



O PAPEL DA NORMOTERMIA E PREVENÇÃO DE INFECÇÃO DO SÍTIO CIRÚRGICO

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4.13 Maintaining normal body temperature (normothermia)

Recommendation

The panel suggests the use of warming devices in the operating room and during the surgical procedure for patient body warming with the purpose of reducing SSI.
(Conditional recommendation, moderate quality of evidence)

JAMA Surgery | Special Communication

Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017

Sandra I. Berríos-Torres, MD; Craig A. Umscheid, MD, MSCE; Dale W. Bratzler, DO, MPH; Brian Leas, MA, MS; Erin C. Stone, MA; Rachel R. Kelz, MD, MSCE; Caroline E. Reinke, MD, MSHP; Sherry Morgan, RN, MLS, PhD; Joseph S. Solomkin, MD; John E. Mazuski, MD, PhD; E. Patchen Dellinger, MD; Kamal M. F. Itani, MD; Elie F. Berbari, MD; John Segreti, MD; Javad Parvizi, MD; Joan Blanchard, MSS, BSN, RN, CNOR, CIC; George Allen, PhD, CIC, CNOR; Jan A. J. W. Kluytmans, MD; Rodney Donlan, PhD; William P. Schecter, MD; for the Healthcare Infection Control Practices Advisory Committee

Manutenção da normotermia- Forte recomendação – Qualidade Moderada
Ademais, atua otimizando a oxigenação

Oxygenation

Normothermia

1. Maintain perioperative normothermia. (Category IA—strong recommendation; high to moderate-quality evidence.)
2. The search did not identify randomized controlled trials that evaluated strategies to achieve and maintain normothermia, the lower limit of normothermia, or the optimal timing and duration of normothermia for the prevention of SSI. Other organizations have made recommendations based on observational evidence, and a summary of these recommendations can be found in the Other Guidelines section of the narrative summary for this question (eAppendix 1 of the Supplement). (No recommendation/unresolved issue.)

6B. For patients with normal pulmonary function undergoing general anesthesia with endotracheal intubation, administer increased FI_{O_2} during surgery and after extubation in the immediate postoperative period. To optimize tissue oxygen delivery, maintain perioperative normothermia and adequate volume replacement. (Category IA—strong recommendation; moderate-quality evidence.)


American College of Surgeons and Surgical Infection Society: Surgical Site Infection Guidelines, 2016 Update




- Normothermia: aquecimento pré e intraoperatório

Kristen A Ban, MD, Joseph P Minei, MD, FACS, Christine Laronga, MD, FACS, Brian G Harbrecht, MD, FACS, Eric H Jensen, MD, FACS, Donald E Fry, MD, FACS, Kamal MF Itani, MD, FACS, E Patchen Dellinger, MD, FACS, Clifford Y Ko, MD, MS, MSHS, FACS, Therese M Duane, MD, MBA, FACS

APIC IMPLEMENTATION GUIDE



Infection Preventionist's Guide to the OR



Association for Professionals in Infection Control and Epidemiology

CORE ELEMENTS OF SSI PREVENTION BUNDLES



*Strong recommendations from CDC-HICPAC SSI Guideline.

Sources: Berrios-Torres S, 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* August 2017;152(8):784-791; Summary of SSI bundle posters presented at APIC Annual Conference 2016.

+ A HIPOTERMIA E O PACIENTE CIRÚRGICO



- Hipotermia no perioperatório



50 a 90% dos pacientes



- Exposição aumentada a fatores de risco

BORMS et al. (1994), AORN (2017)



