BARIATRIC SURGICAL PRACTICE AND PATIENT CARE
Volume 18, Number 2, 2023

DOI: 10.1089/bari.2022.0038

The Effect of Inadvertent Perioperative Hypothermia on Surgical-Site Infection in Bariatric Surgery Patients

Pinar Yilmaz Eker, PhD and Ezgi Yildiz, PhD, MSc

Background and Objective: There are differing results as to whether inadvertent perioperative hypothermia (IPH) is associated with the risk of surgical-site infection (SSI). This study was carried out to determine the effect of IPH developing in bariatric surgery patients on SSI.
Materials and Methods: The study is a descriptive/cross-sectional/prospective study. The study group consisted of 102 patients who underwent bariatric surgery. The body temperatures of the patients were measured tympanically and recorded in the perioperative period and patients were followed up for SSI postoperative and 30 days after discharge.
Findings: In this study, it was found that all patients aged 31–40 years developed IPH and SSI. All patients with chronic disease developed IPH, and the presence of chronic disease affected the development of SSI at a rate of 88.9%. IPH developed in all patients with a body mass index >45 kg/m^2, and the rate of SSI development was 76.9% in these patients. A statistically significant difference was found between IPH and SSI in patients ($p = 0.001$).
Conclusion: It was found that IPH after bariatric surgery affected the development of SSI. The results confirm the relevance of intraoperative and postoperative hypothermia as an independent risk factor for SSI.

Keywords: inadvertent perioperative hypothermia, surgical-site infection, bariatric surgery

Introduction

Surgical-site infection (SSI) is defined by the American Centers for Disease Control and Prevention as infections that can develop at the surgical site within 30 or 90 days following surgery. SSI is a common complication that can affect patients undergoing anesthetic-surgical procedures, especially resulting in increased morbidity, mortality rate, and health care costs.[1] Despite the increased awareness of infection control practices, SSI continues to be among the most common postoperative complications.[2] Hypothermia may impair immune function and trigger subcutaneous vasoconstriction and the subsequent tissue hypoxia impairing neutrophil function, thereby increasing the risk of developing SSI. Hypothermia also increases the risk of SSI by impairing granulocyte activation.[3,4] The Institute for Health care Improvement and the Implementation Guideline for SSI have recognized inadvertent perioperative hypothermia (IPH) as a risk factor for SSI.[5–8]

IPH is a decrease in body temperature below 36°C between 1 h before anesthesia and the first 24 h after anesthesia.[9] Some studies show that 50–90% of patients experience IPH.[10–12] Given the high incidence and potential preventability of SSI, studies have generally focused on perioperative risk factors that contribute to the risk of SSI. However, the link between IPH and the risk of SSI remains controversial. Kurz et al[13] reported that a 2°C decrease in a patient's normal body temperature could increase the incidence of SSI threefold. In addition, Geiger et al[14] showed that low intraoperative temperatures are associated with lower rates of SSI. On the contrary, Baucom et al[15] and Bu et al[16] found no correlation between IPH and SSI. These conflicting results raise the question of whether IPH is associated with the risk of SSI in surgical patients.

As with any surgical procedure, SSI is a potentially devastating complication. The severity of SSI can range from a relatively mild surface incisional infection to a severe infection, such as an intra-abdominal abscess involving a deep organ cavity.[17] According to Topaloglu et al,[18] while bariatric surgery alone does not carry the risk of infection, another study[19] in the literature showed that the incidence of SSI is higher in obese patients than in nonobese patients. These findings suggest that bariatric surgical procedures performed in obese patients are associated with higher rates

Susehri Health High School, Nursing Department, Sivas Cumhuriyet University, Sivas, Turkey.

of SSI.[15] The incidence of SSI after bariatric surgery ranges from 1% to 21.7%, depending on the surgical intervention (laparoscopy or laparotomy).[20]

Studies have determined that perioperative normothermia should be maintained to prevent SSI in surgical patients who received anesthesia for at least 60 min.[21] In addition, the Surgical Care Improvement Project stated that ensuring normothermia within the first 15 min after the patient leaves the operating room is critical in preventing SSI.[22,23] Despite safe and inexpensive methods being designed to maintain normothermia, IPH is still common.[12] Besides, there is no study in the literature showing the relationship between IPH and SSI in bariatric surgery patients. Therefore, this study was carried out to determine the effect of IPH developing in bariatric surgery patients on SSI.

Materials and Methods

Desing and sample

This research is a descriptive/cross-sectional/prospective study. The study group of this research consisted of patients who underwent bariatric surgery due to morbid obesity in Sivas Cumhuriyet University Health Services Practice and Research Hospital General Surgery Service. This study was conducted from August 10, 2021, to June 10, 2022. During the implementation period of this study, a bariatric surgical procedure was applied to a total of 112 patients. The study was completed with 102 patients who met the inclusion criteria and volunteered to participate in the study.

Inclusion criteria

Participants who underwent one type of surgical procedure (sleeve gastrectomy) so that the operative time was similar.
Participants who underwent a surgical procedure under general anesthesia.
ASA score of II and below.
No premedication.
Prophylaxis.
Older than 18 years.
Participants who speak and understand Turkish.

