NURSING CARE IN THE INTRAOPERATIVE PERIOD FOR BODY TEMPERATURE MAINTENANCE

Cuidados de enfermagem no período intraoperatório para manutenção da temperatura corporal

Cuidados de enfermería en período intraoperatorio para el mantenimiento de la temperatura corporal

Érica de Oliveira Souza[1], Natália Gonçalves[2]*, Ana Graziela Alvarez[3]

ABSTRACT: Objective: To describe nursing care in relation to body temperature maintenence during the intraoperative period. **Method:** Descriptive, cross-sectional study, performed in June 2015 in the operating department of a hospital in the state of São Paulo. Data were collected using an instrument developed for this study, which contained sociodemographic, clinical, surgical and nursing care data. Descriptive analyzes were performed for all variables. **Results:** Nursing care was analyzed in 19 surgeries, with the highest incidence being laparoscopic cholecystectomy (26.3%), under general anesthesia (52.6%). The mean duration of anesthesia was 113 minutes. Hypothermia was identified in 84.2% of the patients in the postoperative period. The active cutaneous heating method, with intravenous solution infusion was used in all patients intraoperatively. **Conclusion:** Unintentional hypothermia is a recurrent condition in the operating department and comprimises patients' recovery. Its prevention is related to the achievement of safer nursing care and the reduction of postoperative complications.

Keywords: Nursing care. Hypothermia. Perioperative nursing.

RESUMO: Objetivo: Descrever os cuidados de enfermagem para manutenção da temperatura corporal durante o intraoperatório. **Método:** Estudo descritivo, transversal, realizado em junho de 2015 no centro cirúrgico de um hospital no interior de São Paulo. Os dados foram coletados por meio de instrumento desenvolvido para este estudo, o qual continha dados de caracterização sociodemográfica, clínica, cirúrgica e cuidados de enfermagem. Para todas as variáveis, foram realizadas análises descritivas. Resultados® Foram analisados os cuidados de enfermagem em 19 cirurgias, sendo a de maior incidência a colecistectomia videolaparoscópica (26,3%), sob anestesia geral (52,6%). O tempo médio de duração da anestesia foi de 113 minutos. A hipotermia foi identificada em 84,2% dos pacientes no período pós-operatório. O método de aquecimento utilizado em todos os pacientes no intraoperatório foi do tipo cutâneo ativo, com infusão de solução aquecida por via endovenosa. Conclusão® A hipotermia não intencional é uma condição real no centro cirúrgico, causando prejuízos à recuperação dos pacientes. Sua prevenção está relacionada à realização de cuidados de enfermagem mais seguros e à redução de complicações pós-operatórias.

Palavras-chave: Cuidados de enfermagem. Hipotermia. Enfermagem perioperatória.

RESUMEN: Objetivo: Describir los cuidados de enfermería para manutención de la temperatura corporal durante el intraoperatorio. **Método:** Estudio descriptivo, transversal, realizado en junio de 2015 en el centro quirúrgico de un hospital en el interior de São Paulo. Los datos fueron colectados por medio de instrumento desarrollado para este estudio, el cual contenía datos de caracterización sociodemográfica, clínica, quirúrgica y cuidados de enfermería. Para todas las variables fueron realizados análisis descriptivos. **Resultados:** Fueron analizados los cuidados de enfermería en 19 cirugías, siendo

[1]Nursing technician degree awarded by the *Centro Paula Souza*. Nursing degree awarded by the *Centro Universitário de Jaguariúna* (UniFaj) – Jaguariúna (SP), Brazil.
[2]Nurse. PhD in Sciences awarded by Ribeirão Preto School of Nursing in the *Universidade de São Paulo* (USP). POSTDOC awarded by the *Universidade Estadual de Campinas* (UNICAMP). Adjunct professor of the Nursing Department and member of the *Laboratório de Pesquisas e Tecnologias em Enfermagem e Saúde à Pessoas em Condição Crônica* (NUCRON) of the *Universidade Federal de Santa Catarina* (UFSC) –– Florianópolis (SC), Brazil.
[3]Nurse.PhD in Nursing awarded by UFSC. Adjunct professor of the Department of Nursing and Postgraduate Program. Professional MSc in Health Informatics and L*aboratório de Produção Tecnologia e Grupo de Pesquisa Clínica*, Technologies and Informatics in Health and Nursing at UFSC – Florianópolis (SC), Brazil.
*Corresponding author: nataliasjbv@gmail.com
Received: 07/26/2018 – Approved: 01/08/2019
DOI: 10.5327/Z1414-4425201900010007

