





# Solventum Perioperative Normothermia Protocol

An evidence-based protocol, based on global guidelines: ERAS, WHO, CDC, ACORN (Australia), ACS, AORN, ASA (US), DGAI (Germany), NICE (UK), ORNAC (Canada), SEDAR (Spain), SFAR (France), and SIAARTI (Italy).


## Prewarm, Monitor, Maintain

PreOp






**Prewarm**  
with forced-air warming for at least 10 minutes on highest setting.<sup>1</sup>

**Monitor**  
patient's core body temperature.



*Prewarming prior to the induction of anaesthesia helps to maintain normothermia and mitigate the effects of heat redistribution caused by anaesthesia.*

IntraOp



**Warm**  
with forced-air warming prior to anaesthesia administration and continue to warm throughout the procedure. The gap from prewarming to IntraOp warming should be less than 10 minutes.<sup>2</sup>




**Monitor**  
patient's core body temperature continuously during surgery.<sup>3</sup>

**Maintain**  
patient's core body temperature near 36.5°C (36.6 + or - 0.5°C).<sup>4</sup>

*Every minute in delay of active warming increases odds of hypothermia by 5%.<sup>2</sup>*

*Fluid warming should be used if more than 1L of IV fluid will be administered.<sup>5</sup>*

PostOp



**Warm**  
with forced-air warming until patient is thermally comfortable and not shivering.<sup>6</sup>


**Monitor**  
patient's temperature on admission to recovery room and then every 15 minutes until 36.0°C or above.

**Maintain**  
patient's core body temperature near 36.5°C (36.6 + or - 0.5°C).<sup>4</sup>


*By maintaining a patient's core body temperature near 36.5°C (36.6 + or - 0.5°C), patient length of stay has been shown to be reduced by 2.6 days.<sup>4</sup>*

Help protect your patients from unintended hypothermia with 3M™ Bair Hugger™ Temperature Management Solutions, the comprehensive warming portfolio from Solventum.


Maintaining normothermia can help protect your patients from:




Morbid cardiac events.<sup>7, 8</sup>




Delayed recovery time, longer stay.<sup>4</sup>



Surgical site infection.<sup>9, 10</sup>



Thermal discomfort.<sup>11, 12</sup>



Blood transfusions.<sup>12</sup>

1. Horn, EP, Bein B, Bohm R, Steinfath M, Sahilin, and Hocker J. The effect of short time periods of pre-operative warming in the prevention of peri-operative hypothermia. *Anaesthesia*. 2012; 67: 612–617.

2. Lau A, Lowlaavar N, Cooke EM, et al. Effect of preoperative warming on intraoperative hypothermia: a randomized-controlled trial. *Can J Anesth*. 2018. doi.org/10.1007/s12630-018-1161-8.

3. National Institute for Health and Care Excellence. Hypothermia: prevention and management in adults having surgery. Clinical Guideline [CG65]. (2016). <https://www.nice.org.uk/guidance/cg65/chapter/Recommendations#perioperative-care>. Published April 2008. Updated December 2016. Accessed July 18, 2019.

4. Kurz A, Sessler DI, Lenhardt R. Perioperative normothermia to reduce the incidence of surgical-wound infection and shorten hospitalization. *NEJM*. 1996 May 9; 334 (19): 1209-16.

5. Horowitz PE, Delagarza MA, Pulaski JJ, Smith RA. Flow rates and warming efficacy with Hotline and Ranger blood/fluid warmers. *Anesth Analg*. 2004; 99 (3): 788-792.

6. Nelson G, Altman AD, Nick A, et al. Guidelines for pre- and intra-operative care in gynecologic/oncology surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations — Part I. *Gynecologic Oncology*. 2015; 2016; 140: 313-322.

7. Frank SM, Fleisher LA, Breslow MJ, et al. Perioperative maintenance of normothermia reduces the incidence of morbid cardiac events. A randomized clinical trial. *JAMA*. 1997; 277 (14): 1127-1134.

8. Scott AV, Stonemetz JL, Wasey JO, Johnson DJ, Rivers RJ, Koch CG, et al. (2015) Compliance with Surgical Care Improvement Project for Body Temperature Management (SCIP Inf-10) Is Associated with Improved Clinical Outcomes. *Anesthesiology*. 123: 116–125.

