

EM CASE OF THE WEEK.

BROWARD HEALTH MEDICAL CENTER
DEPARTMENT OF EMERGENCY MEDICINE



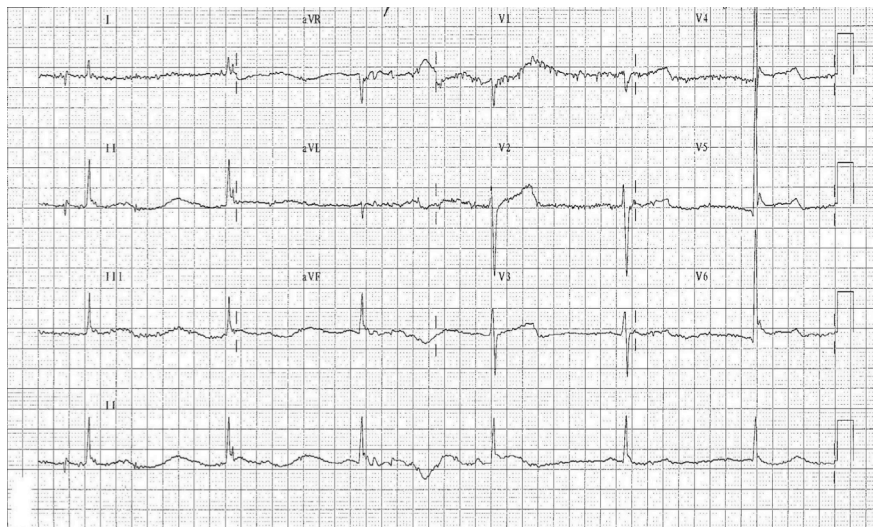
Care Warriors

Author: Richard Deppisch | Editor: Benita Chilampath DO, PGY II

April 2018 | Vol 4 | Issue 66

Accidental Hypothermia

A 88-year-old male with history of dementia, diabetes mellitus, and thyroidectomy presents to the ED for a temperature of 88°F on routine screening at his ALF this evening. The nurses at the facility say he had been found sitting in his chair under the air conditioning watching tv in shorts and a shirt with no complaint. Upon arrival to the ED, the patient is found to have the following vitals: temp 88°F, pulse of 38 bpm, 70/50 mmHg, respirations 12 bpm, 94% saturation. An ECG is performed and displayed below:



©2018 Lifeinthefastlane®

Which initial treatment technique should be performed to warm the patient?

- A. Passive external warming using blankets at a rate of 0.9°F/hour
- B. Active external rewarming of the whole body using a warm bath or heating pads
- C. Active external warming of the trunk using warm bath or heating pads
- D. Active internal core rewarming using 40°F IV Crystalloid
- E. Extracorporeal warming through cardiopulmonary bypass

EM Case of the Week is a weekly "pop quiz" for ED staff.

The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.

BROWARD HEALTH MEDICAL CENTER

Department of Emergency Medicine
1625 SE 3rd Avenue
Fort Lauderdale, FL 33316

The correct answer is C. Active external warming of the trunk using a warm bath or heating pads.

This patient is in moderate hypothermia and cannot be rewarmed adequately by passive external heating alone. Rewarming the entire body instead of focusing on the trunk first through active external rewarming puts the patient at risk for temperature “afterdrop” where cooled extremity blood pools and reaches the warmed heart and can lead to cardiac arrest. Active internal warming should be attempted after active external warming fails in moderately hypothermic patients. This patient’s hypothermia is not severe enough to necessitate extracorporeal warming.

DISCUSSION

Accidental hypothermia is defined as a decrease in core temperature below 95°F (35°C). It is broken down into the three categories seen in table 1. Thermal regulation in the human body is controlled by the hypothalamus which receives input from central and peripheral thermal receptors that react to stimuli. Upon receiving a cold stimulus, the body reacts by the hypothalamus attempting to stimulate heat production through shivering, increased thyroid, catecholamine, and adrenal activity. Sympathetically mediated vasoconstriction minimizes heat loss by reducing blood flow to peripheral tissues, where cooling is most effective. Peripheral blood vessels also vasoconstrict in direct response to cold.

While it is generally associated with the environment and winter regions, hypothermia can be induced by many other factors such as drugs that impair thermal regulation (intoxicants, antidepressants, opioids), alcohol, hypothyroidism, adrenal insufficiency, hypoglycemia, hypothalamic dysfunction, neuromuscular deficiency, sepsis, and trauma. Geriatric patients are at increased risk of developing hypothermia. Even with modern supportive care, in-hospital mortality of moderate to severe hypothermia approaches 40% with the most common cause of death being hypothermia induced cardiac arrhythmia.