la de mayor incidencia la colecistectomía video-laparoscópica (26,3%), bajo anestesia general (52,6%). El tiempo promedio de duración de la anestesia fue de 113 minutos. La hipotermia fue identificada en un 84,2% de los pacientes en el período postoperatorio. El método de calentamiento utilizado en todos los pacientes em el intraoperatorio fue del tipo cutáneo activo, con infusión de solución calentada por vía endovenosa. **Conclusión:** La hipotermia no intencional es una condición real en el centro quirúrgico, causando perjuicios a la recuperación de los pacientes. Su prevención está relacionada a la realización de cuidados de enfermería más seguros y a la reducción de complicaciones postoperatorias.

Palabras-clave: Atención de enfermería. Hipotermia. Enfermería perioperatoria.

INTRODUCTION

Hypothermia is defined as a body temperature below 36ºC[1], which can be classified as unintentional or therapeutic, the first being more frequent in most patients submitted to anesthetic-surgical procedures[2,3]. Different factors can cause unintentional hypothermia in the surgical process, such as type and duration of anesthesia, operating room temperature (OR), medications administered, use of solutions and cold intravenous infusions[2,4] as well as factors related to individuals such as age, body mass index and the presence of associated diseases or traumas[2,5]. Thus, hypothermia canlead to systemic complications, compromise the healing process and increase the risk of surgical site infection, bleeding and cardiac alterations[2,4].

To avoid the complications resulting from hypothermia, it is essential to implement preventive measures, even by the nursing team. The methods used to maintain body temperatur can be described as active or passive skin warming. Active heating methods include the use of thermal mattresses with water circulation, infusion of heated solutions, heating and humidification of the administered gases[6]. In passive heating, patients are heated using sheets or blankets[3].

Hypothermia is recurrent in clinical practice and, often, professionals do not give due importance to this complication and its repercussions in the surgical patient. In an area of great complexity, such as the operating department (OD), all professionals need to act in a preventive manner, thereby improving nursing care and, consequently, the well-being of the patient as a whole.

Nurses play a crucial role in this scenario, as they are responsible for planning and implementing interventions that minimize the complications and risks involved in this phase.

OBJECTIVE

To describe nursing care for the maintenance of adequate body temperature and the prevention of hypothermia during the intraoperative period.

METHOD

This was a cross-sectional, observational, quantitative study performed in the OD of a municipal hospital in the state of São Paulo, in June 2015.

Nursing professionals (nurses, technicians and nursing assistants), over 18 years old, working in the OD during the period of the study and who agreed to participate in the study were invited to participate in the data collection. Professionals on vacation, maternity or health leave, and those scheduled for emergency / emergency and / or midwifery surgeries were excluded from the study.

Three nursing technicians present in the period of data collection and rostered to assist in elective surgeries in the OD of the studied hospital accepted to participate in the research and, therefore, assisted in the participant observation. The technicians were aged between 28 and 35 years and had between 7 and 12 years of professional experience. One of the professionals had been working in the industry for five years and the others for one and two years. During the period of collection, the three nursing professionals provided care to 19 subjects and these data were considered for the analysis.

The data collection took place in three periods:

- before surgery;
- during surgery;
- immediately after surgery.

The data were recorded by the first researcher and by the participating nursing team, using a form developed for this study.

The instrument was submitted to appearance and content validation by three nursing professionals who work in patient care in the perioperative period. This procedure aimed to refine the instrument.