ALTERAÇÕES RESULTANTES DA
HIPOTERMIA

**HIPOTERMIA
PERIOPERATÓRIA**

Atraso no
metabolismo de
medicamentos



Calafrios



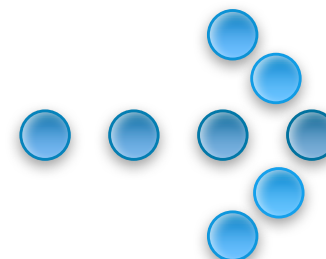
Infeção do sítio
cirúrgico



Vasoconstricção
periférica e alteração
na perfusão de
oxigênio tecidual



Função plaquetária e
coagulação

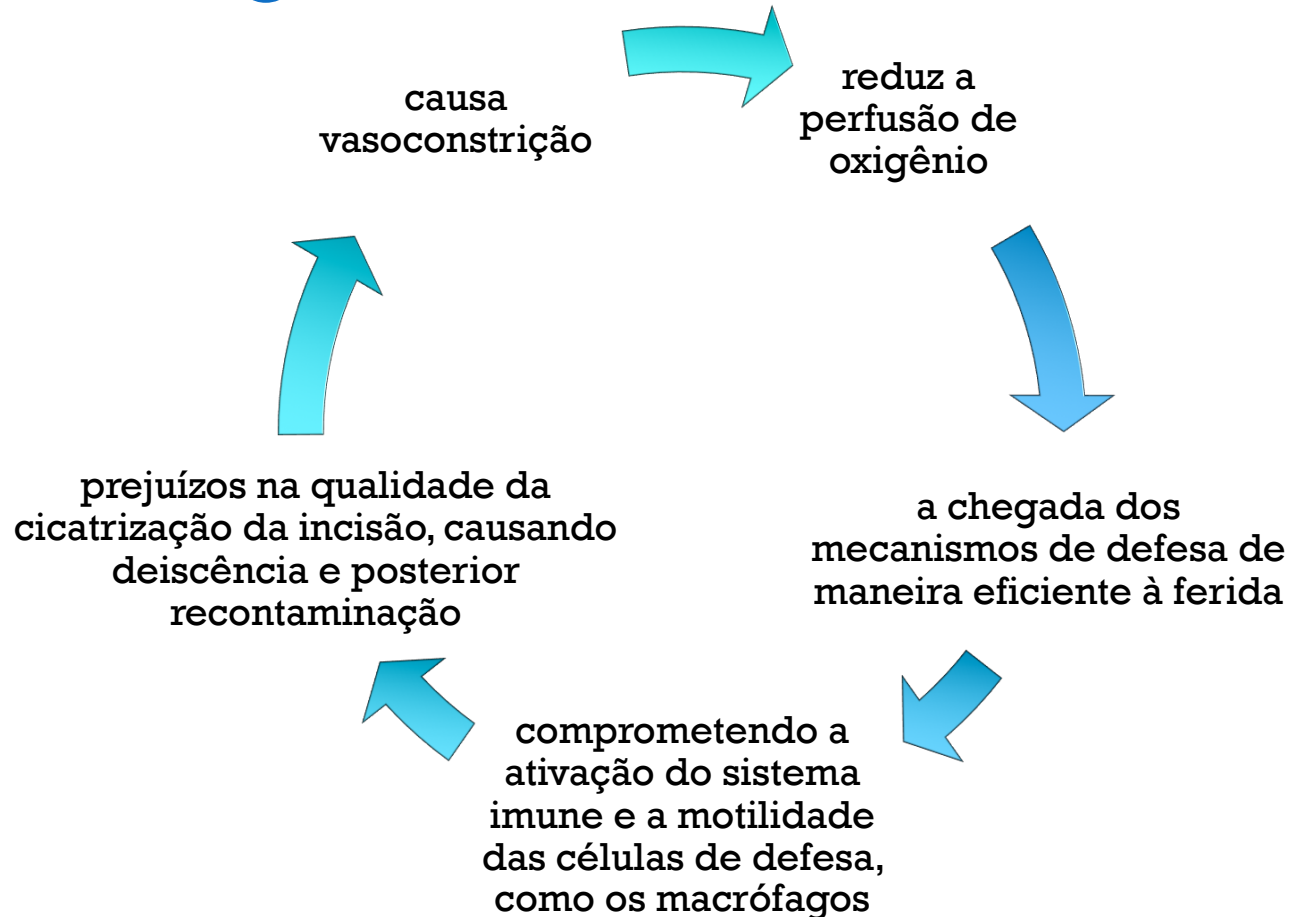


+ Relação Hipotermia x Infecção do sítio cirúrgico

- Efeito negativo que exerce na linhagem de células de defesa do organismo, diminuindo a capacidade fagocítica dos leucócitos e produção de anticorpos
- Decréscimo de 2°C na temperatura central triplica a incidência de ISC
- Aumenta a duração da hospitalização em até 20%
- Compromete a disponibilidade de oxigênio para tecidos periféricos

