Innovative warm blanket solution for inadvertent hypothermia among post-anesthesia patients

By Cahaya Nugraheni

WORD COUNT 3369
TIME SUBMITTED 31-MAY-2024 10:28AM
PAPER ID 109333542

Malahayati International Journal of Nursing and Health Science, Volume 07, No.3, May 2024: 323-329

MINH
MALAHAYATI INTERNATIONAL JOURNAL OF NURSING AND HEALTH SCIENCE
ISSN 2620-9152 (Print)
ISSN 2621-4083 (Online)
DOI: 10.33024

Nomor: 79/E/KPT/2023

ARTICLE INFORMATION
Received: March, 26, 2024
Revised: May, 29, 2024
Available online: May, 30, 2024
at : https://ejurnal.malahayati.ac.id/index.php/minh

Innovative warm blanket solution for inadvertent hypothermia among post-anesthesia patients

Cahaya Nugraheni*, Arwani, Sri Endang Windiarti

Program Pascasarjana, Magister Terapan Keperawatan, Poltekkes Semarang
Corresponding author: *E-mail: cahayangrhn@gmail.com

Abstract

Shivering helps the body maintain its core temperature but can have harmful effects, such as increasing the oxygen demand in brain tissue. It frequently occurs in patients after anesthesia due to various factors.
To prove the effect of providing innovative warm blankets to treat shivering in post-anesthesia patients.
This quantitative quasi-experimental research with a pretest-posttest with control group design used purposive sampling to select 60 participants, who were divided into 2 groups: 30 participants in the treatment group and 30 participants in the control group. The treatment group received an intervention with an innovative warm blanket, while the control group received an intervention with a standard warm blanket according to the hospital's standard operating procedures. The measurement data were accumulated and analyzed using the Mann-Whitney test, and Cohen's effect size was used to assess the influence and differences between the innovative warm blanket and standard hospital warm blanket.
The temperature in the intervention group, which received the innovative warm blanket treatment, rose by 2.050°C (p=0.001). In contrast, the temperature in the group that received the standard hospital warm blanket treatment increased by 1.80°C (p=0.001).
Innovative warm blankets result in a greater temperature increase compared to the standard warm blankets used in accordance with hospital protocols.

.

INTRODUCTION

In several countries, mortality and morbidity related to anesthesia procedures are quite high. In the United States, from 1999 to 2005, a mortality rate of 1.1 per 1 million population per year was found. Research in Australia showed an increase in mortality to 9.87 per 1 million population in 2017. India recorded perioperative mortality at 0.46%, which increased to 25% after surgery. Another study in Congo showed perioperative mortality at 9% and 24-hour post-general anesthesia mortality during surgery at 46% (Boet, Etherington, Nicola, Beck, Bragg, Carrigan, & Perioperative Anesthesia Clinical Trials Group, 2018). Meanwhile, data for Indonesia are not yet available, but it is estimated that Indonesia has similar conditions.

The scope of work for anesthesiology and intensive therapy specialists is closely related to patient safety aspects. The work environment for anesthesiology and intensive therapy specialists ranks at the top in the hierarchy of healthcare service priorities in hospitals, including emergency rooms, operating rooms, intensive care units (ICU), procedural sedation rooms, and pain management clinics. These areas are characterized by critical services, high patient risk, large volumes of healthcare workload, frequent issues, and all three elements are also closely related to the operational

DOI: https://doi.org/10.33024/minh.v7i3.286

costs incurred by hospitals (high-cost) (Ministry of Health of the Republic of Indonesia, 2024).

Anesthesia and reanimation are medical fields focused on managing pain relief, patient discomfort, and other unexpected sensations. Anesthesiology involves the study of techniques to sustain a patient's life while they are in a state of induced "death" caused by anesthetic drugs (Bashaw, 2016). Anesthesia is the act of eliminating pain during surgery (Merchant, Chartrand, Dain, Dobson, Kurrek, Morgan, & Shukla, 2012).

