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Application of Blanket Warmer to Increase Body Temperature in Post-Cesarean Hypothermia: A Case Study

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ABSTRACT

Introduction: Postoperative hypothermia is a common complication caused by the effects of anesthesia, low operating room temperature, and impaired thermoregulation. Untreated hypothermia may increase the risk of shivering, bleeding, surgical site infection, delayed wound healing, and prolonged recovery. One of the non-pharmacological nursing interventions used to manage postoperative hypothermia is the application of a blanket warmer.
Objective: To describe the application of a blanket warmer in increasing body temperature among postoperative hypothermic patients in the recovery room of the Central Surgical Installation.
Method: This Final Nursing Scientific Project employed a descriptive case study, without a comparison group, involving three postoperative patients with hypothermia in the recovery room. A blanket warmer set at 38°C was applied for 20 minutes. Body temperature was measured before and after the intervention using a digital thermometer, and changes in body temperature were evaluated.
Result: All patients showed an increase in body temperature following the intervention, from 35.0°C to 36.1°C in the first case, from 33.6°C to 35.8°C in the second case, and from 35.2°C to 36.0°C in the third case. All patients also reported reduced shivering and cold sensation, resulting in improved comfort during recovery.
Conclusion: The application of a blanket warmer for 20 minutes was associated with an increase in body temperature and a reduction in shivering and cold sensation among the postoperative hypothermic patients observed. As this descriptive case study did not include a comparison group, these findings are preliminary; controlled studies with larger samples are needed before the intervention can be recommended as standard practice.

Keywords: blanket warmer, body temperature, hypothermia, postoperative, recovery room.

Introduction

Surgery is a medical procedure performed to establish a diagnosis, treat disease, restore organ function, or manage conditions that cannot be resolved conservatively. After undergoing a surgical procedure, patients enter a recovery phase in the recovery room, a critical period during which physiological functions are restored to a stable condition before the patient is transferred to the inpatient ward. During this phase, nurses play an essential role in comprehensively monitoring the patient's condition and in the early detection of postoperative complications that may affect the recovery process (Jiang et al., 2024).

One of the complications frequently encountered in postoperative patients is hypothermia. Postoperative hypothermia is defined as a core body temperature below 36°C resulting from disturbances in the thermoregulatory mechanism during surgery. This condition may be caused by the effects of anesthesia, which induce vasodilation and redistribution of body heat; exposure to the relatively low temperature of the operating room; administration of room-temperature intravenous fluids; and prolonged exposure of body surfaces during the surgical procedure. As a result, patients lose body heat more rapidly than the body's capacity to maintain a normal temperature (Jiang et al., 2024). These risk factors are consistent with Fitrianingsih et al. (2022), who identified anesthesia technique, operating room temperature, and duration of surgery as key factors associated with postoperative hypothermia following spinal anesthesia.

Sectio caesarea (SC) is a surgical procedure performed to deliver a fetus through an abdominal (laparotomy) and uterine (hysterotomy) incision when vaginal delivery is not feasible or poses a risk to the mother or fetus. This procedure is generally performed using regional anesthesia, particularly spinal anesthesia, because of its rapid onset, high success rate, and lower risk of complications compared with general anesthesia. However, spinal anesthesia also increases the risk of hypothermia because sympathetic nerve blockade causes peripheral vasodilation and redistribution of body heat (Jiang et al., 2024).

If left untreated, hypothermia can lead to various clinical consequences, including shivering, increased oxygen consumption, discomfort, impaired blood coagulation, an increased risk of bleeding, delayed metabolism of anesthetic agents, a higher risk of surgical site infection, and a prolonged length of stay in the recovery room. Based on its severity, hypothermia is classified as mild when the core temperature ranges from 35.0–35.9°C, moderate at 34.0–34.9°C, and severe when below 34.0°C (Allene et al., 2020). Management of hypothermia may be pharmacological or non-pharmacological, with non-pharmacological interventions including the use of warm blankets, warming of intravenous fluids, adjustment of room temperature, and the application of a blanket warmer as a method of active external warming, either applied alone or in combination with other strategies (Purwadadi et al., 2024).

