

Inadvertent perioperative hypothermia overview

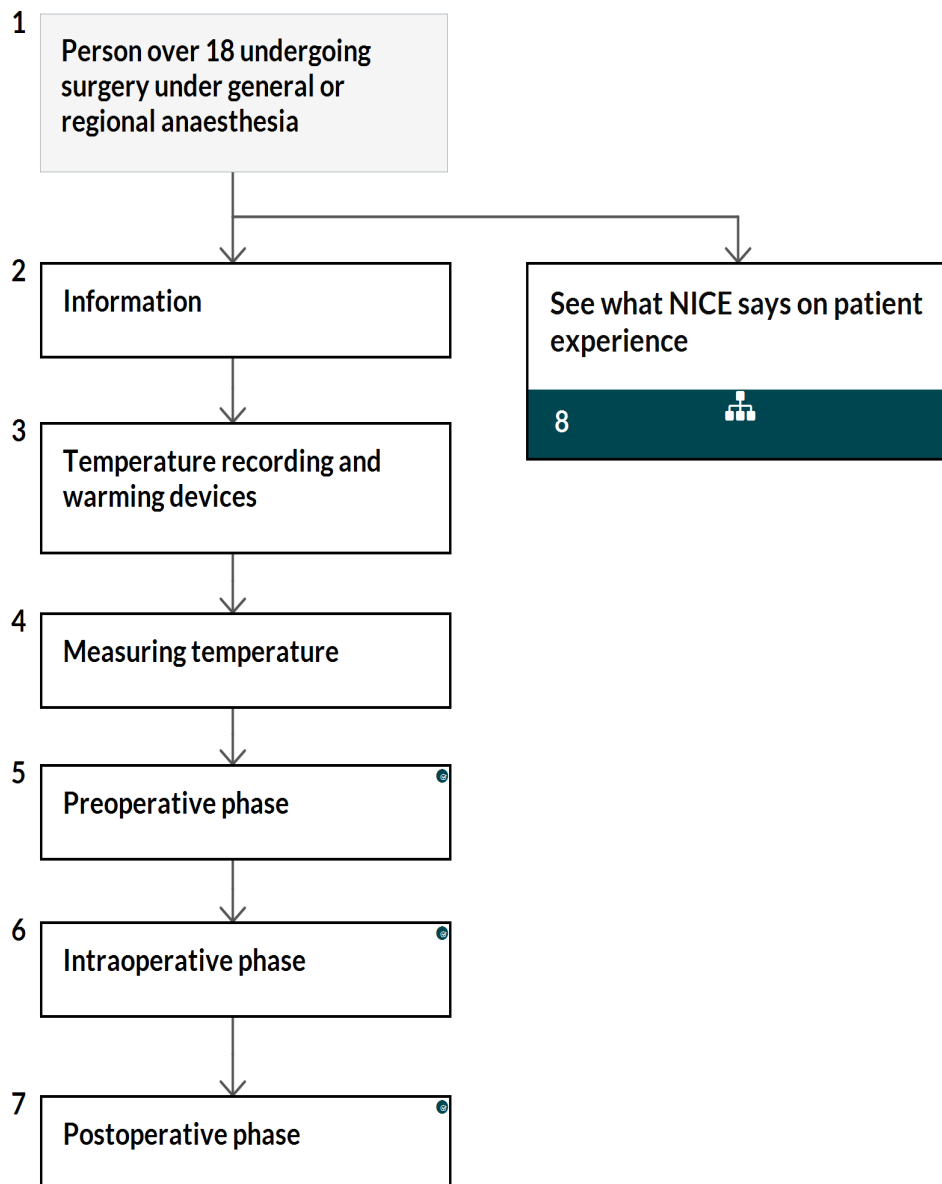
NICE Pathways bring together everything NICE says on a topic in an interactive flowchart. NICE Pathways are interactive and designed to be used online.

They are updated regularly as new NICE guidance is published. To view the latest version of this NICE Pathway see:

<http://pathways.nice.org.uk/pathways/inadvertent-perioperative-hypothermia>

NICE Pathway last updated: 29 March 2017

This document contains a single flowchart and uses numbering to link the boxes to the associated recommendations.



1 Person over 18 undergoing surgery under general or regional anaesthesia

No additional information

2 Information

Patients (and 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 their own home
- they should bring additional clothing, such as a dressing gown, a vest, warm clothing and slippers, to help them keep comfortably warm
- they should tell staff if they feel cold at any time during their hospital stay.

NICE has written information for the public explaining its guidance on [hypothermia: prevention and management in adults having surgery](#).

3 Temperature recording and warming devices

When using any temperature recording or warming device, healthcare professionals should:

- be trained in their use
- maintain them in accordance with manufacturers' and suppliers' instructions
- comply with local infection control policies. (For further information see what NICE says on [prevention and control of healthcare-associated infections](#).)

