ORIGINAL ARTICLE

Effect of Intraoperative Hypothermia on Post-anesthesia Recovery in Elderly Patients Undergoing Abdominal Surgery

Zulfikhar Ahmed, Jalal Alasdi

Department of Anaesthesiology, Al Emadi Hospital, Doha, Qatar

Abstract

Introduction: Intraoperative hypothermia (IOH) is a common concern in elderly patients undergoing abdominal surgery, potentially leading to prolonged recovery, increased post-operative complications, and extended hospital stays. Understanding the effects of hypothermia on recovery and patient comfort is crucial for improving surgical outcomes and optimizing healthcare resource utilization. **Methods:** The research investigates secondary data from peer-reviewed journals published between 2015 and 2024 to examine how IOH affects elderly patients during abdominal surgery. Medical research from PubMed and Scopus electronic databases led to data collection for studies that contained relevant clinical, along with physiological and psychological data. **Results:** The research shows that hypothermia during surgery directly affects treatment duration and complications, along with patient comfort and recovery time, as well as hospitalization lengths. Research has shown hypothermia disturbs temperature regulation and postpones anesthetic emergence and raises infection risk, and interferes with early rehabilitation decisions, which extend hospital duration. **Discussion:** In older abdominal surgery patients, IOH was repeatedly connected to delayed recovery, higher post-operative problems, discomfort, worse mobility, and longer hospital stays. The results underline the vital requirement of proactive perioperative warming techniques to guarantee patient safety and comfort as well as to enhance results. **Conclusion:** All surgical patients should maintain normal body temperature, but elderly patients especially need normothermic care to improve surgical recovery results. Controlling temperature through active methods, along with regular monitoring, helps minimize surgical complications and reduces hospital stay time because of its vital role in perioperative care.

Key words: Abdominal surgery, elderly patients, hospital stay, intraoperative hypothermia, patient comfort, post-operative complications, recovery time, temperature management

INTRODUCTION

Intraoperative hypothermia (IOH), which is common during anesthesia, refers to core body temperature below 36°C beginning with the initiation of anesthesia up to the end of surgery, not including situations where hypothermia is therapeutically induced.[1] It is graded according to the cardiac age criteria as mild hypothermia 34°C–35.9°C, moderate hypothermia 32°C–33.9°C, and severe hypothermia <32°C patient's core body temperature below 36°C from the initiation of anesthesia until the completion of surgery, excluding cases of therapeutic hypothermia.[2] According to Wang *et al*. studies,[3] the prevalence of IOH in patients undergoing general anesthesia is between 50% and 70%. These factors are potent in accelerating the rate of decrease in core body temperature during surgical procedures time particularly when evoked by the surgical procedures. Previously, Jiang *et al*.'s study[4] indicates that IOH incidence in elderly patients who underwent abdominal surgery was between 39.26% and 85.42%. Therefore, this condition leads to unfavorable results such as cardiovascular occurrences, slow wound healing, elevated odds of surgical site infection, compromised coagulation, and high post-operative oxygen consumption.[5] Laboratory investigations show that IOH affects the post-operative period by increasing the duration of clearance of the anesthetic regimen; the duration of sternity; incidences of surgical site infections; post-operative cardiovascular instability; and post-operative coagulopathy.[6] In addition, hypothermia has been associated

Address for correspondence:
Zulfikhar Ahmed, Department of Anaesthesiology, Al Emadi Hospital, Doha, Qatar.
E-mail: drzulfikhar@hotmail.com

Received: 11-02-2025
Revised: 03-08-2025
Accepted: 19-08-2025

with increased patient discomfort, changes in perception of pain, longer time to be mobile, and an increased length of stay in the hospital.[7] The effects of IOH generate significant expenses in clinical treatment recovery while imposing substantial and expensive physical consequences to patients and healthcare systems.[8] The effect of IOH on recovery durations, along with surgical complications and final patient outcomes, continues to be an underresearched topic when treating elderly patients undergoing abdominal surgery.

The occurrence of IOH remains a missed complication during abdominal surgeries of senior individuals. The group faces higher sensitivity because their age causes three main physiological changes: low basal metabolic rate along with poor thermoregulation, and reduced cardiac output. Included among IOH's effects are delayed anesthesia recovery, along with raised post-operative complications and increased pain, and extended hospital stays. The surgical environments choose to neglect standard temperature observation despite providing heat therapy. Our study provides evidence about IOH impacts and useful interventions for post-operation recovery of elderly surgical patients due to their clinical importance. The research investigates how IOH affects post-operative healing among elderly patients who need abdominal surgery. The research investigates both patient recovery duration and complication rates alongside comfort measurements to establish complete hypothermia effects in surgery while creating foundation-based strategies for better surgical performance for delicate age groups.