The first stage occurred prior to surgery, at the patient's admission to the OD on the hospital trolley, where the patient waited to be seen by the anesthetist and the surgeon. At that

moment, the nursing professionals filled out the characterization form and sociodemographic data of the patient. Then, inside the operating room, they continued to fill out the form with the surgery time, name of surgery, comorbidities, medications, weight, height, body mass index (BMI), vital signs (temperature, blood pressure, heart and respiratory rate), the nursing care applied to prevent hypothermia and the cutaneous method used (active or passive), as well as its specifications.

In relation to BMI, the classification proposed by the World Health Organization (WHO) was used:

- obesity I: BMI from 30 to 34.99 kg / m^2;
- severe obesity II: BMI of 35 to 39.99 kg / m^2;
- morbidly obesity: BMI > 40 kg / m^2.

This data was calculated by the researchers, based on the weight and height of the patients.

The second stage occurred during surgery, when the professionals filled in the fields related to the type of anesthesia, air temperature and humidity in the OR, patient's vital signs and method used to prevent hypothermia (active or passive).

The third stage occurred immediately after surgery. In the same way as in the previous steps, the professionals filled out the data regarding the method used to prevent hypothermia (active or passive) and the patient's vital signs at that time.

The researchers collected the completed questionnaires and the data were entered, organized and analyzed on a spreadsheet, with the help of Excel version 2010 software. Descriptive analyzes (simple frequency, percentage, minimum and maximum) were performed for the variables studied.

The study complied with the recommendations of Resolution 466/2012 of the National Health Council and was approved by the Ethics Committee of the Faculdade de Jaguariúna, São Paulo (CAAE 44601315.3.0000.5409).

RESULTS

During the month of June 2015, 68 surgical procedures were performed, among which 19 were included in the study. The majority of operated patients were females (11, 57.9%), with a mean age of 39 years (SD = 21.2, 3-77), 4 were aged between 3 and 10 years and 4 were older than 60 years.

Seven patients (36.8%) had the following comorbidities: asthma, bronchitis, systemic arterial hypertension, diabetes mellitus, gallstones, hypothyroidism, heart disease or depression, and 2 of them had more than one disease. In addition, 6 patients (31.5%) used medications prior to surgery (glibenclamide, fluoxetine, omeprazole, budesonide, hydrochlorothiazide, depakote, cetalapram or losartan).

Regarding BMI, two presented class I obesity; one presented class II obesity; five were overweight; eight had ideal weight; two were underweight and one patient was not weighed.

Among the surgeries performed, laparoscopic colecystectomy was the most frequently performed surgery (26.3%) (Table 1).

Ten patients (52.6%) underwent general anesthesia, followed by spinal anesthesia (7; 36.8%) and associated general anesthesia (2; 10.5%). The mean duration of surgery was 113 minutes (30-465).

The OR temperature at the time of surgery was, on average, 21.1°C (SD = 19; 19.6-23.4) and the humidity was 59% (SD = 0.1; 21-69).

Preoperative period

During their admission to the OD, the patients remained on hospital trolleys where vital signs were measured and recorded (Table 2). It must be noted, that 2 of the 6 patients (36.8%) with mild hypothermia in this period were children aged 3 and 6 years.

Table 1. Procedures included in the study, according to the surgeries performed.

Surgical procedure	n (%)
Videolaparoscopic cholecystectomy	5 (26.3)
Surgical treatment of bilateral varices	2 (10.5)
Umbilical herniation + postectomy	1 (5.3)
Umbilical herniation	1 (5.3)
Umbilical Hernioplasty	1 (5.3)
Total hysterectomy	1 (5.3)
Left inguinal hernia repair	1 (5.3)
Surgical treatment of bilateral varicose veins + saphenectomy	1 (5.3)
Exploratory laparotomy	1 (5.3)
Postectomia	1 (5.3)
Septoplastia + cauterização de cornetos	1 (5.3)
Colecistectomia convencional	1 (5.3)
Adenoidectomia + cauterização de cornetos	1 (5.3)
Hemorroidectomia	1 (5.3)
Total	19 (100.0)

Regarding nursing care in this period, the active cutaneous method of intravenous solution infusion and the passive cutaneous method using cotton sheets were used in all patients (19; 100.0%) to maintain body temperature. It should be noted that in one patient, the lower limbs were wrapped with orthopedic cotton.

