NATIONAL INSTITUTE FOR HEALTH AND CLINICAL EXCELLENCE

Centre for Clinical Practice

Review consultation document

Review of Clinical Guideline (CG65) – The management of inadvertent perioperative hypothermia in adults

1. Background information

Guideline issue date: 2008
3 year review: 2011
National Collaborating Centre: Nursing and Supportive Care

2. Consideration of the evidence

Literature search

From initial intelligence gathering and a high-level randomised control trial (RCT) search clinical areas were identified to inform the development of clinical questions for focused searches. Through this stage of the process 30 studies were identified relevant to the guideline scope. The majority of the identified studies were related to the following clinical areas within the guideline:

- Preventing inadvertent perioperative hypothermia (IPH)
  - Warming devices
  - Pharmacology

Some studies also related to the following areas, but there was insufficient evidence to warrant further investigation:

- One study related to risk factors for IPH (1)
- One study related to the consequences of IPH (2)
- One study related to treating IPH (3)

A series of Cochrane reviews focusing on the prevention of IPH are also in development and so a collaboration between NICE and Cochrane Collaboration was established to undertake focused searching in this clinical area and two clinical questions based on preventing IPH were developed. The results of the focused searches are summarised in the table below. All references identified through the high-level RCT search and the focused searches can be viewed in Appendix 1

Table 1

Clinical area 1: Preventing IPH (Warming Devices)		
Clinical question	**Summary of evidence**	**Relevance to guideline recommendations**
Are warming devices/mechanisms effective in preventing IPH in adults in the different phases of perioperative care? **Relevant recommendations** Research recommendation 3 1.2.2 1.2.3 1.2.5	Through the high level RCT search and the focused searches conducted by the Cochrane Collaboration, 30 studies relevant to the clinical question were identified. **General warming** Two studies looked at general warming methods and concluded that warming should be routine and part of anaesthetic management to prevent IPH (4) (5) **Forced air warming** Twelve studies addressed forced air warming (FAW). Two studies examined prewarming with FAW, finding that preoperative warming results in smaller decreases in core temperature intraoperatively (6), and pre-warming is effective in maintaining body temperature, lowering sensitivity	No conclusive evidence was identified that would invalidate current guideline recommendations.

1.2.6 1.2.7 1.3.4 1.3.5 1.3.6 1.3.9 1.3.10 1.4.1 1.4.2 1.4.3	to pain and anxiety, and promoting thermal comfort (7) Studies examining the intraoperative phase found that FAW works as well as blankets but patient thermal comfort is increased (8), FAW is significantly more efficient than a cotton blanket alone at maintaining perioperative normothermia during arthroscopic shoulder surgery (9), convective warming systems were effective in maintaining perioperative normothermia in patients undergoing major abdominal and orthopedic surgery (10) that intraoperative FAW prevents hypothermia in elderly patients (11), that a FAW mattress with three appendages was superior to the circulating water mattress for preventing heat loss in vascular surgery (12), FAW is significantly more efficient than a cotton blanket alone at maintaining perioperative normothermia during arthroscopic shoulder surgery (9), FAW with a surgical access blanket is more effective than the other warming methods in ameliorating the temperature decrease during surgery (13), the combination of a circulating water mattress and FAW is significantly non-inferior in maintaining intraoperative core temperature than a circulating water garment (14).	

	One study found no differences between FAW and radiant warming on patient temperature (15). One study found that a wet forced-air warming blanket is ineffective at maintaining normothermia, and that once wet, the warming blanket resulted in cooling similar to the control group (16). Two studies found that even with forced air warming patients ended surgery in mild hypothermia (17) and it did not reduce the complaints of patients feeling cold and tremors (18). A meta-analysis found that circulating water garments offer better temperature control than FAW systems, and both are more effective than passive warming devices (19), and one study found that heat transfer in the resistive heating system was significantly greater than that of the FAW system (20) **Heated blankets** Three studies looked at heated blankets finding that a circulating water blanket was found to effectively prevent body temperature drop for surgical patients during operation (21),and that the Mediwrap blanket is as effective as the FAW blanket in maintaining core body temperature during	

	thoracotomy when applied thirty minutes before the surgery (22), a forced-air blanket is effective to prevent intraoperative hypothermia when applied for a period ranging from 30 min before anesthetic induction to 120 min after anesthetic induction (23). One study found that even with using a resistive heating blanket patients still ended surgery in mild hypothermia (17). **VitalHeat** Two studies examined the vitalHeat warming device finding the device was not inferior to FAW and is suitable for maintaining normothermia even during large and long operations (24), and that although the vitalHEAT system may have advantages over convective warming systems because it requires a much smaller body surface area, it underperformed when compared with FAW (25). **Heated Fluids** 4 studies addressed this, finding that core temperature may be influenced by irrigation fluid temperature and recommend that fluid be warmed to	

	36degreesC (26), that the warming of intravenous fluids by using the Hotline system prevents decreases in systemic temperatures during off pump coronary bypass surgery (27), that the use of warm irrigation fluid during arthroscopic shoulder surgery decreases perioperative hypothermia, especially in elderly patients (28), and that pre-warmed fluid is effective at preventing perioperative hypothermia regardless of whether it is heated to room temperature through a warming cabinet or whether it is delivered at room temperature through an inline warming system (29). **Heated gases** Two studies found that heated gas insufflation, with or without humidification, has minimal benefit on patient outcomes (30), and the use of heated humidified carbon dioxide insufflation for short-duration gynecologic laparoscopy up to 90 minutes' duration was not associated with any significant benefit with regard to postoperative pain, hypothermia, or time of recovery room stay (31).	