Exclusion criteria

Participants who underwent minigastric bypass surgery.
Participants who did not undergo general anesthesia.
ASA score of III and above.
Administering premedication.
No prophylaxis.
Younger than 18 years.
Participants who do not speak Turkish.

Data collection

The body temperatures of the patients were tympanically measured and recorded three times at 60-min intervals in the preoperative period, five times at 15-min intervals during the operation, and at 15-min intervals in the first hour of the postoperative period, at 30-min intervals in the second 1 h, and every hour for the next 8 h. The same thermometer was used throughout the application and attention was paid to its calibration. The incision area was observed in the patients, and the wound classification was made taking into account the surgeon's operation note. Except for the routine procedures in the hospital, no application was made to the patients by the researchers. After discharge, the patients were called at least once a week for 30 days and questioned whether there was any sign of infection (discharge, swelling, redness, pain) in the surgical site.

During these 30 days, patients were encouraged to come to the outpatient clinic every 15 days and the wound site was examined by the researchers. The patients with SSI at these outpatient controls were recorded, and the type of SSI was determined according to the condition of the wound. Patients who were thought to have developed SSI were referred to the surgeon and SSI treatment was started for these patients.

A single data collection tool, a patient information form developed by the researchers, was used in the study.

Patient information form. This form, developed by the researchers in line with the literature,[7,12,21] consists of three parts. The first part consists of six questions on the patient's age, gender, weight, height and body mass index (BMI), and the presence of any chronic disease. The second part contains information about the patient's body temperature follow-up chart (preoperative, intraoperative, and postoperative), whether the patient has developed hypothermia, and, if so, the type of hypothermia. The third part includes questions about wound classification according to the contamination status, whether SSI has developed in the patients, and, if so, its type and characteristics.

Surgical technique

The operations were performed under general anesthesia (Thiopental, IV, 5 mg × kg). All patients had an ASA score of II. No patient received premedication. Before the incision, antibiotics containing 1 g of cefazolin were given to all patients for prophylactic purposes. Hair removal was not performed on any of the patients and iodopovidone antiseptic was used in skin preparation. None of the patients was warmed during the perioperative period, as there was no device in the institution to warm the patients. The surgical area was prepared with iodopovidone and covered in a sterile manner. All patients underwent laparoscopic sleeve gastrectomy. All surgical procedures were completed within 30–60 min. All bariatric surgeries were performed by an expert surgeon who was an associate professor.

Statistical analysis

SPSS (Statistical Package for Social Science) version 22.0 software package was used for data analysis. Descriptive statistics were used in the analysis of the data obtained from the patient information form, such as ''age, gender, body mass index, presence of chronic disease, IPH development status, SSI development status'' of the participating patients, and the number and percentage distribution were determined. In addition, the chi-square test was used in 2 × 2 and multiway designs to determine the relationship between IPH and SSI in demographic data, and the significance level was accepted as 0.05.

Ethics committee approval

Before the data collection, approval from the Ethics Committee of the Sivas Cumhuriyet University, where the study was conducted (Decision No.: 2021-08/19), and written permission were obtained from the institutions where the research was conducted. After individuals were informed according to the informed consent principle, their verbal and written informed consent was obtained.

Results

Table 1 presents the demographic data of bariatric surgery patients. Of the patients, 43.1% were between the ages of 18 and 30, 62.7% were female, 52.9% had a chronic disease and 70.6% had a BMI of >45.00. The mean BMI was 47.37 ± 4.42.

The numbers of hypothermic and normothermic patients in the perioperative period are given in Table 2. As seen in the table, all patients were normothermic in the preoperative period. They all went into hypothermia intraoperative period. In the postoperative period, 94.1% of the patients were hypothermic.

Table 3 shows the distribution of IPH and SSI development status by individual characteristics. As seen in Table 3, the development of IPH and SSI differed statistically significantly by age, presence of chronic disease, and BMI ($p < 0.05$).

Table 4 shows the SSI status of patients with and without IPH. The development of SSI was found to be 81.3% in individuals with IPH, and the relationship between IPH and SSI was statistically significant ($p = 0.001$).

In the preoperative period, the first, second, and third temperature measurements were 36.22 ± 0.24, 36.36 ± 0.20, and 36.38 ± 0.25, respectively. In the intraoperative period, the first, second, third, fourth, and fifth measurements were 35.31 ± 0.21, 35.12 ± 0.12, 35.03 ± 0.05, 35.01 ± 0.11, and 35.14 ± 0.20, respectively. Postoperative temperature measurements were as follows: minute 0 (35.12 ± 0.55), minute 15 (35.36 ± 0.36), minute 30 (35.63 ± 0.37), minute 45 (35.99 ± 0.36), minute 60 (36.26 ± 23.55), minute 90 (36.36) ± 0.22), minute 120 (36.51 ± 0.21), minute 180 (36.35 ± 0.20), minute 240 (36.42 ± 0.25), minute 300 (36.41 ± 0.28), minute 360 (36.37 ± 0.21), minute 480 (36.36 ± 0.27), minute 600 (36.40 ± 0.24), hour 16 (36.36 ± 0.28), hour 20 (36.34 ± 0.32), and hour 24 (36.39 ± 0.29).

