Reducing the Risk of Unplanned Perioperative Hypothermia

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ABSTRACT

Maintaining normothermia is important for patient safety, positive surgical outcomes, and increased patient satisfaction. Causes of unplanned hypothermia in the OR include cold room temperatures, the effects of anesthesia, cold IV and irrigation fluids, skin and wound exposure, and patient risk factors. Nurses at Riddle Memorial Hospital in Media, Pennsylvania, performed a quality improvement project to evaluate the effectiveness of using warm blankets, warm irrigation fluids, or forced-air warming on perioperative patients to maintain their core temperature during the perioperative experience. Results of the project showed that 75% of patients who received forced-air warming perioperatively had temperatures that reached or were maintained at 36° C (96.8° F) or higher within 15 minutes after leaving the OR. AORN J 92 (November 2010) 553-562. © AORN, Inc, 2010. doi: 10.1016/j.aorn.2010.06.015

Key words: normothermia, hypothermia, perioperative patient warming.

Perioperative normothermia is important for patient safety, positive surgical outcomes, and patient satisfaction. Maintaining normothermia has been proven to decrease the postoperative length of hospital stay by as much as 40% and has been shown to decrease the risk of surgical site infections by 64%. Unplanned perioperative hypothermia is widely recognized as a preventable cause of many complications and adverse reactions in patients undergoing surgical interventions. An estimated 50% to 90% of surgical patients (ie, approximately 14 million patients) experience unplanned surgical hypothermia each year. Thus, one responsibility of perioperative nurses is to prevent this avoidable surgical complication. We undertook a quality improvement project to evaluate methods of perioperative patient warming to facilitate a change in nursing practice at Riddle Memorial Hospital, Media, Pennsylvania. Our goals were to achieve optimal results in patient temperatures, meet governing agency requirements for patient safety, and minimize patient risks.

HOW IS NORMOTHERMIA MAINTAINED?

Thermal regulation is the body’s physiological means of balancing heat production with heat loss. The hypothalamus regulates body temperature in
the central nervous system by acting as a thermostat that responds to temperature changes. Normothermia is defined as a core body temperature in the range of 36°C to 38°C (96.8°F to 100.4°F). Hypothermia occurs when a patient’s core temperature drops below 36°C (96.8°F). Vasoconstriction or vasodilatation occurs to increase or decrease the body’s temperature. Normal thermoregulatory vasoconstriction maintains core body temperature two to four degrees warmer than the peripheral temperature of the body. Vasoconstriction from hypothermia reduces the flow of nutrients to the body, altering the wound healing process by lessening oxygen delivery to tissue. When oxygen is limited, neutrophils, the first line of white blood cell defense, are not able to perform at optimal levels, which increases the risk for infection.

Often, core body temperature is measured in the pulmonary artery, but it also can be monitored in the distal esophagus, nasopharynx, and tympanic membrane. The oral, axillary, bladder, rectal, and forehead skin temperature monitoring techniques can be used to estimate core temperature. During general anesthesia, core body temperatures are usually monitored in the esophagus, rectum, or bladder; however, these techniques are invasive and are considered unhygienic. Bladder temperature readings are similar to rectal temperature readings; however, decreased urine flow can pose interpretation difficulties. Skin surface site temperatures are usually 0.5°C (0.9°F) lower than oral temperatures. Core body temperatures should be monitored in anesthetized patients for all procedures that last longer than 30 minutes.

**TYPES OF HEAT LOSS**
Maintaining normothermia can be challenging in the perioperative environment. In the OR, patients lose heat rapidly for many reasons, for example, low ambient room temperatures, vasoconstriction as a result of general anesthesia, skin exposure caused by the surgical procedure and positioning requirements, exposure of internal organs, and use of room-temperature irrigation and IV fluids. Radiation, convection, conduction, and evaporation are four important factors that affect perioperative heat loss. Radiation and convection are the major contributors to heat loss and result in 85% of perioperative heat loss. Conduction and evaporation account for the remaining 15% of total heat loss.