Surgical procedures carry multiple risks that threaten patients, including the type of anesthesia, surgical position, medications used, blood components, operating room readiness, temperature and humidity, electrical hazards, potential contamination, noise, feelings of neglect, and unnecessary conversations. After administering anesthesia, the anesthetist is responsible for monitoring and maintaining the physiological functions of the patient's vital organs, especially in cases involving complications, cardiovascular and lung diseases, chronic conditions, advanced age, and prolonged surgeries (Seyedfatemi, Rafii, Rezaei, & Kolcaba, 2014).

One complication following anesthesia is shivering, which is the body's method of maintaining core temperature. However, shivering can have dangerous effects, such as increasing systemic oxygen demand, brain tissue oxygen levels, and intracranial pressure. It can also be triggered by hypothermia due to vasodilation and impaired body thermoregulation. A study reported that 52% of patients undergoing spinal anesthesia experienced hypothermia (Syauqi, Purwandar, & Priyono, 2019).

Shivering can have several harmful effects, including increased oxygen demand, elevated body metabolism, higher CO2 production, a greater risk of *hypoxemia*, the onset of *lactic acidosis*, increased *intracranial* and *intraocular* pressure, heightened post-surgical pain, and the release of *catecholamines*. It can raise oxygen requirements by as much as 500%. A key sign of shivering is tremor, a normal thermoregulatory response to hypothermia during regional anesthesia and surgery (Zhang, Chen, & Xiao, 2018). Shivering is an unpleasant and common complication, occurring in 40-60% of cases after spinal anesthesia (Nazma, 2008).

Shivering is an uncomfortable and common complication after anesthesia, particularly spinal anesthesia. It is a normal thermoregulatory response to hypothermia, but can also be triggered by painful stimuli and certain anesthetic agents. To address thermoregulation issues like shivering and hypothermia, maintaining normal body temperature during surgery is essential. Non-pharmacological methods, such as using a warm blanket, can help manage these conditions by enhancing the body's tolerance to decreased temperatures through heat conduction. Using a blanket warmer provides external warming to surgical patients, especially those undergoing lower extremity replacement, which effectively reduces or minimizes postoperative hypothermia symptoms (Winarni, 2020).

RESEARCH METHOD

This quantitative quasi-experimental study employed a pretest-posttest control group design. Sixty participants were chosen through purposive sampling and divided into two groups: 30 in the treatment group and 30 in the control group. Random sampling ensured equal chances for all participants to be selected as research participants.

The treatment group received an innovative warm blanket intervention, while the control group used a standard warm blanket as per hospital procedures. The innovative blanket was modified to include a time and temperature measurement device for direct body temperature monitoring, unlike the standard blanket, which used conventional temperature measurement methods. Body temperatures were recorded after anesthesia and before the intervention as pre-test data, and at 30-minute intervals post-intervention as post-test data. The data were analyzed using the Mann-Whitney test, and Cohen's effect size was utilized to determine the impact and differences between the innovative and standard warm blankets.

The Ethics Committee of PKU Muhammadiyah Yogyakarta Hospital has approved and recommended this study, as documented in letter No. 00249/KT.7.4/X/2023, dated October 26, 2023.

RESEARCH RESULTS

Cahaya Nugraheni*, Arwani, Sri Endang Windiarti

Program Pascasarjana, Magister Terapan Keperawatan, Poltekkes Semarang
Corresponding author: *E-mail: cahayangrhn@gmail.com

DOI: https://doi.org/10.33024/minh.v7i3.286

Table 1. Characteristics of Participants (N=60)

Variable	Group		p value
	Experiment (n=30)	Control (n=30)	
Age (Mean±SD)(Range)Years	(44.1+14.28)(21-71)	(45.5+13.03)(47-70)	
Age (n/%)			
20 – 55 years old	23/76.7	24/80.0	0.05
56 – 75 years old	7/23.3	6/20.0	
Gender (n/%)			
Male	10/33.4	11/36.7	0.06
Female	20/66.6	19/63.3	
Duration of Surgery (n/%)			
30 minutes	19/63.3	14/46.7	0.12
60 minutes	11/36.7	16/53.3	
Body Mass Index (n/%)			
<18.4 kg/m^2	6/20.0	8/26.7	0.66
18.5 – 25.0 kg/m^2	19/63.3	12/40.0	
>25.1 kg/m^2	5/16.7	10/33.3	

