

PREVENTION OF HYPOTHERMIA USING BLOOD AND INFUSION WARMER

Introduction:

Hypothermia is a medical condition that occurs when the body's core temperature drops to a dangerously low level. This condition can have serious implications on the body's functions and overall health.

Hypothermia is a dangerous medical condition that occurs when the body loses heat faster than it can produce it, resulting in a dangerously low body temperature. It can happen in cold weather or water, but also in moderate temperatures if a person is exposed for an extended period. The symptoms range from shivering and confusion to more severe effects like slowed heart rate and breathing. Immediate medical attention is crucial in severe cases. Preventive measures like layering clothing and staying dry are essential to avoid hypothermia, especially in chilly conditions.

Causes of Hypothermia:

Hypothermia can be caused by various factors, primarily exposure to cold temperatures. Prolonged exposure to cold air, water, or windy conditions can lead to the body losing heat faster than it can produce it. Other contributing factors include wet clothing, inadequate insulation, and insufficient warm clothing.

Hypothermia occurs when more heat is lost than the body can make. In most cases, it occurs after long periods in the cold.

Common causes include:

- Being outside without enough protective clothing in winter
- Falling into cold water of a lake, river, or other body of water
- Wearing wet clothing in windy or cold weather
- Heavy exertion, not drinking enough fluids, or not eating enough in cold weather
- Rapid infusion of large volumes of stored blood contributes to hypothermia. Infants are particularly at risk during exchange or massive transfusion.

Symptoms:

As a person develops hypothermia, they slowly lose the ability to think and move. In fact, they may even be unaware that they need emergency treatment. Someone with hypothermia also is likely to have frostbite.

The symptoms include:

- Confusion
- Drowsiness
- Pale and cold skin
- Slowed breathing or heart rate
- Shivering that cannot be controlled (although at extremely low body temperatures, shivering may stop)
- Nausea or vomiting.
- Headache, confusion, or fatigue
- Muscle weakness, twitching, or cramps
- Seizures or coma

Lethargy (weakness and sleepiness), cardiac arrest, shock, and coma can set in without prompt treatment. Hypothermia can be fatal.

The symptoms of hypothermia can vary depending on the severity of the condition. Mild hypothermia may cause shivering, numbness, and confusion. As hypothermia worsens, the individual may experience slurred speech, dizziness, slowed heart rate, and difficulty coordinating movements. Severe hypothermia can lead to unconsciousness, cardiac arrest, and even death.

Effects of Hypothermia:

Hypothermia affects various body systems and functions. The cold temperature causes blood vessels to constrict, reducing blood flow to extremities and vital organs. This can lead to tissue damage and frostbite. Additionally, the body's metabolic rate decreases, which can result in impaired cognitive functions and confusion. In severe cases, hypothermia can lead to organ failure and death.

People with mild hypothermia usually recover with no lasting damage. However, people with moderate-to-severe hypothermia can face serious complications and even death. Children are more likely to recover from severe hypothermia than adults. The death rate for hypothermia in older people is about 50%.

There are many possible complications from hypothermia, including:

- Hypoxia (lack of oxygen in the tissues)
- Frostbite leading to gangrene in the hands and feet
- Inflammation of the pancreas
- Fluid in the lungs
- Pneumonia
- Kidney failure
- Heart problems

Treatment for Hypothermia:

Prompt treatment is crucial when dealing with hypothermia. Mild cases can often be managed by moving the individual to a warmer environment, providing dry clothing, and offering warm beverages. In more severe cases, medical attention is necessary. Passive rewarming methods, such as using warm blankets, can be employed. For severe hypothermia, active rewarming techniques like warm intravenous fluids and heated blankets are used under medical supervision.

Medical treatment:

Depending on the severity of hypothermia, emergency medical care for hypothermia may include one of the following interventions to raise the body temperature:

- **Blood rewarming:** Blood may be drawn, warmed and recirculated in the body. A common method of warming blood is the use of a hemodialysis machine, which is normally used to filter blood in people with poor kidney function. Heart bypass machines also may need to be used.
- **Irrigation:** A warm saltwater solution may be used to warm certain areas of the body, such as the area around the lungs (pleura) or the abdominal cavity (peritoneal cavity). The warm liquid is introduced into the affected area with catheters.
- In cases of advanced hypothermia, hospital treatment is required to rewarm the core temperature. Hypothermia treatment may include warmed IV fluids, heated and humidified oxygen, peritoneal lavage (internal "washing" of the abdominal cavity), and other measures.
- **Warm intravenous fluids:** A warmed intravenous fluids may be put into a vein to prevent from causing hypothermia. Warming of infusion solutions, IV fluids, blood and its substitutes is one of the conditions of proper infusion therapy. IV fluid warmer helps to improve patients' conditions in pre-, intra- and post-operative periods, and reduce complications caused by hypothermia.

BLOOD AND INFUSION WARMER:

These are some of the most important devices in a hospital when it comes to treating patients with hypothermia.

A blood warmer is used to warm blood or other fluids, minimizing the risk of hypothermia. Blood is kept refrigerated for preservation of the cells. It is essential to warm it to an appropriate temperature not only to prevent hypothermia but also to prevent hemolysis, or breakdown of the blood cells. If the transfusion is done too quickly without warming, the colder blood can initiate a state of hypothermia within the patient. There is a delicate balance of temperature over time that must be maintained. Manufacturers of these devices test their instruments so as not to create complications that could cause the patient further harm.

Blood warmers in the hospital can be found in the emergency department, the intensive care unit, and the operating room, just to name a few. No matter where they are used, blood warmers require the same attention to detail as a life support device. So how do these devices work? Blood and Infusion warmers use surface heat, in which the tubing set is inserted into the device. As the fluid passes through the IV tube, it is heated so that when it exits the blood or the IV fluid is warmed at the specified temperature. However blood and infusion warmers do their job, the testing of the temperature, the over-temperature alarm, and other functions is essential to determine if the device is working properly. The Joint Commission (JCAHO) has specified that testing of these devices cannot simply be a pass or fail. Actual temperature recordings of the operating temperatures and the over-temperature alarm is essential. However the manufacturer recommends testing these devices, the technician must ensure that he or she follows the recommendations and records the temperatures accurately. The blood and infusion warmer comes with pre-set temperature option that helps to modify the output temperature of the fluid.

Usage of Blood and Infusion Warmer:

- Used in already hypothermic patients or rare conditions where cold fluid delivery is problematic (e.g. cold agglutinins)
- Massive transfusion (avoid hypothermia)
- To warm donor blood and blood products or IV fluids before administration and to reduce complications associated with the infusion of cold donor blood.
- To avoid complications of large volume cold fluid administration.

Various types and methods for warming IV fluid:

- Water-bath warmers
- Dry heat plate warmers
- Intravenous fluid tube warmers

Water-bath warmers

- Warms IV fluid with prewarmed water; maximum temperature is 38°C and whilst cheap the system is inefficient at high infusion rates.

Dry heat plate warmers

- Increases heat transfer capability of the material and enables an increase in temperature up to 41°C
- The IV fluid is warmed in a cassette between the heat plates.

Intravenous fluid tube warmers

- An outer tube warms the wrapped IV tube within it and let output liquid warmed
- Fluid heating rate is a function of the power of the heating device

Conclusion:

Hypothermia is a serious medical condition that requires attention and preventive measures, especially in cold environments. Understanding its causes, symptoms, effects, treatment, and prevention is crucial for staying safe and informed. By adopting proper precautions and awareness, individuals can minimize the risks associated with hypothermia and ensure their well-being in challenging weather conditions.