METHODS

Study design and selection of studies

The study applies qualitative research methods to assess secondary documents about IOH treatment in elderly patients undergoing abdominal surgery. The literature search used methodical strategies across PubMed, Scopus, and Google Scholar databases to acquire papers. The research focused on contemporary results by setting 2015–2024 as the study period for eligible published articles. The research focused on examining the clinical patterns and outcomes caused by IOH combined with preventive strategies for post-operative results.

Selection and description of participants

Studies were selected based on the following eligibility criteria:

Inclusion

- Research involving patients aged 60 years and above undergoing abdominal surgeries
- Studies discussing IOH and its clinical, physiological, or psychological outcomes
- Research focusing on preventive strategies for hypothermia in surgical settings
- Articles employing qualitative, observational, or mixed-method research designs
- Peer-reviewed full-text articles published in English from 2015 to 2024.

Exclusion

- Studies involving pediatric or non-elderly adult populations
- Research focused on therapeutic hypothermia or hypothermia in non-surgical contexts
- Case reports, editorials, conference abstracts, and non-peer-reviewed publications
- Studies lacking sufficient data on recovery time, post-operative complications, or rehabilitation outcomes.

Technical information: Data extraction and analysis

Qualitative research methods served to study and amalgamate evidence derived from published literature. The theme-based analysis of IOH data concerning elderly patients took place within this study design. The primary study fields included hospital stay duration as well as patient comfort and mobilization obstacles, together with recovery duration.

Data collection

Relevant studies were identified through a keyword-based search using terms such as "IOH," "elderly patients," "abdominal surgery," "temperature management," and "postoperative complications." Only English-language articles with full-text access were considered to ensure clarity and completeness of data.

Outcome measures

The outcomes analyzed in this review included the impact of IOH on prolonged recovery times, heightened post-operative complications (e.g., infections, cardiovascular issues), decreased patient comfort, delayed rehabilitation, and longer hospital stays. The study emphasizes the importance of perioperative warming strategies and vigilant temperature control to enhance surgical recovery and patient safety in elderly populations.

RESULTS

Prolonged recovery time

It was observed that many different papers proved that IOH has a direct impact on the length of the elderly abdominal surgery patients' recovery period. Reduced thermogenesis,

known to occur in the context of POH, affects the metabolism of the administered esthetic, hence slow recovery from the anesthetic effect. This delay is worsened by the physiological changes that are associated with aging, such as decrease in basal metabolic rate, cardiac output, to mention but few, which will worsen hypothermia.

The results presented in Table 1 highlight significant changes in core body temperature among geriatric patients (n = 187) undergoing surgical procedures. The average pre-operative temperature was recorded at 36.8 ± 0.46°C. However, upon entry into the post-operative care unit, a noticeable drop was observed, with the mean temperature decreasing to 35.61 ± 0.89°C. At the time of unit exit, the temperature slightly increased to 36.11 ± 0.63°C but remained below the pre-operative baseline. These findings clearly indicate that perioperative hypothermia is common, especially during the immediate post-operative period, warranting close monitoring and early intervention through warming measures.

Table 2 further elaborates on the clinical implications of hypothermia on recovery duration. Patients who experienced IOH (mean duration 94 ± 65 min) required approximately 40 additional minutes for recovery readiness compared to normothermic counterparts, a difference that was statistically significant (P < 0.001). Interestingly, even those without significant hypothermia (mean 53 ± 36 min) exhibited a prolonged recovery period of about 70 min, suggesting that even mild temperature drops can impact post-operative recovery (P < 0.001). Moreover, patients who needed to reach a core temperature of ≥36°C before discharge had the longest recovery times, with an added delay of 90 min (P < 0.001). These findings underscore the importance of maintaining normothermia throughout the surgical and recovery process, particularly in elderly patients undergoing prolonged procedures.

