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New surgical thermal management guidelines

Core temperature is normally tightly controlled in human beings. However, general anaesthesia profoundly impairs the thermoregulatory system; to a lesser extent, so does neuraxial (spinal and epidural) anaesthesia. The result is that unwarmed surgical patients almost inevitably become hypothermic.¹

Core temperature usually decreases 1–1.5°C in the hour after induction of anaesthesia; this initial rapid onset of hypothermia results from redistribution of heat from the warmer core (trunk and head) to the cooler arms and legs. Core temperature subsequently decreases when heat loss exceeds metabolic heat production. Two factors contribute to an imbalance between heat production and loss. The first is that general anaesthesia reduces metabolic rate by about 30%; and the second is that surgical patients are exposed to a cool environment, compounded by evaporation from within surgical incisions and administration of cool intravenous fluids. Core temperatures nonetheless rarely decrease to 34.5°C or lower because re-emergence of thermoregulatory arteriovenous-shunt vasoconstriction constrains metabolic heat to the core thermal compartment, thus preventing further core hypothermia.²

Perioperative hypothermia was routine and considered unremarkable until about a decade ago. But since publication of the first randomised outcome trial in 1996,³ a series of studies have shown that even mild perioperative hypothermia (such as is typical

in unwarmed surgical patients) causes many severe consequences. Well-established consequences of mild perioperative hypothermia include a three-fold increase in surgical wound infections,^{3,4} a three-fold increase in morbid myocardial complications,⁵ increased bleeding and transfusion requirement,⁶ and prolonged recovery⁷ and hospitalisation,³ along with shivering and thermal discomfort.

Perioperative thermal management is an attractive topic for performance measures because, although published reports are compelling, many patients are still inadequately warmed. Furthermore, effective management is inexpensive, easy to implement, and remarkably safe. The US hospital cost of forced-air warming, for example, is usually less than \$10 per patient. Two guidelines related to thermal management will soon become effective in the USA.

The Surgical Care Improvement Project (SCIP) is a hospital-level public-reporting measure that is used to grade hospital quality and thus possibly influence patients' choice of facility. SCIP initially focused on surgical site infection; its hospital-level thermal management reports were thus restricted to colectomies under general anaesthesia, the specific population for which the best evidence was available. However, it is now established that mild hypothermia provokes many serious complications. A new version of the measure (version 3.0, SCIP-Inf-10), available in



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October, 2009, therefore includes all patients having general or neuraxial anaesthesia lasting an hour or more in whom therapeutic hypothermia is not specifically indicated. The requirements can be met by a temperature (site and device unspecified) of 36°C or higher within 30 min before the end of anaesthesia or within 15 min postoperatively. But terms of the measure can also be satisfied by the use of forced-air warming even in patients who remain hypothermic.⁸ The new SCIP measure thus combines process (use of effective warming) and outcome (normothermia).

The Physicians Quality Reporting Initiative (PQRI) results from the United States Tax Relief and Healthcare Act of 2006. PQRI measures are physician-based and associated with a 2% Medicare payment incentive. The incentives are currently linked to reporting compliance with the measure's terms; however, it is assumed that the incentive will soon be linked to actually fulfilling the measure's terms. The PQRI thermal management requirement was developed independently through a rigorous evidence-based process involving all major stakeholders. However, the measure was then harmonised with SCIP. Requirements for the two programmes are thus expected to be virtually identical. The PQRI thermal management measure has yet to be officially released, but is expected to become available

in January, 2010. Presumably, the details will then be available from the Centers for Medicare and Medicaid website.⁹ Although PQRI financial incentives only apply to Medicare payments, private insurers are likely to provide similar quality incentives.

Overwhelming evidence indicates that mild perioperative hypothermia causes many serious complications. Most patients are at risk for one or more hypothermia-induced complications. The coming SCIP and PQRI requirements reinforce a growing community standard-of-care that surgical patients should be kept normothermic. These new guidelines differ from previous ones in being broadly applicable in terms of patients and geographic region. PQRI also differs in being explicitly linked to financial incentives. Technically, of course, SCIP and PQRI guidelines only apply in the USA, but the science on which they are based is universal. With only rare exceptions, surgical patients worldwide should thus be kept normothermic.

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