Radiant heat is a form of energy that is given off from a central source (eg, the body). Radiation is the transfer of heat from an object surface without direct contact to another surface (eg, by removing clothing, exposure to cold air). Radiant heat loss occurs through the skin by vasodilatation. Body positioning increases radiant heat loss (eg, the fetal position minimizes heat loss, the supine position increases heat loss).

Convection is the transfer of heat through a gas or liquid. Heat loss by convection occurs as air or liquid transfers across the patient’s skin (eg, prep solutions, irrigation solutions).

Conduction is a process whereby heat is transferred from one substance to another because of a difference in temperature. Conduction heat loss occurs in the OR when the patient’s body comes in contact with colder objects (eg, mattresses, equipment).

Evaporation is the change of a substance from a liquid to a gaseous state. Evaporative heat loss occurs through sweating or by the drying of liquid substances on the patient (eg, prep solutions).

**PERIOPERATIVE HYPOTHERMIA**
The causes of unplanned perioperative hypothermia are numerous, and the types of patients at risk vary. Ambient room temperatures, length of
surgery, blood and fluid loss, anxiety, and the effects of anesthesia (eg, general, regional) contribute to a decrease in core body temperature by altering hypothalamic body temperature regulation.\textsuperscript{2} Wet skin preps, skin exposure related to specific surgical procedures or positioning, and the use of cold or room-temperature fluids for body cavity irrigation also contribute to unplanned loss of heat.\textsuperscript{1} A patient’s body type (eg, very thin, malnourished) can affect heat loss. Individuals at greater risk for unplanned hypothermia include

- neonates,
- patients who have experienced trauma,
- patients who experienced a burn,
- older adults,
- female patients,
- patients experiencing significant fluid shifts, and
- patients with certain pre-existing conditions (eg, peripheral vascular disease, endocrine disorders, pregnancy, open wounds).\textsuperscript{1,2}

Unplanned perioperative hypothermia affects multiple body systems, including the respiratory, cardiovascular, adrenergic, and immune systems.\textsuperscript{16} A 1.5° C (3.6° F) decrease in temperature can increase

- muscle relaxation action;
- the need for red blood cells, plasma, and platelets;
- time in the postanesthesia care unit (PACU); and
- blood loss by approximately 500 mL.

In addition, hypothermia can alter medication metabolism and cause variations in electrolyte levels. These factors may result in prolonged hospital stays and an increase in the incidence of surgical site infections.\textsuperscript{1}

Hypothermia increases discomfort in the unanesthetized patient and results in shivering, which increases oxygen consumption and the workload of the myocardium, and thus can increase blood pressure.\textsuperscript{17} Overall, thermal discomfort is an unpleasant experience for the patient before and after he or she is anesthetized. The body’s ability to control and conserve heat is further impaired by anesthetic agents, which affect the patient’s ability to regulate temperature.\textsuperscript{12}

After induction of general anesthesia, warmer blood from the patient’s core mixes with cooler peripheral blood; this is referred to as the redistribution phase. The cooler blood circulates and returns to the heart. Within 30 minutes of induction, this cooled blood that returns to the heart can cause a core body temperature drop of 1° C (1.8° F).\textsuperscript{1} The largest heat loss occurs within the first hour after induction, and the patient is at risk for additional heat loss during the next two- to three-hour period under anesthesia.\textsuperscript{1} This is a slow process, which is followed by a temperature-loss plateau that occurs three to four hours after induction.\textsuperscript{1}

During anesthesia, hypothermia can cause cardiac arrhythmias and increase the need for mechanical ventilation, which can increase the risk of patient mortality.\textsuperscript{18} At 30° C (86° F), a 30% decrease in cardiac output occurs.\textsuperscript{17} Temperatures below 30° C (86° F) produce atrial flutter and fibrillation.\textsuperscript{1} Ventricular tachycardia and ventricular fibrillation result from core temperatures below 28° C (82.4° F), and asystole occurs at temperatures below 15° C (50° F).\textsuperscript{1}