Intraoperative period

During this time, most of the patients (13; 68.4%) remained normothermic during the surgical procedure (Table 3). Sixteen patients presented a temperature change between the immediate preoperative period and during the procedure; 3 patients' temperatures increased, ranging from 0.1 to 0.4°C and 10 showed a decrease, ranging from 0.1 to 1.7°C. Among the four patients who presented a decrease of at least 1°C in body temperature, two had been submitted to general anesthesia for laparoscopic cholecystectomy and umbilical hernioplasty.

The main nursing care applied during this period was the infusion of heated intravenous solution and the use of a cotton surgical drapes. (Table 4).

Immediately after surgery

After the end of surgery, the patients' vital signs were recorded, and the predominance of hypothermia was identified in most patients (16; 84%) (Table 5).

The variation of body temperature between the surgical procedure and immediately after the surgery was 0 to 2.8°C. The biggest alteration was presented by a patient who underwent umbilical herniorrhaphy under spinal anesthesia.

In this period, the type of nursing care used for body temperature maintenance was the active cutaneous method with intravenous solution infusion and the passive cutaneous method with the use of cotton sheets, used with all patients (19, 100, 0%). Only one patient had their lower limbs wrapped with orthopedic cotton.

DISCUSSION

In this study, we sought to identify nursing care in relation to maintaining body temperature during the intraoperative period and immediately before the surgical procedure.

Table 2. Vital signs of patients in the preoperative period.

Vital signs				n (%)
Blood pressure	Normotensive			8 (42.1)
	Hypertensive			5 (26.3)
	Stage 1	Stage 2	Stage3	
	04	1	0	
	Hypotensive			4 (21.5)
	Unidentified			2 (10.5)
Heart rate	Normocardic			13 (68.4)
	Tachycardic			0 (00.0)
	Bradicardic			5 (26.3)
	Unidentified			1 (5.2)
Respiratory rate	Normal			13 (68.4)
	Tachypneic			6 (31.5)
	Bradypnea			0 (00.0)
	Unidentified			0 (00.0)
Axillary temperature	Normothermic			13 (68.4)
	Hyperthermic			0 (00.0)
	Hypothermic			6 (31.5)
	Mild	Moderate	Severe	
	6	0	0	
	Unidentified			0 (00,0)

Table 3. Patients' body temperature during the surgical procedure.

Temperatura	n (%)
Normothermic	13 (68.4)
Hyperthermic	0 (00.0)
Mild hypothermia	3 (15.7)
Moderate hyperthermia	2 (10.5)
Severe Hypothermia	0 (00.0)
Unidentifed	1 (5.2)

Table 4. Nursing care to maintain body temperature during the intraoperative period, during the procedure.

Nursing care	n (%)
Active methods	
Infusion of heated introvenous fluids	19 (100.0)
Infusion of heated solution by cavity wash	1 (5.0)
Passive methods	
Cotton surgical drapes	14 (74.0)
Surgical drapes + cotton sheets	2 (11.0)
Wrapping lower limbs with orthopedic cotton + cotton surgical drapes	3 (16.0)

According to the results presented, before the surgery, while in the preparation room, all the patients received heated fluids via intravenous route and were covered with cotton sheets. The heating of the patient prior to anesthetic induction is important for the redistribution of body temperature throughout the surgical procedure, since it increases the body temperature in the peripheral regions and also causes vasodilation[7]. Studies show that, for the period prior to surgery, the most effective heating system is forced air[2,7,8], however, the effectiveness of preheating may be influenced by external factors, such as the low temperature of the environment, which is applicable to this study, as well as metabolic factors.

