Realities of perioperative hypothermia: time for action

Consensus guidance from an expert working group

Expert group

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"Perioperative hypothermia is still in 2016 a clinical problem with a high incidence and severe associated complications."

Foreword

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In several large studies published between 2010 and 2015 the incidence of perioperative hypothermia was still high. After large non-cardiac and cardiac operations the incidence of postoperative hypothermia at admission to the intensive care units still ranged between 46% and 66%[1,2]. In a mixed group of surgical patients intraoperative hypothermia was found in 64%.[3]

The new German and Austrian Guidelines[5] published in 2015 are focusing on: Core temperature monitoring throughout the perioperative process, active prewarming, active skin warming during anesthesia and fluid warming if large amounts of fluids are needed.

In a recent survey in Germany with more than 2000 participants, several elements for improvement were identified in terms of measurement of core temperature, prewarming, warming during anesthesia and infusion warming.[4]

Implementing this new guideline into clinical practice has been successful. Adding prewarming to an established good intraoperative warming concept consisting of forced-air warming and fluid warming can reduce the risk for postoperative hypothermia. This was recently published with data from six months of clinical practice on more than 3200 surgeries. Results demonstrate that the risk for postoperative hypothermia is significantly higher without additional prewarming (24.4% vs. 12.5%; Odds Ratio by 1.79 [Confidence Interval: 1.39–2.33]).[6] This is further supported by the updated NICE guidance in the UK[7] and new guidance in Italy[8] which also recommend pre-warming and continuous temperature monitoring.

On 27th May 2016, a group of 10 European anesthetists from 7 countries met in London. The objective of this meeting was to develop a short and pragmatic consensus, summarizing the most important elements of the latest guidelines for the prevention of perioperative hypothermia. This document aims at supporting anesthesiologist professionals in optimizing their clinical practice by focusing their effort on implementing the most important interventions.

References

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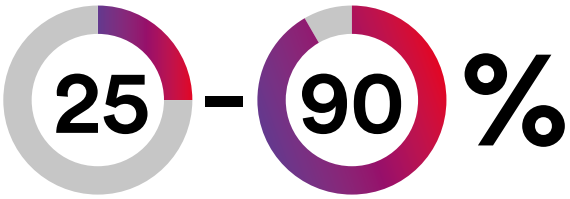
"Core temperature should be measured continuously using the same method throughout the perioperative period."

Introduction

Core body temperature is normally tightly regulated to within a few tenths of a degree. General and neuraxial anaesthesia impair thermoregulation and prevent vasoconstriction and shivering in anaesthetised areas. Consequently, unwarmed anaesthetised patients become hypothermic, typically by 1–2°C. Hypothermia results initially from an internal redistribution of body heat from the core to the periphery, followed by heat loss exceeding metabolic heat production.[1]



of all patients undergoing elective surgery suffer from inadvertent perioperative hypothermia

25–90% of all patients undergoing elective surgery suffer from inadvertent perioperative hypothermia. In other words, a core body temperature below 36°C. Compared to normothermic patients, these patients have more frequent wound infections (relative risk [RR] 3.25, 95% confidence interval [CI] 1.35–7.84), cardiac complications (RR 4.49, 95% CI 1.00–20.16), and blood transfusions (RR 1.33, 95% CI 1.06–1.66). Hypothermic patients feel uncomfortable and shivering raises oxygen consumption by about 40%.[2]

In a recent large retrospective study looking at over 45,000 patient files, Scott et al. showed that compliance to SCIP Inf -10 bundle for patient temperature management shows significant improved outcomes: ischemic cardiovascular event, healthcare associated infections and in-hospital mortality.[3]

Core temperature measurement

The maintenance of perioperative core temperature is an essential part of anaesthesia practice and requires patient preparation and monitoring of core temperature during the perioperative journey. While there is little scientific justification for the currently accepted temperature boundaries for normothermia, it is reasonable to continue their use until there is compelling scientific data to revise them. Core temperature is challenging to measure with reliability, and infrared thermometers are not be suitable for clinical measurements. The most common inaccuracy for rapid-measuring thermometers is a low reading.