When using any device to measure patient temperature, healthcare professionals should:

- be aware of, and carry out, any adjustments that need to be made in order to obtain an estimate of core temperature from that recorded at the site of measurement
- be aware of any such adjustments that are made automatically by the device used.

NICE has published a medtech innovation briefing on [Bair Hugger for measuring core temperature during perioperative care](#).

HumiGard

The following recommendations are from NICE medical technologies guidance on [HumiGard for preventing inadvertent perioperative hypothermia](#).

HumiGard shows promise for preventing hypothermia during abdominal surgery. There is, however, insufficient robust evidence to support the case for routine adoption, particularly on using HumiGard to avoid important adverse outcomes and on how it affects resource use in open and laparoscopic surgery.

Research is recommended on HumiGard compared with standard insufflation gases in patients having laparoscopic or open surgery alongside general measures to reduce the risk of perioperative hypothermia (as described in [section 2.5](#) of MTG31). Research should report on the comparative rate of surgical site infections and other complications associated with hypothermia and normothermia, as well as related resource use.

Inditherm patient warming mattress

The following recommendations are from NICE medical technologies guidance on [Inditherm patient warming mattress for the prevention of inadvertent hypothermia](#).

The case for adopting the Inditherm patient warming mattress in the NHS is supported by the evidence. The clinical evidence suggests that the effectiveness of the Inditherm patient warming mattress in maintaining patient core body temperature above 36°C is similar to that of forced air warming, and that the Inditherm mattress may have practical advantages.

The Inditherm patient warming mattress should be considered for use in patients undergoing operations that carry a risk of inadvertent hypothermia.

The annual cost saving when the Inditherm patient warming system is compared with forced air warming is estimated to be £9800 per operating theatre (assuming that all eligible patients are warmed). This is based on an annual cost of £1300 for an Inditherm patient warming system comprising one full-length and one half-length mattress, two blankets and three controllers, and including maintenance costs.

4 Measuring temperature

Measure the patient's temperature using a site that produces either:

- a direct measurement of core temperature, or
- a direct estimate of core temperature that has been shown in research studies to be accurate to within 0.5°C of direct measurement. At the time of publication these sites are:
 - pulmonary artery catheter
 - distal oesophagus
 - urinary bladder
 - zero heat-flux (deep forehead)
 - sublingual¹
 - axilla
 - rectum.

Do not use indirect estimates of core temperature in adults having surgery.

5 Preoperative phase

The preoperative phase is defined as the hour before induction of anaesthesia, during which the patient is prepared for surgery on the ward or in the emergency department, including possible use of premedication.

Each patient should be assessed for their risk of inadvertent perioperative hypothermia and potential adverse consequences before transfer to the theatre suite. Patients should be managed as higher risk (see information on induction of anaesthesia in [intraoperative phase](#) [See page 7]) if any 2 of the following apply:

- ASA grade II to V (the higher the grade, the greater the risk)
- preoperative temperature below 36.0°C (and preoperative warming is not possible because of clinical urgency)
- undergoing combined general and regional anaesthesia
- undergoing major or intermediate surgery
- at risk of cardiovascular complications.

Pay particular attention to the comfort of patients with communication difficulties before, during and after surgery.

The patient's temperature should be measured and documented in the hour before they leave the ward or emergency department.

¹ Be aware of possible inaccuracies in core temperature estimation when using peripheral sites, such as sublingual

or axilla, in patients whose core temperature is outside the normothermic range (36.5°C to 37.5°C).

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If the patient's temperature is below 36.0°C, start active warming preoperatively on the ward or in the emergency department (unless there is a need to expedite surgery because of clinical urgency, for example bleeding or critical limb ischaemia).

If the patient's temperature is 36.0°C or above, start active warming at least 30 minutes before induction of anaesthesia, unless this will delay emergency surgery.

Maintain active warming throughout the intraoperative phase.

The patient's temperature should be 36.0°C or above before they are transferred from the ward or emergency department (unless there is a need to expedite surgery because of clinical urgency, for example bleeding or critical limb ischaemia).

On transfer to the theatre suite:

- active warming should be continued (or re-started as soon as possible)
- the patient should be encouraged to walk to theatre where appropriate.

Quality standards

The following quality statement is relevant to this part of the interactive flowchart.

3. Patient temperature

6 Intraoperative phase

The intraoperative phase is defined as total anaesthesia time, from the first anaesthetic intervention through to patient transfer to the recovery area of the theatre suite.

Patient temperature measurement and control

The patient's temperature should be measured and documented before induction of anaesthesia and then every 30 minutes until the end of surgery.

Standard critical incident reporting should be considered for any patient arriving at the theatre suite with a temperature below 36.0°C.

The patient should be adequately covered throughout the intraoperative phase to conserve heat, and exposed only during surgical preparation.

The temperature setting on forced-air warming devices should be set at maximum and then adjusted to maintain a patient temperature of at least 36.5°C.

