The Essentials of Maintaining Patient Normothermia


Maintaining patient normothermia pre-, peri- and post-operatively is a critical element of preventing surgical site infections and other complications such as metabolic acidosis, cardiovascular effects, increased respiratory distress and surgical bleeding.

According to the Guideline Statement for the Maintenance of Normothermia in the Perioperative Patient from the Association of Surgical Technologists (AST), “Measures to monitor and maintain body temperature should begin in the pre-operative phase and continue into the postoperative phase of the surgical procedure. The monitoring of patient temperature is the responsibility of all surgical team members and not just the anesthesia provider. Maintaining normothermia in the perioperative patient is a collaborative effort between the anesthesia provider, the surgeon, perioperative personnel and perianesthesia personnel.”

The American Society of PeriAnesthesia Nurses (ASPAN)’s Evidence-Based Clinical Practice Guideline for the Promotion of Perioperative Normothermia states, “Perioperative hypothermia, defined as a core temperature below 36 degrees C, has adverse effects that range from patient thermal discomfort to increased morbidity and mortality. Even mild intraoperative hypothermia, a core temperature of 34 degrees C to 36 degrees C, has adverse consequences that are well documented ... The prevention of unplanned perioperative hypothermia and promotion of normothermia remains a national priority in the prevention of surgical site infection, and has been designated as a quality measure by the Surgical Care Improvement Project (SCIP).”

According to the AST guideline, perioperative temperature management is imperative to positive surgical outcomes. The body maintains its temperature between 36 degrees C and 38 degrees C by balancing heat production and heat loss. It is imperative for the surgical team to remember that the body loses heat through radiation (from tissues), conduction (contact with cool surfaces), evaporation (respiration) and convection (exposure to the environment).

The challenge lies in effective body temperature measurement and monitoring. According to the ASPAN guideline, “Although the measurement of core temperature (e.g., pulmonary artery, distal esophagus, nasopharynx, tympanic membrane [via thermistor]) is the best indicator of thermal status, core temperatures are frequently not feasible and unrealistic during the perianesthesia period. Skin temperature, easily obtained during the perioperative period, is a function of external influences and thermoregulatory function of the body. Clinically available ‘near-core’ measures (e.g.,
oral, bladder, rectal, temporal artery, tympanic membrane [via infrared sensor], axilla) must be relied on to evaluate thermal balance across much of the perianesthesia/perioperative period. Unfortunately, each near-core measure has limitations in the ability to reflect core temperature.” ASPAN acknowledges in its guideline that “the research on perianesthesia temperature measurement is weak due to a lack of controls, insufficient statistical analysis, and lack of replication,” but makes the following recommendations on temperature measurement: Near-core measures of oral temperature best approximates core; the same route of temperature measurement should be used throughout the perianesthesia period for comparison purposes; and caution should be taken in interpreting extreme values (e.g., 35 degrees C) from any site with near-core instruments.

Patients are at risk for hyperthermia during surgery because the average adult can lose 0.5 degrees C to 1.5 degrees C in temperature under anesthesia, and the greatest heat loss can occur during the first hour of sedation. As House (unpublished) notes, “The Surgical Care Improvement Project (SCIP), a national collaboration of healthcare organizations working to reduce surgical complications, states that maintaining a normothermic state in a surgical patient within the first 15 minutes after the patient leaves the operating room is a key measure to preventing infections.” The patient’s body temperature should be continuously monitored throughout the surgical procedure in order to assess any metabolic changes. According to the AST, risk factors for hypothermia include: a cold surgical environment; a large volume of irrigation; major blood or fluid loss; exposure of a large body cavity; the patient’s physical status and preexisting conditions; length and type of surgical procedure; and type of anesthesia.

For intraoperative warming, ASPAN makes the following recommendations:

**Assessment:**

Identify patient’s risk factors for unplanned perioperative hypothermia

Frequent intraoperative temperature monitoring should be considered in all cases

Assess for signs and symptoms of hypothermia

Determine patient’s thermal comfort level

Document and communicate all risk factor assessment findings to all members of the anesthesia/surgical team

**Interventions:**

All patients should receive the following:

Limit skin exposure to lower ambient environmental temperatures
Initiate passive warming measures

Maintain ambient room temperature from 20-25 degrees C based on AORN and architectural recommendations

Active warming should be implemented

There is evidence to suggest that alternative active warming measures may maintain normothermia when used alone or in combination with forced-air warming. These warming measures include: warmed IV fluids; warmed irrigation fluids; circulating water garments; circulating water mattresses; radiant heat; gel pad surface warming; and resistive heating.