Expert consensus

1 During the perioperative period, core temperature should never become less than 36.0°C unless hypothermia is required for the surgical procedure.

For patient comfort, a core temperature between 36.5 and 37.5 °C is considered the comfortably warm temperature range for adult patients.[5]

2 Core temperature should be measured continuously using the same method throughout the perioperative period, where possible. Periodic temperature measurements at intervals not exceeding 30 minutes are acceptable if technical limitations prevent continuous evaluation.

3 When repeated temperature measures are taken using a rapid method, the average value in the set should be recorded.

4 Temperature measurements should not be taken at an anatomic location close to the warming source.

Increased wound infection

Increased cardiac complications

Increased blood transfusions

“Pre-warm as long as possible but try to plan at least for a minimum of 10 minutes.[6]”

Continuous active warming including pre-warming

Preliminary results of a multi-centre observational study run in over 41 centres in France were presented at the Euroanaesthesia 2016 conference in London.[4] This study has identified the critical importance to minimise disruption of active warming throughout the perioperative process. The study identified that two periods are at risk for developing hypothermia: the first hour after the induction of anesthesia and the time between end of intra-operative warming and arrival in the recovery room/PACU.

Adding prewarming to an established good intraoperative warming concept consisting of forced-air warming and fluid warming reduce the risk for postoperative hypothermia.

Pre-warming is the only effective method that can mitigate the thermal effect of redistribution and maintain normal core temperature during short procedures. Pre-warming involves the use of active warming systems that persistently maintain a surface temperature well above normal core body temperature for the entire pre-warming period. This means that warmed hospital blankets or space blankets can be used but are not considered as active pre-warming. Pre-warming is deemed successful when patients are normothermic during the entirety of the perioperative period.

Expert consensus

1 Patients should be pre-warmed according to a specific protocol using an active warming technology.

2 Select a pre-warming solution that is compatible with the proposed surgical procedure.

3 Pre-warm patients by selecting the highest temperature setting on the warming unit and adjust to patient’s tolerance.

4 Pre-warm as long as possible but try to plan at least for a minimum of 10 minutes.[6]

5 Minimise the time from the end of pre-warming to the beginning of induction.

If possible, continue pre-warming during induction of anaesthesia.

6 Minimise the warming disruption between the OR and arrival in the recovery room/PACU to maintain normothermia/prevent a fall in core temperature. Non-warming time should be kept to a minimum.

7 If the patient is normothermic in recovery, consideration should be given to stop active patient warming. However continuous core temperature monitoring must be continued.

Blood and fluid warming

"Fluid warming should be considered an adjunct to forced-air warming."

The fluid requirements for each surgical patient should be anticipated to help guide the decision to use fluid warming devices.

In terms of overall heat transfer, forced-air warming is more effective and less expensive than fluid warming. However, fluid warming is important to consider because large volume of unwarmed fluid will reduce core temperature.

Expert consensus

1 If anticipated fluid requirements exceed 500ml/h, fluid warming devices should be considered.

2 All irrigation fluid should be warmed.

3 Blood should never be administered without being actively warmed first.

Expert consensus summary

Maintaining Patient Normothermia throughout the perioperative process has been shown to reduce surgical complications and in-hospital mortality.

Recent surveys run in Germany and France confirmed that perioperative hypothermia is still a frequent issue today.

This expert consensus document aims at supporting anaesthesiologist professionals in optimising their clinical practice by focusing their effort on implementing the most important interventions.

1 Measuring core temperature continuously throughout the peri-operative process ensuring patient core temperature never becomes less than 36.0°C.

2 Continuous warming combining active pre-warming with intra-operative forced-air warming.

3 Fluid warming should be considered an adjunct to forced-air warming intra-operatively.

To view NICE recommendations on the prevention of unintended hypothermia, please visit: www.nice.org.uk/guidance/CG65

For more information on temperature management solutions provided by 3M, please visit www.bairhugger.com

References

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