Kurz; Sessler; Lenhardt, 1996; Doufas, 2003

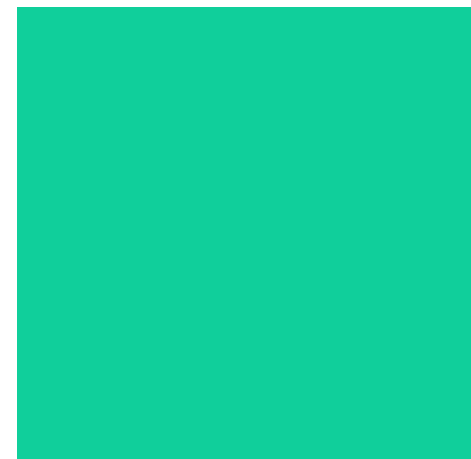
+ Relação Hipotermia x Infecção do sítio cirúrgico



Todo mundo tem um ponto fraco...



Hipotermia: qualidade da evidência



+ Evidência citada nos Guidelines

Melling et al., 2001

Effects of preoperative warming on the incidence of wound infection after clean surgery: a randomised controlled trial

Andrew C Melling, Baqar Ali, Eileen M Scott, David J Leaper

Summary

Background Wound infection after clean surgery is an expensive and often underestimated cause of patient morbidity, and the benefits of using prophylactic antibiotics have not been proven. Warming patients during colorectal surgery has been shown to reduce infection rates. We aimed to assess whether warming patients before short duration, clean surgery would have the same effect.

Methods 421 patients having clean (breast, varicose vein, or hernia) surgery were randomly assigned to either a non-warmed (standard) group or one of two warmed groups (local and systemic). We applied warming for at least 30 min before surgery. Patients were followed up and masked outcome assessments made at 2 and 6 weeks.

Findings Analysis was done on an intention-to-treat basis. We identified 19 wound infections in 139 non-warmed patients (14%) but only 13 in 277 who received warming (5%; $p=0.001$). Wound scores were also significantly lower ($p=0.007$) in warmed patients. There was no significant difference in the development of haematomas or seromas after surgery but the non-warmed group were prescribed significantly more postoperative antibiotics ($p=0.002$).

Interpretation Warming patients before clean surgery seems to aid the prevention of postoperative wound infection. If applied according to the manufacturers guidelines these therapies have no known side-effects and might, with the support of further studies, provide an alternative to prophylactic antibiotics in this type of surgery.

Lancet 2001; 358: 876–80

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Introduction

Wound infection remains one of the most common causes of morbidity in the surgical patient despite advances in surgical practice and the widespread use of prophylactic antibiotics. The average cost of a surgical wound infection has proved difficult to estimate,¹ but hospital costs alone may be over £1500 per patient.^{2,3} The costs of treatment after discharge from hospital, where most wound infections are now diagnosed,^{4,5} or the cost to the patient in prescription charges, loss of earnings and a reduced quality of life, are rarely taken into account.

Clean surgery is defined as uninfected, operative surgery, where no inflammation is encountered and the respiratory, alimentary, and genitourinary tracts are not opened.⁶ The importance of infection rates in clean surgery should not be underestimated as they might be seen as an indicator of quality and used to determine surgical performance.^{6,9}

Most studies suggest that the infection rate in clean surgery is 5% or lower.^{10–12} However, other studies have shown that if patients are followed up intensively for 6 weeks after surgery, and the definition of infection is not solely limited to the presence of a purulent discharge, then infection rates might be nearer 10%.^{6,8,14}

Many factors have been shown to reduce the incidence of surgical wound infection, most of which are now part of best practice. The value of prophylactic antibiotics in clean-contaminated and contaminated surgery is not contentious but the benefits of prophylactic antibiotics in reducing wound infection rates after clean surgery remain unclear. Although it has been suggested that antibiotics are beneficial¹⁵ this idea has not been supported by other studies.^{16,8}

Animal and human studies have shown that intraoperative hypothermia increases the risk of wound infection.^{17–19} Intraoperative hypothermia is likely to cause a reduction in peripheral circulation, which may increase tissue hypoxia and make the wound more susceptible to infection, even if contamination levels are low. The process of warming using a warm air blanket, to prevent hypothermia, is becoming common practice for most major surgery but the benefits of warming during clean surgical procedures, where surgery usually lasts less than an hour.

An alternative may be to warm patients before short duration, usually day case, surgery. We aimed to assess the use of a local warming device and a warm air blanket for the reduction of infection after clean wound surgery.

