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Perioperative hypothermia: knowledge and interventions by the nursing team

ABSTRACT | Objective: To evaluate the knowledge and interventions of the nursing team about perioperative hypothermia in surgical patients. Method: Descriptive-exploratory study with a cross-sectional approach using a quantitative approach. Data were collected from 77 professionals, including nurses and nursing technicians working in the operating room and in the post-anesthetic recovery room of a reference hospital in overly complex surgeries. Results: The research shows that the participants obtain basic knowledge about the subject, mainly about the concept, the signs, the symptoms and how to intervene when the patient presents the problem. Complications and their management present themselves as a difficulty. Conclusion: The knowledge about perioperative hypothermia and the interventions of the nursing team has gaps. It is expected to contribute to the planning of educational actions that guide quality care strategies for surgical patients.
Keywords: Hypothermia; Perioperative Nursing; Surgical Center; Intraoperative Complications.

RESUMEN | Objetivo: evaluar el conocimiento y las intervenciones del equipo de enfermería sobre la hipotermia perioperatoria en pacientes quirúrgicos. Método: estudio descriptivo-exploratorio con un enfoque transversal utilizando un enfoque cuantitativo. La recopilación de datos se realizó con 77 profesionales, incluidas enfermeras y técnicos de enfermería que trabajan en la sala de operaciones y en la sala de recuperación postanestésica de un hospital de referencia en cirugías altamente complejas. Resultados: La investigación muestra que los participantes obtienen conocimientos básicos sobre el tema, principalmente sobre el concepto, los signos, los síntomas y cómo intervenir cuando el paciente presenta el problema. Las complicaciones y su manejo se presentan como una dificultad. Conclusión: El conocimiento sobre la hipotermia perioperatoria y las intervenciones del equipo de enfermería tiene lagunas. Se espera que contribuya a la planificación de acciones educativas que guíen las estrategias de atención de calidad para pacientes quirúrgicos.
Descriptores: Hipotermia; Enfermería Perioperatoria; Centro Quirúrgico; Complicaciones Intraoperatorias.

RESUMO | Objetivo: Avaliar o conhecimento e intervenções da equipe de enfermagem sobre hipotermia perioperatória no paciente cirúrgico. Método: Estudo descritivo-exploratório com corte transversal de abordagem quantitativa. Foi realizada a coleta dos dados com 77 profissionais entre enfermeiros e técnicos de enfermagem atuantes no bloco operatório e da sala de recuperação pós-anestésica de um hospital de referência em cirurgias de alta complexidade. Resultados :A pesquisa evidencia que os participantes obtêm conhecimento básico sobre o assunto, principalmente sobre o conceito, os sinais, os sintomas e como intervir quando o paciente apresenta o problema. As complicações e o seu manejo apresentam-se como uma dificuldade. Conclusão: O conhecimento sobre hipotermia perioperatória e as intervenções da equipe enfermagem apresenta lacunas. Espera-se contribuir no planejamento de ações educativas que norteiem as estratégias de assistência de qualidade ao paciente cirúrgico.
Palavras-chaves: Hipotermia; Enfermagem Perioperatória; Centro Cirúrgico; Complicações Intraoperatórias.

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INTRODUCTION

During the surgical procedure, the patient is subject to some risk factors, including hypothermia, which is characterized by a clinical condition in which the body temperature is below 36° C[1]. With the hypothalamus as a thermoregulatory center, body temperature is one of the physiological parameters strictly controlled by our organism, and one of those responsible for its perfect functioning, which accepts variations in the range of 36.4º C to 37.6º C[2,3].

The human body can lose heat in four ways: radiation, convection, conduction, and evaporation. Radiation promotes heat loss by electromagnetic waves when the body has a temperature higher than the environment. Loss by convection occurs when the difference in density of water or air is transferred to the body, removing the surface heat from the skin. In loss by conduction, heat is lost by direct contact, with a transfer of body heat to an object with a lower temperature. While evaporating, there is the diffusion of liquids present in the skin for vapor in the environment, which occurs in breathing and in sweating[3].

Through these forms of heat loss, hypothermia can occur, a clinical condition in which the body is not able to generate the heat necessary to ensure

the proper maintenance of physiological functions. Hypothermia can be considered mild (32º to 35º C), moderate (28º to 32º C) and severe - less than 28º C[4].