A blanket warmer is an active external warming device that transfers heat to the patient through a warmed blanket, thereby helping to reduce heat loss, gradually restore body temperature toward normothermia, and reduce the incidence of shivering. This intervention has been widely applied to postoperative patients in the recovery room because it is easy to use, safe, and reported to be effective in increasing body temperature among hypothermic patients (Muchtar et al., 2023; Bobihu et al., 2026; Erawanjie et al., 2025; Sari et al., 2024; Budiarti et al., 2026; Carvalho et al., 2024).

Based on an assessment of three managed patients in the recovery room of the Central Surgical Installation, all patients were found to experience hypothermia after undergoing

surgery with spinal anesthesia. The three patients shared similar clinical characteristics, namely body temperatures below 36°C, ranging from 33.6°C to 35.2°C, accompanied by complaints of feeling cold, shivering, cold extremities, and discomfort during the recovery period. This condition indicates that hypothermia remains a nursing problem that requires prompt intervention to help the patient's body temperature return to a normothermic state (Muchtar et al., 2023).

Several previous studies report the effectiveness of blanket warmer application in increasing body temperature and reducing shivering among postoperative patients. Muchtar et al. (2023) reported a significant effect of blanket warmer application on the increase in body temperature among postoperative patients ($p = 0.001$). Bobihu et al. (2026) also found a significant effect of blanket warmer use on body temperature increase among post sectio caesarea patients, a finding corroborated by Budiarti et al. (2026) in a pre-experimental study of post-cesarean hypothermic patients. Ekorini and Lumadi (2021) further reported a significant increase in central body temperature after warm blanket application in postoperative patients receiving subarachnoid block (spinal) anesthesia, supporting its relevance for the spinal anesthesia population described in this case study. This is consistent with Qona'ah et al. (2019), who found that warming blankets combined with warm fluid therapy were effective in managing shivering following spinal anesthesia. Comparative studies by Purwadadi et al. (2024, 2025) similarly found blanket warmer application to be an effective strategy for preventing perioperative hypothermia when compared with warmed intravenous fluids and operating room temperature modification, while Erawanjie et al. (2025) demonstrated that blanket warmer application significantly reduced the incidence of shivering after sectio caesarea.

Broader support for the physiological rationale of active external warming comes from a randomized controlled trial by Carvalho et al. (2024), which found that a thermal insulation blanket improved both temperature control and patient comfort during the perioperative period, and from a meta-analysis by Ye et al. (2025) which, although conducted in a pediatric surgical population, found inflatable warming blankets effective in preventing perioperative hypothermia across age groups. Sutton et al. (2012) additionally found that a higher blanket temperature improved patient comfort without compromising safety compared with a lower setting, and in the out-of-hospital setting, O'Leary et al. (2025) similarly found a self-warming blanket helpful for maintaining normothermia compared with a foil blanket, indicating that the benefit of active or self-warming devices over passive alternatives extends beyond the hospital environment. In addition, an estimated 70–90% of patients experience a decrease in body temperature within the first hour after surgery, particularly among those undergoing procedures with spinal anesthesia (Bobihu et al., 2026), underscoring the importance of early recognition and prompt management of hypothermia as part of comprehensive perioperative nursing care.

Considering the high incidence of postoperative hypothermia and its potential complications, along with the availability of blanket warmer facilities in the Central Surgical Installation, the authors selected the application of a blanket warmer as an Evidence-Based Practice (EBP) intervention in the nursing care of patients with postoperative hypothermia in the recovery room. This intervention was chosen because it is a non-pharmacological measure that is easy for nurses to apply, safe to use during the postoperative recovery period, and supported by prior research suggesting its potential to increase body temperature toward a

normothermic condition. This report describes the implementation of that intervention in three managed cases as a descriptive case study, and the findings should be read with that scope in mind.