Table 1. Demographic Characteristics of Patients

Descriptives	n (%)
Age	
18–30	44 (43.1)
31–40	40 (39.2)
41 years and older	18 (17.7)
Gender	
Female	64 (62.7)
Male	38 (37.3)
Having a chronic illness	
Yes	54 (52.9)
No	48 (47.1)
BMI (kg/m^2)	
40.00–44.99	30 (29.4)
>45.00	72 (70.6)

BMI, body mass index.

Table 2. Number of Hypothermic and Normothermic Patients During the Perioperative Period

Body temperature	*Preoperative period* n *(%)*	*Intraoperative period* n *(%)*	*Postoperative period* n *(%)*
<36°C	0	102 (100)	96 (94.1)
≥36°C	102 (100)	0	6 (5.9)

According to the surgical notes in the postoperative period, the wound class of the patients was clean-contaminated. In the 30-day follow-up of the patients, superficial incisional infection was detected in all of the patients who developed SSI.

Limitations of the study

This study is limited only because of the varying body temperatures of the patients in the postoperative period. Obtained data reveal the effects of postoperative hypothermia duration on SSI. The absence of hypothermia in the preoperative period in the patients included in the study and the development of hypothermia in each patient in the intraoperative period limit the comparisons in the study.

Discussion

All surgical wounds get contaminated. It is largely the adequacy of host defense that determines whether inevitable contamination progresses to clinical infection. Morbidly obese patients are at high risk for complications related to wound infection and healing. IPH can also trigger this risk. Therefore, this study aimed to determine the effect of IPH development on SSI in bariatric surgery patients.

Consistent with many risk factors, wound infections and infection-related complications are common in obese individuals.[24] Despite recent advances in surgical techniques for abdominal surgery, SSI is still one of the most common complications, and prevention of IPH is recommended to reduce this type of infection.[25] To the best of our knowledge, there is no study in the literature evaluating IPH in the same way as our study. Our findings revealed a statistically significant difference between the development of IPH and SSI in bariatric patients.

Preoperative body temperature below 36°C is a risk factor for IPH.[26–28] Based on accumulated evidence to date,[28,29] maintaining the patient's normal body temperature during the perioperative period is considered a preventive measure against SSI.[30,31] In this research, preoperative hypothermia cannot be modeled for the overall study, as the preoperative body temperature of the patients was above 36°C. Since none of the patients was warmed up during the intraoperative period, they all went into hypothermia. It can be said that the IPH status in the postoperative period was selective in this study.

A study showed no association between perioperative hypothermia and 30-day SSI in patients who underwent ventral hernia repair.[15] Another study using continuous intraoperative temperature measurements to examine 1008 colorectal surgery patients also found no association between IPH and SSI.[32] On the contrary, another study examining the

Table 3. Inadvertent Perioperative Hypothermia and Surgical-Site Infection Development Status According to the Demographic Data of the Patients

Descriptives	IPH		SSI	
	Development n (%)	No development n (%)	Development n (%)	No development n (%)
Age				
18–30 ($n=44$)	38 (86.4)	6 (13.6)	22 (50.0)	22 (50.0)
31–40 ($n=40$)	40 (100.0)	0	40 (100.0)	0
41 years and older ($n=18$)	18 (100.0)	0	16 (80.0)	2 (20.0)
Total ($n=102$)	96 (94.1)	6 (5.9)	78 (76.5)	24 (23.5)
Test	$\chi^2=8.403$ $p=0.038$*		$\chi^2=31.973$ $p=0.001$**	
Gender				
Female ($n=64$)	62 (96.9)	2 (3.1)	52 (81.3)	12 (18.7)
Male ($n=38$)	34 (89.5)	4 (10.5)	26 (68.4)	12 (31.6)
Total ($n=102$)	96 (94.1)	6 (5.9)	78 (76.5)	24 (23.5)
Test	$\chi^2=2.359$ $p=0.125$		$\chi^2=2.181$ $p=0.140$	
Having a chronic illness				
Yes ($n=54$)	54 (100)	0	48 (88.9)	6 (11.1)
No ($n=48$)	42 (87.5)	6 (12.5)	30 (62.5)	18 (37.5)
Total ($n=102$)	96 (94.1)	6 (5.9)	78 (76.5)	24 (23.5)
Test	$\chi^2=7.172$ $p=0.007$*		$\chi^2=9.835$ $p=0.002$*	
BMI				
40.00–44.99 ($n=30$)	24 (25.0)	6 (75.0)	18 (60.0)	12 (40.0)
>45.00 ($n=72$)	72 (100.0)	0	60 (83.3)	12 (16.7)
Total ($n=102$)	96 (94.1)	6 (5.9)	78 (76.5)	24 (23.5)
Test	$\chi^2=15.300$ $p=0.001$**		$\chi^2=6.408$ $p=0.011$*	

*$p<0.05$, **$p=0.001$
IPH, inadvertent perioperative hypothermia; SSI, surgical-site infection.

development of SSI after colorectal surgery found a relationship between IPH and SSI.[14] A study investigating the relationship between IPH and SSI after elective abdominal surgery found no statistically significant relationship.[33] In a study examining the outcomes of the plastic surgery population, it was shown that IPH was not associated with wound complications.[12] These studies in different procedures have shown that the relationship between IPH and SSI may differ in clinical significance.

