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Editorial II

NICE and warm

Inadvertent perioperative hypothermia, defined as core body temperature $\leq$36.0°C, is a common consequence of anaesthesia. Its adverse effects are well known to anaesthetists and include greater intraoperative blood loss and consequent blood transfusion.[1] After operation, inadvertent perioperative hypothermia can lead to an increased rate of wound infection,[2] morbid cardiac events,[3] and pressure sores,[4] and also a longer stay in both recovery and hospital.[5] These are apart from the subjective discomfort and wound pain which cold and shivering may cause the patient. Significantly, maintaining normothermia perioperatively can modify these adverse effects.

Despite this knowledge, implementation of warming strategies remains patchy. An audit in the hospital of one of the authors (C.M.H.) indicated that there is an incidence of inadvertent perioperative hypothermia in the region of 20% and that there is inconsistency in the methods of warming used. There are no active temperature management protocols and, as with anything that may cost money, there is resistance to more aggressive prevention of inadvertent perioperative hypothermia on economic grounds. In the USA, where there are guidelines,[6] compliance remains poor. It has been suggested that there are a number of factors contributing to this: a misguided belief that forced-air warming can increase the rates of infection,[7] surgeons' complaints of discomfort, inconsistent monitoring (hindered by the inconsistency between different thermometers and sites of measurement), and a simple lack of appreciation of the causes and consequences of inadvertent perioperative hypothermia.[8] Additionally, even where there are standards such as those of the American Society of Anesthesiologists (ASA),[9] they are criticized for being vague and giving flexibility at the expense of clear guidance.[8]

Recognizing the significance of inadvertent perioperative hypothermia and the deficiencies in current practice in the UK, the National Institute for Clinical Excellence (NICE) convened a guideline development group to address the issue. This culmination of the group's work came with the publication of the 'Management of inadvertent perioperative hypothermia in adults' guideline.[10]

The guidance is divided into the pre-, intra-, and postoperative phases. Before operation, the key recommendations are that a formal assessment of the risk of hypothermia should be undertaken for each patient and that patients themselves should be empowered by being given information that will help them minimize that risk. Another important element is that the temperature should be measured in the hour before surgery. Should it be $<$36.0°C, unless the operation is life or limb saving, active warming should be initiated until such time as the patient is normothermic.

Intraoperatively, the recommendations are that forced-air warming is commenced as early as possible, preferably in the anaesthetic room, for any patient having surgery with an anaesthetic time (i.e. from first anaesthetic intervention to arrival in recovery) of $>$30 min, or who has two or more risk factors for inadvertent perioperative hypothermia. I.V. fluids should be warmed when $>$500 ml is to be given.[11 12] These recommendations therefore encompass the majority of operations and infusions.

Monitoring is an integral part of perioperative thermal management and one that remains neglected.[13] The guide recommends that core temperature should be recorded at

least every 30 min intraoperatively to ensure that heat delivery is titrated optimally so that the patient does not become too cold or too hot. There are limitations to all currently available methods of perioperative temperature monitoring but, unfortunately, this area was deemed to be outside of the scope of the guidelines.

After operation, patients should not be discharged from the recovery area before their temperature reaches 36.0°C. Their temperature should be measured with the same frequency as pulse, arterial pressure, and other standard postoperative observations for the first 24 h for in-patients. For ambulatory surgery, normothermia should be a prerequisite for discharge. This should focus attention on the issue.

The guidance is clear and the recommendations are logical. The implementation of forced-air warming for all operations over 30 min and the warming of all i.v. infusions of 500 ml or more may seem controversial at first. Although clinicians are unlikely to object to this advice on medical grounds, it will have significant cost implications.

A broad-ranging analysis was carried out in setting these guidelines, but the analysis can only be as good as the available evidence. One weakness of the analysis is that, because of the lack of direct evidence, much of the data on the benefits of forced-air warming for short procedures have been extrapolated from studies in longer operations. Despite this, even if the estimated economic effects of the complications are diluted quite significantly, the cost-effectiveness analysis results in overall savings. The cost implications of implementing the guidelines could be mitigated through the use of warming equipment that requires the use of fewer or no disposables. This again exposes another weakness in that there are papers suggesting that new technology has rendered older warming techniques more effective. Both circulating-water[14] and electric mattresses[15 16] are reusable so have the potential to substantially reduce the cost of implementing optimal thermal perioperative care. However, because evidence for a reduction in complications comes from publications using forced-air warming, this is what the guideline has to reflect. The situation is similar with regard to fluid warming. No technological assessment was carried out, but there is evidence to suggest that not all warmers are the same.[17] It may be that for short cases where 500–1000 ml is given i.v. that fluid taken from a warming cabinet may be effective.

In recognition of the gaps in the evidence-base, the guideline makes certain research recommendations. Of particular note are those for research into alternative (i.e. to forced-air warming) warming technologies, the incidence and effects of inadvertent perioperative hypothermia on patients undergoing short (i.e. anaesthetic duration of $<$1 h) operations, and the effectiveness of prewarming.

It is unusual for NICE to produce a guideline that relies so heavily on anaesthetists for its implementation. The nearest it has come in the past is its technological assessment on the use of ultrasound for central venous catheter (CVC) placement.[18] That guideline had a significant impact on the provision of ultrasound machines in operating theatres.[19] The inadvertent perioperative hypothermia guideline gives anaesthetists significant leverage to obtain adequate funding for warming equipment. To assist in this process, a new version of the inadvertent perioperative hypothermia audit that takes into account the NICE recommendations will shortly be available. The combination of audit information along with the NICE guideline should make it possible to significantly reduce the incidence of inadvertent perioperative hypothermia. This guidance provides anaesthetists with an unprecedented opportunity to have a positive effect on the outcome of surgery.

Declaration of interest

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