SCIP provides the following guidance:

Limit heat loss in patients prior to operative procedure; keep at >36 degrees C

Standardize process to use warming devices (warming blankets, hot air blankets, IV fluid heaters, filter heater hydrator for laparoscopic procedures, warming caps) to ensure patient temperature >36 degrees C perioperatively

Warm patient preoperatively, intraoperatively and postoperatively

Standardize temperature monitoring method and process (perioperatively).

Adopt Thermal Management Flow Chart to evaluate, monitor and regulate patient temperature throughout perioperative period

Assign responsibility for preoperative temperature monitoring and regulation to preop/holding area

Assign responsibility for intraoperative temperature monitoring and regulation to anesthesia department

Assign responsibility for postoperative temperature monitoring and regulation to PACU/SICU

Regarding protocol, SCIP says to provide devices and protocol for consistent measurement of patient temperature and to revise charting to include required fields for interval temperature monitoring

Other SCIP provisions include:

Assure engineering controls allow surgical staff to control room temperature
Increase ambient room temperature in the OR. (increase humidity if ambient room temperature is increased to prevent dry eyes/skin among staff.)

Provide surgical staff with cooling gear/devices

Normothermia has its misperceptions among clinicians. For example, not every heat loss can be attributed to a lengthy surgery, according to Lois Lane of Enthermics Medical Systems. “I feel that most common misperception is that hyperthermia begins while the patient is undergoing lengthy surgical procedures,” she says. “Research has shown that that patient can begin to lose body heat while still in the preoperative holding area.”

“One misperception that we often address with medical professionals is the ability to recover a patient’s temperature once they have become hypothermic,” says Robyn Whalen of Kimberly-Clark Health Care. “Unfortunately, once the patient becomes hypothermic, it is difficult if not impossible, to recover to normothermia during the procedure. A patient’s temperature drops most significantly in the first hour and slowly continues for the next three to five hours. Making up that loss during the procedure is difficult, so it is vital to understand what can cause unintentional intra-operative hypothermia such as pre-operative fasting and medication which reduces the body’s ability to thermo-regulate itself; cold holding areas, OR tables, irrigation fluids, infusion of fluids and prep solutions, and open body cavities. General anesthesia also causes heat loss from the lungs via inhaled gases, as well as medication-induced vasodilation, decreased metabolic rate, decreased tissue perfusion and redistribution hypothermia.”

Whalen continues, “Another misperception is that traditional methods of warming can be ‘tweaked’ or maximized to achieve a satisfactory result in difficult cases. There are limitations on the lengths of procedures, types of procedures, amount of surface area access, etc. that traditional warming methods were designed to address. It is important that the OR team be aware of these limitations and ensure alternative technologies are considered for these cases.”

Another misperception is the idea that only certain patients are vulnerable to unintended hypothermia and its associated complications. “We hear so many stories of hospitals selectively warming their patients based on age, condition or procedure length,” says Troy Bergstrom of Arizant Healthcare. “Those factors just shouldn’t be the basis for deciding who should be warmed. The greatest impact on initial temperature drop is the body’s physiological reaction to the induction of anesthesia, meaning any anesthetized patient is at risk. A healthy 26-year-old woman is at the same risk as a frail 80-year-old man. Every surgical patient should be warmed.” Bergstrom adds, “Another misperception is that today’s warming technologies are similarly effective, and that is certainly not the case. With the new CMS normothermia measure now a reality, products with broad clinical flexibility and proven efficacy are more important than ever. Ask for efficacy studies and research the product features. Often it can be small yet very important additional features, like a specialized perforation pattern in forced-air warming blankets or drain holes in an underbody design that can set one product apart from another.”
The use of warming blankets is a common method of maintaining normothermia, and Lane says the application of a single heated blanket while the patient is in pre-op should be considered to be a best practice. “Warmed blankets are known to reduce heat loss by 33 percent,” she says. “Increased skin temperatures from warmed blankets help with pre-surgical vasodilation and aids in easier IV access.”

Bergstrom recommends making patient warming a standard practice. “Implement a warming protocol that is simple, straight-forward and then apply it to every surgical patient,” he says. “Next, warm throughout the perioperative process, but start in pre-op. It’s easier to maintain normothermia that it is to warm a hypothermic patient. To accomplish both of these suggestions, look for flexible warming technology. For example, a product like the Bair Paws Flex gown that can be used before, during and after surgery, and with upper- and lower-body cases, offers a practical, economic solution as more patients are warmed.”