Patients and methods

We did a randomised controlled trial to investigate the effects of preoperative warming using a local warming device and a warm air blanket on postoperative wound infection rates after clean surgery. We obtained local research ethics committee approval and informed consent from all patients. All data collection took place within the same district general hospital.

Kurz et al., 1996

The New England Journal of Medicine

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PERIOPERATIVE NORMOTHERMIA TO REDUCE THE INCIDENCE OF SURGICAL-WOUND INFECTION AND SHORTEN HOSPITALIZATION

ANDREA KURZ, M.D., DANIEL I. SESSLER, M.D., AND RAINER LENHARDT, M.D., FOR THE STUDY OF WOUND INFECTION AND TEMPERATURE GROUP*

Abstract Background. Mild perioperative hypothermia, which is common during major surgery, may promote surgical-wound infection by triggering thermoregulatory vasoconstriction, which decreases subcutaneous oxygen tension. Reduced levels of oxygen in tissue impair oxidative killing by neutrophils and decrease the strength of the healing wound by reducing the deposition of collagen. Hypothermia also directly impairs immune function. We tested the hypothesis that hypothermia both increases susceptibility to surgical-wound infection and lengthens hospitalization.

Methods. Two hundred patients undergoing colorectal surgery were randomly assigned to routine intraoperative thermal care (the hypothermia group) or additional warming (the normothermia group). The patients' anesthetic care was standardized, and they were all given cefamandole and metronidazole. In a double-blind protocol, their wounds were evaluated daily until discharge from the hospital and in the clinic after two weeks; wounds containing culture-positive pus were considered

infected. The patients' surgeons remained unaware of the patients' group assignments.

Results. The mean (\pm SD) final intraoperative core temperature was $34.7 \pm 0.6^\circ\text{C}$ in the hypothermia group and $36.6 \pm 0.5^\circ\text{C}$ in the normothermia group ($P < 0.001$). Surgical-wound infections were found in 18 of 96 patients assigned to hypothermia (19 percent) but in only 6 of 104 patients assigned to normothermia (6 percent, $P = 0.009$). The sutures were removed one day later in the patients assigned to hypothermia than in those assigned to normothermia ($P = 0.002$), and the duration of hospitalization was prolonged by 2.6 days (approximately 20 percent) in the hypothermia group ($P = 0.01$).

Conclusions. Hypothermia itself may delay healing and predispose patients to wound infections. Maintaining normothermia intraoperatively is likely to decrease the incidence of infectious complications in patients undergoing colorectal resection and to shorten their hospitalizations. (N Engl J Med 1996;334:1209–15.)

©1996, Massachusetts Medical Society.

WOUND infections are common and serious complications of anesthesia and surgery. A wound infection can prolong hospitalization by 5 to 20 days and substantially increase medical costs.^{1,2} In patients undergoing colon surgery, the risk of such an infection ranges from 3 to 22 percent, depending on such factors as the length of surgery and underlying medical problems.³ Mild perioperative hypothermia (approximately 2°C below the normal core body temperature) is common in colon surgery.⁴ It results from anesthetic-induced impairment of thermoregulation,^{5,6} exposure to cold, and altered distribution of body heat.⁷ Although it is rarely

desired, intraoperative hypothermia is usual because few patients are actively warmed.⁸

Hypothermia may increase patients' susceptibility to perioperative wound infections by causing vasoconstriction and impaired immunity. The presence of sufficient intraoperative hypothermia triggers thermoregulatory vasoconstriction,⁹ and postoperative vasoconstriction is universal in patients with hypothermia.¹⁰ Vasoconstriction decreases the partial pressure of oxygen in tissues, which lowers resistance to infection in animals^{11,12} and humans (unpublished data). There is decreased microbial killing, partly because the production of oxygen and nitroso free radicals is oxygen-dependent in the range of the partial pressures of oxygen in wounds.^{13,14} Mild core hypothermia can also directly impair immune functions, such as the chemotaxis and phagocytosis of granulocytes, the motility of macrophages, and the production of antibody.^{15,16} Mild hypothermia, by decreasing the availability of tissue oxygen, impairs oxidative killing by neutrophils. And mild hypothermia during anesthesia lowers resistance to inoculations with *Escherichia coli*¹⁷ and *Staphylococcus aureus*¹⁸ in guinea pigs.

