

## Perioperative normothermia

Please check with your local ethics service or governing body about the process requirements for auditing your own practice.

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| <p><b>Background</b></p>                       | <p>The maintenance of normothermia is the aim for all patients in the perioperative period. Hypothermia is common, particularly in the intraoperative and immediate postoperative period. If hypothermia is to be avoided, temperature monitoring is essential during induction and maintenance of anaesthesia<sup>1</sup> and should be available during recovery from surgery.<sup>2</sup></p> <p>There are a number of reviews of the adverse effects of inadvertent perioperative hypothermia (IPH) in the literature. Research has shown IPH can lead to morbidity including prolonged recovery and hospital stay<sup>3</sup>, increased blood loss and transfusion requirement<sup>4</sup>, wound infections<sup>5</sup> and morbid cardiac events<sup>6</sup>.</p> <p>Reducing the incidence of IPH through appropriate perioperative care can reduce the incidence of these complications. This audit reflects the recommendations of the NICE guideline “Perioperative hypothermia (inadvertent): the management of inadvertent perioperative hypothermia in adults”<sup>7</sup>.</p>   |
| <p><b>Aim and objectives</b></p>               | <p>To minimise the proportion of patients with a core temperature of &lt;36°C in the perioperative period.</p>   |
| <p><b>Research evidence/ best practice</b></p> | <p>When mildly hypothermic volunteers shiver post-anaesthesia, they can regain heat with simple passive re-warming.<sup>8</sup> However, the anaesthetised patient is unable to shiver, and in recovery it is unpleasant for the patient to shiver, where it can increase oxygen demand and worsen pain. This makes the provision of active warming essential in at-risk patients perioperatively.</p> <p>Patients are at higher risk of hypothermia and its consequences if any two of the following apply:</p> <ul style="list-style-type: none"> <li>• ASA grade 2–5 (the risk at 5 is greater than the risk at 2).</li> <li>• Pre-operative temperature below 36.0°C.</li> <li>• Combined regional and general anaesthesia.</li> <li>• Intermediate or major surgery.</li> <li>• At risk of cardiac complications.</li> <li>• Extremes of age.</li> </ul> <p>Care should be taken to ensure patients are adequately covered on the ward and during transfer to the operating theatres. Unless emergency surgery is life or limb saving, patients should be actively warmed to a temperature 36.0°C or above before being anaesthetised.</p> <p>Otherwise, 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. For total operative times less than 30 minutes, only higher risk patients should be actively warmed. For all patients, intravenous infusions of greater than 500ml (and all blood products and irrigation fluids) should be warmed.</p> <p>Body temperature is as vital a clinical sign as the pulse or blood pressure and should be recorded in the hour prior to the patient coming to theatre. It should be measured throughout the operation and in recovery. It should be recorded at the same frequency as other vital sign measurements for the first 24 postoperative hours.</p> |

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| <b>Research evidence/ best practice</b>         | <p>NICE recently published a guideline on the management of IPH, which details appropriate perioperative thermal management.<sup>7</sup> Although it recommends the use of forced-air warming, there is some preliminary evidence that other forms of active warming (of which there are an increasing number available) may be equally effective<sup>9,10</sup> and that combining two methods can improve outcome.</p>   |
| <b>Suggested indicators</b>                     | <ul style="list-style-type: none"> <li>• Proportion of patients where temperature is measured.</li> <li>• Temperature &lt;36.0°C at any time.</li> <li>• Use of body and fluid warming techniques.</li> </ul>  |
| <b>Standards and criteria for best practice</b> | <p><b>Preoperative phase</b></p> <ul style="list-style-type: none"> <li>• <b>Key outcome: 100 per cent of patients should have their temperature recorded in the hour prior to their arrival in theatres.</b></li> <li>• 100 per cent of patients should have had their risk of IPH and its consequences assessed and documented preoperatively.</li> <li>• 100 per cent of patients should have a sheet and two blankets or a duvet for their transfer to theatres and be comfortably warm throughout.</li> <li>• 100 per cent of patients not scheduled for emergency surgery should have a temperature of 36.0°C or above before the start of anaesthesia.</li> </ul> <p><b>Intraoperative phase</b></p> <ul style="list-style-type: none"> <li>• <b>Key outcome: 100 per cent of patients should have their core temperature recorded every half-hour during anaesthesia.<sup>11</sup></b></li> <li>• 100 per cent of “at-risk” patients should have active warming from the first anaesthetic intervention unless febrile.</li> <li>• 100 per cent of ambient theatre temperatures at or above 21°C while active warming is being established.</li> <li>• 100 per cent of intravenous infusions greater than 500ml and all blood products and irrigation fluids should be warmed.</li> </ul> <p><b>Postoperative phase</b></p> <ul style="list-style-type: none"> <li>• <b>Key outcome: All 100 per cent of patients admitted to recovery should have core body temperature of 36.0°C or above.</b></li> <li>• 0 per cent of patients shivering in recovery.</li> <li>• 100 per cent of patients should have their temperature recorded every 15 minutes in recovery until they are ready for discharge to the ward.</li> <li>• 100 per cent of patients should have their temperature recorded on the ward at same frequency as other vital signs.</li> <li>• 100 per cent of patients should not be discharged from recovery until their temperature is above 36.0°C.</li> <li>• 100 per cent of patients whose temperature drops below 36.0°C in recovery or on the ward should receive active warming until this is rectified.</li> </ul> |
| <b>Method</b>                                   | <p>Data for series of 50 consecutive patients.</p> <p>Suggested data collection (refer to Perioperative Normothermia Data Collection Form):</p> <ul style="list-style-type: none"> <li>• Date and time of procedure.</li> <li>• Preoperative temperature measurement.</li> <li>• Thermal protection in place on arrival in operating theatre suite.</li> <li>• Core temperature (tympenic, oesophageal, nasotracheal, rectal or</li> </ul>   |