In this study, the effect of IPH on SSI in bariatric surgery patients makes this study important in terms of adding new information to the literature. Because even the fact that bariatric surgery patients are morbidly obese is considered a condition that should be examined alone.

The type of anesthesia affects the development of IPH and SSI. Spinal anesthesia may be an independent protective factor for SSI. There is no study in the literature comparing and discussing this finding. As the thermoregulatory disturbance caused by each type of anesthesia is different, combined anesthesia (general anesthesia+epidural anesthesia) increases the risk of hypothermia in patients.[34] Since general anesthesia was administered intravenously to all participating patients, this study does not explain the relationship of anesthesia type with IPH and SSI alone.

Table 4. Surgical-Site Infection Status in Patients With and Without Inadvertent Perioperative Hypothermia

	SSI	
	Development	No development
Participants with IPH	78 (81.3)	18 (18.8)
Participants without IPH	0	6 (100.0)
Total ($n=102$)	78 (76.5)	24 (23.5)
Test	$\chi^2=20.719$ $p=0.001$**	

**$p=0.001$.

One study found that the risk of developing IPH increases with age.[35] A previous study investigating the risk factors for hypothermia concluded that being older than 70 years poses a risk for developing IPH.[36] Recent studies also support this finding.[37,38] However, in our study, the risk of developing IPH increased in individuals between the ages of 31 and 40. This finding reveals that, contrary to the literature, young individuals are also at risk for IPH. Considering that the patients in this study were morbidly obese, it can be thought that BMI has a greater effect on IPH than age. No study has been found showing that IPH development is high in this age group. It is thought that this situation should be supported by the results of more studies. The fact that this finding, which is also supported by recent studies, brings different up-to-date information to the literature reveals the importance of the study.

A recent large-sample study examining the development of SSI in patients after bariatric surgery determined that the group of patients who developed SSI the most was between the ages of 40 and 49, and the group of patients who developed SSI the least was between the ages of 18 and 29.[39] The same study determined that advanced age is protective against SSI.[39] In this study, we also found that those who developed IPH between the ages of 31 and 40 developed SSI

more, and the incidence of SSI decreased over the age of 40. Since it has been reported in previous studies that the risk of SSI increases with age, it is crucial and necessary to support the current results of studies conducted in recent years with more studies.

Humans generate heat based on body muscle mass and dissipate heat over the surface area. In women, body surface area is larger than body mass, and subcutaneous fat content is higher. Therefore, their response to thermoregulation is different from that of men.[40] Studies have determined that the incidence of IPH is higher in women.[38,41] In this study, although there was no statistical difference, the development of IPH and SSI was found to be higher in women than in men. This finding supports the existing literature. In this case, it can be thought that excess subcutaneous adipose tissue will pose a risk for SSI. Studies inadequate in explaining why women are at higher risk than men also emphasize the need for more evidence in this area.[39]

In this study, all patients with chronic disease developed IPH. The presence of chronic disease also affected the development of SSI. A study examining the effect of IPH on SSI found that patients with type 2 diabetes and hypertension showed no statistically significant difference in the development of IPH, and this did not affect the development of SSI.[33] In another study examining postbariatric SSI, the development of SSI was found to be statistically significantly higher in people with chronic diseases such as type 2 diabetes, hypertension, chronic obstructive pulmonary disease, and hyperlipidemia.[39] Accordingly, the results of our study can be interpreted as the presence of chronic disease in bariatric surgery patients increases IPH and therefore IPH contributes to the development of SSI.

A study examining the development of SSI in patients who underwent gastrointestinal surgery found that the risk of developing SSI increased as the BMI increased.[42] In their study in which they followed up on SSI in bariatric patients, Ferraz et al found that those with a BMI of 40–49.9 kg/m^2 were the riskiest group for SSI.[43] Due to obesity, bariatric surgery patients have an increased risk of SSI.[44–46] The incidence of SSI in bariatric surgery varies between 1.4% and 30%, depending on the bariatric procedure and technique.[47–51] Bariatric surgery can be performed with an open or laparoscopic approach.

Also, in our study, IPH and SSI developed statistically significantly in patients with BMI >45 kg/m^2 compared with patients with BMI between 40 and 44.9 kg/m^2. This finding suggests that an increase in BMI always triggers IPH and the development of IPH causes SSI, as all 72 patients with BMI >45 kg/m^2 in the study developed IPH, and of those patients, 83.3% ($n = 60$) developed SSI.

Conclusion

Bariatric surgery carries a low risk of SSI when performed laparoscopically, but our findings suggest that postbariatric surgery IPH affects the development of SSI. These results confirmed the relevance of IPH as an independent risk factor for SSI. Maintaining patient normothermia during surgery still poses a challenge for health care professionals, as it requires the use of technologies as well as collaboration between surgeons, anesthesiologists, and nurses. In this context, nurses should focus on identifying factors associated with IPH, implementing interventions to prevent this condition, and educating health care professionals on how to maintain patients' normothermia. The nurse's knowledge and skills can help reduce the number of IPH cases, which will be a momentous step toward preventing SSI.