**PREVENTING HYPOTHERMIA**

AORN’s “Recommended practices for the prevention of unplanned perioperative hypothermia” describes optimal patient care and is provided to guide the perioperative nurse in maintaining normothermia and preventing unplanned hypothermia.\textsuperscript{19} Perioperative nurses should assess surgical patients for risks that would contribute to unplanned hypothermia and develop and implement a plan to decrease these risks.\textsuperscript{6,19} A perioperative nursing care plan for surgical patients at risk of imbalanced body temperature is provided in Table 1.

The nurse should assess the patient’s baseline temperature on arrival in the holding area. The
<table>
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| Risk for imbalanced body temperature | ■ Assesses risk for normothermia regulation.  
■ Assesses risk for inadvertent hypothermia.  
■ Assesses risk for inadvertent hyperthermia.  
■ Identifies physiological status by  
  ■ assessing diagnostic study results;  
  ■ evaluating buccal membranes, sclera, and skin (eg, dryness, cyanosis, jaundice);  
  ■ performing or reviewing assessment of and identifying deviations in the patient’s  
    ■ peripheral tissue perfusion;  
    ■ cardiovascular status;  
    ■ respiratory system;  
    ■ renal status;  
    ■ nutritional status (eg, basal metabolic rate, weight gain or loss, skin turgor); and  
    ■ liver status (eg, ascites).  
■ Identifies patient’s NPO status before surgery.  
■ Assesses baseline temperature.  
■ Records patient’s height and current weight.  
■ Plans nursing care based on physiological data.  
■ Reports deviation in diagnostic study results by  
  ■ reporting variances in diagnostic study results (eg, laboratory, pathology, hemodynamic monitoring) to appropriate members of the health care team;  
  ■ communicating physiological health status (eg, verbal reports, patient record) to appropriate team members; and  
  ■ collaborating with other health care providers regarding diagnostic study results or assessment findings.  
■ Implements thermoregulation measures by  
  ■ selecting temperature-monitoring devices based on identified patient needs;  
  ■ implementing appropriate passive warming measures to implement preoperatively (eg, head coverings, socks);  
  ■ implementing appropriate active warming measures (eg, forced-air warming, warmed irrigation and IV fluids, elevated OR room temperature);  
  ■ ensuring that devices are readily available, clean, and functioning according to manufacturers’ specifications before inserting, attaching, or placing devices on the patient;  
  ■ inserting or applying temperature-monitoring and regulation devices to the patient according to the plan of care, facility practice guidelines, and manufacturers’ written instructions; | ■ The patient’s temperature is greater than 36° C (96.8° F) at time of discharge from the operating or procedure room.  
■ The patient is at or returning to normothermia at the conclusion of the immediate postoperative period. |
A preoperative nurse should intervene, depending on the patient’s preoperative temperature, to normalize or maintain the patient’s temperature before surgery.

All patients are at risk for hypothermia in the OR; however, patients who are either very young or elderly are at increased risk because they lose heat more rapidly and are less able to maintain their body temperature. The nurse should provide passive warming measures before surgery (eg, head coverings, socks) to maintain the patient’s temperature and plan for warming measures in the OR to prevent inadvertent hypothermia (eg, forced-air warming, warmed irrigation and IV fluids, reduced body exposure to room air, elevated OR temperature).

Patients with extremes in body weight or condition (eg, thin, obese, malnourished) are at risk for hypothermia because of body surface area to weight ratios. The nurse should plan to implement all methods of temperature maintenance and preservation available for these patients.

Procedures that last more than one hour and that expose large patient body cavities to room air and cool irrigation fluids place the patient at risk for hypothermia. Perioperative nurses should collaborate with the surgeon and anesthesia care provider to determine the advisability of increasing the OR temperature, using warm irrigation fluids, and instituting forced-air warming.