Objective

This case study aims to describe the application of a blanket warmer in increasing body temperature among postoperative hypothermic patients following sectio caesarea in the recovery room of the Central Surgical Installation of RSUP Surakarta.

Method

Design and setting

This Final Nursing Scientific Project used a descriptive case study design, without a comparison group, to illustrate the implementation of an evidence-based nursing intervention. The study was conducted in the recovery room of the Central Surgical Installation (Instalasi Bedah Sentral) of RSUP Surakarta, where postoperative patients are monitored during the immediate recovery period following surgery. Because this design does not include a control condition, the findings describe the clinical course observed in three cases rather than establish a comparative or causal effect.

Population and sampling

The population in this case study consisted of postoperative patients who experienced hypothermia in the recovery room of the Central Surgical Installation. The inclusion criteria were patients who underwent sectio caesarea with spinal anesthesia and had a body temperature below 36°C upon arrival in the recovery room, accompanied by clinical signs such as feeling cold, shivering, and cold extremities. Patients with contraindications to active external warming, such as skin injury at the application site, were excluded.

The sample consisted of three patients who were purposively selected because they met the inclusion criteria during the period of clinical practice in the Central Surgical Installation. The three patients, referred to as Case 1 (Mrs. M, 42 years old), Case 2 (Mrs. Y, 28 years old), and Case 3 (Mrs. A, 25 years old), underwent sectio caesarea with spinal anesthesia lasting between 1 hour 10 minutes and 1 hour 25 minutes.

The sampling procedure was carried out by selecting patients who met the inclusion criteria among those undergoing surgery during the clinical practice period, based on the results of nursing assessment conducted immediately after the patients arrived in the recovery room. Prior to the intervention, the researcher directly asked each patient whether they were willing to participate, and verbal consent was obtained accordingly; patient confidentiality was maintained throughout the study.

Instrument and measurement

Body temperature was measured using a digital thermometer before and after the intervention. Hypothermia severity was classified as mild (35.0–35.9°C), moderate (34.0–34.9°C), or severe (<34.0°C) (Allene et al., 2020). Nursing diagnosis, intervention, and expected outcome criteria followed the Indonesian National Nursing Standards (Indonesian National Nurses Association [PPNI], 2018a, 2018b, 2019). The blanket warmer intervention was

implemented following a standard operating procedure (SOP) adapted from Astuti (2021) and consisting of pre-interaction, orientation, working, and termination phases, in which the device was set at 38°C and applied to the patient from the shoulders to the toes.

Data collection and analysis

Data were collected through direct observation and measurement of body temperature before and 20 minutes after the application of the blanket warmer, along with observation of clinical signs of hypothermia such as shivering and cold extremities. Vital signs were monitored every 15 minutes during the intervention and documented on an observation sheet. Data from the three cases were then analyzed descriptively by comparing pre- and post-intervention body temperature, calculating the temperature difference and percentage increase, and narratively describing the clinical response of each patient. As this case study involved a small, non-randomized sample without a comparison group, no inferential statistical testing was performed, and the findings describe observed clinical patterns rather than a generalizable or causal effect.

Result

The characteristics of the three patients are presented in Table 1. All patients were female, aged between 25 and 42 years, and underwent sectio caesarea with spinal anesthesia lasting between 1 hour 10 minutes and 1 hour 25 minutes. All three patients presented with a body temperature below 36°C upon arrival in the recovery room, accompanied by cold and pale skin, shivering, and reduced lower-extremity muscle strength as a residual effect of spinal anesthesia. Based on these findings, the primary nursing diagnosis established for all patients was Hypothermia, accompanied by Risk for Falls as a secondary diagnosis related to the postoperative condition and the residual effect of spinal anesthesia.