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|                        | <p>urinary bladder) measured at induction, every 30 minutes and on arrival in PACU.</p> <ul style="list-style-type: none"> <li>• Methods used to maintain normothermia (and timing).</li> <li>• Ambient temperature of OT.</li> <li>• Temperature on discharge from PACU</li> </ul>  |
| <b>References</b>      | <ol style="list-style-type: none"> <li>1. ANZCA PS18. <a href="#">Recommendations on Monitoring During Anaesthesia</a>. 2013 (last accessed July 2014).</li> <li>2. ANZCA PS04. <a href="#">Recommendations for the post-anaesthesia recovery room</a>. 2006 (last accessed July 2014).</li> <li>3. Lenhardt R et al. Mild intraoperative hypothermia prolongs postanesthetic recovery. <i>Anesthesiology</i> 1997;87:1318–1323.</li> <li>4. Scott EM et al. Effects of warming therapy on pressure ulcers – a randomized trial. <i>AORN J</i>, 2001;73:921–927, 9–33, 36–38.</li> <li>5. 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. <i>New Engl J Med</i>, 1996;334:1209–1215.</li> <li>6. Frank SM et al. Perioperative maintenance of normothermia reduces the incidence of morbid cardiac events. A randomized clinical trial. <i>J Am Med Assoc</i>. 1997; 277:1127–1134.</li> <li>7. Perioperative hypothermia (inadvertent): The management of inadvertent perioperative hypothermia in adults. <a href="#">NICE Clinical Guideline 65</a>. NICE London 2008.</li> <li>8. Deacock S, Holdcroft A. Heat retention using passive systems during anaesthesia: comparison of two plastic wraps, one with reflective properties. <i>Br J Anaesth</i> 1997;<b>79</b>:766–769.</li> <li>9. Rowley B, Kerr M, Van Poperin J, Everett C, Stommel M, Lehto R. H. Perioperative Warming in Surgical Patients A Comparison of Interventions. <i>Clinical nursing research</i>, 2014:1054773814535428.</li> <li>10. John M, Ford J, Harper M. Peri-operative warming devices: performance and clinical application. <i>Anaesthesia</i>, 2014;69(6):623-638.</li> <li>11. Alderson P, Campbell G, Smith AF, Warttig S, Nicholson A, Lewis SR. Thermal insulation for preventing inadvertent perioperative hypothermia. <i>Cochrane Database of Systematic Reviews</i>, 2014, Issue 6. Art. No.: CD009908.</li> </ol> |
| <b>Acknowledgement</b> | <p>This audit guide is adapted from Harper, M. “Peri-operative Temperature Management” In: Royal College of Anaesthetists. <i>Raising the Standard: a compendium of audit recipes</i>, 2012; p.104-105. The Royal College has kindly granted ANZCA permission to use this material.</p> <p>Author: Dr Michael Bennett, FANZCA. August 2014.</p>  |

Associated documents:

[Perioperative Normothermia Data Collection Form](#)

[Perioperative Normothermia Results Summary and Conclusions Form](#)