Positions that expose large areas of the patient’s body to OR temperatures or which alter normal circulation contribute to heat loss. Perioperative team members should implement methods to reduce the patient’s exposure (eg, cover unnecessarily exposed areas of the body, warm the areas of the body not involved in the surgery).

Refrigerated fluids (eg, blood products) or crystalloid solutions administered to the patient at room temperature or used as irrigation can lower the core temperature. These fluids should be warmed, if possible.

Certain chronic conditions (eg, metabolic, cardiac, respiratory) have the potential to affect the patient’s temperature in the perioperative environment. Perioperative nurses should identify and assess the patient for comorbidities and work cooperatively with other members of the surgical team (eg, surgeon, anesthesia care provider) to treat comorbidities preoperatively, intraoperatively, and postoperatively as needed.

Trauma can affect the patient’s core temperature, either as a result of prolonged exposure, blood loss, or shock. Hypothermia can cause coagulopathies and acidosis, which can increase the risk of death. Trauma that involves burns

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**TABLE 1. (Continued)**

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<tr>
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<td>■ operating temperature-monitoring and regulation devices according to manufacturers’ written instructions; ■ removing temperature-monitoring and regulation devices from the patient when indicated; and ■ ensuring that the malignant hyperthermia cart is complete and medications are available and within expiration date. ■ Monitors body temperature. ■ Monitors physiological parameters. ■ Evaluates response to thermoregulation measures.</td>
<td></td>
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can further affect a patient’s ability to regulate temperature.19

TEMPERATURE-REGULATING MEASURES IN THE PACU
The American Society of PeriAnesthesia Nurses recommends that every patient undergoing surgery be considered at risk for unplanned hypothermia and be assessed on admission to phase I PACU.2 If the patient’s temperature is within the normothermic range (ie, 36° C to 38° C [96.8° F to 100° F]), then the PACU nurse should institute maintenance measures, including maintaining the patient’s temperature, providing pain control, and ensuring hydration. Increasing ambient room temperature, providing warm blankets, and minimizing skin exposure are helpful.18 Socks and head coverings also are effective interventions.2

If the patient is normothermic, the postanesthesia care unit nurse should institute maintenance measures. If the patient is hypothermic, the nurse should institute active warming measures.

OUR PROJECT
The purpose of our project was to research and implement best practices to ensure normothermia in surgical patients and to meet the AORN standard of care outlined in the “Recommended practices for the prevention of unplanned perioperative hypothermia.”19 Our focus was to improve outcomes for patients and to use the data we recovered to assist us in making the best choices for patients’ treatment and equipment investments. Meeting the Surgical Care Improvement Project normothermia goal for surgical patients inspired our management group to initiate trials on methods of patient warming.

Although the focus of the national quality measures is normothermia in the immediate postoperative period for patients undergoing colorectal surgery,23 we chose to monitor patients undergoing our highest volume surgical procedure: laparoscopic cholecystectomy. By focusing on this subset of patients, we compared various warming mechanisms and processes to determine which would provide the best patient outcome.

All patients received tympanic membrane temperature monitoring on entry into the preoperative holding area, during the surgical procedure, and in the PACU. The perioperative educator ensured that all health care providers responsible for obtaining the temperature readings were trained on the proper use of the tympanic membrane thermometer and deemed competent in its use before the project. Biomedical engineering staff members calibrated and tested the thermometers regularly.