Table 1. Characteristics of the Patients

No	Patient	Age	Occupation	Medical Diagnosis
1	Mrs. M	42	Housewife	G5P4A1 Post sectio caesarea
2	Mrs. Y	28	Private employee	G1P1A0 Post sectio caesarea
3	Mrs. A	25	Entrepreneur	G1P1A0 Post sectio caesarea

Following the application of a blanket warmer set at 38°C for 20 minutes, all three patients showed an increase in body temperature, as presented in Table 2 and Figure 1.

Table 2. Comparison of Body Temperature Before and After Blanket Warmer Application

Patient	Pre-intervention Temp.	Post-intervention Temp.	Difference	Increase (%)
Mrs. M	35.0°C	36.1°C	+1.1°C	3.14%
Mrs. Y	33.6°C	35.8°C	+2.2°C	6.55%
Mrs. A	35.2°C	36.0°C	+0.8°C	2.27%

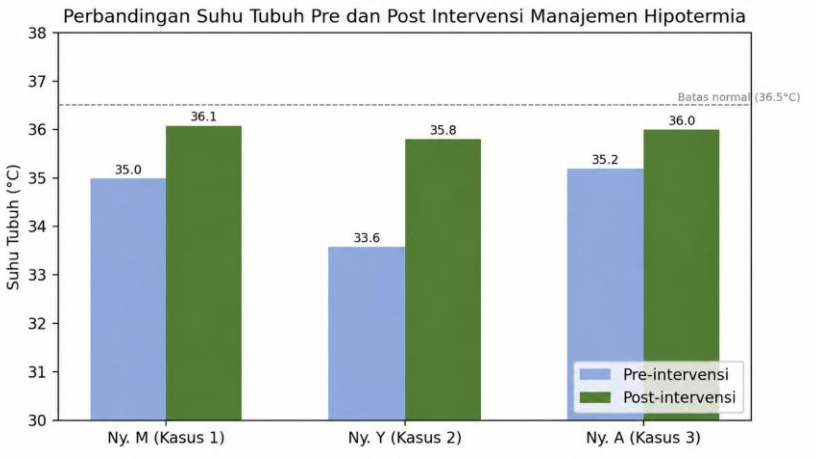

Figure 1. Comparison of Pre- and Post-Intervention Body Temperature

Based on the results presented in Table 2, two patients, Mrs. M and Mrs. A, reached the normothermic range after the intervention, so the nursing problem of hypothermia was considered resolved and the hypothermia management intervention was discontinued, while efforts to maintain patient warmth continued until they were transferred to the inpatient ward. Mrs. Y experienced the greatest increase in body temperature (2.2°C); however, her final temperature of 35.8°C had not yet reached the normothermic range, so the nursing problem of hypothermia was considered unresolved and the intervention was continued until the patient was transferred to the ward. In addition to the increase in body temperature, all patients reported reduced shivering and cold sensation, and appeared more comfortable during their stay in the recovery room.

Discussion

The results showed that all three patients were female, aged between 25 and 42 years, who underwent sectio caesarea with spinal anesthesia. All patients experienced mild hypothermia shortly after arriving in the recovery room, indicated by a body temperature below 36.5°C, cold and pale skin, and shivering. This finding is consistent with Bobihu et al. (2026), who stated that hypothermia following sectio caesarea occurs due to the combined effects of anesthesia and operating room temperature, with an estimated 70–90% of patients experiencing a decrease in body temperature within the first hour after surgery.

After the blanket warmer intervention set at 38°C was applied for 20 minutes, all patients showed an increase in body temperature. Mrs. M (Case 1) increased by 1.1°C (from 35.0°C to 36.1°C) and Mrs. A (Case 3) increased by 0.8°C (from 35.2°C to 36.0°C), both reaching the normal range so that the hypothermia problem was considered resolved. Meanwhile, Mrs. Y (Case 2) experienced the largest increase in temperature, 2.2°C (from 33.6°C to 35.8°C), but had not yet fully reached the normal range. This finding indicates that the magnitude of temperature increase is not always proportional to the achievement of normothermia, but is also influenced by the patient's initial degree of hypothermia. The lower a patient's initial temperature, the greater the heat deficit that must be restored, so that 20 minutes may not be sufficient to fully return body temperature to the normal range, as also noted by Bobihu et

al. (2026), who stated that body size and the degree of hypothermia experienced influence the rate of body temperature increase.