Continuing education, training, competence development, and institutional support to implement current hypothermia management guidelines are essential aspects of nurses' roles. Providing the necessary materials to ensure normothermia in hospitals will be a great start in preventing the development of SSI.

Authors' Contributions

Study conception and design: P.Y.E. and E.Y. Data collection: P.Y.E. Data analysis and interpretation: E.Y. Drafting of the article: P.Y.E. and E.Y. Critical revision of the article: P.Y.E.

Author Disclosure Statement

No competing financial interests exist.

Funding Information

No funding was received for this article.

References

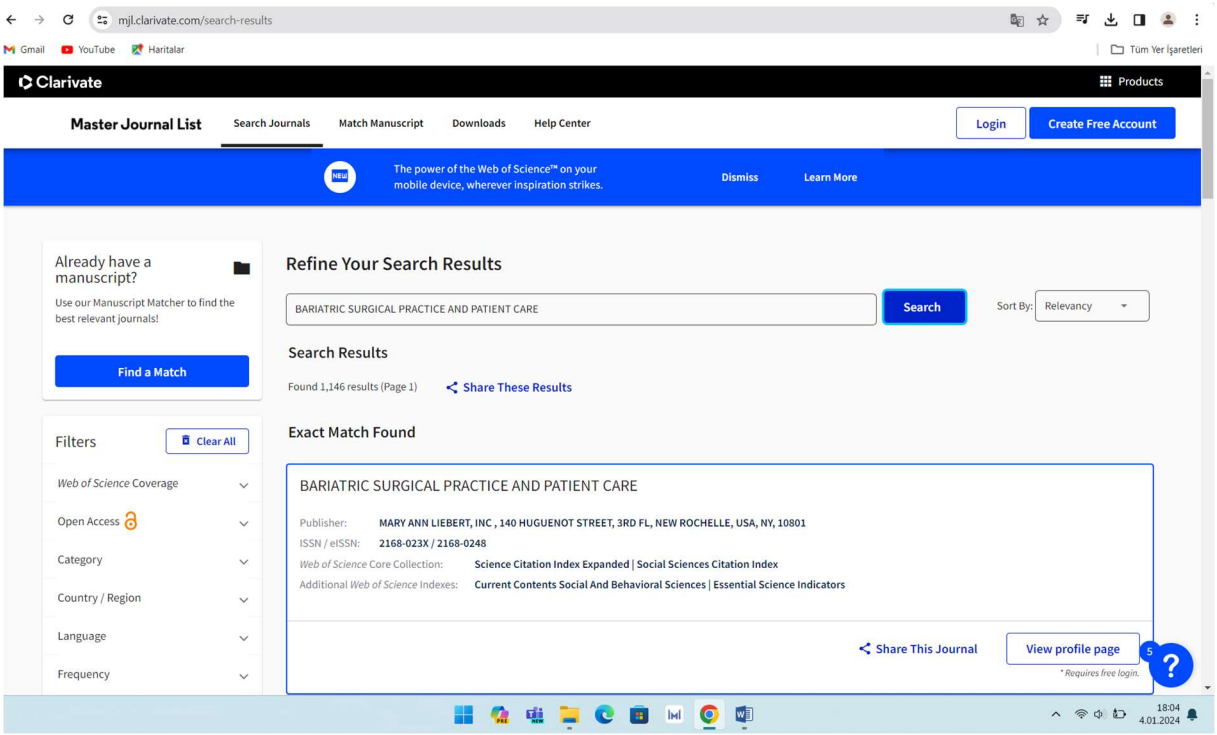
1. World Health Organization. Global guidelines for the prevention of surgical site infection. 2016. Available from: https://www.who.int/infection-prevention/publications/ssi-prevention-guidelines/en [Last accessed: March 10, 2018].
2. Savage JW, Anderson PA. An update on modifiable factors to reduce the risk of surgical site infections. Spine J 2013; 13(9):1017–1029.
3. Hart SR, Bordes B, Hart J, et al. Unintended perioperative hypothermia. Ochsner J 2011;11(3):259–270.
4. Torossian A, Brauer A, Hocker J, et al. Preventing inadvertent perioperative hypothermia. Dtsch Arztebl Int 2015; 112(10):166–172.
5. Implementation Guide for Surgical Site Infection. The Military Health System's Partnership for Patients Campaign; 2013. Available from: https://www.health.mil/Reference-Center/Technical-Documents/2013/02/14/Implementation-Guide-for-Surgical-Site-Infections [Last accessed: May 1, 2022].
6. The latest updates on the definition of surgical site infections and current practice in perioperative hair removal. Online Turk J Health Sci 2016;1(3):28–36.
7. Yılmaz GR, Bayazıt NF, Erdinç S. Surgical site infections (SSI). FLORA 2014; 19(4):145–156.
8. Surgical Site Infection Event (SSI). National Healthcare Sfety Network. 2022. Available from: www.cdc.gov/nhsn/PDFs/pscManual/9pscSSIcurrent.pdf. [Last accessed: May 5, 2022].
9. Brogly N, Alsina E, de Celis I, et al. Perioperative temperature control: Survey on current practices. Rev Esp Anestesiol Reanim 2016;63(4):207–211.
10. Adriani MB, Moriber N. Preoperative forced-air warming combined with intraoperative warming versus intraoperative warming alone in the prevention of hypothermia during gynecologic surgery. AANA J 2013;81(6):446–451.
11. Koksal GM, Dikmen Y, Utku T, et al. Perioperative patient temperature monitoring and warming: A survey study. Turk J Anaesthesiol Reanim 2013;41:149–155.