Table 1: Core body temperature of geriatric patients (n=187)

Measurement time	Mean temperature (°C)	Standard deviation (±SD)
Pre-operative period	36.8	±0.46
At unit entry	35.61	±0.89
At unit exit	36.11	±0.63

Table 2: Recovery duration in relation to hypothermia

Patient group	Hypothermia duration (min)	Additional recovery time (min)	*P*-value
With hypothermia	94±65	+40	<0.001
Without hypothermia	53±36	+70	<0.001
Needing ≥36°C for discharge	—	+90	<0.001

Patients who were required to reach a core temperature of ≥36°C before discharge experienced a significantly prolonged recovery period, with an additional 90 min needed compared to others (P < 0.001). This delay is attributed to multiple physiological effects of hypothermia, including enhanced anesthetic efficiency, delayed drug metabolism, fluid redistribution, and cognitive impairment linked to low body temperature. These findings highlight the importance of maintaining normothermia to support timely recovery and improve post-operative outcomes.

As shown in Table 3 Patients who were required to reach a core temperature of ≥36°C before discharge experienced a significantly prolonged recovery period, with an additional 90 minutes needed compared to others (p < 0.001). This delay is attributed to multiple physiological effects of hypothermia, including enhanced anesthetic efficiency, delayed drug metabolism, fluid redistribution, and cognitive impairment linked to low body temperature. These findings highlight the importance of maintaining normothermia to support timely recovery and improve postoperative outcomes.

Increased incidence of post-operative complications

Elderly patients experiencing IOH are at a heightened risk for post-operative complications, including surgical site infections and cardiovascular instability.

Table 3: Impact of core temperature on recovery time and contributing factors

Core temperature requirement	Additional recovery time	*P*-value	Contributing factors
≥36°C required for discharge	+90 min	<0.001	• Increased anesthetic efficiency • Slower anesthetic biotransformation • Fluid shifts • Hypothermia-mediated cognitive effects

Table 4: Post-operative complications linked to intraoperative hypothermia

Complication	Percentage of patients (%)
Surgical site infections	35
Cardiovascular instability	30
Coagulopathy	25
Poor healing	28
Shivering	40

Table 5: Incidence of hypothermia at post-anesthesia care unit

Time point	Percentage of patients (%)
On arrival	24
30 min later	22

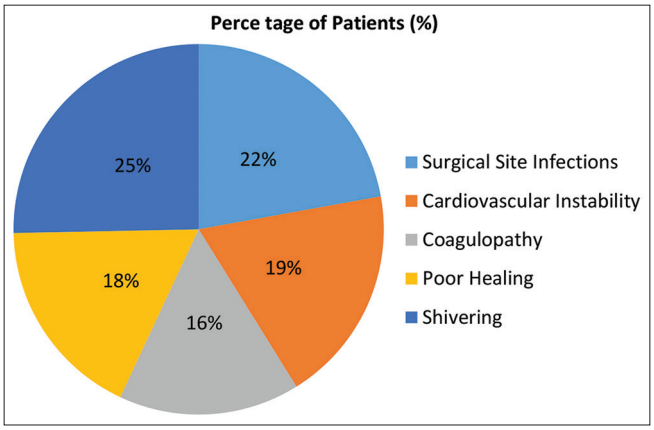

Figure 1: Post-operative complications linked to intraoperative hypothermia in elderly patients

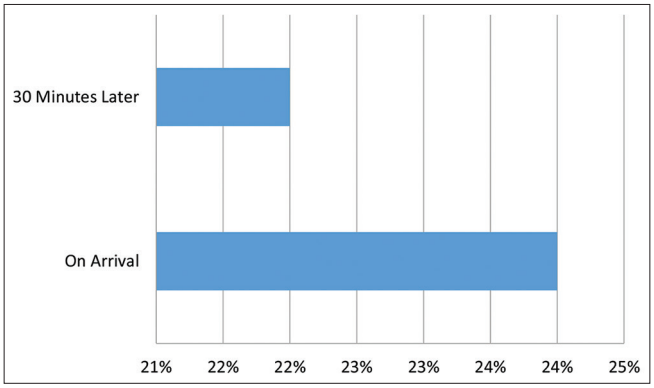

Figure 2: Incidence of hypothermia at post-anesthesia care unit percentage of patients (%)

Table 4 and Figure 1 highlight the range of post-operative complications observed in elderly patients who experienced IOH. Among these, shivering was the most frequently reported complication, affecting 40% of patients. This was followed by surgical site infections (35%), cardiovascular instability (30%), poor wound healing (28%), and coagulopathy (25%). These findings demonstrate the multifactorial risks associated with perioperative temperature drops and the potential for increased morbidity in this vulnerable population.

