Effects of using a Baby Swaddling during Nursing Procedures on Body Temperature, Wriggling, Dislodgement of Peripheral line and The Incidence of Needlestick injury

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Abstract

Preterm and low birth weight infants are at higher risk of hypothermia, which is associated with increased morbidity and mortality due to ineffective thermoregulation and physical characteristics that facilitate rapid heat loss. Peripheral intravenous insertion procedure often requires an open procedure cart in drafty areas along with swaddling due to radiant warmer insufficient. As a result, the conventional swaddling are thin and unable to secure infants properly. Resulting in, increased risk of needlestick injuries, dislodgement of IV sites, prolong procedure time and increasing rate of hypothermia. If not addressed promptly, hypothermia can lead to cold stress, apnea, hypoglycemia, or even death.

The researcher developed an innovation called “Baby Swaddling during Nursing Procedures” to prevent hypothermia, limit movement, and reduce squirming in infants.

This experimental research employed a two-group posttest design comparing the innovative swaddling with conventional swaddling. The study aimed to compare mean body temperature, infant movement, peripheral IV line dislodgement and needlestick injuries between the two groups. The purposively selected sample consisted of 60 stable preterm and low birth weight infants (BW 1,800-2,000 grams), admitted to the Intermediate Neonatal Intensive Care Unit at Thammasat University Hospital, divided into experimental (n=30, using innovative swaddling) and control groups (n=30, using conventional swaddling). Research instruments included a demographic data forms, a vital signs chart record as well as the clinical practice procedure for the peripheral intravenous catheter insertion, and experimental record forms. Data were analyzed using descriptive statistics, Chi-Square, Fisher exact test, and T-test. Results showed Post-procedure body temperatures in the experimental group was significantly higher than those of the control group ($p<0.01$). The control group experienced an average temperature decrease of 0.37 °C with 16.17% developing hypothermia, while the experimental group showed an average increase of 0.35 °C with temperatures remaining within normal range. Regarding restraint effectiveness, 53.3% of the control group wriggled free of their swaddle compared to none in the experimental group ($p<0.01$). Additionally, 20% of the control group experienced peripheral IV line dislodgement compared to none in the experimental group($p<0.05$). No needlestick injuries occurred in either group. This research demonstrates the innovation's effectiveness in swaddling infants during procedures, preventing hypothermia as an alternative to radiant warmers, preventing movement-related displacement, reducing required staff assistance, and ensuring

safety for both patients and staff. The innovation should be extended for use in vaccinations, eye examinations, hearing tests, etc., and implemented in other units. Future research should study the innovation's effects on infant skin friction, procedure duration, explore its applications in diverse neonatal populations to ensure broader relevance., and user satisfaction to further improve its contextual appropriateness.

Keywords: Innovation, Baby swaddling during Nursing procedures, Hypothermia, Wriggling, Needlestick injury, Preterm infant, Low birth weight infant

Baby Swaddling during Nursing Procedures

Introduction

Preterm and Low birth weight infants are the vulnerable group who have greater risk of hypothermia (hypothermia is defined as a body temperature of less than 36.5 °C), which is associated with increased morbidity and mortality. Due to their ineffective thermoregulation, as their hypothalamus is not fully developed for this function. Physical characteristics that contribute to rapid heat loss include a large body surface area compared to weight, less brown fat, thinner skin, and the lack of non-shivering thermogenesis. If not addressed promptly, hypothermia can lead to complications such as lethargy, bradycardia, tachypnea, apnea, acidosis, hypoglycemia, poor feeding, weight loss, and poor weight gain, resulting in longer hospital stays and higher medical costs.

As this result, preterm infants usually observe in incubator as well as monitor their body temperature. When they are stabilized and weight gain more than 1,800 grams, the neonates were weaning from incubator soon. Then, stable preterm infants should be closed observe in crib and kept warn by a double blanket wrapped.

Preterm infants require regular follow up care to identify health issue, physician might require blood sampling, peripheral IV insertion and perform health assessment. Then, it necessary to open a double blanket during perform this procedure, those preterm infants will show hypothermia later. From this review, during perform IV insertion or any procedure which require to open a blanket, nurse usually use radiant warmer and swaddling to keep infants warm before operating procedure. However, in the INICU, the number of radiant warmers is inadequate, so we often use an open procedure cart in drafty areas along with conventional swaddling. As a result, conventional swaddling are thin and unable to secure the baby properly before IV catheter insertion. It was found to be too risky, leading to needlestick injuries, dislodgement of the IV site, prolong procedure time and increased rate of hypothermia. Thus, we require more staff assistance.