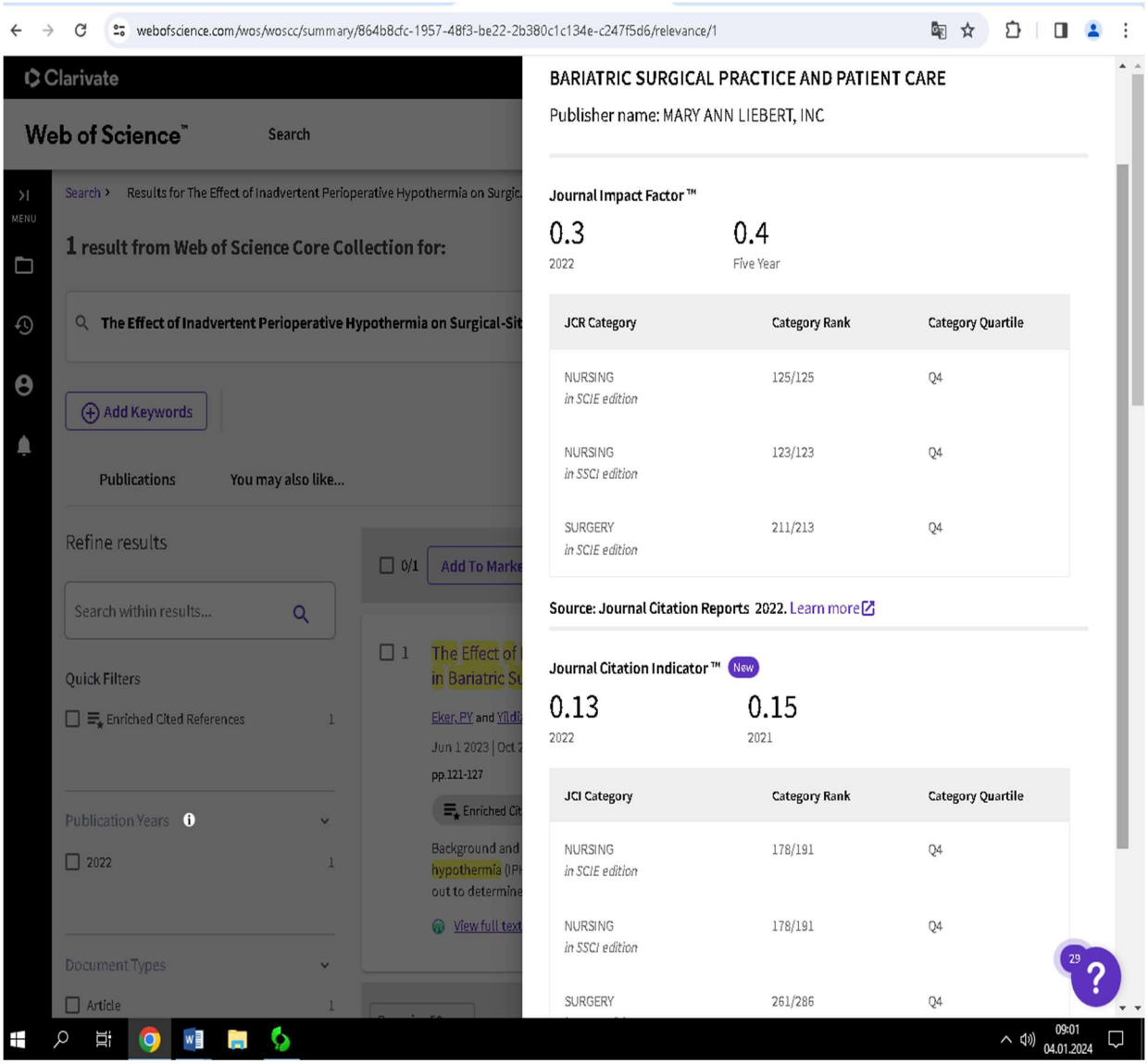
12. Constantine RS, Kenkel M, Hein RE, et al. The impact of perioperative hypothermia on plastic surgery outcomes: A multivariate logistic regression of 1062 cases. Aesthet Surg J 2015;35(1):81–88.
13. Kurz A, Sessler DI, Lenhardt R. Perioperative normothermia to reduce the incidence of surgical-wound infection and shorten hospitalization. Study of wound infection and temperature group. N Engl J Med 1996;334:1209–1215.
14. Geiger T, Horst S, Muldoon R, et al. Perioperative core body temperatures effect on outcome after colorectal resections. Dis Colon Rectum 2011;54:e44–e45.
15. Baucom RB, Phillips SE, Ehrenfeld JM, et al. Defining intraoperative hypothermia in ventral hernia repair. J Surg Res 2014;190:385–390.
16. Bu N, Zhao E, Gao Y, et al. Association between perioperative hypothermia and surgical site infection. Medicine 2019;98(6):1–8.
17. Christou NV, Jarand J, Sylvestre JL, et al. Analysis of the incidence and risk factors for wound infections in open bariatric surgery. Obes Surg 2004;14(1):16–22.
18. Topaloglu S, Avsar FM, Ozel H, et al. Comparison of bariatric and non-bariatric elective operations in morbidly obese patients on the basis of wound infection. Obes Surg 2005;15:1271–1276.
19. Olsen MA, Nepple JJ, Riew KD, et al. Risk factors for surgical site infection following orthopaedic spinal operations. J Bone Joint Surg Am 2008;90(1):62–69.
20. Fischer MI, Dias C, Stein AT, et al. Antibiotic prophylaxis in obese patients submitted to bariatric surgery. A systematic review. Acta Cir Bras 2014;29(3):209–217.
21. Anderson DJ, Podgorny K, Berríos-Torres SI, et al. Strategies to prevent surgical site ınfections in acute care hospitals: 2014 update. Infect Control Hosp Epidemiol 2014; 35(6):605–627.
22. Sajid MS, Shakir AJ, Khatri K, et al. The role of perioperative warming in surgery: A systematic review. Sao Paulo Med J 2009;127(4):231–237.
23. Stevens DL, Bisno AL, Chambers HF, et al. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 update by the Infectious Diseases Society of America. Clin İnfect Dis 2014;59(2):e10–e52.
24. Wadhwa A, Kabon B, Fleischmann E, et al. Supplemental postoperative oxygen does not reduce surgical site infection and major healing-related complications from bariatric surgery in morbidly obese patients: A randomized, blinded trial. Anesth Analg 2014;119(2):357–365.
25. Tovar R, Badia JM. Prevention of surgical site infection in abdominal surgery. A critical review of the evidence. Cir Esp 2014;92(4):223–231.
26. NICE Guidance. Inadvertent perioperative hypothermia: The management of inadvertent perioperative hypothermia in adults. Clinical guideline [CG65] 2008. Available from: http://guidance.nice.org.uk/CG65. [Last accessed: March 3, 2022].
27. American Society of PeriAnesthesia Nurses ASPAN. Clinical guideline for the prevention of unplanned perioperative hypothermia. 2016. Available from: https://or.org/pdf/HYPOTHERMIA_GUIDELINE10-02.pdf [Last accessed: October 20, 2020].
28. Turkish anesthesiology and reanimation society (TARS). A guide for prevention of undesired perioperatıve hypothermia. Turkish J Anesth Reanim 2013; 41:188–190.
