

# Prevention and management of inadvertent perioperative hypothermia in adults

## Practice Guideline 01

### 1. Purpose

The purpose of this guideline is to assist clinicians in the aim to optimize the management of inadvertent hypothermia.

### 2. Scope

This guideline applies to the perioperative period, specifically before, during and after induction of anaesthesia and sedation and does not apply to induced hypothermia or to paediatric patients. It is not intended to apply to maintaining normothermia outside the setting of monitoring and management of the patient by an anaesthetist, where alternative guidelines apply.

### 3. Introduction

Management to prevent perioperative hypothermia is intended to promote normothermia and is based on the evidence of measuring temperature and warming patients before and after induction of anaesthesia.<sup>1</sup> Inadvertent perioperative hypothermia is a preventable complication of perioperative interventions associated with poor patient outcomes, and is different from the deliberate induction of hypothermia for medical reasons such as during cardiac surgery, which is not included in this document.

This guideline defines hypothermia as a patient core temperature of below 36.0°C. The term "temperature" is used to denote core temperature and is defined as the temperature of the internal environment deep within the body including organs such as the heart, liver, brain and blood. Hypothermia may occur in adult patients at any

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stage of the perioperative pathway which is divided into 3 phases:

- the preoperative phase, which is the one hour before induction of anaesthesia, when the patient is prepared for surgery on the ward, in the day of surgery admissions department or in the emergency department.
- the intraoperative phase which is the total anaesthesia time.
- the postoperative phase, defined as the 24 hours after entry into the post-anaesthesia care unit, intensive care unit, high dependency unit or other specialist care unit, and including transfer to and time spent on the ward, while still under the care of the anaesthetist.

The phrase “comfortably warm” is used in recommendations relating to both the preoperative and postoperative phases and refers to the expected normal temperature range of adult patients, between 36.0°C and 37.5°C.<sup>1</sup>

General anaesthesia impairs thermoregulation by reducing the thresholds for vasoconstriction and shivering resulting in induced peripheral vasodilation and associated heat loss. Additionally, the patient may have become cold while waiting for surgery. Neuraxial anaesthesia also impairs central thermoregulatory control, preventing vasoconstriction and shivering in blocked areas.<sup>2</sup> The patient may experience fluid deprivation because of fasting prior to anaesthesia, but this is rare with up to date fasting protocols. A patient’s temperature may drop to below 35.0°C during the first 40 minutes of anaesthesia because of impairment of the thermoregulatory heat-preserving mechanisms, with unwarmed intravenous and irrigation solutions contributing to hypothermia.<sup>1</sup>

Inadvertent perioperative hypothermia may lead to increased rates of wound infection, cardiac events, altered drug action and pressure injuries. Other adverse outcomes are longer stays in post anaesthetic care and hospital with associated increased costs and use of resources, increased incidence of patient discomfort including feeling cold and shivering, patient dissatisfaction and wound pain.<sup>1-3</sup>

Care Bundles are a structured way of improving processes in health care delivery and have been proven to facilitate better patient outcomes.<sup>4</sup> Use of a Thermal Care Bundle has shown improvement in detection of inadvertent perioperative hypothermia.<sup>5</sup>

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### 4. Prevention and Assessment of Hypothermia<sup>1,3,6-11</sup>

- 4.1. Early recognition and prompt management of hypothermia is essential. Patients are at a higher risk of hypothermia with any 2 of the following:
  - American Society of Anesthesiologists' ASA grade II to V.
  - preoperative temperature below 36.0°C, without clinical warming.
  - planned combined general and regional anaesthesia.
  - major surgery.
  - at risk of cardiovascular complications.
- 4.2. Assess the age of the adult patient, as the elderly are at higher risk of hypothermia.
- 4.3. Assess the patient's medical condition and the environment to identify if active warming would not be suitable. Contraindications include burns, ischaemic or poorly perfused limbs, limbs that have been surgically cross-clamped, open wounds, and the direct presence of flammable anaesthetic gases, nitrous oxide and oxygen.<sup>9</sup> Warm theatres are an important strategy as per local protocols when active warming is inappropriate. Forced-air warming is not likely to cause surgical field contamination in the presence of sufficient laminar airflow.
- 4.4. 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.
- 4.5. Patients, their families and carers should be informed that:
  - staying warm before surgery will lower the risk of postoperative complications.
  - the hospital environment may be colder than home, so to come to hospital with appropriate clothing.
  - it is essential to tell staff if the patient is feeling cold in hospital.
- 4.6. The temperature should be measured in the hour prior to surgery using a method of thermometry consistent with pre-operative care protocols for the patient's location, for example Day of Surgery Admissions, the ward or the Intensive Care Unit (ICU).
- 4.7. Nurses should be trained and competent in using the thermometers and warming devices used in their clinical area.
- 4.8. Clinical thermometry is governed by International Standards.<sup>10</sup> Thermometers should be cleaned regularly and maintained to ensure correct operation, so that the probe or lens is free from dirt and debris, particularly with infrared-sensing thermometers. Thermometers should also be calibrated routinely using equipment and procedures that follow these

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- standards. Manufacturers should provide protocols, calibration instruments and technical recommendations to verify a thermometer's accuracy.
- 4.9. The patient's temperature should be measured perioperatively using a site that produces either:
- a direct measurement of core temperature which is preferred intraoperatively, at one of the following sites: pulmonary artery, distal oesophagus, nasopharynx.
  - an indirect estimate of core equivalent temperature, produced by a thermometer which employs a correction factor using algorithms ("offsets") and is accurate to within 0.5°C of direct measurement, at one of the following sites: urinary bladder, rectum or tympanic.<sup>8</sup>
- 4.10. The indirect measurement method is preferred in preoperative, postoperative and procedural locations where direct measurement options are not available.

### 5. Immediate Management <sup>1,2,7,10-14</sup>

- 5.1. If the temperature is <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.
- 5.2. A resistive heating mattress or resistive heating blanket may be used if a forced-air warming device is unsuitable for the patient.
- 5.3. 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
- 5.4. >30 minutes, or who has 2 or more risk factors for inadvertent perioperative hypothermia.
- 5.5. 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.
- 5.6. Induction of anaesthesia should not begin unless the patient's temperature is 36.0°C or above, except when urgent surgery needs to be expedited.
- 5.7. The ambient temperature should be at least 21.0°C while the patient is exposed, but once active warming is established, the ambient temperature may be reduced as required, within reason and dependent on patient factors.
- 5.8. The patient should be adequately covered throughout the intraoperative period for heat conservation, and only exposed for surgical preparation.

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- 5.9. Set the temperature for forced-air warming devices according to the manufacturer's instructions, and adjust to maintain a patient temperature of a minimum of 36.0°C.
- 5.10. Use humidified gases for anaesthesia.
- 5.11. Warm irrigation fluids in a thermostatically controlled cabinet to a temperature of 38°C to 40°C.
- 5.12. Intravenous fluids should be warmed when >500 ml is to be given.

### 6. Postoperative Management<sup>1,2</sup>

- 6.1. The patient's temperature should be measured and documented on admission to the postanesthetic care unit (PACU) and then at least 15 minutes, or more frequently according to individual patient assessment.
- 6.2. If the patient's temperature is below 36.0°C, the patient should be actively warmed unless contraindicated, until the patient is "comfortably warm".
- 6.3. Transfer to the ward from PACU should not be arranged until the patient's temperature is 36.0°C or above.
- 6.4. The patient's temperature should be measured and documented on arrival on the ward, with active warming implemented unless contraindicated, if the temperature is <36.0°C.

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