This condition can affect the metabolism, causing several complications, such as: risk of infection of the surgical site, changes in renal function, coagulation disorders, decreased level of consciousness and, consequently, increased length of hospital stay[5].

The surgical procedure is usually responsible for promoting hypothermia in the patient due to several factors, such as anesthetic induction that has a vasodilating action and for reducing the metabolism and interfering with the central thermoregulatory center[6].

Other factors such as time and type of surgery, exposure of body cavities to low temperatures maintained in operating rooms (between 19 and 24° C), body changes caused by the infusion of fluids and cold blood products, anesthetic agents, as well as cold skin preparations(1). The patient's own condition can also be a risk factor that predisposes him to hypothermia: extremes of age and body weight, neurological disorders and metabolic diseases[7].

Studies show that, when not induced, hypothermia occurs in more than 70% of patients who are submitted to anesthetic-surgical procedures, usually in the intra and postoperative periods[8].

As for signs and complications, it is observed that the hypothermic patient may experience tremors, cold extremities, cyanosis, piloerection, decreased metabolism, altered kidney function, altered level of consciousness, respiratory depression and even coagulopathies(9).

To minimize the occurrence of this condition, it is important that the surgical team, and especially the nursing team, act in promoting measures to maintain normothermia for the surgical patient and, therefore, the prevention of complications[10].

Thus, it is important to monitor patients' body temperature during and after surgery to facilitate thermal control and avoid possible complications caused by hypothermia. In this sense, nursing stands out as one of the main agents in reducing possible complications caused by hypothermia.

By emphasizing the importance of the nursing team's performance, their knowledge and interventions in monitoring and maintaining body temperature within the patient's safety levels during the perioperative period, the relevance of this study is justified, which aims to contribute to a safe surgical procedure and satisfactory results.

Given the above, we intend to answer the following question: What do nurses, and nursing technicians know about perioperative hypothermia and how do they work to prevent and combat it? Thus, the aim of the present study was to evaluate the knowledge of the nursing team in the operating room (BO) and the post-anesthetic recovery room (SRPA) about hypothermia in the perioperative patient.

METHODOLOGY

This is a descriptive-exploratory study with a cross-sectional approach with a quantitative approach.

Data collection took place from July to September 2017 in the operating room of a referral hospital in the State of Pernambuco. With a search strategy for the research subjects, the professional was approached personally and the research objective and the need to sign the Free and Informed Consent Term were presented.

After receiving both copies, reading and signing the Free and Informed Consent Form, the participants answered a self-applicable semi-structured form, adapted by the researchers, of the instrument used in the study by Mendonza[11], containing six questions related to sociodemographic aspects and nine to knowledge about the occurrence of hypothermia in the perioperative patient.

It is noteworthy that the development of the research met the national and international standards of ethics in research involving human beings and the data collection was carried out after approval by the Ethics and Research Committee (CEP) of the University of Pernambuco under the number of the opinion : 69052317.8.0000.5198.

As inclusion criteria, it was established that the participants were nurses or nursing technicians who had been working for at least 3 months in the operating room or in the post-anesthetic recovery room who made themselves available to participate in the research. Collaborators who had undergone any training on prevention of perioperative hypothermia in the last 3 months, and those who were on sick leave and vacation during the data collection period were excluded.

The sample of participants was non-probabilistic due to adherence, being composed of 77 employees, including nurses and nursing technicians working in the operating room and in the post-anesthetic recovery room.

For data analysis, a bank was built in an electronic spreadsheet in the Microsoft Excel program, which was exported to the SPSS® version 21 statistical software, where the association was made between the quantitative variables of the collected data. Percentage frequencies were calculated to assess the sociodemographic profile of the population participating in the study, the description of the knowledge of the nursing team, identifying the practices and strategies used for the management of perioperative hypothermia.

In addition, the Chi-square test of proportion comparison was applied to compare the percentages found in the levels of the factors evaluated. This test considered the conclusions with a 5% significance level to be satisfactory. The results were grouped in tables, la-

ter discussed in the light of the scientific literature.

