

## **20 Questions: Hypothermia**

**By Gregg A, Jones, MD**

1. What temperature is considered hypothermia?
2. Is hypothermia serious?
3. How can I diagnose hypothermia in the prehospital setting?
4. The EKG can help, how?
5. What are the main EKG changes or arrhythmias in hypothermia?
6. What is this “Osborn Wave” you speak of?
7. Are the Osborn Waves always that obvious and diffuse in the EKG?
8. Other than being outside in the cold, what are some common precipitating factors that cause people to develop hypothermia?
9. Are there different severity temperatures making hypothermia mild versus severe?
10. Why does blood pressure decrease in hypothermic patients?
11. How do I treat these patients before I get them to the hospital...is there a hypothermia protocol I can use as a guideline?
12. What if I respond to a call and the patient has no pulse?
13. What if that patient without a pulse is frozen solid?
14. How will the hospital re-warm my patient?
15. Does a patient need to be in cardiac arrest for the hospital to rewarm them with ECMO?
16. Which hospitals in the West Metro do ECMO?
17. Is Frostbite a concern in hypothermic patients? If so, is there a specific type of hospital that treats frostbite?
18. I have heard of this thing called “Core Afterdrop”, what is that?
19. Remind me again, what are some of the indications for ECMO?
20. If I am working as a medical provider in outstate Minnesota and I have a severe hypothermic patient, should I consider sending them to an ECMO center? If so, how should I treat them en route?

### **Answers:**

1. Hypothermia is a reduced body temperature and is defined as a core body temperature less than 35 degrees Celsius (95.0 degrees F).

2. Yes it is. Based on the New England Journal of Medicine article from 2012, more than 1,500 people per year die from hypothermia in the United States. Of note, more than 8,000 people per year die from hypothermia in Canada...and Minnesota is close to Canada.

3. There are a few clues to help diagnose hypothermia in the prehospital setting. First you can use your thermometer and check a rectal temperature...

An EKG is another potential clue

Skin temperature alone is not enough. Patients may have cold peripheral skin, but their core temperature is fine, or the opposite may be true as well.