Vasoconstriction-induced tissue hypoxia may decrease the strength of the healing wound independently of its ability to reduce resistance to infection. The formation

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Presented in part at the International Symposium on the Pharmacology of Thermoregulation, Giessen, Germany, August 17–22, 1994, and at the Annual Meeting of the American Society of Anesthesiologists, Atlanta, October 21–25, 1995.

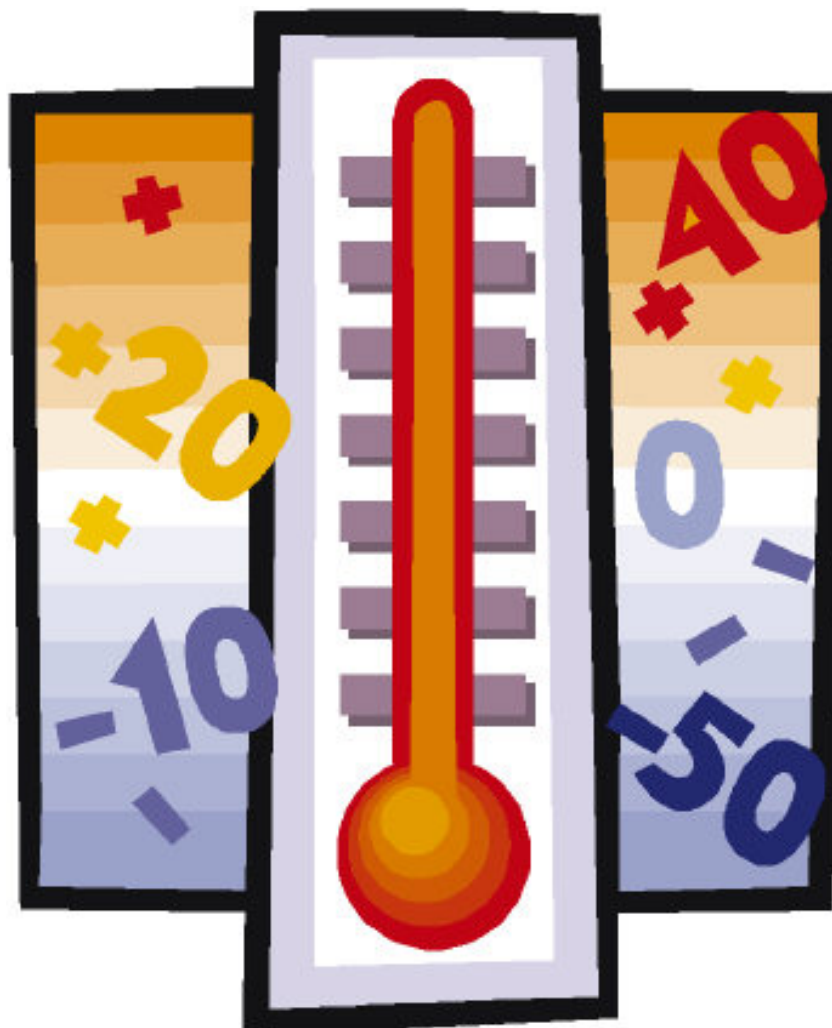
*The study investigators are listed in the Appendix.

+ Questões não resolvidas

- Berríos-Torres et al., 2017
- consenso entre especialistas na área de prevenção e ao controle de ISC
- lacunas de conhecimento na área, em relação a normotermia:
 - Qual é o limite inferior da normotermia?
 - Qual é a duração ideal da normotermia?
 - Existe uma proporção entre normotermia/hipotermia que eleva as taxas de ISC?
 - A normotermia sistêmica reflete na mesma temperatura observada na ferida?
- Itani et al. (2017)



Recomendações



+ Resolução Conselho Federal de Medicina N. 2.174, de 14 de dezembro de 2017

Dispõe sobre a prática do ato anestésico e revoga a Resolução CFM n° 1.802/2006

- Art. 3º Entende-se por condições mínimas de segurança para a prática da anestesia a disponibilidade de:
 - I – Monitorização do paciente, incluindo:
 - a) Determinação da pressão arterial e dos batimentos cardíacos;
 - b) Determinação contínua do ritmo cardíaco por meio de cardioscopia; e
 - c) **Determinação da temperatura e dos meios para assegurar a normotermia, em procedimentos com duração superior a 60 (sessenta) minutos e, nas condições de alto risco, independentemente do tempo do procedimento** (prematuros, recém-nascidos, história anterior ou risco de hipertermia maligna e síndromes neurolépticas).
- Prevê verificação e registro da temperatura no pré-operatório, intraoperatório (a cada 10 minutos) e SRPA (a cada 15 minutos na primeira hora)