The researcher developed an innovation called 'Baby Swaddling during Nursing Procedures.' It is made from three layers of fabric to prevent heat loss. The design allows it to wrap the entire body, with the option to open only the specific arm or leg required for the procedure. Available in two sizes, it can be adjusted to fit the infant's body. Additionally, it includes thin Velcro tape to secure a snug fit and limit movement. It is an innovative solution to reduce squirming infants and prevent hypothermia, serving as a replacement for the radiant warmer.

Objectives

1. To prevent hypothermia and reduce squirming during procedures.
2. To compare mean of body temperature between groups at before and after perform IV insertion procedure.
3. To compare rate of the wriggling, dislodgement of the original peripheral intravenous Catheter and needlestick injuries between groups after implement nursing procedure.

Target group

Stable preterm infants with a gestational age of less than 37 weeks and a low birth weight of 1,800–2,000 grams.

Innovation process

The Design Thinking Process was used in the development of the innovation:

1. Empathize: Understand the problems and pain point of the target group. (The conventional swaddling blanket are thin and unable to secure infants properly)

2. Define: In the INICU, statistics show that 25% of preterm and Low Birth Weight Infants wriggle free from the swaddle, 19% incidence of hypothermia after the procedure, Needlestick injuries average 1-2 times per year.

3. Ideate: Review literature, Data Analyze, Collaborate with the team to propose potential solutions.

4. Prototype: Design and create an innovative prototype suitable for the target group to address problems, that is user-friendly and safe. for both infants and staff.

5. Test: Evaluate the efficiency and effectiveness of the prototype, Data collection for improvement and development, and ensure successful practical use.

Features of the Innovation

"Baby Swaddling during Nursing Procedures" is an innovative solution to prevent hypothermia and reduce squirming during procedures.

- Made from three fabric layers : the outer layer is breathable cotton, the middle layer has a thin synthetic polyester fiber lining to prevent heat loss, and the inner layer is faux fleece polyester. The materials used are safe, soft, gentle on the infant's skin, and do not create pressure marks.
- Available in two sizes can be adjusted to fit the infant's body : Small size for body weight 1,800-2,000 grams and Large size for body weight more than 2,000-2,500 grams.
- Thin Velcro tape to secure a snug fit and limit movement.
- Designed to open only the specific arm or leg required for the procedure.
- It is Easy to use, washable, cleanable, sterilizable and reusable.

- Offers a cost-effective alternative, used as a replacement for the radiant warmer to provide warmth in short procedures, such as IV insertion, blood sampling, vaccinations, ear and eye examinations. It has a production cost of 2,500 THB/unit, compared to the radiant warmer, which costs 400,000 THB/unit.

Benefits

1. Infants:

- Prevent hypothermia
- Limits movement to reduce squirming during nursing procedures such as blood sampling, peripheral intravenous line insertion, vaccinations, examinations of the ears and eyes.

2. Nurses and Nursing Assistants:

- Improves convenience and efficiency.
- Reduces the risk of harm or prevents needlestick injuries.
- Reduces the need for additional staff assistance.
- Decreases procedure time.

3. Doctors:

- Allows for quicker diagnosis and more efficient treatment.

4. Hospitals:

- Reduces medical equipment costs.

Results

1. Body Temperature : Post-procedure body temperatures in the experimental group was significantly higher than those of the control group ($p<0.01$). The control group experienced an average temperature decrease of 0.37 °C with 16.17% developing hypothermia, while the experimental group showed an average increase of 0.35 °C with temperatures remaining within normal range.

2. Wriggling : 53.3% of the control group wriggled free of their swaddle, compared to none in the experimental group ($p<0.01$).

3. Dislodgement of the original peripheral intravenous catheter : 20% of the control group experienced peripheral IV line dislodgement compared to none in the experimental group ($p<0.05$).

4. Needlestick injuries : No needlestick injuries occurred in either group.

Conclusion

The innovative baby swaddling method is effective for wrapping infants during IV catheter insertion. It is useful in reducing heat loss and preventing hypothermia in preterm infants with low birth weight, and less harm or prevent any needlestick injuries during the procedure. Additionally, it helps reduce infant squirming, which in turn minimizes the need for staff assistance and enhances safety for both patients and staff