4. The heart does not enjoy extreme temperatures. Hypothermia can lead to cardiac arrhythmias and even cardiac arrest.

5. The most common EKG changes are:

Sinus Bradycardia

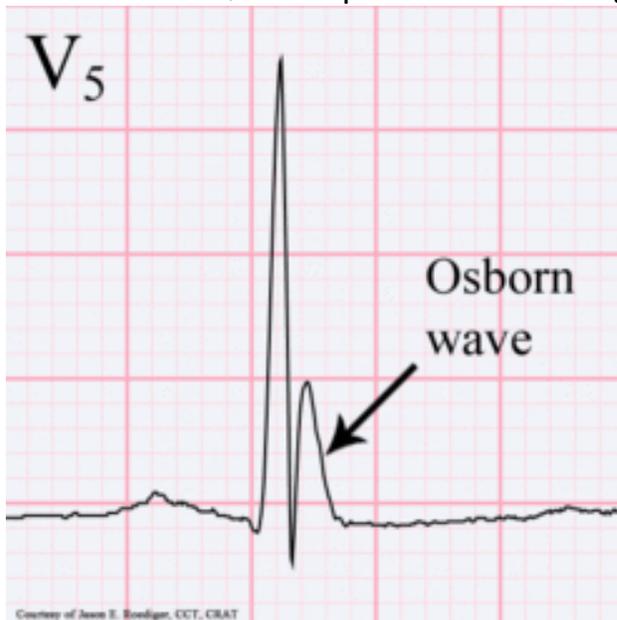
Junctional Bradycardia

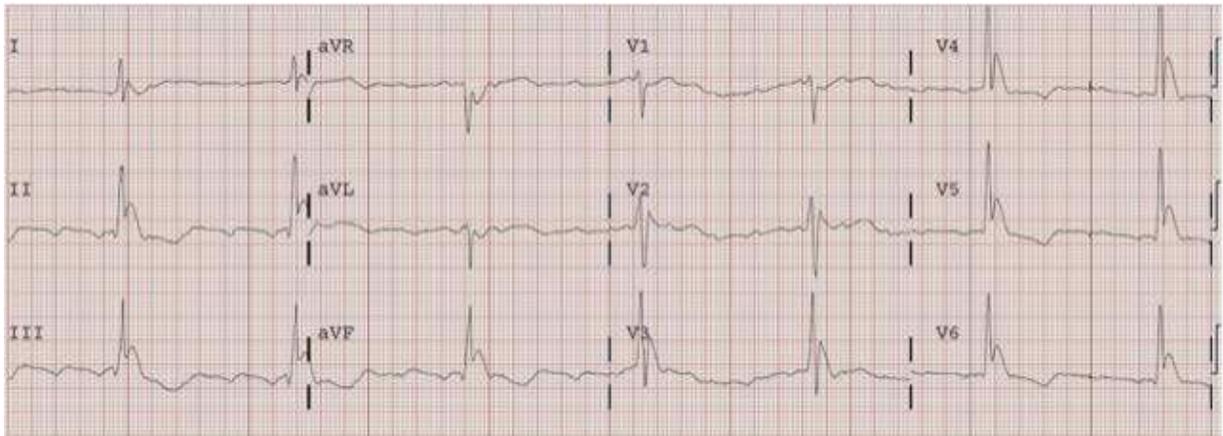
Atrial Fibrillation

Ventricular Fibrillation (below 30 degs C)

Osborn Waves (AKA J waves)

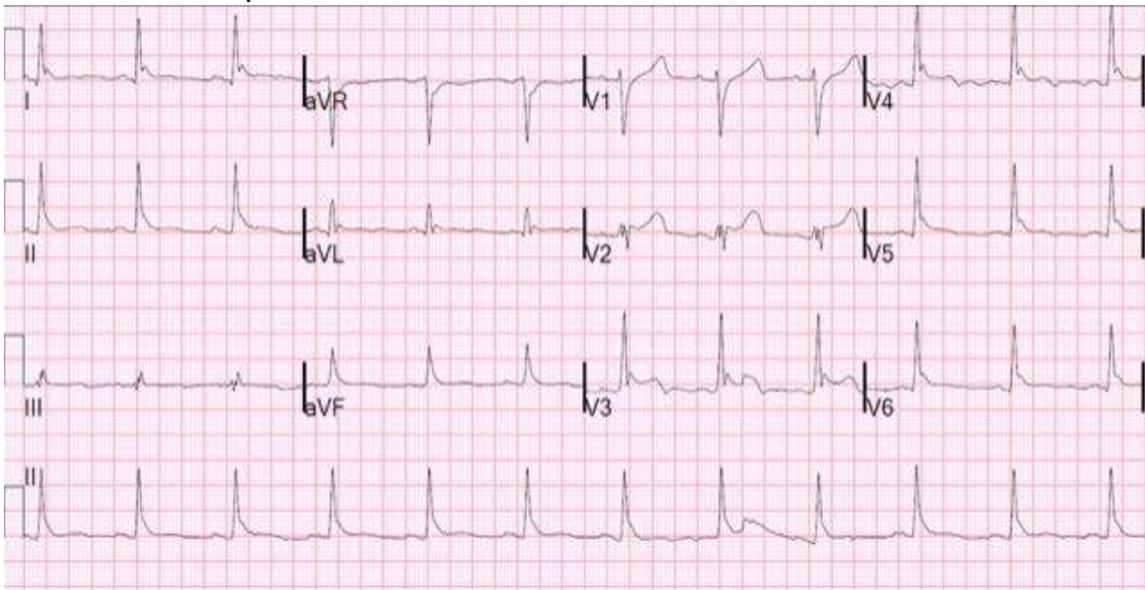
6. The Osborn Wave, also known as J wave, is a positive deflection between the QRS complex and the ST segment.





7. Of course not!!! EKGs are not easy and findings can be subtle. Your EKG computer will NOT interpret Osborn waves for you.

Here is an example of subtle Osborn Waves in leads V3-V6:



8. Common precipitating factors that increase the risk of hypothermia while outside in the cold include everything that causes altered mental status. Some of the most common are:

Alcohol intoxication

Hypoglycemia

Old age



9. Yes there is. As stated earlier, hypothermia is defined as core temperature below 35 degrees Celsius or 95 degrees F.

Mild hypothermia: 32-35 degrees Celsius (89.6-95.0 degrees F)

Moderate hypothermia: 28-32 degrees Celsius (82.4-89.6 degrees F)

Severe hypothermia: Less than 28 degrees Celsius (<82.4 degrees F)



10. Hypothermia leads to bradycardia by decreasing the spontaneous rate of pacemaker cell depolarization. Overall cardiac output can drop as much as 50%.

