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Maintaining perioperative normothermia

A simple, safe, and effective way of reducing complications of surgery

Perioperative hypothermia can have a wide range of underappreciated, detrimental effects. These include increased rates of wound infection, morbid cardiac events, blood loss, and length of stay in both recovery and hospital. Maintaining core temperature at or above 36°C can be beneficial for the patient and cost effective.

Frank et al studied high risk cardiac patients undergoing thoracic, abdominal, and vascular surgery.[1] Patients randomised to routine thermal care were, on average, 1.3°C cooler than patients warmed more aggressively. Despite this small difference the incidence of perioperative morbid cardiac events, assessed in a double blind fashion, was 300% higher in the cooler group. Frank et al thought that this may be the a consequence of the dramatic increase in noradrenaline release seen in even mild hypothermia.

It has also been said that the increase in noradrenaline may contribute to the higher number of wound infections seen in hypothermic patients. A randomised study of patients undergoing colorectal surgery showed that 1.9°C hypothermia resulted in an infection rate of 19% compared with 6% in the normothermic group.[2]

The same study also showed that postoperatively the hypothermic group remained, on average, 2.6 days longer in hospital. Interestingly, even those hypothermic patients who did not have wound infections were discharged two days later. The surgeons participating in discharging the patients and assessing their wounds were unaware of the thermal management.

Efficiency of the operating theatre and costs can be affected adversely by delayed discharge of patients from recovery. In a blinded, randomised study of 150 patients undergoing major elective abdominal surgery it was found that the hypothermic patients (34.8 ±0.6°C) were fit to be discharged an average of 40 minutes later than the normothermic group (36.7 ±0.6°C).[3] This decision was made on the basis of a validated scoring. The delay would have been 90 minutes had a temperature of equal to or more than 36°C been part of the criteria for discharging patients.

The clinical effect of hypothermia on blood loss was shown in a randomised, controlled study of 60 patients undergoing primary total hip replacement. The hypothermic group, whose mean postoperative temperature was 1.6°C lower than that of the normothermic group, lost on average 500 ml or 30% more blood.[4] When using predetermined targets for packed cell volumes, this translated into seven of the hypothemic group receiving transfusions, as against one out of 30 in the normothermic group. Although not a primary end point, the increased blood loss was also noted in the study by Kurz et al.[2]

Such an outcome is unsurprising given that hypothermia produces a multifactorial coagulopathy involving defective thromboxane A2 release, alterations in platelet function, and inhibition of the coagulation cascade. These effects can often be overlooked as most widely available tests of coagulation are compensated by temperature. When prothrombin times are measured at different temperatures a 3°C drop can increase the value by approximately 10%.[5]

A recent editorial in the *BMJ* said that a haemovigilance programme is overdue in the United Kingdom, with mandatory local participation; new funds to pay for training, innovation, and audit; removal of incentives to supply and use blood; and an independent body to administer the programme.[6] On this evidence it seems that aggressive perioperative warming policies should be considered as a means of reducing the need for allogenic blood transfusion.

Urology patients, particularly those presenting for transurethral prostatectomy, are at a relatively high risk of hypothermia and its consequences. They tend to be elderly and as such at higher risk of perioperative complications.[7] [w1] The use of irrigation fluids can cause significant fluid shifts[w2] and the development of the transurethral prostatectomy syndrome,[8] which may aggravate any problems secondary to hypothermia. If inadequately warmed the fluids can exacerbate drops in temperature.[9] [w3] Furthermore, many of these operations are carried out under regional anaesthesia, which has been shown to attenuate the thermogenic response to hypothermia,[10] thereby prolonging the adverse effects.

In 1984 Carpenter noted that hypothermia during transurethral prostatectomy has received relatively little attention in the urology literature, and this is still the case.[11] One study, which looked at the consequences of hypothermia in these patients, showed a clinically significant, adverse, haemodynamic response in those patients who were not warmed aggressively.[12]

Hypothermia can be reduced by the use of forced air warming blankets, irrigation fluid that has been warmed in a heating cabinet, and by warming intravenous fluid.[12] Blankets and fluid warmers are likely to present the largest ongoing costs; they currently cost approximately £11 ($18; €16) each. In our institution operating theatres cost £750 an hour to run, and a unit of packed red blood cells costs £120. A

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saving of one hour and three units of blood could perhaps cover the cost of warming 50 patients.

Perioperative warming can be cost effective and reduce a patient's discomfort by cutting the incidence of wound infections, length of stay in hospital, and shivering. It may also reduce the rate of allogenic blood transfusions and its associated risks. Given these end points it should now be possible to set up a randomised controlled trial to encompass all the possible benefits of maintaining perioperative normothermia.

Christopher Mark Harper *research fellow*

Centre for Anaesthesia, Middlesex Hospital, London W1T 3AA (drmarkharper@hotmail.com)

Thomas McNicholas *consultant urologist*

(mcnic@globalnet.com)

S Gowrie-Mohan *consultant anaesthetist*

Lister Hospital, Stevenage, Hertfordshire SG1 4AB

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Setting global health research priorities

Burden of disease and inherently global health issues should both be considered

When the G8 countries met in Canada in 2002 the topics of security, health, and Africa figured prominently. The three issues are related. Africa's human health is reeling from HIV/AIDS and other infectious diseases, posing national and regional security risks. The continent's economic health is stagnant or eroding, the result of structural adjustment programmes,[1] domestic conflicts, corruption, and deteriorating human health. Recognising the complexities of these entwined relations, the G8 Africa action plan included a commitment to support health research on diseases prevalent in Africa. How well G8 member nations—Canada, the United States, England, France, Germany, Italy, Japan, and Russia—abide by this commitment is a matter of time and lobbying efforts. But what form should this new health research investment take? Should it emphasise specific diseases affecting poor people most, as favoured by the Commission on Macroeconomics and Health of the World Health Organization?[2] Should it heed the call of biotechnology researchers, who have tabled their list of "top 10" research investments for global health, which range from better diagnostic devices and recombinant vaccines against HIV/AIDS to simpler vaccine devices replacing needle injections?[3]

Both lists are consistent with the "burden of disease" approach to research priorities. This approach has become an important vehicle for exposing the imbalance between research investment and disease burden, the "10/90 gap"—less than 10% of worldwide health research is devoted to diseases that account for 90% of the global burden of disease.[4] The burden of disease approach has helped efforts to create and finance new programmes for treatment and prevention of disease (for example, the Global Fund to Fight Aids, Tuberculosis and Malaria) or for vaccine research (for example, the Global Alliance for Vaccines and Immunisation), however inadequate these commitments are at present. But is the burden of disease approach sufficient to sustain improvements in human health? We think not and propose its integration with a different conceptualisation of global health that emphasises the social, environmental, and economic contexts in which health, disease, and healthcare interventions are embedded.

The social and environmental contexts that determine disease are no longer simply domestic but increasingly global. The box lists what we consider the main inherently global health issues, a term describing health determining phenomena that transcend national borders and political jurisdictions. Considerable research exists on each of these issues, although not always with health as a principal outcome. Greater attention in research is required to the linkages between these issues and to their economic and political drivers that are, like the issues, increasingly global in scope. Such drivers include macroeconomic policies associated with international finance institutions, liberalisation of trade and investment, global trade agreements, and technological innovations, all of which are creating greater interdependence between people and places.[5] Assessing how these inherently global health issues affect health is a complex task. Recent work on locating these inherently global health issues in comprehensive health frameworks,[5 6] however, will prove useful in identifying specific research questions that are useful to policy makers and civil society.

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