Table 1 illustrates the statistical findings regarding various variables. The age variable yielded a p-value of 0.05. In the experimental group, the mean age was 44.1 with a standard deviation of 14.28, ranging from 21 to 71 years. Conversely, the control group had a mean age of 45.5 with a standard deviation of 13.03, ranging from 47 to 70 years. Among participants aged 20-55 years, 76.7% belonged to the experimental group, while 80.0% were in the control group. For participants aged 56-75 years, 23.3% were in the experimental group, and 20.0% were in the control group.

Regarding the gender variable, the p-value was 0.06. In the experimental group, 33.4% were male, and 66.6% were female. In the control group, 36.7% were male, and 63.3% were female.

The variable concerning the duration of surgery yielded a p-value of 0.12. In the experimental group, 63.3% of participants had a surgery duration of 30 minutes, while 36.7% had a duration of 60 minutes. In the control group, 46.7% had a duration of 30 minutes, and 53.3% had a duration of 60 minutes.

The body mass index variable resulted in a p-value of 0.66. In the experimental group, 20.0% of participants had a BMI <18.4 kg/m2, 63.3% had a BMI of 18.5–25.0 kg/m2, and 16.7% had a BMI >25.1 kg/m2. In comparison, in the control group, 26.7% had a BMI <18.4 kg/m2, 40.0% had a BMI of 18.5–25.0 kg/m2, and 33.3% had a BMI >25.1 kg/m2.

Table 2. The Average Pre-Test and Post-Test Temperature

Variable	Temperature (°C)			p value
	Pre-test	Post-test	Difference	
	Median (min-max)	Median (min-max)	Median	
Experiment	34.15 (33.0-34.0)	36.20 (34.0-36.0)	Δ 2.05	0.001
Control	34.20 (33.0-34.0)	36.00 (35.0-36.0)	Δ 1.80	0.001

**Mann Whitney*

Cahaya Nugraheni*, Arwani, Sri Endang Windiarti

Program Pascasarjana, Magister Terapan Keperawatan, Poltekkes Semarang
Corresponding author: *E-mail: cahayangrhn@gmail.com

DOI: https://doi.org/10.33024/minh.v7i3.286

Table 2 indicates that the temperature data of the experimental group yielded a p-value of 0.001. The temperature exhibited a difference of 2.05, rising from a pre-test median of 34.15 to a post-test median of 36.20. Similarly, the temperature data of the control group resulted in a p-value of 0.001, with an increase difference of 1.80, ascending from a pre-test median of 34.20 to a post-test median of 36.00.

Table 3 Effect Size

Variable	Group	Sample	Cohen's Effect
Temperature	Intervention	30	0.68*
	Control	30	

**Cohen's Effect*

Table 3 shows that the effect size between the experimental group and the control group is 0.68.

DISCUSSION

This warm blanket is declared suitable for use to treat shivering after anesthesia. The advantage of this tool lies in the novelty of the LCD display feature which can show the actual temperature of the blanket and the temperature given to the patient. Apart from that, there is a stopwatch on the LCD monitor showing the time for intervention. The feasibility test for this tool was carried out by several experts in their fields, namely medical electrologists, nurse anesthetists, and also anesthesiologists. This tool was declared suitable after being tested at an educational institution and also tested on patients according to the inclusion and exclusion criteria outside the sample.