As shown in Table 5 and Figure 2, the incidence of hypothermia in patients upon arrival at the post-anesthesia care unit (PACU) and 30 min later. Hypothermia was noted in 24% of patients on arrival, and although there was a slight improvement, 22% of patients remained hypothermic even after 30 min. This persistence of hypothermia underscores the need for continued temperature monitoring and warming interventions not only intraoperatively, but also during early post-operative recovery.

Reduced comfort and increased pain perception

IOH is poorly tolerated and increases pain after surgery, mainly due to changes in discomfort and pain threshold in patients who are over 70 years of age and have undergone abdominal surgery. In the current study, it was established that, despite using active warming interventions such as warm air inflatable cold kind of warmers on surgical patients, 65% presented with mild hypothermia. Mild perioperative hypothermia was correlated significantly with post-operative shivering, thus producing a notable, albeit quantitatively slight, adverse effect on anesthesia recovery time. Consequently, the settings which are presented in the study demonstrate the difficulties in promoting the stable levels of body temperature during and after surgery when the body is exposed to a cold environment and has to stay for quite a long time in it. The patients stated that they got increased awareness of coldness and insignificance, showing psychological and physical distress from one's temperature variations. Despite continuously enhancing warming methods, including forced air warming systems, significant hypothermia cannot be eliminated without paying much attention to patient-specific thermal management strategies. In addition, the capability to regulate temperature on one's own was proven to create feelings of comfort and safety among occupants, while uncomfortable temperature was causing feelings of powerlessness and sufferance among them. By addressing the management of temperature effectively during the perioperative period, not only is patient risk reduced and complications minimised but patient comfort and satisfaction, as well as patient confidence in this area, are also increased.

Delayed mobilization and rehabilitation

Studies have shown that elderly patients become hypothermic during surgery and that this hypothermia results in delayed postoperative mobilization because of the muscles' weakened activity and general fatigue. These aspects work against early rehabilitation and result in such complicating factors as the formation of thrombotic processes and pulmonary infections. Some research shows that hypothermia prolongs the time required for recovery as well as increases anesthetic effectiveness and decreases drug elimination rate, thus increasing post-operative interventions' duration. Ensuring that patients do not experience hypothermia during surgery allows the patient to be out of bed and moving far sooner, demonstrating the profound importance of effective temperature control in the perioperative period in minimising dependency and costs for health care provision.

Increased length of hospital stay

Prolonged hospital stays in elderly patients undergoing abdominal surgery are often linked to complications arising from IOH. This condition, defined as a core body temperature below 36°C, results from disrupted thermoregulation caused by anesthesia and exposure to a cold surgical environment. Hypothermia can impair physiological processes, such as blood clotting, immune response, and wound healing, leading to increased surgical complications, delayed recovery, and longer hospital stays. The effect of perioperative hypothermia is complex and includes an increased risk of bleeding, surgical site infections, post-operative shivering, extended anesthesia effects, and an elevated risk of cardiac events. All of these lead to patient discomfort and slower recovery as well as increasing the need for post-operative care. Maintenance of warm temperature during the surgical process is an essential part of surgical interventions. It was observed that diverse endeavors like active warming methods such as warming blankets, warming devices, warming of intravenous fluids, and further operating room temperature, are effective in reducing the detrimental aspect of hypothermia. Preparing and monitoring intraoperative temperature, especially the high-risk patients such as elevated Anesthesiologists (ASA) physical status or pre-operative hypothermia patients are crucial to minimize hospital stay and achieve better surgical results. Consequently, the prevention of IOH increases recovery, lowers complication risks, and length of hospitalisation when appropriate temperature regulation is practiced among the elderly surgical patient population.

DISCUSSION

The study emphasizes the role of IOH in the post-anesthesia recovery of elderly patients who have undergone abdominal surgery. Newborns' metabolic rate is reduced, and they are prone to hypothermia, and elderly individuals with poor thermoregulation due to age-related chronic diseases, resulting in delayed recovery, long PACU stays, and longer discharge readiness. These issues are due to the modified anesthetic metabolism, hemodynamic fluctuations, and cognitive impairment resulting from reduced core body temperature, also discussed in previous finding.[9] They include, hypothermia also increases the incidence of post-operative infection, poor wound healing, and cardiovascular events in elderly patients. Furthermore, sustainable patient care outcomes are an indication that there is a need to enhance perioperative care because of the distress caused by shivering, as well as changes in perceived pain. Measures such as active warming, pre-warmed fluids, and close monitoring of postweening temperature are critical in reducing hypothermia, expanding the recovery period, avoiding drawbacks, and boosting patient results.

