

The Embrace Infant Warmer for the Treatment of Hypothermia in Resource Limited Settings

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Abstract—Hypothermia continues to be a leading cause of infant morbidity and mortality in underdeveloped counties due to lack of education about the risks and lack of resources to treat hypothermia. With education and distribution of low cost/low resource infant warmers there is opportunity to increase infant survival in these countries

I. INTRODUCTION

INFANT hypothermia is associated with significant morbidity and mortality. Four million infant deaths per year globally are believed to be due to hypothermia, a largely preventable cause. Developed nations with easily accessible healthcare resources and infrastructure are able to overcome the challenges of infant thermoregulation. However, current global birth practices have yet to sufficiently address this challenge. Newborns are born with complex mechanisms of body temperature regulation, a critical function for newborn survival. In premature and low birth weight infants these mechanisms are easily overcome initiating detrimental pathophysiological and metabolic processes leading to infant morbidity and mortality.



An infant inside the Embrace Infant Warmer

II. METHODS

Treatment of hypothermia in developed nations is done through the use of high tech resource rich incubators. These incubators require not only large amounts of capital (\$15,000-\$36,000 US) but also education, and resources such as electricity and monitoring, luxuries not available to rural and underdeveloped areas. This is the challenge the engineers at Embrace Global set out to overcome. Started as an undergraduate engineering challenge course at Stanford, the Embrace team targeted an area of rural India with high infant mortality rates as a market to design a low cost/low resource infant warmers. The team designed the Embrace Infant Warmer to be able to be utilized in the resource limited area taking into account cultural practices such as babies not wearing diapers, inconsistent or nonexistent electricity supplies, lack of technical expertise for maintenance of devices or complex assembly or use. Most importantly the

team needed to design a low cost infant warmer that could be distributed easily.

III. RESULTS

To address these challenges the team at Embrace Global design a reusable, washable infant warmer consisting of a durable sleeping bag like baby wrap in which a heated plastic pouch is placed. The wax material within the pouch changes from a solid when cool to a liquid when heated to 98.6°F. The heat then dissipates over 4-6 hours keeping the infant normothermic during this time. The wax pouch can be heated in the accompanying heating case by either hot water or by electricity in 25 minutes. The wrap itself can be washed up to 50 times. The cost of this device is \$25 (US) and its low tech manufacturing is able to be done in developing nations close to where the device is most useful.



The Embrace Infant Warmer; BabyWrap, WarmPak, and AccuTemp Heater

IV. DISCUSSION

The Embrace Infant Warmer exhibits how Biomedical Engineers can help implement social change. Through the design of this low cost/low resource infant warmer Embrace Global by partnering with non-governmental organizations in areas of need have been able to help treat infant hypothermia and the associated morbidity and mortality. Through social engineering projects like this Biomedical Engineers are able to make a lasting impact on world health.

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