- + Associação Brasileira de Enfermeiros de Centro Cirúrgico, Recuperação Anestésica e Centro de Material e Esterilização (SOBECC (2017)
- + Association of periOperative Registered Nurses (AORN) (2017)



- Avaliar paciente fatores de risco
- Equipe perioperatória deve monitorizar a temperatura em todas as fases do perioperatório
- Equipe perioperatória deve implementar intervenções no perioperatório para prevenir a hipotermia não intencional
- Educação e implementação de protocolos

+ Sociedade de Anestesiologia do Estado de São Paulo (SAESP) (2018)

Instruções Brasileiras sobre Intervenções para Prevenção e Treinamento a Respeito de Hipotermia Perioperatória Inadvertida em Adultos – Produzida pela Sociedade de Anestesiologia do estado de São Paulo

Brazilian guidelines on interventions for preventing and treating inadvertent perioperative hypothermia in adults – produced by the São Paulo State Society of Anesthesiology

Consenso brasileño sobre intervenciones para la prevención y tratamiento de la hipotermia perioperatoria inadvertida en adultos - elaborado por la Sociedad Estatal de Anestesiología de São Paulo

Enis Donizetti Silva^{a, b, c, e}, Florentino Fernandes Mendes^d, Leandro Gobbo Braz^e, Gastão Fernandes Duval Neto^{f, g}, Luis Fernando dos Reis Falcão^h, Carlos Galhardo Juniorⁱ, André Luís Montagnini^j, Eduardo Henrique Giroud Joaquim^k, Ricardo Caio Gracco de Bernardis^{l, m, z}, Vanessa Povedaⁿ, Virgínia Godoy^o, Daniel Cagnolati^p, Lígia Andrade da Silva Telles Mathias^l, Regina El Dib^e, Amílcar Hidalgo Tejada^q, Darwin Cohen^r, David Torres Perez^s, Fernando Montealegre^t, José Leonardo Masri^u, José Guillermo Dominguez Cherit^v, Luis Fernando Botero^w, Renato Chacón Abba^x, Claude Laflamme^y.

Standards for Basic Anesthetic Monitoring

Developed By: ✓ Committee on Standards and Practice Parameters (CSPP)

Last Amended: October 28, 2015 (original approval: October 21, 1986)

5. BODY TEMPERATURE

5.1 Objective –

To aid in the maintenance of appropriate body temperature during all anesthetics.

5.2 Methods –

Every patient receiving anesthesia shall have temperature monitored when clinically significant changes in body temperature are intended, anticipated or suspected.

Manutenção da
normotermia
durante toda
cirurgia

+ NICE – Clinical Practice Guidelines for Management of Inadvertent Perioperative Hypothermia in Adults

- Utilizar preferencialmente sítios de aferição considerados “centrais”
- Pré-operatório: avaliação de fatores de risco, mensuração temperatura, corrigir temperatura menor 36° C
- Intraoperatório: manter aquecimento ativo, monitorização da temperatura a cada 30 minutos da indução ao final da cirurgia, **não começar a cirurgia se a temperatura <36° C**
- Pós-operatório
- SRPA: temperatura mensurada e documentada a cada 15 minutos, paciente só pode ser transferido se normotérmico
- Na clínica: confortavelmente aquecidos e com temperatura verificada e registrada
- NICE. Inadvertent Perioperative Hypothermia: The Management of Inadvertent Perioperative Hypothermia in Adults. NICE Clinical Guideline No. 65.: NICE. 2008. [Last accessed on 03-06-2017]. Available from <http://www.nice.org.uk/guidance/cg65>.

+ Ações em todo o perioperatório...

A diagram illustrating the perioperative process. It features a large, light blue arrow pointing to the right. Inside this arrow, there are three rounded rectangular boxes of varying shades of blue, arranged horizontally from left to right. The first box is dark blue and contains the text 'Pré-operatório'. The second box is a medium blue and contains 'Intraoperatório'. The third box is a lighter blue and contains 'Pós-operatório'.

Pré-operatório

Intraoperatório

Pós-operatório

+ Ações em todo o perioperatório...