In this application, the blanket warmer was set at 38°C prior to use, a setting consistent with studies applying active external warming devices at similar temperatures to help increase body temperature under hypothermic conditions (Muchtar et al., 2023; Prasetyo et al., 2024). This setting is further supported by Sutton et al. (2012), who found that a higher blanket temperature improved patient comfort without compromising safety compared with a lower setting. The 20-minute duration of application was supported by Fitrina et al. (2024), who applied a blanket warmer for 20 minutes to patients under regional anesthesia in the recovery room and found it effective in reducing Post-Anaesthetic Shivering (PAS) and improving patients' thermal condition. This is further consistent with Fitriani et al. (2021), who found that an electric warming blanket was more effective than a conventional thick blanket in reducing postoperative shivering, supporting the choice of an active, temperature-controlled warming device over passive insulation alone. These findings together informed the selection of a 20-minute duration in the present case study.

Initial temperature measurement was performed within approximately five minutes of the patient's arrival in the recovery room to obtain an accurate picture of the patient's postoperative temperature before receiving any warming intervention. This is important because, according to Bobihu et al. (2026), spinal anesthesia causes sympathetic nerve blockade that triggers peripheral vasodilation, resulting in a rapid transfer of heat from the body core to peripheral tissues and a decrease in core temperature of 0.5–1.5°C within only 30–60 minutes after the block is established. Therefore, measuring temperature as soon as possible after the patient arrives in the recovery room is essential to capture hypothermia at its earliest stage before further temperature decline occurs.

Besides the blanket warmer intervention, the temperature difference between the operating room (approximately 15°C) and the recovery room (approximately 25°C) also influenced the patient's temperature recovery process. Bobihu et al. (2026) explained that postoperative hypothermia after sectio caesarea is influenced by a combination of anesthesia effects, low operating room temperature, heat loss during surgery, and reduced muscle activity that normally contributes to heat production. After being transferred to the warmer recovery room, the patient's body begins to adapt to the environment, so temperature recovery in these three cases likely reflects both this natural adaptation and the effect of the blanket warmer, with the design of this case study unable to separate the two contributions. In addition, the duration of surgery may also affect heat loss, as longer exposure to the low operating room temperature increases the likelihood of a greater decrease in body temperature. The lingering effect of spinal anesthesia also inhibits the thermoregulatory mechanism and causes peripheral vasodilation, further affecting the process of temperature recovery.

The variation in outcomes among the three patients may also be influenced by the initial degree of hypothermia, age, and body mass index (BMI). Patients with a lower initial temperature require a greater increase in temperature to reach normothermia, as observed in Case 2, who experienced the most severe hypothermia with an initial temperature of 33.6°C. Although BMI was not a specifically measured study variable, the three patients showed differing BMI categories: Mrs. M (Case 1) and Mrs. A (Case 3) had a normal BMI, whereas Mrs. Y (Case 2) was classified as overweight. Wardhani et al. (2025) noted that BMI may be related

to the body's ability to maintain temperature, since adipose tissue contributes to heat retention, which may partly help explain the slower return to normothermia observed in Case 2, although this association cannot be confirmed from three cases alone.

