

Heat Stroke: Rapid Cooling in the Emergency Department

Site Applicability

St. Paul's Hospital and Mount St. Joseph Emergency Departments.

Practice Level

Advanced Competency: RNs who work in the emergency department at Providence Health Care and have specialty certification in critical care nursing or emergency nursing (or equivalent).

Need to Know

Climate change is leading to higher global temperatures and more frequent and longer heatwaves, causing people to experience unprecedented levels of heat exposure. As a result, emergency departments are likely to see a growing influx of patients affected by extreme heat (Hess et al., 2014).

The most serious heat-related illness is heat stroke. Heat stroke is defined as a patient who has been exposed to high environmental temperatures and has:

- A core body temperature greater than 40 degrees Celsius
- Altered level of consciousness
- Hot, dry skin
- Presence of coagulopathy, hepatic impairments, or renal impairments

(Hifumi et al., 2018).

Once heat stroke is recognized, rapid cooling to a temperature less than 39 degrees Celsius is required to prevent end-organ failure; rapid cooling used below this point may inadvertently lead to accidental hypothermia. Cooling rates faster than 1 degree Celsius every 10 minutes is the ideal goal for improving patient outcomes from heat stroke (Epstein & Yanovich, 2019).



Guideline

Assessment

- Perform an emergency nursing assessment including airway, breathing, and circulation.
- Perform a rectal temperature reading to screen for temperatures greater than 40 degrees Celsius.
- For patients with an altered level of consciousness, inform a provider and obtain an order to insert an indwelling urinary catheter with temperature probe or an esophageal temperature probe for ongoing temperature monitoring.
 - Esophageal temperature readings are preferred as they may respond to core temperature changes faster than bladder temperature readings (Markota et al., 2015).
- Place patient on cardiac monitoring.

Rapid Cooling for Patients with an Altered Level of Consciousness

Notify a provider (physician or nurse practitioner) immediately for any patients suspected of having heat stroke with an altered level of consciousness. Start cooling measures immediately to prevent end-organ damage.

- If the patient has an altered level of consciousness but does not require resuscitative measures (e.g. intubation, CPR), ice-cold water immersion is recommended first.
- If the patient requires resuscitation, use evaporative cooling measures.
- Pharmacological agents such as acetaminophen and dantrolene are not effective for heat stroke; however, benzodiazepines may be used to reduce agitation and prevent shivering which could increase body temperature.

I. Ice-Cold Water Immersion

Recent evidence recommends ice-cold water immersion as first-line for patients with heat stroke, particularly those who are unresponsive and are hemodynamically unstable (Ruble et al., 2021; Sorensen & Hess, 2022). Traditionally, this would require placing the patient in a bathtub filled with ice-cold water. In the emergency department setting, a post-mortem bag or “body” bag can be used (Wang et al., 2019).

Avoid ice-cold water immersion if there are signs of airway compromise (and the patient is not already intubated) or if the patient is in cardiac arrest (Epstein & Yanovich, 2019).

Equipment & Supplies:

- Post-mortem/“body” bag
- Ice
- Towels

Procedure

1. Place post-mortem bag underneath the patient, ensuring that it completely encapsulates the patient.
2. Fill the post-mortem bag with as much as ice as possible so that the patient is immersed in ice.
 - Consider adding cold water to the bag to help ensure complete coverage of the patient.
 - Do not cover the patient's head or neck. Place blankets or towels underneath the patient's head to raise it above the level of the ice-cold water.
 - Stir the water vigorously during cooling.
 - As the ice melts, consider adding more ice if the ice-cold water temperature is warming significantly.
3. Keep the patient submerged in the ice-cold water until core temperatures are below 39 degrees Celsius. At this point:
 - Transfer the patient out of the post-mortem bag.
 - Dry the patient's skin with towels.
 - Assess the patient's skin for any pale, peeling skin that are signs of frostbite.

II. Evaporative Cooling

Evaporative cooling should be used if ice-cold water immersion is not an option (Ruble et al., 2021). As portable fans are used in this method, patients should preferably be in a private, negative-pressure room.

Equipment & Supplies

- Portable fans
- Wet towels

Procedure

1. Cover the patient's entire body with wet cloths.
2. Place the fans at the level of the patient.
3. Direct the fans so that the air travels *across* the wet cloths.
4. When the patient's core temperature drops below 39 degrees Celsius, remove the wet cloths and dry the patient's skin.
 - Assess the patient's skin for any signs of macerated skin (e.g. pallor, wrinkled skin).