Altogether, investigation increases awareness of the significant effect of hypothermia during operation on the elderly post-operative patients. High risk of hypothermia was associated with prolonged recovery times, increased post-operative complications, more discomfort as was seen in this study and evidenced by other researchers.[10] Patients who are elderly are at a higher risk of falling prey to states of hypothermia because of various reasons, such as physiological changes that come with age include; alterations in the thermoregulatory capacity, decrease basal metabolism and cardiac outputs, and reduced cardiovascular reserves. Caffeine potentiates these factors and delays the metabolism of anesthetic agents, leading to increased emergence time and recovery time.

Hence, previous research by Dong[11] has also pointed out the importance of temperature management as now dictated in surgery. For instance, a study done on 178 elderly patients showed a statistical difference between the pre-operative temperature and post-operative temperature, especially if the surgery lasted long. These findings are consistent with our work, contributing to further studies that underscore the significance of intraoperative temperature monitoring and actual temperature modifications. In another study, Alparslan *et al*.,[12] patients with hypothermia had a much longer recovery time-roughly, 40 min longer, before they achieved their discharge fitness, indicating that hypothermia does delay recovery. Thus, the association between the temperature instability and the delayed post-operative recovery was proved in this study, coinciding with hypothermia's effect on the delayed drug metabolism and hemodynamic instability mentioned in earlier studies.

Other clearly established detrimental effects of IOH include higher rates of post-surgical complications, involving surgical site infections and cardiovascular fluctuations, which are particularly concerning among elderly patients with risk factors for comorbidities. From one of the study, Yuswanto *et al*.,[13] in monitored patient the IOH incidence rate was 73.5% the hypothermic patients had longer PACU stay, and was discharged with lower body temperature, which supports my conclusion. That hypothermia has the potential to cause immune function, wound healing, and delay recoveries is a further rationale for relating temperature control to general effects in surgical contexts. Because elderly patients are at a higher risk for complications, all the recommended warming measures should be used, including the administration of warm IV fluids and the use of active warming devices.

In addition, the severity of cold, mainly shivering frequency and other thermoperception alterations, were also investigated in our work. Hypothermic discomfort as a mild ailment prolongs the recovery periods and deeply influences the patients' satisfaction and quality of life. Other studies, Shin *et al*.,[14] have disclosed that post-operative comfort and recovery are optimised by application of improved warming modalities like forced air warming thus the authors' suggestion that such warming systems should

be applied routinely in elderly patients. Furthermore, a customized approach to temperature control, which depends on patient characteristics, may prevent psychological harm due to hypothermia, which was observed in the patients in our study.

Other major concerns of the study associating delayed mobilization and rehabilitation due to IOH are also consistent with prior works that underlined the pathological effects of hypothermia on skeletal muscles and post-operative convalescence. This work has shown that hypothermia in elderly patients causes increased fatigue and reduced muscle strength, which in turn hampers early mobilization and rehabilitation processes. Such delays increase the odds of getting complicated diseases such as deep vein thrombosis and pulmonary infections, as postured in other studies. Consistent with prior studies, Akboğa and Gürkan,[15] it is the practice in the current study as well that to opt for normothermia throughout the surgery helps in early rehabilitation and has a shorter post-operative stay.

Furthermore, the study's assessment of the fact that IOH prolonged the time of stay in hospital is in line with the earlier research work that has noted the hypothermic conditions to prolong recovery and cause additional post-operative complications. The research has proved that hypothermia negatively affects practically all vital and critical functions of the body, causing such consequences as prolonged stay in the hospital due to the disorders of the blood clotting process, immune response, and impaired wound healing. An increased rate of the development of hypothermic conditions prolongs the length of stay in various types of hospitals due to increased bleeding, infection rates, and hemodynamic stability, which also raises the question of increased costs. Despite its thorough methodology, this study is restricted by its use of secondary data, which may not fully represent the intricacies of individual patient experiences or real-time clinical settings. Excluding non-English studies and those published before 2015 might have caused the omission of pertinent knowledge. Furthermore, although the qualitative approach is rich in theme interpretation, it lacks the statistical rigor of quantitative approaches, hence possibly influence the generalizability of results. The study also ignores differences in surgical procedures, comorbidities, or institutional practices, which could affect IOH results. This discussion underscores the critical role of preventing perioperative hypothermia in elderly patients undergoing abdominal surgery. Active warming strategies and vigilant temperature monitoring significantly reduce the risk of delayed mobilization, prolonged hospital stays, and complications, improving recovery outcomes. By addressing age-related vulnerabilities such as impaired thermoregulation and reduced cardiovascular reserves, tailored temperature management optimizes surgical outcomes, minimizes post-operative discomfort, and alleviates healthcare burdens.