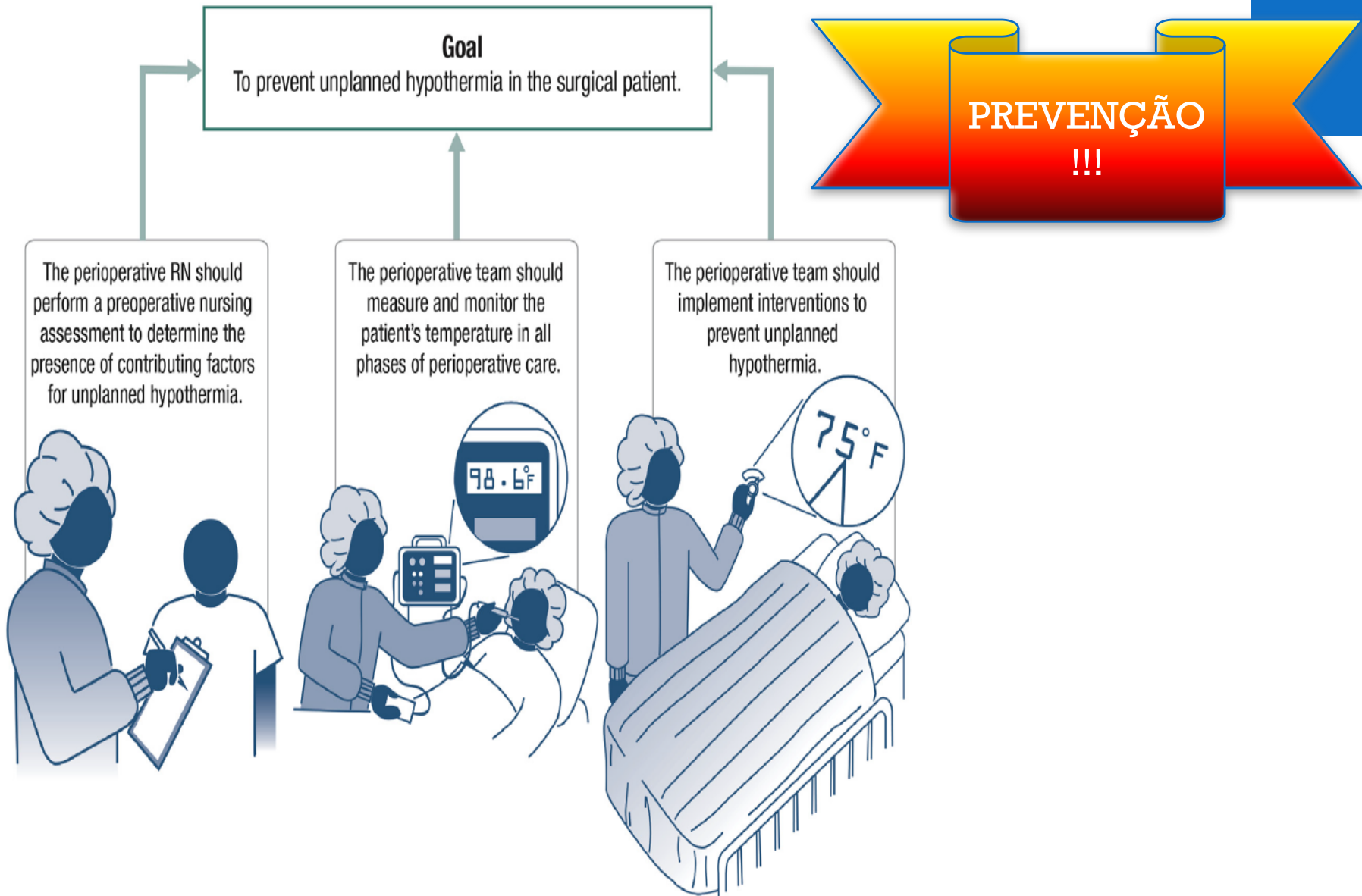


Figure 1. Key takeaways from the AORN "Guideline for prevention of unplanned patient hypothermia."

+ DESAFIOS

- ✓ Educação sobre os malefícios da hipotermia e treinamento para utilização dos materiais e equipamentos para prevenção
- ✓ Documentação
- ✓ Desenvolvimento de protocolos multiprofissionais, com revisão periódica
- ✓ Acompanhamento processo



+ ALGUMAS REFERÊNCIAS BIBLIOGRÁFICAS

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OBRIGADA!



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