III. Internal Cooling

Internal cooling measures are used as *adjuncts* to either ice-cold water immersion or evaporative cooling. A provider order is required to perform these measures. These include, when available:

- Using cold intravenous fluids
- Inserting a 3-way catheter and performing bladder irrigation with cold fluids

IV. Other Cooling Measures

Other cooling measures, such as ice packs, have lower cooling rates compared to the other methods listed here and are not considered as effective for rapidly cooling patients (Rublee et al., 2021). If ice packs are used, apply them to the *entire* body and not just the groin and axilla.

If all attempted cooling measures fail to drop temperatures rapidly, consider more invasive measures to cool the patient rapidly in collaboration with the health care team, such as the use of extracorporeal membrane oxygenation (ECMO).

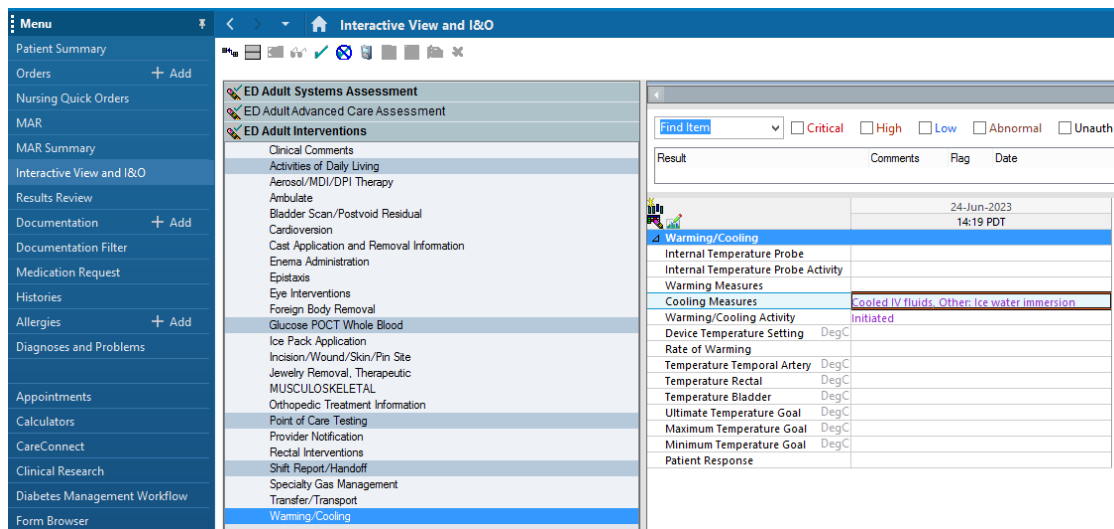
Rapid Cooling for an Alert Patient

Patients who are alert and ambulatory likely have heat exhaustion, but are at risk of progressing into heat stroke. If available, provide patient with a cold shower or evaporative cooling until their temperature is below 39 degrees Celsius. Provide the patient with cool fluids to drink until signs and symptoms have resolved.

Documentation

When either ice water immersion or evaporative cooling measures are used, record core temperatures every 5 to 15 minutes.

Document all cooling measures under iView in the **ED Adult Interventions** band, **Warming/Cooling** section.



The screenshot displays the iView interface for a patient's ED Adult Interventions. The left sidebar shows the 'Menu' with options like Patient Summary, Orders, Nursing Quick Orders, MAR, MAR Summary, Interactive View and I&O, Results Review, Documentation, Documentation Filter, Medication Request, Histories, Allergies, Diagnoses and Problems, Appointments, Calculators, CareConnect, Clinical Research, Diabetes Management Workflow, and Form Browser. The main area shows the 'Interactive View and I&O' section with a list of interventions. The 'Warming/Cooling' section is expanded, showing a table with columns for Result, Comments, Flag, and Date. The table contains one entry for 'Warming/Cooling' with a result of 'Initiated' and a date of '24-Jun-2023 14:19 PDT'. The 'Cooling Measures' section is also expanded, showing a table with columns for Result, Comments, Flag, and Date. The table contains one entry for 'Cooling Measures' with a result of 'Initiated' and a date of '24-Jun-2023 14:19 PDT'. The 'Cooling Measures' section is further expanded, showing a table with columns for Result, Comments, Flag, and Date. The table contains one entry for 'Cooling Measures' with a result of 'Initiated' and a date of '24-Jun-2023 14:19 PDT'.

Patient and Family Education

Inform patients and their family members about the interventions used to rapidly cool body temperatures. Prior to discharge, discuss the symptoms and prevention of heat-related illnesses. HealthLink BC provides publically available information about heat-related illness at <https://www.healthlinkbc.ca/healthlinkbc-files/heat-related-illness>.

References

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Groups/Persons Consulted:

SPH/MSJ Emergency Physicians

SPH Emergency Department CNLs

MSJ Emergency Department CNLs

Developed/Revised By:

SPH Emergency Department Educator

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	Emergency Department