29. Forbes SS, Eskicioglu, C, Nathens AB, et al. Evidence-based guidelines for prevention of perioperative hypothermia. J Am Coll Surg 2009;209(4):492–503.
30. Berríos-Torres SI, Umscheid CA, Bratzler DW, et al.; for the Healthcare Infection Control Practices Advisory Committee. Centers for Disease Control and Prevention guideline for the prevention of surgical site infection, 2017. JAMA Surg 2017;152(8):784–791.
31. World Health Organization. Global guidelines for the prevention of surgical site infection. World Health Organization: Geneva, Switzerland; 2016.
32. Melton GB, Vogel JD, Swenson BR, et al. Continuous intraoperative temperature measurement and surgical site infection risk: Analysis of anesthesia information system data in 1008 colorectal procedures. Ann Surg 2013;258: 606–612.
33. Siddiqiui T, Pal KI, Shaukat F, et al. Association between perioperative hypothermia and surgical site infection after elective abdominal surgery: A prospective cohort study. Cureus 2020;12(10):e11145.
34. Joris J, Ozaki M, Sessler DI, et al. Epidural anesthesia impairs both central and peripheral thermoregulatory control during general anesthesia. Anesthesiology 1984;80(2): 268–277.
35. Aksu A, Kus A, Gurkan Y, et al. Survey on postoperative hypothermia incidence in operating theatres of Kocaeli University. Turk J Anaesth Reanim 2014;42(2):66–70.
36. Shapiro Y, Pandolf KB, Avellini BA, et al. Physiological responses of men and women to humid and dry heat. J Appl Physiol 1980(1);49:1–8.
37. Putnam K. Prevention of unplanned patient hypothermia. AORN J 2015;104(2):10–12.
38. Giuliano KK, Hendricks J. Inadvertent perioperative hypothermia: Current nursing knowledge. AORN J 2017; 105(5):453–463.
39. Dang JT, Tran C, Switzer N, et al. Predicting surgical site infections following laparoscopic bariatric surgery: Development of the Bariwound tool using the MBSAQIP database. Surg Endosc 2020;34(4):1802–1811.
40. Guclu A, Karadag M. Inadvertent perioperative hypothermia care algorithm. Duzce Univ J Health Sci Inst 2021; 11(3):431–440.
41. Hooper VD, Chard R, Clifford T, et al. ASPAN's evidence-based clinical practice guideline for the promotion of perioperative normothermia. J Perianesthesia Nurs 2009; 24(5):271–287.
42. Watanabe A., Kohnoe S, Shimabukuro R, et al. Risk factors associated with surgical site infection in upper and lower gastrointestinal surgery. Surg Today 2008;38(5):404–412.
43. Ferraz ÁAB, Vasconcelos CFDM, Santa-Cruz F, et al. Surgical site infection in bariatric surgery: Results of a care bundle. Rev Col Bras Cir 2019:46:e2252.
44. Freeman JT, Anderson DJ, Hartwig MG, et al. Surgical site infections following bariatric surgery in community hospitals: A weighty concern? Obes Surg 2011;21(7):836–840.
45. Winfield RD, Reese S, Bochicchio K, et al. Obesity and the risk for surgical site infection in abdominal surgery. Am Surg 2016;82(4):331–336.
46. Thelwall S, Harrington P, Sheridan E, et al. Impact of obesity on the risk of wound infection following surgery: Results from a nationwide prospective multicentre cohort study in England. Clin Microbiol Infect 2015;21:1008.e1–e1008.e8.