Severity	Range	Characteristics
Mild	32-35°C (90-95°F)	Tachypnea, tachycardia, hyperventilation, ataxia, dysarthria, impaired judgement
Moderate	28-32°C (82-90°F)	Bradycardia, hypoventilation, CNS depression, hyporeflexia, decreased renal blood flow, loss of shivering, paradoxical undressing, Atrial fibrillation and junctional and other arrhythmias
Severe	Below 28°C (82°F)	pulmonary edema, oliguria, areflexia, coma, hypotension, bradycardia, ventricular arrhythmias, asystole

Table 1: Severity of Hypothermia

EVALUATION

Diagnosis begins with taking a history. Knowing the history allows for the practitioner to determine the cause of the hypothermia as well as consider what symptoms may present themselves. Physical exam may not be as reliable as symptoms can vary per severity. Next a temperature reading is needed to classify which level of hypothermia is present. In conscious patients, a low reading thermometer used rectally is adequate. Severely hypothermic unconscious patients, especially those likely to be intubated, should be evaluated using an esophageal thermometer. This has been found to be the most precise method to manage rewarming. An ECG and blood draw should be ordered and labs sent out for coagulation studies, CBC, electrolytes, BUN, and creatinine to watch for the main complications of hypothermia including coagulopathy, acidosis, arrhythmia, and FEN derangements.

For a list of educational lectures, grand rounds, workshops, and didactics please visit BrowardER.com and click on the “Conference” link.

All are welcome to attend!

TREATMENT

As with the approach to all emergencies, maintaining Airway, Breathing and Circulation is the first step. Patients in respiratory distress may need to be intubated. If the patient is in cardiac arrest, CPR should still be performed unless the chest wall has frozen and become uncompressible. Care should be taken to avoid rough movement of the patient as it may induce arrhythmias, most commonly ventricular fibrillation, which should be managed via normal ACLS protocol. However, electrical defibrillation has been found to be rarely successful until core temperature is above 30°C. Additionally, moderate to severe hypothermic patients should be given aggressive fluids as they frequently become hypotensive.

All rewarming techniques should be based upon the minimum warming rate of 0.5 °C/hour to be considered effective. If a technique is not reaching desired rate, the next level or warming should be initiated. Mild hypothermia can be treated through passive external rewarming. This is done through the removal of wet clothes, covering with blankets, and elevating room temperature to 82°F (27.8°C). Moderate hypothermia should be initially treated with external warming through heating pads, warm baths and forced warm air. Care should be taken to watch out for core temperature afterdrop by warming the trunk first and knowing that the temperature can paradoxically drop if cold blood goes to the core. If active external fails to achieve the 0.5 °C/hour warming rate the patient should be started on active internal warming. Severe hypothermia patients should undergo active external and active internal warming, which consists of using heated IV crystalloid (40 to 42°C) and irrigation of peritoneum with warmed isotonic crystalloid. Extracorporeal blood rewarming can be considered if less invasive means do not work. After resuscitation, attention should be taken to watch for potential arrhythmia, hyperkalemia, hypoglycemia, rhabdomyolysis, bladder atony, and bleeding diathesis.

Take Home Points

- Hypothermia can be caused by environmental and medical conditions such as hypothyroidism, alcohol abuse, hypoglycemia.
- Temperature should be measured with low reading thermometers as most do not measure below 34°C (93°F) with esophageal thermometer preferred.
- Mild hypothermia: core temperature 32 to 35°C (90 to 95°F); findings include confusion, tachycardia, and increased shivering. Treat with passive external rewarming.
- Moderate hypothermia: 28 to 32°C (82 to 90°F); findings include lethargy, bradycardia and arrhythmia, loss of pupillary reflexes, and decreased shivering. Initially treat trunk with active external rewarming and advance to active internal as necessary.
- Severe hypothermia: below 28°C (82°F); findings include coma, hypotension, arrhythmia, pulmonary edema, and rigidity. Treat with active external and internal rewarming.
- Be mindful of possible hypotension during rewarming arrhythmia, hyperkalemia, hypoglycemia, rhabdomyolysis, bladder atony, bleeding diathesis.



ABOUT THE AUTHOR

This month's case was written by Richard Deppisch. Richard is a 4th year medical student from NSU-COM. He did his emergency medicine rotation at BHMC in April 2018. Richard plans on pursuing a career in Internal Medicine after graduation.

REFERENCES

1. Zafren MD. Accidental Hypothermia. In: UpToDate, Danzl, Daniel F (Ed), UpToDate, Waltham, MA, 2018.
2. James, L., MD. (2017, June 05). Hypothermia. Retrieved April 25, 2018, from <https://emedicine.medscape.com/article/770542-overview>
3. Burns, E. (2017, April 04). ECG changes in hypothermia - LITFL ECG Library. Retrieved April 25, 2018, from <https://lifeinthefastlane.com/ecg-library/basics/hypothermia/>