RESULTS

Table 1 shows the distribution of the personal profile of the evaluated professionals. It appears that the majority composed of nursing technicians (72.7%), is female (86.2%), aged between 31 and 45 years (47.0%), has worked professionally for more than 15 years (41.6%), 53.5% in the operating room and had no training on perioperative hypothermia (92.2%). The proportion comparison test was significant in all the evaluated factors (p-value less than 0.05), indicating that the profile described is relevantly the most present in the evaluated professionals. On average, the group is 41.9 years old with a standard deviation of 11.1 years. For the time of operation, the average was 14.6 years with a deviation of 11.0 years, and for the time of operation in the operating room, the average was 8.4 years with a standard deviation of 9.1 years.

Table 1. Distribution of the personal profile of the evaluated professionals. Olinda, PE, Brazil, 2017

Fator avaliado	N	%	p-valor
Q1 - Categoria profissional			
Enfermeiro	21	27,3	<0,001
Técnico de enfermagem	56	72,7	
Q2 - Sexo			
Masculino	9	13,8	<0,001
Feminino	56	86,2	
Q3 - Idade			
22 a 30 anos	13	16,9	<0,001
31 a 45 anos	36	47,0	
46 a 59 anos	21	27,3	
Igual ou maior a 60 anos	6	7,8	
Mínimo - Máximo	22 - 66	-	
Média ± Desvio padrão	41,9 ± 11,1	-	
Q4 - Tempo de atuação profissional			
Até 5 anos	22	28,6	0,002
6 a 10 anos	10	12,9	
11 a 15 anos	13	16,9	
Mais de 15 anos	32	41,6	
Mínimo - Máximo	0,25 - 40,0	-	
Média ± Desvio padrão	14,6 ± 11,0	-	
Q5 - Tempo de atuação no Centro Cirúrgico			
Até 5 anos	38	53,5	<0,001
6 a 10 anos	12	16,9	
11 a 15 anos	9	12,7	
60 ou mais anos	12	16,9	
Mínimo - Máximo	0,25 - 33,0	-	
Média ± Desvio padrão	8,4 ± 9,1	-	
Q6 - Já teve alguma capacitação sobre hipotermia perioperatória?			
Sim	6	7,8	<0,001
Não	71	92,2	

Note: [1]p-value of the proportion comparison test.

Table 2 shows the distribution of factors related to the professionals' knowledge about Hypothermia. Most of the evaluated professionals stated that hypothermia is low body temperature (98.7%), considers that the Hypothalamus is the thermoregulatory center of body temperature (79.6%), believes that evaporation is the main form of loss of heat (37.0%) and considers that at all times, before, during and after the operation, it is important to control the patient's body temperature (45.7%). The proportion comparison test was significant in all the evaluated factors, indicating that the description made about the professionals' knowledge is, relevantly, the most present.

Table 2. Distribution of factors related to the professionals' knowledge about hypothermia. Olinda, PE, Brazil, 2017

Fator avaliado	N	%	p-valor[1]
Q7 - O que é Hipotermia			
Baixa temperatura corporal	76	98,7	<0,001
Aumento da temperatura	1	1,3	
Q8 - Qual o centro termorregulador da temperatura corporal			
Hipotálamo	66	79,6	<0,001
Hipófise	8	9,6	
Bulbo	8	9,6	
Ponte	1	1,2	
Q9 - Formas de perda de calor			
Evaporação	37	37	<0,001
Convecção	25	25	
Condução	11	11	
Irradiação	9	9	
Outros	18	18	
Q10 - Em quais momentos é importante 0 - realizar o controle da temperatura corporal do paciente no Centro Cirúrgico?			
No pré-operatório	3	4,3	<0,001
Durante o procedimento cirúrgico	18	25,7	
Após o procedimento cirúrgico	5	7,1	
Em todos os momentos, pré, durante e pós-cirúrgico	32	45,7	
No momento pré e pós-cirúrgico	5	7,1	
Durante e pós-cirúrgico	7	10,0	

Note: [1]p-value of the proportion comparison test.