Overall, the results of the blanket warmer application in these three cases are broadly consistent with previous studies reporting that a blanket warmer is associated with increases in body temperature among postoperative patients. Muchtar et al. (2023) reported an increase in body temperature among postoperative patients from 100% hypothermic to 100% normothermic ($p = 0.001$). Bobihu et al. (2026) also found a significant effect of blanket warmer application on body temperature increase among post sectio caesarea patients, with mean scores increasing from 54.62 to 67.69 ($p = 0.000$), a pattern echoed by Budiarti et al. (2026) in a pre-experimental study of post-cesarean hypothermic patients. Similarly, Aprilia et al. (2024) reported an increase in body temperature among intra-sectio caesarea patients, ranging from a minimum of 35.7°C to a maximum of 36.6°C ($p = 0.000$), and Ekorini and Lumadi (2021) reported a comparable increase in central body temperature among postoperative patients receiving subarachnoid block (spinal) anesthesia after warm blanket application, a finding aligned with Qona'ah et al. (2019), who reported effective shivering management with warming blankets and warm fluid therapy after spinal anesthesia. Carvalho et al. (2024), in a randomized controlled trial, similarly found that a thermal insulation blanket improved both temperature control and comfort during the perioperative period, while O'Leary et al. (2025) reported comparable benefits of a self-warming blanket for maintaining normothermia in the out-of-hospital setting. While these prior studies used quasi-experimental, pre-post, or randomized controlled designs with statistical testing, the present case study used a descriptive design without a comparison group or hypothesis testing; the similarity in the pattern of temperature increase across studies is therefore supportive but not confirmatory evidence that the blanket warmer mechanism of conductive and convective heat transfer was responsible for the changes observed in these three cases.

These findings suggest that a blanket warmer may serve as a non-pharmacological nursing intervention to help increase body temperature among patients with postoperative hypothermia following sectio caesarea in the recovery room. For operating room nurses, a blanket warmer set at 38°C for 20 minutes was applied and observed in this case study, consistent with supporting research; for patients who have not yet reached normothermia, the intervention can be adjusted according to the patient's condition and evaluation results. These observations may also serve as input for the Central Surgical Installation of RSUP Surakarta in developing a standard operating procedure for blanket warmer use in the future, pending confirmation from studies with stronger designs.

This case study has several limitations that should be considered when interpreting the findings. First, the descriptive design involving only three patients without a comparison group does not permit statistical testing or causal inference; the observed increases in body temperature cannot be attributed to the blanket warmer alone and may partly reflect the natural rewarming process after transfer to a warmer recovery room, as discussed above. Second, potentially influential variables such as BMI were observed but not systematically measured or controlled. Third, the 20-minute observation window may not capture the full trajectory of temperature recovery, particularly for patients with more severe hypothermia. Controlled studies with larger, randomly selected samples and statistical analysis are

recommended to confirm whether the associations observed here reflect a true effect of the blanket warmer.

Conclusion

The postoperative hypothermic patients described in this case study underwent surgery with spinal anesthesia in the recovery room of the Central Surgical Installation. Assessment findings showed that all patients experienced a decrease in body temperature (<36°C), accompanied by complaints of feeling cold, shivering, and cold extremities, requiring nursing intervention to increase body temperature toward normothermia. Following the application of a blanket warmer for 20 minutes, all three managed patients showed an increase in body temperature, accompanied by reduced shivering and improved comfort during their stay in the recovery room. As this descriptive case study did not include a comparison group, these findings are preliminary and should not be interpreted as definitive proof of effectiveness; nevertheless, they suggest that a blanket warmer may be a useful non-pharmacological adjunct in the nursing management of postoperative hypothermia. Further research with larger sample sizes, a controlled design, and statistical analysis is needed to confirm the effectiveness of blanket warmer use in postoperative hypothermic patients.

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Author Contribution

R.A. conducted the patient assessment, implemented the intervention, collected and analyzed the data, and drafted the manuscript. I.I. and Y.B.D.A. provided supervision, guidance, and critical revision of the manuscript. All authors read and approved the final version of the manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest in the preparation of this article.

Ethical Clearance

This case study was conducted in accordance with nursing ethical principles, including obtaining verbal consent from the patients prior to the intervention. The researcher directly asked each patient whether they were willing to participate in the blanket warmer intervention. Patient information was kept confidential throughout the process.

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