	Thermal Suit Two studies found that a thermal suit is a good alternative to conventional measures of warming in reducing heat loss during surgical procedure under regional anaesthesia (32), and the Kimberly-Clark warming system allowed for better control of core body temperature during off pump coronary artery bypass surgery compared to traditional techniques. This translated in less intra and postoperative blood loss and shorter hospital length of stay (33). **Comparison of different warming devices (research recommendation)** Ten studies compared forced air warming to 7 different warming devices. The majority of studies found that other types of warming devices were not inferior to FAW (34-40), and 3 studies found that FAW was superior (41-43). ***Summary*** The current guideline recommends using clothing and blankets to keep people comfortably warm and forced air warming to be instigated if the	

	patient's temperature drops below 36ºC. Intravenous fluids and blood products should be warmed to 37ºC, and if irrigation fluids are used they should be warmed to 38-40ºC	

Clinical area 1: Preventing IPH (Pharmacology)		
Clinical question	**Summary of evidence**	**Relevance to guideline recommendations**
Which pharmacological interventions are clinically and cost effective in the prevention of IPH? **Relevant recommendations** No specific recommendations made	Through the high level RCT search and the focused searches conducted by the Cochrane Collaboration, 3 studies relevant to the clinical question were identified. The three studies found that epidural anesthesia with 1% ropivacaine may prevent redistribution hypothermia during general anesthesia for gynecologic surgery (44), vasodilation induced by droperidol, given prior to induction of anaesthesia, increases total thermal content of the body and minimizes redistribution hypothermia, presumably by decreasing the core-to-peripheral tissue temperature gradient (45), and Clonidine, given orally in a dose of 150 mug, as a premedication is effective at preserving core temperature and preventing post-subarachnoid block shivering in patients undergoing elective urological surgery (46).	The guideline makes no specific recommendations about pharmacological agents in the prevention of IPH. Since all three studies examined a different pharmacological agent, there is not enough evidence to recommend the use of any particular agent.

Four ongoing clinical trials were identified:

- A Study to Determine if Modern Under-patient Warming Mattresses Are as Effective as Forced-air Warming Blankets in Preventing Perioperative Hypothermia (anticipated end date: March 2012)
- Carbon Polymer Blankets to Prevent Incidence Of Perioperative Hypothermia (IPH) in the DSU (anticipated end date: unknown)
- Effects of Insufflated Gas on Core Temperature and Post-operative Pain During Laparoscopic Surgery (anticipated end date: January 2012)
- A Study to Determine the Effectiveness of a Warming Mattress in Preventing Inadvertent Perioperative Hypothermia and Shivering in Patients Undergoing Elective Cesarean Section (outside the scope of the current guideline. Anticipated end date: September 2011)

Some evidence was identified that was relevant to one of the research recommendations in the original guideline:

- Research recommendation 3: Comparison of intraoperative warming devices:- Are different active warming devices (for example, forced air warming devices, electric heating mattresses, electric heating pads) used intraoperatively equally effective in preventing inadvertent perioperative hypothermia?

Ten studies (in table 1) were identified that compared forced air warming to 7 different types of warming device. This heterogeneity means that this research recommendation cannot be fully addressed yet, but the evidence found supports the existing guideline recommendation that forced air warming should be used to warm patients perioperatively.

In conclusion, no identified new evidence contradicts current guideline recommendations.

Guideline Development Group and National Collaborating Centre perspective

A questionnaire was distributed to GDG members and the National Collaborating Centre to consult them on the need for an update of the guideline. Two responses were received with respondents highlighting:

- New evidence for alternatives to forced air warming, particularly the inditherm mattress (no references were provided).
- A reluctance amongst medical staff to monitor patient temperature
- Potential to widen the scope to include obstetrics

Both respondents felt that the guideline should be updated.

Implementation and post publication feedback

In total 54 enquiries were received from post-publication feedback, most of which were routine. A theme emerging from post-publication feedback was related to forced air warmers. One enquirer had raised a concern about the use of recommended forced air warmers which they stated may potentially contravene health and safety regulations, and several other enquirers sought clarification on this matter. However, the Medicines and Healthcare products Regulatory Agency (MHRA) confirmed that there was no evidence to support the claims, and no evidence relating to this issue was found in the literature searches.

No specific feedback was provided by the implementation team.

No new evidence was identified through post publication enquiries or implementation feedback that would indicate a need to update the guideline.

Relationship to other NICE guidance

The following NICE guidance is related to CG65:

Guidance	Review date
None	
Related NICE guidance not included in CG65	
CG3 Perioperative tests: the routine use of perioperative tests in elective surgery	Published: 2003 Last reviewed: 2010 Next review: 2013
Related NICE guidance in progress	
Inditherm Mattress for the prevention of inadvertent perioperative hypothermia. Medical Technologies guidance	Due for publication: 2011 This device is currently being reviewed by the Medical Technology Evaluation Programme. The publication has been delayed subject to the outcome of a resolution request. See here for further details.

Anti-discrimination and equalities considerations

No evidence was identified to indicate that the guideline scope does not comply with anti-discrimination and equalities legislation. The original scope is inclusive of adults (over 18 years of age) undergoing elective and emergency surgery (including surgery for trauma), under general and regional (central neuraxial block).

Conclusion

Through the process no additional areas were identified which were not covered in the original guideline scope or would indicate a significant change in clinical practice. There are no factors described above which would invalidate or change the direction of current guideline recommendations. Thus

the inadvertent perioperative hypothermia in adults guideline should not be updated at this time.

3. Review recommendation

The guideline should not be updated at this time.

The guideline will be reviewed again according to current processes.

Centre for Clinical Practice
25/07/11 – 12/08/11

Appendix I

Reference List

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