Whalen says that in addition to following the manufacturer’s best practice guideline, it is also important to follow AORN’s recommended practices for prevention of unplanned perioperative hypothermia. “Overall, there are 10 recommended best practices developed by AORN. Though all of the recommendations are important, here are some that we believe to be key to helping facilities prevent hypothermia and maintain normothermia for their patients undergoing surgery.” They are:

Facilities need to develop a care plan to minimize risk. The care plan should include establishing expected patient outcomes and collaborating with anesthesia care providers in the selection of appropriate temperature monitoring technology and intervention risk of unplanned hypothermia.

Select equipment for core temperature monitoring based on reliability and access. Also make sure that the core temperature of patients at risk of unintentional hypothermia is monitored preoperatively, intraoperatively and postoperatively.

Lastly, it is key that administrative personnel assess and document annual competency of personnel and prevention of unplanned hypothermia and safe use of warming devices and accessories according to hospital and departmental policy. It is also beneficial to provide education throughout the year on hypothermia techniques as well as staying abreast on the latest updates from the various associations that they report to.

It is important to note that the use of warming blankets should be carefully monitored to prevent injury to the patient. House (unpublished) notes, “In May 2005, the Emergency Care Research Institute (ECRI) issued a warning that fluid and blanket warmers be limited to a temperature no higher than 43 degrees C (110 degrees F) to decrease the risk of thermal injuries to patients. ECRI further clarified its position in 2006, stating that while some warming cabinets may be designed with a wide range of temperature settings allowing a variety of temperature settings, patient safety and the prevention of thermal burns should be a primary concern. ECRI asserted that temperatures above 110 degrees F unnecessarily increased the risk of burns while providing no added clinical benefit. In
July 2009, ECRI published a hazard report update changing the recommended safe temperature setting for blanket warmers to 130 degrees F with the provision that solutions would not be warmed in the same cabinet. The Association of periOperative Registered Nurses (AORN) amended their Recommended Practices for a Safe Environment of Care (2010) to reflect ECRI’s updated guidelines. While the Joint Commission currently does not have any required range settings for the temperature of blanket warming cabinets, their environment of care standards (EC 6.10 and 6.20) require that institutions provide written plans concerning the effective, safe and reliable operation of medical equipment.”

Besides the clinical benefits, normothermia maintenance pays dividends in patient satisfaction. House (unpublished) observes, “Maintenance of the surgical patient in a normothermic state commences at time of admission to the preoperative unit. As part of the pre-surgical preparation and assessment, the nurse routinely asks the patient about feeling cold as well as monitoring temperature measurement. Intuitively, the nurse knows that by providing a warmed blanket the patient will not only feel warmer but also have a sense of comfort and well being. That intuitive knowledge has been validated through patient satisfaction measurement and improvement surveys conducted by independent healthcare research companies such as Press Ganey.”

The AST outlines a sample protocol for preventing hypothermia in the surgical patient:

1. Limit the amount of skin exposed during all phases of the surgical procedure. Suggestions: Surgical team members coordinate efforts to keep patient covered and warm during the preoperative and postoperative phases with the use of warm blankets or warming devices.

2. Monitor patient’s temperature during all phases of the surgical procedure. Suggestions: This is primarily a role of the anesthesia provider, but the circulator or surgical assistant can provide assistance in monitoring the patient’s temperature by checking the temperature surface monitor that is placed on the patient’s forehead.

3. Use warmed irrigation and infusion fluids/solutions. Suggestions: The CST and CFA should use irrigation fluids obtained from the blanket and solution warmer located in the sub-sterile room.

4. Use of warmed anesthetic gases. Suggestions: The anesthesia provider is responsible for this function.

5. Monitor operating room temperature and humidity closely. Suggestions: The CST and CFA should follow established recommendations for temperature and humidity levels in the OR, and periodically check and record these levels for each operating room.

6. Utilize heat-maintenance devices (head coverings, leggings, forced-air warming systems, hypothermia/hyperthermia mattress, reflective blankets/head coverings, radiant heat sources). Suggestions: The CST and CFA should know the proper procedures for
operating warming devices and the safety protocol associated with the use of any type of warming device as established by hospital policy and manufacturer’s recommendations.

References:


House LR. Blankets Warmed to 200 Degrees F: Do No Harm. Enthermics Medical Systems white paper.