11. Yes there is. There is also a protocol for pediatric patients that is very similar to the adult protocol.

12. Like we discussed earlier, hypothermia increases the risk of cardiac arrest. In severe hypothermia, cardiac arrest is common.

For pulseless patients with or without an organized EKG rhythm:

Begin CPR

Establish IV access

Do NOT use warm packs or external warming

Can consider ACLS medications and defibrillation but not usually effective until hypothermia is corrected.

If you are going to try ACLS medications and defibrillation, only attempt once. The protocol says to withhold all ACLS medications so consider med control call. ACLS medications are unlikely to work and may delay further cares or transport.

Transport patient immediately.

13. If you suspect your patient is frozen solid and unfortunately dead, ask yourself these questions:

Is the patient known to have been submerged under water for greater than 90 minutes?

Does the patient have obvious signs of death such as decapitation or animal predation?

Is the patient's airway frozen and has ice build up?

Is the patient's chest frozen and stiff making chest compressions impossible?

If your patient has one of the above situations, resuscitation does not need to be initiated. They qualify as clearly deceased. If there is any question in your mind, start resuscitation and transportation.

14. There are many ways and techniques to rewarm hypothermic patients.

Mild Hypothermia → External rewarming

Moderate hypothermia → Active External rewarming (possible internal)

Severe Hypothermia → Active internal rewarming

Below is a list of techniques and how fast it can rewarm a patient.

	Modality	Degrees Celsius/Hr
<b>PASSIVE EXTERNAL</b>	<b>Blankets</b>	<b>0.5</b>
<b>ACTIVE EXTERNAL</b>	<b>Forced air (Bair Hugger)</b> <b>Warm blankets</b> <b>Warm water immersion</b>	<b>1-2.5</b> — <b>2-4</b>
<b>ACTIVE INTERNAL</b>	<b>Warm, humidified air</b> <b>Warm IVFs</b> <b>Pleural, bladder lavage</b> <b>Peritoneal dialysis</b>	<b>0.5-1.2</b> — <b>Varies</b> <b>1-3</b>
<b>EXTRACORPOREAL</b>	<b>Dialysis</b> <b>Bypass</b> <b>ECMO</b>	<b>2-3</b> <b>7-10</b>

15. NO. ECMO is a great and safe way to rewarm patients but given how invasive it is, it is only reserved for those in severe hypothermia or those in cardiac arrest thought secondary to their hypothermia (typically the same group). ECMO will also provide cardiac support during the rewarming process.

16. Here are the main hospitals performing ECMO:



Of these hospitals, only Hennepin Healthcare has a Burn Center to deal with other aspects of cold injury, such as frostbite.

17. Yes, frostbite is commonly seen in patients suffering from hypothermia. Frostbite is treated after hypothermia is fixed. Frostbite is treated by Burn Surgeons. These patients should be taken to a hospital with a burn center.



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18. Core Afterdrop refers to the continued decline in temperature despite removal from the cold environment and during the initial phases of rewarming. This is caused by peripheral vasodilation. As the skin starts to rewarm, vasodilation occurs shunting cold blood to the patient's core leading to colder core temperatures. This is one reason why heating packs and active external rewarming should be avoided in moderate and severe hypothermia.

19. There are many uses of ECMO, and trials are ongoing as we discover more ways to use ECMO. Here are some of the known uses:

Refractory Ventricular Fibrillation cardiac arrest (VFIB arrest)

Pulmonary embolism with shock

Massive Overdose

Amniotic fluid embolism following pregnancy

Hypothermia and Hypothermic cardiac arrest

Drowning

ARDS

20. Yes you should consider sending them to an ECMO center.

If they still have pulses:

Obtain IV access

Continuous cardiac monitoring

Have LUCAS Device close

No active external rewarming

If they do NOT have pulses:

Continuous LUCAS CPR

IV access

Can consider one round of ACLS medications and one defibrillation

Hypothermic patients can have good neurologic outcomes despite prolonged cardiac arrest.

**Stay frosty out there...but no too frosty!!!**