We conducted three trials of warming the patient with different methods and at separate intervals.
Unplanned Perioperative Hypothermia

Unplanned perioperative hypothermia is more than just a patient comfort issue. Perioperative nurses have become increasingly aware of the many adverse effects of unplanned perioperative hypothermia, foremost of which is the increased risk of surgical site infection. The preoperative patient assessment, perioperative interventions, and discharge criteria for preventing unplanned hypothermic events are the same no matter the type of health care facility (eg, inpatient, ambulatory surgery, office-based surgery). Nevertheless, ambulatory surgery nurses have an additional challenge that nurses in inpatient facilities might not experience. If a patient is identified during the preoperative nursing assessment as being at increased risk for unplanned hypothermia or, in fact, presents with pre-existing hypothermia (eg, patients who are homeless, older adult patients, pediatric patients), nurses in the preoperative area may encounter time constraints that make it difficult, if not impossible, to resolve the problem. Many clinical trials have shown the effectiveness of preoperative forced-air warming for preventing unplanned hypothermia, but ambulatory surgery nurses may lack the time needed to institute forced-air warming before surgery. Presenting evidence-based research to surgeons and facility managers will help pave the way to instituting routine preoperative warming in spite of the time constraints.

If a patient arrives in the postanesthesia care unit (PACU) in a hypothermic state, then the PACU nurses continue intraoperative or initiate postoperative warming interventions. Again, this can pose time challenges. Typically, patients in ambulatory settings want to move through recovery quickly so that they can go home as soon as possible, and it is also in the facility’s best interest financially, to decrease the length of the patient’s recovery time. The limited time that a patient has in recovery in an ambulatory setting may make it more difficult to achieve desired normothermia goals. If routine preoperative warming is implemented and standard intraoperative warming techniques are used (eg, forced-air warming, warmed irrigation and IV fluids), then the incidence of patients arriving in the PACU in a hypothermic state will be reduced, thus lessening the effect of prolonged PACU stays on the rapid flow of patients through the unit.

Preoperative assessment, perioperative interventions, and discharge criteria to prevent unplanned perioperative hypothermia are the same regardless of the surgical setting. Ambulatory surgery nurses in all three perioperative areas must take the necessary steps to avoid this very preventable surgical complication.

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Ms Holm has no declared affiliation that could be perceived as posing a potential conflict of interest in the publication of this article.

Trial 1 (control group)—Warm blankets were used to provide temperature maintenance during the intraoperative and postoperative periods.

Trial 2—Warmed irrigation fluids were used intraoperatively.

Trial 3—Forced-air warming was used preoperatively, intraoperatively, and postoperatively.

Patient participants consisted of men and women older than 18 years of age who were undergoing laparoscopic cholecystectomy. We measured the patients' temperatures before surgery and then instituted the temperature-control method assigned to each trial as the means to keep the patients warm. We maintained the OR temperature between 20° C to 22.7° C (68° F to 73° F). We compared patient temperatures in each group within the first 15 minutes after leaving the OR.

**Trial 1**

From November 2007 through February 2008, we used warm blankets on 28 randomly selected patients as the only means of maintaining or warming body temperature. We did not use any means of warming the patient before surgery; we applied a warm blanket at the beginning of the procedure and replaced it with another warm blanket at the end of the procedure before the patient left the OR. We also applied warmed blankets in the PACU. Participants in this group included

- one woman between the ages of 18 and 25 years,
- 25 women between the ages of 25 and 44 years,
- one woman older than age 45 years, and
- one man between the ages of 25 and 44 years.

Within 15 minutes after leaving the OR, 54% of the patients had temperatures of 36° C (96.8° F) or higher.

**Trial 2**

In the second trial, we used warmed laparoscopic irrigation fluid as the only means of warming. We monitored a group of 28 randomly assigned patients from June 2008 through July 2008. Participants in this group included

- two women between the ages of 18 and 25 years,
- 22 women between the ages of 25 and 44 years,
- two women older than age 45 years,
- one man between the ages of 25 and 44 years, and
- one man older than age 45 years.

Within 15 minutes after leaving the OR, the temperatures of 68% of the patients increased to or were maintained at 36° C (96.8° F) or higher.