Theatre suite temperature

In the theatre suite:

- the ambient temperature should be at least 21°C while the patient is exposed
- once active warming is established, the ambient temperature may be reduced to allow better working conditions
- using equipment to cool the surgical team should also be considered.

Induction of anaesthesia

Induction of anaesthesia should not begin unless the patient's temperature is 36.0°C or above (unless there is a need to expedite surgery because of clinical urgency, for example bleeding or critical limb ischaemia).

Warm patients intraoperatively from induction of anaesthesia, using a forced-air warming device, if they are:

- having anaesthesia for more than 30 minutes or
- having anaesthesia for less than 30 minutes and are at higher risk of inadvertent perioperative hypothermia (see [preoperative phase](#) [See page 5]).

Consider a resistive heating mattress or resistive heating blanket if a forced-air warming device is unsuitable.

Fluid warming

Intravenous fluids (500 ml or more) and blood products should be warmed to 37°C using a fluid warming device.

All irrigation fluids used intraoperatively should be warmed in a thermostatically controlled cabinet to a temperature of 38°C to 40°C.

Quality standards

The following quality statement is relevant to this part of the interactive flowchart.

3. Patient temperature

7 Postoperative phase

The postoperative phase is defined as the 24 hours after the patient has entered the recovery area of the theatre suite.

In recovery

The patient's temperature should be measured and documented on admission to the recovery room and then every 15 minutes:

- Ward transfer should not be arranged unless the patient's temperature is 36.0°C or above.
- If the patient's temperature is below 36.0°C, they should be actively warmed using forced-air warming until they are discharged from the recovery room or until they are comfortably warm.

On the ward

Patients should be kept comfortably warm when back on the ward.

- Their temperature should be measured and documented on arrival at the ward.
- Their temperature should then be measured and documented as part of routine 4-hourly observations.
- They should be provided with at least 1 cotton sheet plus 2 blankets, or a duvet.

If the patient's temperature falls below 36.0°C while on the ward:

- they should be warmed using forced-air warming until they are comfortably warm
- their temperature should be measured and documented at least every 30 minutes during warming.

Quality standards

The following quality statement is relevant to this part of the interactive flowchart.

3. Patient temperature

8 See what NICE says on patient experience

[See Patient experience in adult NHS services](#)

Glossary

active warming

a process that transfers heat to the patient

ASA

American Society of Anesthesiologists

comfortably warm

the expected normal temperature range of adult patients (between 36.5°C and 37.5°C)

core temperature

the temperature of the blood and internal organs

direct estimate of core temperature

the reading produced by a thermometer with no correction factors applied

hypothermia

core temperature below 36.0°C

indirect estimates

the reading produced by a thermometer after a correction factor has been applied, examples include infrared tympanic, infrared temporal, infrared forehead and forehead strips

temperature

the core temperature

Sources

[Hypothermia: prevention and management in adults having surgery \(2008 updated 2016\) NICE guideline CG65](#)

[HumiGard for preventing inadvertent perioperative hypothermia \(2017\) NICE medical technologies guidance 31](#)

[Inditherm patient warming mattress for the prevention of inadvertent hypothermia \(2011\) NICE medical technologies guidance 7](#)

Your responsibility

Guidelines

The recommendations in this guideline represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, professionals and practitioners are expected to take this guideline fully into account, alongside the individual needs, preferences and values of their patients or the people using their service. It is not mandatory to apply the recommendations, and the guideline does not override the responsibility to make decisions appropriate to the circumstances of the individual, in consultation with them and their families and carers or guardian.

Local commissioners and providers of healthcare have a responsibility to enable the guideline to be applied when individual professionals and people using services wish to use it. They should do so in the context of local and national priorities for funding and developing services, and in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities. Nothing in this guideline should be interpreted in a way that would be inconsistent with complying with those duties.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should [assess and reduce the environmental impact of implementing NICE recommendations](#) wherever possible.

Technology appraisals

The recommendations in this interactive flowchart represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, health professionals are expected to take these recommendations fully into account, alongside the individual needs, preferences and values of their patients. The application of the

recommendations in this interactive flowchart is at the discretion of health professionals and their individual patients and do not override the responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or their carer or guardian.

Commissioners and/or providers have a responsibility to provide the funding required to enable the recommendations to be applied when individual health professionals and their patients wish to use it, in accordance with the NHS Constitution. They should do so in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.

Medical technologies guidance, diagnostics guidance and interventional procedures guidance

The recommendations in this interactive flowchart represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, healthcare professionals are expected to take these recommendations fully into account. However, the interactive flowchart does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

Commissioners and/or providers have a responsibility to implement the recommendations, in their local context, in light of their duties to have due regard to the need to eliminate unlawful discrimination, advance equality of opportunity, and foster good relations. Nothing in this interactive flowchart should be interpreted in a way that would be inconsistent with compliance with those duties.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.