In preventing preterm infant heat loss in the delivery room, how does the use of a plastic bag compare to a chemical heat pack?

Background
Preterm neonates are prone to a multitude of different problems including rapid heat loss. Newborns quickly lose body heat after birth and must rely on outside sources to maintain their body temperature (McCarthy & O'Donnell, 2011). This loss of heat increases the infant’s risk of developing cold stress and undergoing hypothermia. Cold stress is defined as body temperature of 36.0˚C to 36.5˚C (based on axillary readings). The infant’s condition is considered hyperthermic if the head temperature is above 37.0˚C (Parker, Donlon, Janel, & McCarthy, 2004). Hypothermia is a common problem among preterm infants admitted to a neonatal intensive care unit (NICU). A new low body temperature can cause severe stress to the infant, which ultimately can lead to organ dysfunction, transitioning out of fetal circulation, defective blood coagulation, renal failure, hypoglycemia, prematurity and respiratory distress syndrome (Rohana, Khairina, Boo, & Shareena, 2009). An increased incidence of hypothermia is also associated with an increase in neonatal morbidity and mortality (McCarthy & O’Donnell, 2011; Protirolo et al., 2011). Rohana et al. (2009) showed there are four main routes by which infants lose body heat including: conduction, convection, evaporation, and radiation (Protirolo et al., 2011). Different methods have been developed to prevent heat loss caused by these different routes in preterm neonates. The purpose of this literature review was to examine different methods of hypothermia prevention and how they affect the outcomes of preterm neonates.

Warming preterm infants in the delivery room: polyethylene bags, exothermic mattresses or both?

Purpose:
McCarthy and O’Donnell (2011) performed a study to analyze the benefits and disadvantages of using plastic bags with and without a chemical heat pack. They followed the ADOBE standards on axillary temperature taken digitally when the infant reached the NICU. Inclusion in this study required the infant to be less than 37 weeks gestation and born within the designated time frame (July 2010 to January 2011). Infants born with a birth defect resulting in a skin lesion were excluded.

Methods:
In the delivery room, all infants were placed on a radiant warmer after delivery. Standard procedure for this study was to place infants in a plastic, food grade bag without being dried. Their heads were put through the bag and the bag was secured to the infant. They were then placed on the radiant warmer. In the delivery room, babies were conserved with the bag. Infants were placed on the infants after drying their heads to prevent heat loss. The use of exothermic heat pack was at the birth unit’s preference and whether they felt it was necessary or not. Once the infants arrived in the NICU, measurement of their temperature and the radiant warmer were turned off. The infant’s mattress was measured in temperature and the infants were placed on it. Analysis was completed with PASW Version 18.0 software.

Findings:
Bags were used along with Transwarmer mattresses for 23 infants, and 15 infants were included only in the bag group. All these groups were considered similar in age, birth weight, gestation age and the day of birth. Group 1 only had 33% infants with an ideal temperature (36.5-37.5 degrees Celsius) as opposed to 37% of the 2nd group. Though these numbers did not appear significant, they could be influenced by the differences that existed between the groups. Within Group 3, the infants were generally more developed and of greater weight than those in Group 1 who used both a mattress and a bag. Implications:
Though the doctors seemed to prefer it the less mature and lower birth weight infants in a plastic bag and an exothermic mattress. They however, did not prefer it in infants of normal body temperature. When both of these interventions were used, the neonates were more likely to be hypothermic. Hypothermia was defined as body temperature below 36.5˚C. Weaknesses associated with this study include a small sample size, failure to record the baby’s temperature at the delivery room before the start of the heating packs, as well as recording the data one week after birth. Taking axillary instead of rectal temperature was also considered a weakness due to the fact that they were not collecting core body temperatures, resulting in a greater chance of variation.

References

Use of Chemical Warming Packs During Delivery Room Resuscitation Is Associated With Decreased Rates of Hypothermia in Very Low-Birth-Weight Neonates

Purpose:
Scheffler, B. B., Beyrer, F., Fundon, D., and Reu-Denton (2011) conducted a study evaluating the effectiveness of chemical warming packs in reducing hypothermia in very low-birth-weight (VLBW). VLBW infants are associated with an increased risk of prematurity alone.

Method:
This study was a retrospective analysis of previously recorded data used for quality assurance. Analyzed data was taken from a 21 month period starting in January 2006. Inclusion criteria included all VLBW neonates born in the facility and admitted to the NICU with neonates born outside the facility and those who died during delivery being excluded. Temperature were measured using thermal thermometers in the axilla 30 minutes after arrival going to the NICU and prior to removal from the transport warmer. There were 310 VLBW infants total, with 183 being evaluated during use of the chemical warming packs and 137 admitted after the removal of the heating packs as a hypothermia prevention method.

Findings:
Between the two groups there was no significant difference in mean birth weight, gestational age, gender, multiple pregnancy, preterm birth, cesarean section, or surfactant administration. Significant differences were seen between the groups in regards to vaginal delivery rate, delivery room stimulation and the use of surfactant in the delivery room. It was found that there were lower temperatures upon arrival without the use of the chemical warming packs, with the difference between the means of the two groups being 26.4˚C. With the use of the warming packs, 39% of VLBW neonates developed hypothermia, while 68% developed hypothermia with the use of pre-heated blankets alone.

Implications:
Results suggest that chemical warming packs are an effective addition to prevent heat loss and transitional hypothermia in the VLBW population, thus reducing the frequency of cold stress and increasing survival rates. The large sample population allowed for more accurate finding of statistical significance, reducing the risk of finding significance by chance. Possible weaknesses of the study include the previously recorded data versus present data. As a result, the study is a non-randomized control group. Also, the study did not detail the factors that contributed to the infant’s hypothermia. Retrospective data collection makes it difficult to collect all the necessary data, indicating the vaginal delivery rates could have altered the end results of this study.

Discussion
The study that we looked at compared the use of polyethylene bag/shirts and chemical warming packs against other warming interventions with the primary goal to prevent hypothermia in the VLBW population. Both methods were found to be more significant than the methods they were being tested against. Hypothermia was found in 33% of infants who were placed in bags, 76% when warming packs were used, and 78% when the wrap was used which is still a decrease of 20% from the control group that did not use the wrap. From these results it can be concluded that chemical warming packs are better than chemical warming packs in preventing hypothermia in preterm infants; however, the study researching chemical heat packs had a much larger sample size. The sample size showed a significant improvement on the rates of hypothermia, but the rate remained high. Although the use of warmers had higher rates of hypothermia than other documented methods, it did show a significant improvement over that facilities standard hypothermia precautions.

We had three main goals to add significantly to the literature in this area. The first goal was to critically analyze the literature on chemical warming packs and to determine if they were effective or not. The second goal was to compare the effectiveness of chemical warming packs against other documented methods of warming. The third goal was to determine the effectiveness of chemical warming packs against each other. We determined that the effectiveness of chemical warming packs and their ability to prevent hypothermia in preterm neonates is an area that needs more research.