Hypothermia

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Hypothermia is one of the most common complications of anesthesia. Anesthetic and sedative agents profoundly affect central and peripheral thermoregulatory mechanisms and a variety of exogenous factors contribute to perioperative heat loss, including removal of large areas of hair, evaporation of scrub solutions, cold intravenous fluids, open body cavities, low operating room temperatures, and inadequate warming measures.

Initial rapid heat loss occurs upon induction of anesthesia due to redistribution of blood volume from the core to the periphery. A second phase occurs over one to several hours and is due to heat loss that is more rapid than metabolic heat production. If no measures are taken to prevent heat loss, a plateau generally occurs after about 3 hours of anesthesia.

Hypothermia, though common, has significant physiologic consequences:

- Metabolic activity is slowed and the action of injectable anesthetics may be prolonged.
- Inhalational agent needs are reduced by hypothermia and can result in a relative overdose.
- Coagulation factor activity and platelet function are decreased.
- Oxygen distribution to the tissues is disturbed and hypoxia can occur.
- Increased risk of surgical site infection.
- Severe hypothermia decreases cardiac output and increases myocardial irritability. Ventricular fibrillation can result.
- Upon recovery, shivering can increase metabolic oxygen requirements by 300%, at a time when the patient may be hypoventilating and not oxygenating well.
- Hypothermia, and resultant shivering, is a very unpleasant experience and is a common complaint from human patients.

Monitoring Protocol

Normal body temperature of dogs and cats: 100 – 102.5°F (37.8 – 39.2°C).
Mild hypothermia: 92 - 99°F (33.3 – 37.2°C)
Moderate hypothermia: 82 - 92°F (27.7 – 33.3°C)
Severe hypothermia: below 82°F (27.7°C)

In all anesthetized patients, a thermometer or temperature probe should be placed into the esophagus or rectum.

Prevention

Passive surface warming:

Sedated or anesthetized patients should ***never*** be placed directly on a metal table or cage. Covering the patient with a towel or blankets can reduce heat loss by 30%. Plastic sheeting and surgical drapes also help to passively insulate against heat loss and covering the extremities with bubble wrap or baby socks can also help.

Active Surface Warming:

Pre-warming with a forced warm air unit (after premedication and before induction to anesthesia) is the most effective method for preventing the initial rapid drop in temperature due to redistribution.

Active surface heating can stall or reverse the second phase in the development of hypothermia. Safe options include warm water blankets, forced warm air blankets (*e.g.* Bair Hugger), resistive electrical blankets (HotDog warming system).

Other methods, such a heating pads, hot water bottles, and heated rice bags, should **NOT** be used in anesthetized, sedated, or recovering patients. Serious burns can develop due to inability of the patient to move away and altered peripheral blood flow.

This photo shows a third degree burn in an Italian greyhound from an electric heating pad used during a dental procedure.

Active Core Warming:

IV fluid warmers can reduce the heat loss produced by infusion of cold fluid. The fluid warmer must be placed as close to the catheter as possible. Another option is to bury the fluid line in the warm air of the Bair Hugger.

Using a circle rebreathing system allows lower oxygen flow rates which can prevent heat loss through the respiratory tract.

Pleural or peritoneal lavage with warm (104 -109°F) sterile fluid is an extremely effective method for rewarming when a body cavity is open.