During the surgical procedure, the temperature of the OR, the type of surgery, the anesthetic agents, as well as the care provided may influence hypothermia development[2,5]. Regarding the environment, the mean OR temperature was 21.1°C, which is below the recommended value (24°C) for the maintenance of patient body temperature[2].

On average, the length of surgery found in this study was 113 minutes and the most performed surgery was cholecystectomy (26.3%). This type of surgical procedure is considered a type II surgery, lasting between two and four hours[9] and, therefore, has an average risk of presenting post-surgical complications, such as hypothermia.

Table 5. Vital signs of patients immediately after surgery.

Vital signs				n (%)
Blood pressure	Normotensive			4 (21.5)
	Hypertensive			2 (10.5)
	Stage 1	Stage 2	Stage 3	
	2	0	0	
	Hypotensive			11 (57.8)
	Unidentified			2 (10.5)
Heart rate	Normocardic			11 (57.8)
	Tachycardic			0 (00.0)
	Bradycardic			8 (42.1)
	Unidentified			0 (00.0)
Respiratory rate	Normal			13 (68.4)
	Tachypneic			5 (26.3)
	Bradypnea			0 (00.0)
	Unidentified			1 (5.2)
Axillary temperature	Normothermic			3 (15.7)
	Hyperthermic			0 (00.0)
	Hypothermic			16 (84.2)
	Mild	Moderate	Severe	
	13	3	0	
	Unidentifed			0 (00.0)

Although it was not possible to perform more robust statistical analyzes that related the variables of interest such as OR temperature, type of surgery and anesthesia, age and BMI, with the change in body temperature, the factors presented in this study contribute to the decrease in temperature, which may have influenced the results.

During the anesthetic-surgical procedure, ten patients had a decrease in body temperature. The main nursing care provided at that time was the infusion of heated intravenous fluids and the use of cotton surgical drapes. Studies have shown that only forced air intraoperatively managed to warm the patient and maintain body temperature[7,10,11] and therefore seems to be an important method in the prevention of unintentional hypothermia.

The emergence of new technologies which prevent hypothermia started in the 1990s.

However, it is still common to find the OD using traditional methods of cutaneous heating, such as in the hospital studied. As found in this study, authors report that the main method used to warm the patient was the passive method, with the use of cotton sheets[12]. The authors recommend the implementation of protocols aimed at patient safety, based on scientific evidence[12.]

In this study, all patients presented alterated body temperatures, comparing the first measurement, in the preoperative period, with the last evaluation, immediately after surgery. Only three patients remained normothermic at the end of the procedure. The most used nursing care in this period were the same ones applied in the preoperative period: heated intravenous fluid (100.0%) and cotton sheets (100.0%).

Studies have shown that the active heating method, such as heated intravenous fluids, is more efficient for skin warming than passive methods such as cotton sheets or drapes[7,13,14].

However, the active method of heated fluid infusion should be completmentary to hypothermia prevention and should not be the only means of preventing hypothermia. It is recommended to use passive methods, such as sheets and limb wrapping, and active methods, such as cutaneous heating and infusion of heated fluids[12,14].

In addition to the care required to avoid hypothermia, nursing plays an important role in identifying patients with other risk factors, such as advanced age, BMI, surgery time and type of anesthesia[15]. In this study, 4 patients were children, aged between 3 and 4 years, and 4 patients were elderly, over

60 years. Age is a risk factor for the development of hypothermia, especially for children and the elderly, due to the physiology of the thermoregulatory system[3,15]. These risk factors should be evaluated by the team in order to ensure a safe surgical procedure and maximum patient recovery.

As limitations of the study, we can consider that it was not possible to calculate the preheating time before the surgical procedure. Preheating time between 30 and 60 minutes is an important peice of information for the analysis of the maintenance of body temperature in the intraoperative period[7]. Moreover, the small sample of professionals and operated patients prevented more robust analyzes of the data, not allowing generalization.

CONCLUSION

The main heating methods used in the 19 procedures analyzed in this study were the infusion of heated fluids and the use of cotton sheets, however they were not enough to prevent hypothermia. As an active heating method, in addition to infusion of fluids, the use of other technologies available in the market is recommended.