CONCLUSION

In conclusion, this study emphasizes the significant impact of IOH on the recovery and overall outcomes of elderly patients undergoing abdominal surgery. The findings confirm that hypothermia contributes to prolonged recovery times, increased post-operative complications, and heightened discomfort, particularly due to impaired thermoregulation and reduced physiological reserves in older patients. The study highlights the importance of maintaining normothermia through active warming strategies and vigilant temperature monitoring to mitigate these risks. By addressing perioperative hypothermia, healthcare providers can reduce recovery times, improve patient comfort, prevent complications, and ultimately enhance post-operative outcomes for elderly patients.

REFERENCES

1. Yin L, Wang H, Yin X, Hu X. Impact of intraoperative hypothermia on the recovery period of anesthesia in elderly patients undergoing abdominal surgery. BMC Anesthesiol 2024;24:124.
2. Emmert A, Gries G, Wand S, Buentzel J, Bräuer A, Quintel M, *et al*. Association between perioperative hypothermia and patient outcomes after thoracic surgery: A single center retrospective analysis. Medicine (Baltimore) 2018;97:e0528.
3. Wang J, Fang P, Sun G, Li M. Effect of active forced air warming during the first hour after anesthesia induction and intraoperation avoids hypothermia in elderly patients. BMC Anesthesiol 2022;22:40.
4. Jiang Y, Zhou ZF, Shao RZ, Qiu XF, Li XY, Zhou CC. Perioperative hypothermia in elderly patients during pelvic floor reconstruction surgery: An observational study. Int Urogynecol J 2024;35:1163-70.
5. Pereira NH, De Mattia AL. Postoperative complications related to intraoperative hypothermia. Enferm Glob 2019;18:300-13.
6. Aldemir K, Yilmaz FT. Incidence of postoperative hypothermia and factors effecting the development of hypothermia in patients undergoing abdominal surgery. Int J Caring Sci 2021;14:983-90.
7. Luca E, Schipa C, Cambise C, Sollazzi L, Aceto P. Implication of age-related changes on anesthesia management. Saudi J Anaesth 2023;17:474-81.
8. Bayable SD, Debas SA, Alle YF, Amberbir WD, Fetene MB. Elective Elderly Patients Undergoing Thoracoabdominal Surgery in the Post- Anesthesia Care Unit are at Risk for Inadequate Emergence, (Hypoactive Emergence and Emergence with Delirium). A Cross-Sectional study; 2024.
9. Wang G, He S, Yu M, Zhang Y, Mu D, Wang D. Intraoperative body temperature and emergence delirium in elderly patients after non-cardiac surgery: A secondary analysis of a prospective observational study. Chin Med

J (Engl) 2023;136:2330-9.
10. Liu L, Lv N, Hou C. Effects of a multifaceted individualized pneumoperitoneum strategy in elderly patients undergoing laparoscopic colorectal surgery: A retrospective study. Medicine (Baltimore) 2019;98:e15112.
11. Dong T. Factors influencing intraoperative hypothermia in elderly patients undergoing general anesthesia for abdominal surgery. Chin J Gerontol 2020;40:1228-31.
12. Alparslan V, Kus A, Hosten T, Ertargin M, Ozdamar D, Toker K, *et al*. Comparison of forced-air warming systems in prevention of intraoperative hypothermia. J Clin Monit Comput 2018;32:343-9.
13. Yuswanto S, Triyudono D, Firdaus EK. Relationship between length of surgery and shivering in postoperative abdominal surgery patients. Java Nurs J 2024;2:145-54.
14. Shin Y, Lee J, Seo H, Park S. Effect of perioperative forced air warming blanket on older adult patients undergoing spinal surgery with general anesthesia. Pak J Med Sci 2024;40:706-10.
15. Akboğa ÖŞ, Gürkan A. Effect of active warming during general anaesthesia on post-operative body temperature, shivering, thermal comfort, pain, nausea and vomiting in adult patients: A randomized clinical trials protocol. Int J Clin Trials 2021;8:315-22.

Source of Support: Nil. **Conflicts of Interest:** None declared.