Table 3. Distribution of signs indicating the presence of operative hypothermia. Olinda, PE, Brazil, 2017

Fator avaliado	N	%
Tremores	36	20,7
Cianose	29	16,8
Pele fria	19	10,9
Extremidades frias	12	6,8
Calafrios	11	6,3
Hipotensão	10	5,7
Sudorese	7	4,0
Taquicardia	4	2,3
Bradicardia	3	1,7
Baixa saturação	2	1,2

Table 3 shows the distribution of the responses of the evaluated professionals about the signs that indicate the presence of operative hypothermia. It appears that the most cited signs were: tremors (20.7%), cyanosis (16.8%), cold skin (10.9%), cold extremities (6.8%), chills (6.3%) and hypotension (5.7%).

Baixa temperatura	2	1,2
Bradipneia	2	1,2
Sangramento	2	1,2
Temperatura abaixo de 34º	2	1,2
Hemorragia	2	1,2
Palidez	2	1,2
Pulso fraco	2	1,2
Queda de pressão	2	1,2
Suor	2	1,2
Sonolência	2	1,2
Outros*	20	11,6

Note: * Other signals with unit frequency.

Table 4. Distribution of factors that may contribute to the occurrence of perioperative hypothermia. Olinda, PE, Brazil, 2017

Fator avaliado	N	%
Tipo de anestesia	46	24,5
Tempo da cirurgia	45	23,9
Idade	45	23,9
Tipo de cirurgia	40	21,3
Outros	12	6,4

Table 5. Distribution of methods known to professionals to warm the patient. Olinda, PE, Brazil, 2017

Fator avaliado	N	%
Aquecedor	59	35,5
Colchão/manta térmico	47	28,3
Soro aquecido	28	16,9
Cobertores	25	15,1
Temperatura do ambiente	4	2,4
Algodão ortopédico	1	0,6
Ataduras	1	0,6
Botas	1	0,6

Table 6. Distribution of the practice performed during the occurrence of hypothermia. Olinda, PE, Brazil, 2017

Fator avaliado	N	%
Aquece o paciente	**65**	**58,6**
Aplica soro morno	**35**	**31,5**
Desliga o ar condicionado	**6**	**5,4**
Aplica medicamentos	**5**	**4,5**

Table 7. Distribution of possible complications resulting from perioperative hypothermia. Olinda, PE, Brazil, 2017

Fator avaliado	N	%

Table 4 shows the distribution of factors related to patients, the environment and the surgical procedure that can contribute to the occurrence of perioperative hypothermia. It appears that the factors most cited by professionals were the type of anesthesia (24.5%), the time of surgery (23.9%) and the patient's age (23.9%).

Table 5 shows the distribution of known methods for warming the patient. It appears that the best-known practices are using a heater (35.5%), mattress/thermal blanket (28.3%), heated serum (16.9%) and blankets (15.1%). Still, it is observed that the less mentioned methods were boots, bandages and orthopedic cotton (both with 0.6%).

Table 6 shows the distribution of the measures adopted when the patient has hypothermia in the operating room. It appears that warming up the patient and applying heated serum are the procedures adopted by most evaluated professionals.

Table 7 shows the possible complications resulting from perioperative hypothermia mentioned by the evaluated professionals. The most reported consequences are: death (9.4%), cardiac arrest (8.2%), hypotension (6.3%), shock (6.3%) and shaking (5.0%).

DISCUSSION

The results of the present research show that the female sex is still a predominant characteristic in nursing. Most of the interviewees did not have any training on the subject but demonstrate knowledge about the concept of hypothermia and about the hypothalamus being the center responsible for thermoregulation.

The average age of the interviewees and their time in the operating room show that the practical experience probably contributes to the increase in the knowledge of these professionals, but there is still a need to emphasize the importance of continuing education with the health team.

As for other aspects addressed about hypothermia, about the forms of heat loss by the body, many professionals are

Óbito	15	9,4
Parada cardiorrespiratória	13	8,2
Hipotensão	10	6,3
Choque	10	6,3
Tremedeiras	8	5,0
Bradicardia	7	4,4
Cianose	5	3,1
Arritmia	4	2,5
Aumento das chances de infecção	4	2,5
Coagulopatias	4	2,5
Calafrios	3	1,9
Taquicardia	3	1,9
Convulsões	3	1,9
Hemorragia	3	1,9
Isquemia	3	1,9
Trombose venosa profunda	3	1,9
Sangramento	3	1,9
Alteração hemodinâmicas	2	1,3
Alteração de saturação	2	1,3
Parada cardíaca	2	1,3
Perda de consciência	2	1,3
Complicações respiratórias e cirúrgicas	2	1,3
Diminuição do fluxo sanguíneo	2	1,3
Baixa perfusão	2	1,3
Hipóxia	2	1,3
Retardo	2	1,3
Outros*	40	24,8

Note: * Other signals with unit frequency.

unaware of the other three ways that are conduction, convection and irradiation, the latter being the main way of decreasing body temperature[12].