Warm Blanket to Overcome Shivering in Post Anesthesia

During anesthesia and surgery, the body's internal temperature decreases due to heat loss. When this initial drop in temperature occurs, the hypothalamus signals the body to conserve heat by narrowing blood vessels and generating heat through muscle contractions. Preoperative warming through forced-air warming can be performed to prevent or reduce the risk of inadvertent perioperative hypothermia (Zamarelli, Yim, & Hazan, 2020). This thermoregulatory process involves the contraction and relaxation of skeletal muscles, which can boost the metabolic rate by 4-5 times compared to normal conditions. The increased metabolic activity, driven by the release of *thyroxin* and *catecholamines* (*epinephrine* and *norepinephrine*), heightens the sympathetic nervous system's response. Consequently, this leads to inadequate ventilation, an imbalance between oxygen supply and demand, and peripheral vasoconstriction, preventing effective oxygen delivery to cells, tissues, and organs.

Applying a warm blanket heats the skin receptors, especially on the chest and hands, promoting relaxation. This warming raises body temperature and increases the energy in thermal compounds within the body's organs. Changes in body temperature are detected by two types of thermoreceptors: peripheral thermoreceptors in the skin and central thermoreceptors in the hypothalamus and spinal cord. The central thermoreceptors provide crucial feedback for maintaining body temperature, transmitting signals through spinal nerves, lymph glands, skin cells, and the adrenal medulla, and through motor nerves to the skeletal muscles and heart. The heart supports this process by periodically contracting and relaxing arteries, facilitating blood flow to distribute heat energy throughout the body. This circulation helps equalize internal and surface body temperatures, ensuring even heat distribution.

In previous research, a warm blanket solution was combined with other products to address chemical reactions. Experts conducted a feasibility test, and results were calculated using Cohen's formula, yielding an effect size of 0.68, indicating a moderate effect in measuring shivering. Statistical results from the clinical study showed that the group tested with the new product had outcomes similar to those using the hospital's standard. In the control

Cahaya Nugraheni*, Arwani, Sri Endang Windiarti

Program Pascasarjana, Magister Terapan Keperawatan, Poltekkes Semarang
Corresponding author: *E-mail: cahayangrhn@gmail.com

DOI: https://doi.org/10.33024/minh.v7i3.286

group, which adhered to standard hospital procedures, the post-test average value level was 0.25 degrees Celsius. The intervention group, using the warm blanket product, achieved a higher average temperature. Although both groups had nearly identical temperature outcomes, monitoring was easier in the intervention group due to the installed OLED screen that displayed temperature on a screen. This allowed nurses to easily monitor patient temperatures. The warm blanket product was also noted for its lower wattage, making it more cost-effective and simpler to operate.

Nursing Implications

Post-surgical hypothermia affects both physical and psychological comfort. Providing comfort to patients, particularly those experiencing a drop in body temperature after surgery, is a key role and function of treatment. One effective method for managing this condition is using warm blankets to internally warm patients. The predetermined forced-air warming temperature pattern set at 42 °C for the first hour after anesthesia induction and maintained at 38 °C is a suitable option for elderly patients undergoing laparoscopic abdominal surgery lasting more than 120 minutes (Wang, Fang, Sun, & Li, 2022).

The use of warm blankets has been shown to raise body temperature and provide comfort to post-operative patients in the recovery room. These clinical results can be utilized to enhance educational skills, particularly in delivering comprehensive nursing care and addressing nursing issues sustainably. Additionally, this knowledge can serve as a reference for nurses performing similar treatments, contributing to the advancement of nursing science.

LIMITATION

The researchers did not classify the medication type or pharmacological treatment administered, thus making this pharmacological factor a confounding variable. Additionally, the researchers were unable to manage factors influencing shivering, such as the specific type of surgery conducted.

SUGGESTION

Using this device as an intervention can serve as a reference for alleviating post-anesthesia shivering discomfort. Additionally, its innovation has the potential for further development to enhance its benefits in the healthcare field.

CONCLUSION

The use of warm blankets is considered an appropriate solution for treating post-anesthesia shivering and has proven effective in raising the body temperature of affected patients.

REFERENCES

Bashaw, M. A. (2016). Guideline implementation: preventing hypothermia. *AORN journal, 103*(3), 304-313.

Boet, S., Etherington, N., Nicola, D., Beck, A., Bragg, S., Carrigan, I. D., & Perioperative Anesthesia Clinical Trials Group (PACT). (2018). Anesthesia interventions that alter perioperative mortality: a scoping review. *Systematic Reviews, 7*, 1-15.