According to the results, nursing professionals need to perform more effective planning of surgical patient care, aimed at the prevention of unintentional hypothermia, incorporating new technologies and protocols based on evidence, in order to guarantee patient safety in the anesthetic-surgical procedure.

REFERENCES

1. Potter P, Perry AG. Fundamentos de enfermagem. 9ª ed. Rio de Janeiro: Elsevier; 2018.
2. Giuliano KK, Hendricks J. Inadvertent perioperative hypothermia: current nursing knowledge. AORN J. 2017;105(5):453-63. https://doi.org/10.1016/j.aorn.2017.03.003
3. Muniz GS, Teles NSB, Leitão IMTA, Almeida PC, Leitão CL. Accidental hypothermia: implications for nursing care during surgery. Rev SOBECC. 2014;19(1):79-86. http://dx.doi.org/10.4322/sobecc.2014.009
4. Burns SM, Piotrowski K, Caraffa G, Wojnakowski M. Incidence of postoperative hypothermia and the relationship to clinical variables. J Perianesth Nurs. 2010;25(5):286-9. https://doi.org/10.1016/j.jopan.2010.07.001
5. Pereira NHC, Rocha AM, Mattia AL. Warmed venous infusion in the prevention of intraoperative hypothermia complications. Rev SOBECC. 2014;19(2):74-8. http://dx.doi.org/10.4322/sobecc.2014.013
6. Campbell G, Alderson P, Smith AF, Warttig S. Warming of intravenous and irrigation fluids for preventing inadvertent perioperative hypothermia. Cochrane Database Syst Rev. 2015 [acessado em 27 abr. 2018];13(4):CD009891. Disponível em: http://cochranelibrary-wiley.com/doi/10.1002/14651858.CD009891.pub2/epdf/abstract http://dx.doi.org/10.1002/14651858.CD009891.pub2
7. Poveda VB, Clark AM, Galvão CM. A systematic review on the effectiveness of prewarming to prevent perioperative hypothermia. J Clin Nurs. 2013;22(7-8):906-18. https://doi.org/10.1111/j.1365-2702.2012.04287.x
8. 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(2):343-9. https://doi.org/10.1007/s10877-017-0017-z
9. Carvalho R, Moraes MW. Inserção do centro cirúrgico no contexto hospitalar. In: Carvalho R, Bianchi ERF, eds. Enfermagem em centro cirúrgico e recuperação. 2ª ed. Barueri: Manole; 2016. p.1-18.
10. Just B, Trévien V, Delva E, Lienhart A. Prevention of intraoperative hypothermia by preoperative skin surface warming. Anesthesiology. 1993;79(2):214-8.
11. Sessler DI. Perioperative thermoregulation and heat balance. Lancet. 2016;25;387(10038):2655-64. https://doi.org/10.1016/S0140-6736(15)00981-2
12. Poveda VB, Galvão CM. Hypothermia in the intraoperative period: can it be avoided? Rev Esc Enferm USP. 2011;45(2):405-10. http://dx.doi.org/10.1590/S0080-62342011000200016
13. Galvão CM, Liang Y, Clark M. Effectiveness of cutaneous warming systems on temperature control: meta-analysis. J Adv Nurs. 2010;66(6):1196-206. https://doi.org/10.1111/j.1365-2648.2010.05312.x
14. Danczuk RFT, Nascimento ERP, Silveira NR, Hermida PMV, Rasía MA. Heating methods in the prevention of intraoperative hypothermia of elective abdominal surgery. Esc Anna Nery. 2015;19(4):578-84. http://dx.doi.org/10.5935/1414-8145.20150077
15. Hooper VD, Chard R, Clifford T, Fetzer S, Godden B, Martinez EA, et al. ASPAN's Evidence-based clinical practice guideline for the promotion of perioperative normothermia: second edition. J Perianesth Nurs. 2010;25(6):346-65. https://doi.org/10.1016/j.jopan.2010.10.006