**Trial 3**

We monitored another group of 28 randomly selected patients from August 2008 to September 2008. We initiated forced-air warming preoperatively and continued its use intraoperatively and postoperatively. Participants in this group included

- one woman between the ages of 18 and 25 years,
- 19 women between the ages of 25 and 44 years,
- five women older than age 45 years,
- one man between the ages of 18 and 25 years, and
- two men between the ages of 25 and 44 years.

Within 15 minutes after leaving the OR, 75% of patient temperatures reached or were maintained at 36° C (96.8° F) or higher.

**FOLLOW-UP**

We conducted a follow-up project six months after the collection of our initial data by reviewing data on 28 randomly chosen surgical patients older than 18 years of age who were undergoing procedures from all surgical specialties. Forced-air warming had been used for these patients. Our review of the data from these patients was profoundly positive: 100% of the patients maintained a temperature of 36° C (96.8° F) or higher within 15 minutes of leaving the OR. These data showed that forced-air warming was successful.
with patients and during procedures other than laparoscopic cholecystectomy. The results indicated that forced-air warming initiated before surgery and carried through the patient’s stay in the PACU is the best method for maintaining normothermia. We collaboratively reviewed our findings with perioperative staff members, nursing administration personnel, members of the education and anesthesia departments, and the surgeons. Forced-air warming yielded the best outcomes for surgical patients in our project (Figure 1).

Companies offer an array of choices to warm surgical patients, but forced-air warming has been shown to reduce radiant and convection heat loss simultaneously. Forced-air warming also is both cost-effective and efficient in maintaining normothermia. Preoperative forced-air warming of the surgical patient increases the patient’s total peripheral temperature, limits the cooling rate of his or her blood, and promotes warmer blood returning to the patient’s core, which produces a higher core temperature. The cost of using forced-air warming is approximately $7 to $20 per patient at this time.

**CONCLUSION**

Although surgeries that last less than 30 minutes often do not trigger the need for forced-air warming, patients undergoing short procedures can still experience unplanned hypothermia. As a result of this project, forced-air warming is now used for all surgical patients at our facility. The newly adapted process was implemented and remains an ongoing practice for all our surgical patients. Education for staff members and surgeons will continue, and random reviews of the surgical procedure data will be conducted to confirm ongoing positive patient outcomes. The results of our project have sparked interest in furthering the investigation to determine the amount of time all postoperative surgical patients require to reach desired temperatures. By investigating this, we...
hope to achieve postoperative patient temperatures of 36°C (96.8°F) or higher in all postoperative surgical patients in less than the benchmarked 15 minutes.

References

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Reducing the Risk of Unplanned Perioperative Hypothermia

PURPOSE/GOAL

To educate perioperative nurses about evidence-based practices to prevent unplanned perioperative hypothermia.

OBJECTIVES

1. Identify the incidence of unplanned perioperative hypothermia.
2. Describe how body temperature is regulated.
3. Discuss core body temperature measurement.
4. Discuss causes of unplanned perioperative hypothermia.
5. Describe the effects of unplanned perioperative hypothermia.
6. Identify thermoregulation measures that perioperative nurses can use.

The Examination and Learner Evaluation are printed here for your convenience. To receive continuing education credit, you must complete the Examination and Learner Evaluation online at http://www.aorn.org/CE.

QUESTIONS

1. Approximately ___________ patients experience unplanned perioperative hypothermia each year.
   a. 100,000
   b. 1 million
   c. 5 million
   d. 14 million

2. Body temperature is regulated by the
   a. brain stem.
   b. hypothalamus.
   c. pituitary.
   d. frontal lobe.

3. Vasoconstriction from hypothermia can
   1. inadvertently alter wound healing by lessening oxygen delivery to tissue.

4. Core body temperature can be estimated by using temperature monitoring techniques from sources such as the
   1. axilla.
   2. bladder.
   3. forehead skin.
   4. mouth.
   5. pulmonary artery.
   6. rectum.
5. A potential complication of using bladder temperature readings to estimate core temperature is that decreased urine flow can pose interpretation difficulties.
   a. true
   b. false

6. Core body temperatures should be monitored in anesthetized patients for all procedures that are longer than _____ minutes.
   a. 30
   b. 45
   c. 60
   d. 90

7. Transfer of heat through a gas or liquid is called
   a. conduction.
   b. convection.
   c. evaporation.
   d. radiation.