9. Anderson DJ. Strategies to prevent surgical site infections in acute care hospitals: 2014 update. *Infection Control and Hospital Epidemiology*. 2014; 35 (6): 605–627. doi: 10.1086/676022. Accessed December 15, 2016.

10. Melling AC, Ali B, Scott EM, Leaper DJ. Effects of preoperative warming on the incidence of wound infection after a clean surgery: a randomized controlled trial. *Lancet*. 2001; 358 (9285): 876-880.

11. Van Duren A. Patient Warming Plays a Significant Role in Satisfaction, Clinical Outcomes. *Infection Control Today*. 2008; 12 (6): 1-4 (reprint page numbers).

12. Rajagopalan S, et al. The Effects of Mild Perioperative Hypothermia on Blood Loss and Transfusion Requirement. *Anesthesiology*. 2008; 108: 71-7.

KCI Medical Australia Pty Ltd | Level 3, Building A, 1 Rivett Road, North Ryde, NSW 2113 | 1300 363 878  
KCI New Zealand Unlimited | Suite 1701, Level 17, PwC Tower, 15 Customs Street West, Auckland 1010 | 0800 808 182

©Solventum 2024. Solventum and the S logo are trademarks of Solventum or its affiliates. 3M and the 3M logo are licensed trademarks of 3M.

