

Abstract Title:

Reducing Hypothermia in Infants Returning Post Op from OR to NICU

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Introduction: Background: Due to high body surface area infants undergoing surgery are at risk for hypothermia, this is particularly so for premature infants who also have decreased subcutaneous and brown fat. These infants are often operated in cold ORs with high air turn over leading to conductive and convective heat losses, particularly so in those having laparotomies with exposed bowel. Hypothermia induced vasoconstriction can lead to impaired wound healing, surgical site infections, impaired coagulation, decreased drug metabolisms, which can collectively increase perioperative morbidity. The incidence of post op hypothermia and hyperthermia in infants has been reported to be 15.9% and 1.6%. Aim: To reduce the rate of hypothermia in infants returning from the operating room (OR) to the Neonatal Intensive Care Unit (NICU) by 50% in a span of one year (from 10.7% to 5.35%). Setting: CHOC Children's Hospital has a 67 bed regional NICU which receives about 800 admissions a year. In October 2013 a surgical NICU was opened with dedicated neonatal and surgical leadership. Hypothermia in infants returning from the OR was identified as a problem and a QI program to prevent post op hypothermia was initiated. Mechanisms: Infants can be at risk for hypothermia pre op, intra-operatively and post op. A cold NICU environment with inadequate hat/blanket, transport in an improperly heated transport isolette (TI) and opening the TI in a cold OR receiving area can lead to

rapid drops in infant's temperature. Lack of intra operative heating and a cold OR environment can lead to further drop in infant's temperature. Finally, transporting the post op infant back to the NICU in a cold TI can place them at risk for hypothermia. Drivers of Change: Focus on preventing heat loss during transport

Methods: From October 1, 2013 to February 28, 2014, we recorded 6 cases of hypothermia with temperature $<36^{\circ}\text{C}$ out of 56 infants returning to the NICU from the OR (10.71%). Hypothermia prevention strategies were developed and extensive education for the NICU and OR staff was provided in the following six months. A multi-disciplinary QI program was initiated in September 2014 with structured recording of temperature at four time points and compliance with hypothermia preventive strategies which included: Pre op: pre-warming of the TI and having a blanket available during transport. Intra-op: maintaining OR temperature $>72^{\circ}\text{F}$ and use of heating devices during surgery. Post op: Plugged in warm TI for transport back to the NICU. The team met monthly and a PDSA cycle was completed every quarter (Q1-Q4). Measures: Real time axillary temperature recordings at the four time points using the same disposable thermometer were made by the transport nurse. These included baseline temperature T1 prior to leaving the NICU. Temperature on arrival in OR T2 provided feedback regarding pre op strategies. Post op temperature T3 provided information about intra operative heating. Finally, temperature on return to NICU T4 provided information about return transport and overall temperature management. Compliance measures included pre warming of TI, availability of blanket during transport, OR temperature, plugging in of TI in OR and use of heating device by anesthesia during surgery. These were recorded in a structured QI audit sheet.

Results: Results: Axillary temperatures of infants at the four time points are shown in figure 1. In Q1, relatively low compliance with preheated TI and blanket resulted in 2 cases (10.5%) of hypothermia on arrival in OR (T2). With improved compliance with these strategies, there was one case in the second and no case of pre op hypothermia in the last two quarters. While we noted a drop in compliance with keeping OR temperature $>72^{\circ}\text{F}$ in Q2 (50%), this improved and by the Q4, there was 85% compliance. Compliance with use of intra op heating device and keeping TI plugged during surgery remained high throughout the 4 periods. In Q2, there were 3 cases (12.5%) of hyperthermia. With OR and NICU staff education and preventing over wrapping of infants, this was brought down to only 1 case in the last two quarters (3%). Only 1 infant developed hypothermia (in the entire year) on return to the NICU and this was attributed to use of alcohol body scrub prior to PDA ligation. Overall, from Sept 2014 to Aug 2015, the rate of hypothermia in infants returning the NICU was 1 in 76 infants (1.32%).

Conclusion: Discussion: Standardization, multi-disciplinary cooperation, developing nursing awareness and focusing on temperatures at multiple time points were key elements in our success in reducing rate hypothermia in infants returning to the NICU post op. Compliance with heat preserving strategies

improved substantially. Some infants were found to be too warm and judicious use of blanket on the way back from the OR led to improvement during the PDSA cycles.