47. Shope TR, Cooney RN, McLeod J, et al. Early results after laparoscopic gastric bypass: EEA vs GIA stapled gastrojejunal anastomosis. Obes Surg 2003;13(3):355–359.
48. Alasfar F, Sabnis A, Liu R, et al. Reduction of circular stapler-related wound infection in patients undergoing laparoscopic Roux-en-Y gastric bypass, Cleveland clinic technique. Obes Surg 2008;20(2):168–172.
49. Schauer PR, Ikramuddin S, Gourash W, et al. Outcomes after laparoscopic roux-en-Y gastric bypass for morbid obesity. Ann Surg 2000;232(4):515–529.
50. Finks JF, Carlin A, Share D, et al. Effect of surgical techniques on clinical outcomes after laparoscopic gastric bypass—results from the Michigan Bariatric Surgery Collaborative. Surg Obes Relat Dis 2011;7:284–289.
51. Shabino PJ, Khoraki J, Elegbede AF, et al. Reduction of surgical site infections after laparoscopic gastric bypass with circular stapled gastrojejunostomy. Surg Obes Relat Dis 2016;12(1):4–9.

Address correspondence to:
Pinar Yilmaz Eker, PhD
Susehri Health High School
Nursing Department
Sivas Cumhuriyet University
Sivas 58140
Turkey

E-mail: yilmazpinar20@gmail.com


mjl.clarivate.com/search-results
Gmail
YouTube
Haritalar
Tüm Yer İşaretleri
Clarivate
Products
Master Journal List
Search Journals
Match Manuscript
Downloads
Help Center
Login
Create Free Account
The power of the Web of Science™ on your mobile device, wherever inspiration strikes.
Dismiss
Learn More
Already have a manuscript?
Use our Manuscript Matcher to find the best relevant journals!
Find a Match
Refine Your Search Results
BARIATRIC SURGICAL PRACTICE AND PATIENT CARE
Search
Sort By:
Relevancy
Search Results
Found 1,146 results (Page 1)
Share These Results
Exact Match Found
Filters
Clear All
Web of Science Coverage
Open Access
Category
Country / Region
Language
Frequency
BARIATRIC SURGICAL PRACTICE AND PATIENT CARE
Publisher: MARY ANN LIEBERT, INC , 140 HUGUENOT STREET, 3RD FL, NEW ROCHELLE, USA, NY, 10801
ISSN / eISSN: 2168-023X / 2168-0248
Web of Science Core Collection: Science Citation Index Expanded | Social Sciences Citation Index
Additional Web of Science Indexes: Current Contents Social And Behavioral Sciences | Essential Science Indicators
Share This Journal
View profile page
* Requires free login.
18:04
4.01.2024


webofscience.com/wos/woscc/summary/864b8cfc-1957-48f3-be22-2b380c1c134e-c247f5d6/relevance/1
Clarivate
Web of Science
Search
Search › Results for The Effect of Inadvertent Perioperative Hypothermia on Surgic
1 result from Web of Science Core Collection for:
The Effect of Inadvertent Perioperative Hypothermia on Surgical-Sit
Add Keywords
Publications
You may also like...
Refine results
Search within results...
Quick Filters
Enriched Cited References 1
Publication Years
2022 1
Document Types
Article 1
BARIATRIC SURGICAL PRACTICE AND PATIENT CARE
Publisher name: MARY ANN LIEBERT, INC
Journal Impact Factor™
0.3
2022
0.4
Five Year
JCR Category | Category Rank | Category Quartile
NURSING in SCIE edition | 125/125 | Q4
NURSING in SSCI edition | 123/123 | Q4
SURGERY in SCIE edition | 211/213 | Q4
Source: Journal Citation Reports 2022. Learn more
Journal Citation Indicator™ New
0.13
2022
0.15
2021
JCI Category | Category Rank | Category Quartile
NURSING in SCIE edition | 178/191 | Q4
NURSING in SSCI edition | 178/191 | Q4
SURGERY | 261/286 | Q4
09:01
04.01.2024