Regarding the important moments to carry out the control of the patient's body temperature, most interviewees correctly report that this should always be done during the perioperative period. It is noteworthy that maintaining the temperature at normal levels is important to avoid complications and reduce the patient's time spent in the PACU, as well as reducing the need for transfusions and the cost of administering medications and requesting additional laboratory tests[13].

Among the signs that indicate the presence of hypothermia, it can be inferred that in this aspect a large part is unaware that the drop in temperature can become complex and present other signs as its severity varies. In the most extreme cases, for example, it is possible to lose eye reflexes, oliguria, pulmonary edema, areflexia, apnea, coma and asystole[14].

Regarding the factors related to the patient, the environment and the surgical procedure that can contribute to the occurrence of hypothermia, the most cited by the team were the type of anesthesia, a determining factor especially if combined, the time and type of surgery that are elements that affect the temperature, making it lower the longer the time, and the patient's age. At extremes of age, such as at birth, the patient has an immature thermal regulation mechanism, while in the elderly this happens due to the decrease in subcutaneous tissue, metabolism and flaws in the vasomotor control mechanism[12,13].

Other factors unknown to the majority of the team and which can be listed are: the hormonal level, which affects mainly women; the use of drugs and medications that can interfere with the body's thermoregulatory capacity; and the circadian rhythm, which can cause the body to vary from 0.5 ºC to 1.0 ºC during the 24-hour period[12,13].

About the devices known to warm the patient, the team shows to know some that are not commonly available in the service, such as mattresses, thermal blankets, and boots. Among the main measures to be taken to maintain normothermia for patients, the following stand out: passive methods with heating through limited exposure of the skin and the use of cotton blankets, and the most effective methods of active heating through the use of mattresses. thermals, infusion of heated liquids, heating and humidification of the gases administered(9,10,15,16). In addition to these measures, it is recommended to increase the operating room temperature when active heating is not feasible or is not sufficient to warm the patient[17].

Regarding the possible complications resulting from perioperative hypothermia, the most extreme were mentioned, such as cardiorespiratory arrest and death. However, in isolation, some professionals mention several other complications. The exacerbation of postoperative pain in fact happens with hypothermia, as well as tachycardia, increased demand for oxygenation, decreased level of consciousness by increasing the half-life of anesthetics, decreased urine output, and changes and complications hemodynamics such as deep venous thrombosis due to venous stasis[13].

In general, it is possible to notice that the research participants have a basic knowledge about hypothermia in the pe-

rioperative patient, mainly about the concept, the signs, some symptoms and how to intervene when the patient presents the problem. However, this knowledge needs to be further developed as to its etiology and its possible complications, which can be accomplished through permanent education and will reflect positively on interventions and assistance.

It is essential that the nursing team carry out the preoperative evaluation in order to facilitate the identification of patients at risk of developing hypothermia, as the cost for prevention is less than the cost necessary to treat their adverse results. For this, the nurse plays a crucial role in the planning and implementation of interventions that minimize the risks and provide the appropriate treatment of perioperative hypothermia, ensuring the quality of care for the surgical patient[1,18,19].

CONCLUSION

Hypothermia is a common clinical problem, which requires nursing professionals to understand and know about this adverse event. Such competence reduces the possibility of complications during the surgical procedure and in the postoperative period, in addition to having an impact on improving care, reducing costs for the institution, reducing the length of stay in the SRPA and a quick surgical recovery.

This safe assistance is guaranteed through qualified training of nursing professionals and requires policies for permanent and continuing education in health services. Thus, the maintenance of professional updating enables performance in various situations and development of the necessary skills for the management of hypothermia.

Perioperative hypothermia is a subject that presents knowledge gaps and nursing interventions and it is hoped that the findings of this study will help to plan educational actions that guide quality care strategies for surgical patients.

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