# Guideline Summary for Preventing Perioperative Hypothermia

Organisation	Temperature Monitoring	Prewarming	Intraoperatively
<b>ERAS (2020)</b> <i>Enhanced Recovery After Surgery: A Complete Guide to Optimizing Outcomes.</i> Ljungvist, O. et al. Springer. Switzerland. 2020.  <i>Moayeri A, Hynson J, Sessler DI, McGuire J. Pre-induction skin-surface warming prevents redistribution hypothermia. Anesthesiology. 1991;75. Suppl(3A):A1004.</i>	<ul style="list-style-type: none"><li>• All surgical patients, and especially all infants and children, should have their core temperature monitored continuously during the entire perioperative period</li><li>• If continuous measurements are not possible, core temperature should be measured at least every ten minutes to ensure patient's core temperature is maintained above 36°C</li></ul>	<ul style="list-style-type: none"><li>• Prior to surgery, all adult patients scheduled for neuraxial, general, or combined anaesthesia should be prewarmed with a forced-air warming device on its high-temperature setting for at least ten minutes</li><li>• Longer periods of prewarming can be accomplished by adjusting the warming unit setpoint temperature to the highest setting that does not cause sweating or excessive thermal discomfort</li><li>• Prewarming should be considered for children who weigh more than 15 kg</li><li>• The amount of time between the end of prewarming and induction of anaesthesia should be as brief as possible, but ideally fewer than 10 minutes</li></ul>	<ul style="list-style-type: none"><li>• During surgery, all patients with anticipated anaesthesia durations ≥ 30 minutes should receive intraoperative forced-air warming with a blanket that can cover the largest possible amount of skin surface</li><li>• The warming unit should be operated on the lowest temperature and blower settings that maintain the core temperature within the normothermic range</li><li>• Infants and children should be warmed unless contraindicated</li></ul>
<b>ANZCA (2017)</b> <i>ANZCA – Guidelines on Monitoring During Anaesthesia PS18, 2017.</i>	<ul style="list-style-type: none"><li>• Temperature should be measured throughout the operation and in recovery and should be recorded at the same frequency as other vital sign measurements for the first 24 postoperative hours</li></ul>	<ul style="list-style-type: none"><li>• All “at-risk” patients should have active warming from the first anaesthetic intervention unless febrile</li><li>• Patients undergoing procedures for 30 minutes or more should be actively prewarmed</li></ul>	<ul style="list-style-type: none"><li>• Active warming should be initiated in the anaesthetic room for all procedures where the total operative time (from first anaesthetic intervention to arrival in recovery) is greater than 30 minutes</li></ul>
<b>ACPAN (2023)</b> <i>Australian College of Perianaesthesia Nurses (ACPAN) Practice Guideline 01 May 2023. Practice Guideline 01 Prevention and management of inadvertent perioperative hypothermia in adults.</i>	<ul style="list-style-type: none"><li>• Every surgical/procedural patient's temperature should be measured and documented before induction of anaesthesia/sedation and then at least every 30 minutes until the end of surgery/procedure</li></ul>	<ul style="list-style-type: none"><li>• Perioperatively, active (forced-air) warming should be commenced as early as possible, preferably in the anaesthetic room or in the pre-operative waiting area, for any patient having surgery with an anaesthetic time of &gt;30 minutes, or who has 2 or more risk factors for inadvertent perioperative hypothermia</li></ul>	<ul style="list-style-type: none"><li>• If the temperature is &lt;36.0°C, active warming should be initiated unless contraindicated, until the patient is normothermic, ≥36.0°C with an active warming device which utilises the process of heat transfer to the patient</li><li>• Forced air warming devices must not be used with the heat applied directly from the hose nozzle placed under the drapes or blankets and without attachment to the compatible forced air warming blanket</li></ul>
<b>ACORN (2023)</b> <i>The New ACORN Standards. Volume-1-2023 Standards for safe and Quality Care in the Perioperative Environment (SSQCPE) for Individuals. Hypothermia Standard. The New ACORN Standards. Volume-3-2023 Standards for safe and Quality Care in the Perioperative Environment (SSQCPE) for Organisations. Hypothermia Standard.</i>	<ul style="list-style-type: none"><li>• Perioperative personnel shall monitor and document temperature at regular intervals for all patients undergoing surgery</li><li>• Every 15 minutes when forced air-warming is used</li></ul>	<ul style="list-style-type: none"><li>• Warming measures shall be commenced pre-operatively, and all patients at risk of inadvertent perioperative hypothermia shall prewarmed using active warming</li><li>• Commence warming pre-operatively for 30 minutes, if clinically feasible and practically possible, continuing until transfer to the operating room for induction of anaesthesia</li></ul>	<p>Forced air warming should be used:</p> <ul style="list-style-type: none"><li>• For all patients identified at a higher risk of hypothermia and associated adverse outcomes For all patients with an expected duration of anaesthesia longer than 30 minutes</li><li>• At the maximum temperature setting and adjusted thereafter to maintain normothermia and ensure patient comfort</li><li>• In conjunction with regular temperature monitoring</li></ul>
<b>AORN (2022)</b> <i>Cowperthwaite L. AORN Guidelines for Perioperative Practice 2022. Denver, CO: Association for Perioperative Registered Nurses, 2022.</i>	<ul style="list-style-type: none"><li>• Measure and monitor the patient's temperature during all phases of care</li><li>• Use the same site and method of temperature measurement throughout the perioperative phases when clinically feasible</li></ul>	<ul style="list-style-type: none"><li>• When active warming is indicated, prewarm the patient with the selected method</li><li>• Moderate-quality evidence supports prewarming the patient for a minimum of 10 minutes</li><li>• When hypothermia is identified before surgery, initiate interventions to normalise the patient's core body temperature before the patient's transfer to the operating room (OR), if possible</li></ul>	<ul style="list-style-type: none"><li>• When indicated, warm the patient with one or more of the following active warming methods during all phases of preoperative care</li><li>• Forced air warming (FAW) blanket or gown systems may be used</li><li>• Several clinical practice guidelines recommend use of FAW for procedures longer than 30 minutes</li></ul>
<b>NICE (2016, 2022)</b> <i>National Institute of Health and Care Excellence (NICE). Surgical site infection. (QS49). Published October 31, 2013. Accessed May 3, 2022.</i>  <i>National Institute of Health and Care Excellence (NICE). Hypothermia: prevention and management in adults having surgery. (CG65) Published December 14, 2016. Accessed May 3, 2022.</i>	<ul style="list-style-type: none"><li>• Should be direct measurement of core temperature (may be zero-heat-flux), measured and documented before surgery and every 30 minutes to end of surgery</li><li>• Do not use indirect estimates of core temperature in adults having surgery</li></ul>	<ul style="list-style-type: none"><li>• Pre-warm a minimum of 30 minutes</li><li>• Pre-warm for any procedure if patient is at high risk for intraoperative hypothermia</li></ul>	<ul style="list-style-type: none"><li>• Maintain active warming throughout intraoperative phase</li><li>• Active warming for procedures greater than 30 minutes</li></ul>