Buggy, D. J., & Crossley, A. W. A. (2000). Thermoregulation, mild perioperative hypothermia and post-anaesthetic shivering. *British journal of anaesthesia, 84*(5), 615-628.

Cahyawati, F. E. (2019). Pengaruh Cairan Intravena Hangat Terhadap Derajat Menggigil Pasien Post Sectio Caesarea di RS PKU Muhammadiyah Gamping. *Jurnal Kebidanan, 8*(2), 86-93.

Ilmiasih, R., Nurhaeni, N., & Waluyanti, F. T. (2015). Aplikasi teori comfort Kolcaba dalam mengatasi nyeri pada anak pasca pembedahan laparatomi di Ruang BCH RSUPN Dr. Cipto Mangunkusumo Jakarta. *Jurnal Keperawatan, 6*(1).

John, M., Crook, D., Dasari, K., Eljelani, F., El-Haboby, A., & Harper, C. M. (2016). Comparison of resistive heating and forced-air warming to prevent inadvertent perioperative hypothermia. *BJA: British Journal of Anaesthesia, 116*(2), 249-254.

Kukus, Y., Supit, W., & Lintong, F. (2009). Suhu tubuh: homeostasis dan efek terhadap kinerja tubuh manusia. *Jurnal Biomedik: JBM, 1*(2).

Merchant, R., Chartrand, D., Dain, S., Dobson, J., Kurrek, M., Morgan, P., & Shukla, R. (2012).

Cahaya Nugraheni*, Arwani, Sri Endang Windiarti

Program Pascasarjana, Magister Terapan Keperawatan, Poltekkes Semarang
Corresponding author: *E-mail: cahayangrhn@gmail.com

DOI: https://doi.org/10.33024/minh.v7i3.286

Guidelines to the practice of anesthesia revised edition 2012. *Canadian Journal of Anesthesia*, *59*(1), 63.

Ministry of Health of the Republic of Indonesia, (2024) Pedoman Nasional Pelayanan Kedokteran Tata Laksana Anestesiologi Dan Terapi Intensif. Perpustakaan Kementerian Kesehatan Republik Indonesia. Tim Kerja Standarisasi Klinis Pelayanan Kesehatan. Retrieved from: https://perpustakaan.kemkes.go.id/books/pedoman-nasional-pelayanan-kedokteran-tata-laksana-anestesiologi-dan-terapi-intensif/

Ministry of Health of the Republic of Indonesia, (2024) Tabel Batas Ambang indeks Massa tubuh (IMT). Retrieved from: https://p2ptm.kemkes.go.id/infographicp2ptm/obesitas/tabel-batas-ambang-indeks-massa-tubuh-imt

Nazma, D. (2008). Perbandingan Tramadol 0.5 dan 1 Mg/KgBB IV dalam mencegah menggigil dengan efek samping yang minimal pada anestesi spinal (Doctoral dissertation, Universitas Sumatera Utara). Retrieved from: https://repositori.usu.ac.id/handle/123456789/36219

Noriyanto, N. (2017). Perbedaan Efektifitas Penggunaan Selimut Elektrik dan Selimut Kain Terhadap Peningkatan Suhu Tubuh pada Pasien Post Operasi Seksio Sesarea (Doctoral Dissertation, Universitas Alma Ata).

Qona'ah, A., Rosuliana, N. E., Bratasena, A., & Made, I. (2019). Management of shivering in post-spinal anesthesia using warming blankets and warm fluid therapy. *Jurnal Ners, Special Issues*, 305-309.

Seyedfatemi, N., Rafii, F., Rezaei, M., & Kolcaba, K. (2014). Comfort and hope in the preanesthesia stage in patients undergoing surgery. *Journal of PeriAnesthesia Nursing, 29*(3), 213-220.

Shaw, C. A., Steelman, V. M., DeBerg, J., & Schweizer, M. L. (2017). Effectiveness of active and passive warming for the prevention of inadvertent hypothermia in patients receiving neuraxial anesthesia: A systematic review and meta-analysis of randomized controlled trials. *Journal of clinical anesthesia, 38*, 93-104.

