis

Data from 52 neonates were analyzed, comparing the pre-intervention group ($n = 20$) with the post-intervention group ($n = 32$). Categorical variables were compared using the chi-square test, and continuous variables using appropriate parametric or non-parametric tests. A p value <0.05 was considered statistically significant.

Results

A total of 52 neonates were included, of whom 29 were inborn and 23 outborn.

Admission Hypothermia In the pre-intervention phase, 10 of 20 neonates (50%) were hypothermic on admission. After implementation of the PDSA interventions, admission hypothermia reduced to 9 of 32 neonates (28.1%), with 71.9% achieving normothermia ($p < 0.05$).

Inborn vs Outborn Neonates

Among inborn neonates, admission hypothermia decreased from 5/11 (45.5%) pre-intervention to 5/18 (27.8%) post-intervention.

Among outborn neonates, hypothermia reduced from 5/9 (55.6%) to 4/14 (28.6%) following intervention.

Transfer Time

For inborn neonates, mean delivery room-to-NICU transfer time decreased from 40 ± 10 minutes to 24 ± 8 minutes post-intervention. The proportion shifted within 30 minutes increased from 36.4% to 77.8% ($p < 0.01$).

Process and Balancing Measures

Compliance with use of pre-warmed linen and head caps increased from approximately 50% at baseline to >90% post-intervention. Plastic wrap was used in all eligible preterm neonates. No cases of hyperthermia or workflow disruption were observed.

Conclusion

Admission hypothermia among both inborn and outborn neonates can be significantly reduced through structured quality improvement initiatives combining simple thermoregulation measures with timely admission and optimized transport practices. These low-cost, sustainable interventions are practical and effective for improving neonatal outcomes in resource-limited settings.

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