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# HYPOTHERMIA



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<sup>P</sup> indicates a recommendation or evidence relevant to pediatric care.

## MEDICAL ABBREVIATIONS & ACRONYMS

**ASPAN** – American Society of PeriAnesthesia Nurses  
**ERAS** – Enhanced Recovery After Surgery  
**FDA** – US Food and Drug Administration  
**IV** – Intravenous  
**NICE** – National Institute for Health and Clinical Excellence

**OR** – Operating room  
**PACU** – Postanesthesia care unit  
**MHAUS** – Malignant Hyperthermia Association of the United States  
**RCT** – Randomized controlled trial

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## GUIDELINE FOR PREVENTION OF HYPOTHERMIA

The Guideline for Prevention of Hypothermia was approved by the AORN Guidelines Advisory Board and became effective as of July 1, 2019. The recommendations in the guideline are intended to be achievable and represent what is believed to be an optimal level of practice. Policies and procedures will reflect variations in practice settings and/or clinical situations that determine the degree to which the guideline can be implemented. AORN recognizes the many diverse settings in which perioperative nurses practice; therefore, this guideline is adaptable to all areas where operative or other invasive procedures may be performed.

### Purpose

All perioperative patients are at risk for developing unplanned **hypothermia**. This document provides guidance to the perioperative team for measuring the patient's body temperature, selecting methods for the prevention or treatment of unplanned hypothermia, and implementing the selected warming interventions.

In this document, hypothermia is defined as a core body temperature of  $< 36^{\circ}\text{C}$  ( $< 96.8^{\circ}\text{F}$ ).<sup>1</sup> Although the definition of hypothermia varies among sources, it is frequently stated as body temperature lower than  $35^{\circ}\text{C}$  or  $36^{\circ}\text{C}$  ( $95^{\circ}\text{F}$  or  $96.8^{\circ}\text{F}$ ).<sup>2,3</sup> Hypothermia may be further delineated as

- mild ( $32^{\circ}\text{C}$  to  $35.9^{\circ}\text{C}$  [ $89.6^{\circ}\text{F}$  to  $96.6^{\circ}\text{F}$ ]),
- moderate ( $28.1^{\circ}\text{C}$  to  $31.9^{\circ}\text{C}$  [ $82.6^{\circ}\text{F}$  to  $89.4^{\circ}\text{F}$ ]), or
- severe ( $< 28^{\circ}\text{C}$  [ $< 82.4^{\circ}\text{F}$ ]).<sup>4</sup>

The human body has two thermal compartments: the core and the peripheral.<sup>5</sup> The core body compartment includes primarily the trunk and head, which have a nearly constant temperature in a wide range of environments and thermoregulatory responses. The peripheral thermal compartment is composed of tissues that are mostly in the arms and legs, and the temperatures in these tissues are typically lower than core body temperature. The core temperature is normally tightly regulated, but the peripheral temperature may vary over a wider range. A change in the core or peripheral temperature normally leads to a behavioral or an autonomic response. A behavioral response to a temperature decrease may be moving into a warmer environment or putting on more clothing. The primary autonomic responses to a decrease in core body temperature are vasoconstriction and shivering. Anesthesia (eg, general, neuraxial, regional) prevents or alters these behavioral and autonomic responses, which results in a decrease in the patient's core temperature.<sup>5-17</sup>

General anesthesia blocks the autonomic response of vasoconstriction, which causes redistribution of body heat

from the core to the periphery.<sup>6,9</sup> This redistribution is responsible for approximately 80% of the decrease in core body temperature during the first hour after initiation of general anesthesia. During this time period, the patient's core temperature can decrease by  $0.5^{\circ}\text{C}$  to  $1.5^{\circ}\text{C}$  ( $0.9^{\circ}\text{F}$  to  $2.7^{\circ}\text{F}$ ). General anesthesia also decreases metabolic heat production by about 15% to 30% and slightly increases cutaneous heat loss, which exaggerates temperature loss. After the first hour, the temperature continues to drop, but the rate at which it drops declines. The decrease in temperature during this time is generally caused by the heat loss exceeding metabolic heat production. After a period of time, the autonomic response will be reactivated, resulting in the temperature reaching a plateau. Neuraxial anesthesia (eg, spinal, epidural) also blocks the autonomic responses of shivering and vasoconstriction, but only in the anesthetized part of the body.<sup>5</sup>

To a lesser degree, hypothermia is caused by **radiant, evaporative, convective, and conductive heat loss**. Heat loss occurs because of low perioperative room temperature, the patient wearing little or no clothing, exposure of the patient's internal organs and tissue to the environment, air moving at a high velocity over the patient, administration of room-temperature IV and irrigation fluids, and the evaporation of skin preparation solutions.<sup>5-17</sup>

Adverse patient outcomes from unplanned hypothermia may include myocardial events, wound infections, poor wound healing, postoperative pain, increased blood loss and need for blood transfusion, reversible coagulopathy (ie, platelet dysfunction), impaired renal function, decreased drug metabolism, increased peripheral vascular resistance, postoperative protein catabolism, altered mental status, pressure ulcers, increased postanesthesia care unit (PACU) length of stay, prolonged hospitalization, and death.<sup>1,3,4,8,9,13,14,16,18-72</sup> However, some studies have not found an association between hypothermia and the patient outcomes of surgical site infection, blood loss, wound complications, death, increased length of hospitalization, or increased length of time in the PACU.<sup>19,27,52,64,73-87</sup> Further research is needed to determine the association between unplanned patient hypothermia and patient outcomes.

Although thermal comfort is an important patient outcome and is noted in several studies, it has not been found to be an accurate reflection of patient temperature.<sup>88</sup> Patients who have received regional anesthesia may be hypothermic but report their thermal comfort as "warm."<sup>5</sup>

Shivering, an autonomic thermoregulatory response to hypothermia, is also an important adverse patient outcome. Shivering may exacerbate surgical site pain, raise intracranial and intraocular pressure, and increase oxygen