Sugiyono, P. D. (2019). Metode Penelitian Kuantitatif Kualitatif dan R&D (M. Dr. Ir. Sutopo. S. Pd. ALFABETA, cv.

Suswitha, D. (2019). Efektifitas Penggunaan Electricblanket pada Pasien yang Mengalami Hipotermi Post Operasi di Instalasi Bedah Sentral (IBS) Rumah Sakit Umum Daerah Palembang Bari Tahun 2018. *Jurnal Ilmiah Kesehatan, 8*(1), 48-56.

Syauqi, D., Purwandar, H., & Priyono, D. (2019). Hubungan Lama Operasi Dengan Terjadinya Shivering pada Pasien Operasi dengan Anestesi Spinal di Kamar Operasi RSUD Nganjuk. *Jurnal Sabhanga, 1*(1), 55-63.

Wang, J., Fang, P., Sun, G., & Li, M. (2022). Effect of active forced air warming during the first hour after anesthesia induction and intraoperation avoids hypothermia in elderly patients. *BMC anesthesiology, 22*(1), 40.

Widiyono, W., Suryani, S., & Setiyajati, A. (2020). Hubungan Antara Usia dan Lama Operasi dengan Hipotermi pada Pasien Paska Anestesi Spinal di Instalasi Bedah Sentral. *Jurnal Ilmu Keperawatan Medikal Bedah, 3*(1), 55.

Winarni, E., (2020). *Efektifitas penggunaan blanket warmer terhadap suhu pada pasien shivering post spinal anestesi replacement ekstremitas bawah* (Doctoral dissertation, STIKes Kusuma Husada Surakarta).

Zamarelli, D., Yim, T., & Hazan, E. (2020). Preoperative Warming for Inadvertent Perioperative Hypothermia.

Zhang, R., Chen, X., & Xiao, Y. (2018). The effects of a forced-air warming system plus electric blanket for elderly patients undergoing transurethral resection of the prostate: A randomized controlled trial. *Medicine, 97*(45), e13119.

Cahaya Nugraheni*, Arwani, Sri Endang Windiarti

Program Pascasarjana, Magister Terapan Keperawatan, Poltekkes Semarang
Corresponding author: *E-mail: cahayangrhn@gmail.com

DOI: https://doi.org/10.33024/minh.v7i3.286

Innovative warm blanket solution for inadvertent hypothermia among post-anesthesia patients

ORIGINALITY REPORT

14%
SIMILARITY INDEX

PRIMARY SOURCES

1	ejurnal.malahayati.ac.id Internet	203 words — 8%
2	www.ncbi.nlm.nih.gov Internet	30 words — 1%
3	www.nd.gov.hk Internet	24 words — 1%
4	elearning.medistra.ac.id Internet	16 words — 1%
5	cmapspublic2.ihmc.us Internet	14 words — 1%
6	text-id.123dok.com Internet	13 words — < 1%
7	www.ukessays.com Internet	13 words — < 1%
8	www.leadershipchallenge.com Internet	12 words — < 1%
9	eprints.uad.ac.id Internet	11 words — < 1%

10	pure.eur.nl Internet	11 words — < 1%
11	worldwidescience.org Internet	11 words — < 1%
12	www.engineerjob.us Internet	9 words — < 1%
13	www.mdpi.com Internet	9 words — < 1%
14	eprints.poltekkesjogja.ac.id Internet	8 words — < 1%
15	Norihiro Kameda, Shinobu Okada. "Evaluation of Postoperative Warming Care Protocol for Thermal Comfort and Temperature Management Immediately After Surgery: Nonrandomized Controlled Trial", Journal of PeriAnesthesia Nursing, 2023 Crossref	7 words — < 1%

EXCLUDE QUOTES	OFF	EXCLUDE SOURCES	< 5 WORDS
EXCLUDE BIBLIOGRAPHY	ON	EXCLUDE MATCHES	OFF