8. Factors that can contribute to unplanned perioperative hypothermia include
   1. ambient room temperatures.
   2. effects of anesthesia.
   3. length of surgery.
   4. presence of some pre-existing conditions.

9. Hypothermia can alter medication metabolism and cause variations in electrolyte levels.
   a. true
   b. false

10. Perioperative nurses should implement appropriate thermoregulation measures such as
    1. selecting temperature-monitoring devices based on identified patient needs.
    2. placing warm irrigation bottles under the patient’s knees while the patient is in the supine position.
    3. implementing appropriate passive warming measures to implement before surgery (eg, head coverings, socks).
    4. implementing appropriate active warming measures (eg, forced-air warming, warmed irrigation and IV fluids, elevated OR room temperature).
    5. inserting or applying temperature-monitoring and regulation devices to the patient according to the plan of care, facility practice guidelines, and manufacturers’ written instructions.

The behavioral objectives and examination for this program were prepared by Rebecca Holm, MSN, RN, CNOR, clinical editor, with consultation from Susan Bakewell, MS, RN-BC, director, Center for Perioperative Education. Ms Holm and Ms Bakewell have no declared affiliations that could be perceived as potential conflicts of interest in publishing this article.
Reducing the Risk of Unplanned Perioperative Hypothermia

This evaluation is used to determine the extent to which this continuing education program met your learning needs. Rate the items as described below.

OBJECTIVES
To what extent were the following objectives of this continuing education program achieved?
1. Identify the incidence of unplanned perioperative hypothermia. 
   Low 1. 2. 3. 4. 5. High
2. Describe how body temperature is regulated. 
   Low 1. 2. 3. 4. 5. High
3. Discuss core body temperature measurement. 
   Low 1. 2. 3. 4. 5. High
4. Discuss causes of unplanned perioperative hypothermia. Low 1. 2. 3. 4. 5. High
5. Describe the effects of unplanned perioperative hypothermia. Low 1. 2. 3. 4. 5. High
6. Identify thermoregulation measures that perioperative nurses can use. 
   Low 1. 2. 3. 4. 5. High

CONTENT
7. To what extent did this article increase your knowledge of the subject matter? 
   Low 1. 2. 3. 4. 5. High
8. To what extent were your individual objectives met? Low 1. 2. 3. 4. 5. High
9. Will you be able to use the information from this article in your work setting? 
   1. Yes 2. No

10. Will you change your practice as a result of reading this article? (If yes, answer question #10A. If no, answer question #10B.)
10A. How will you change your practice? (Select all that apply)
   1. I will provide education to my team regarding why change is needed.
   2. I will work with management to change/implement a policy and procedure.
   3. I will plan an informational meeting with physicians to seek their input and acceptance of the need for change.
   4. I will implement change and evaluate the effect of the change at regular intervals until the change is incorporated as best practice.
   5. Other: __________________________

10B. If you will not change your practice as a result of reading this article, why? (Select all that apply)
   1. The content of the article is not relevant to my practice.
   2. I do not have enough time to teach others about the purpose of the needed change.
   3. I do not have management support to make a change.
   4. Other: __________________________

11. Our accrediting body requires that we verify the time you needed to complete the 2.2 continuing education contact hour (132-minute) program: __________________________

This program meets criteria for CNOR and CRNFA recertification, as well as other continuing education requirements.
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A score of 70% correct on the examination is required for credit. Participants receive feedback on incorrect answers. Each applicant who successfully completes this program can immediately print a certificate of completion.