Limiting Heat Burden While Wearing Personal Protective Equipment (PPE)

Developed for Healthcare Workers and Site Coordinators Providing Care in West African Countries Affected by the Ebola Outbreak

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Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

Purpose

- Working in the harsh conditions in West Africa and other risk factors, including wearing PPE, puts healthcare workers at risk for heat-related illnesses.

Objectives

- Know what tools can help with monitoring temperatures and humidity.
- Understand risk factors for heat-related illness.
- Recognize symptoms of heat-related illnesses and know first aid.
- Learn recommendations for limiting the heat burden and protecting yourself from heat-related illnesses.

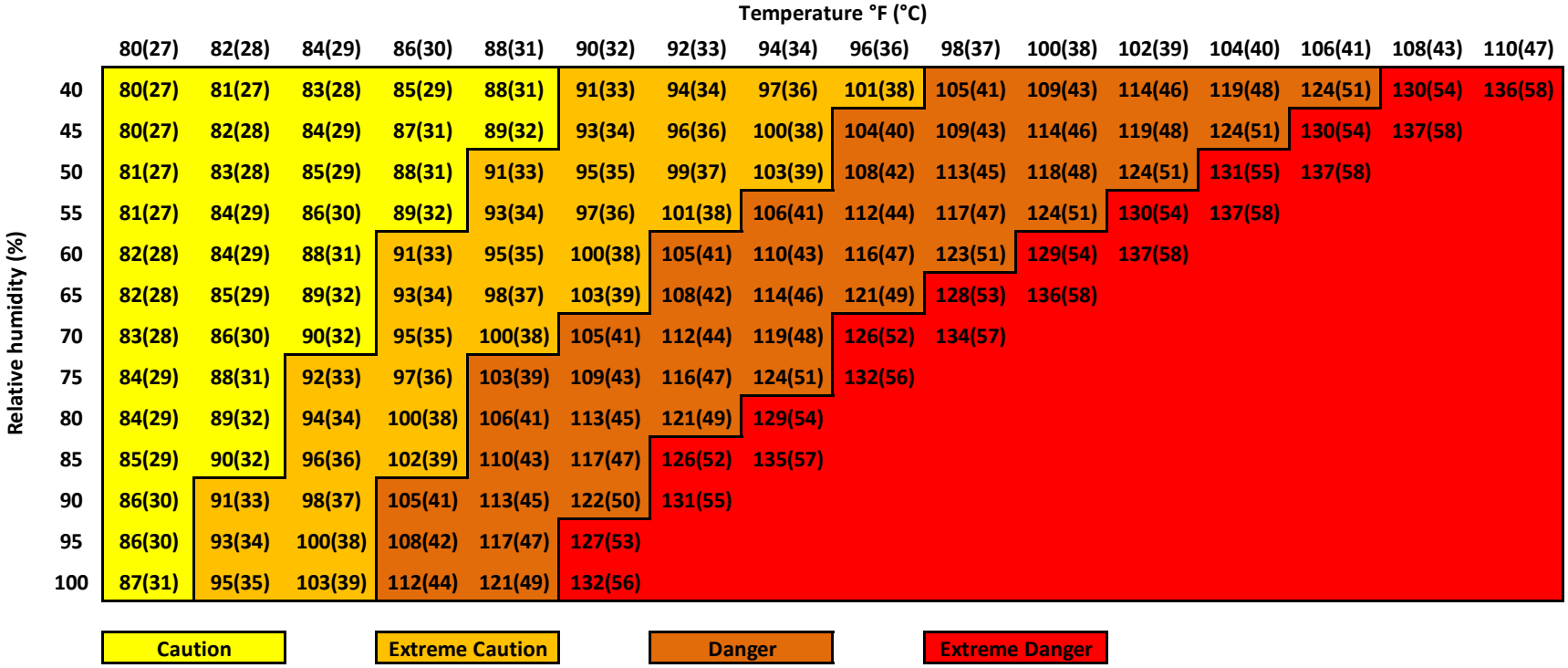
Harsh Conditions at the Worksite

- **Length of work shift:**
  - Shorter work shifts may not be possible where PPE supplies are limited.
  - Shift length is also affected by the large workloads and limited number of workers.
- **Limited electrical power:**
  - Air-conditioning and fans may not be available.
- **Limited access to electrolyte replacement fluids**.
- **Other illnesses:**
  - Contaminated food or water can result in severe vomiting and diarrhea, which can lead to fluid loss and dehydration, increasing the risk for developing a heat-related illness.
- **Limited or no medical oversight for healthcare workers while in the rest area**.
- **Limited number of healthcare workers:**
  - Only 2 days to adjust to working in a hot, humid environment before starting to work with patients.

Monitor Temperatures

- *Monitor temperature and humidity daily.*
- Download the OSHA Heat Safety Tool at https://www.osha.gov/SLTC/heatillness/heat_index/heat_app.html or using the heat index table.
- **Heat index** is a measure of how hot it feels when humidity is taken into account with air temperature.
- As the heat index increases, take more frequent rest breaks and drink more water and/or electrolyte replacement fluids.

Heat Index Table



Heat index	Risk level	Protective measures
Less than 91°F (33°C)	Lower (caution)	Basic health and safety planning
91°F–103°F (33°C–39°C)	Moderate	Implement precautions and heighten awareness
103°F–115°F (39°C–46°C)	High	Additional precautions to protect workers
Greater than 115°F (46°C)	Very high to extreme	Even more aggressive protective measures

PPE: A Risk Factor for Heat-related Illness

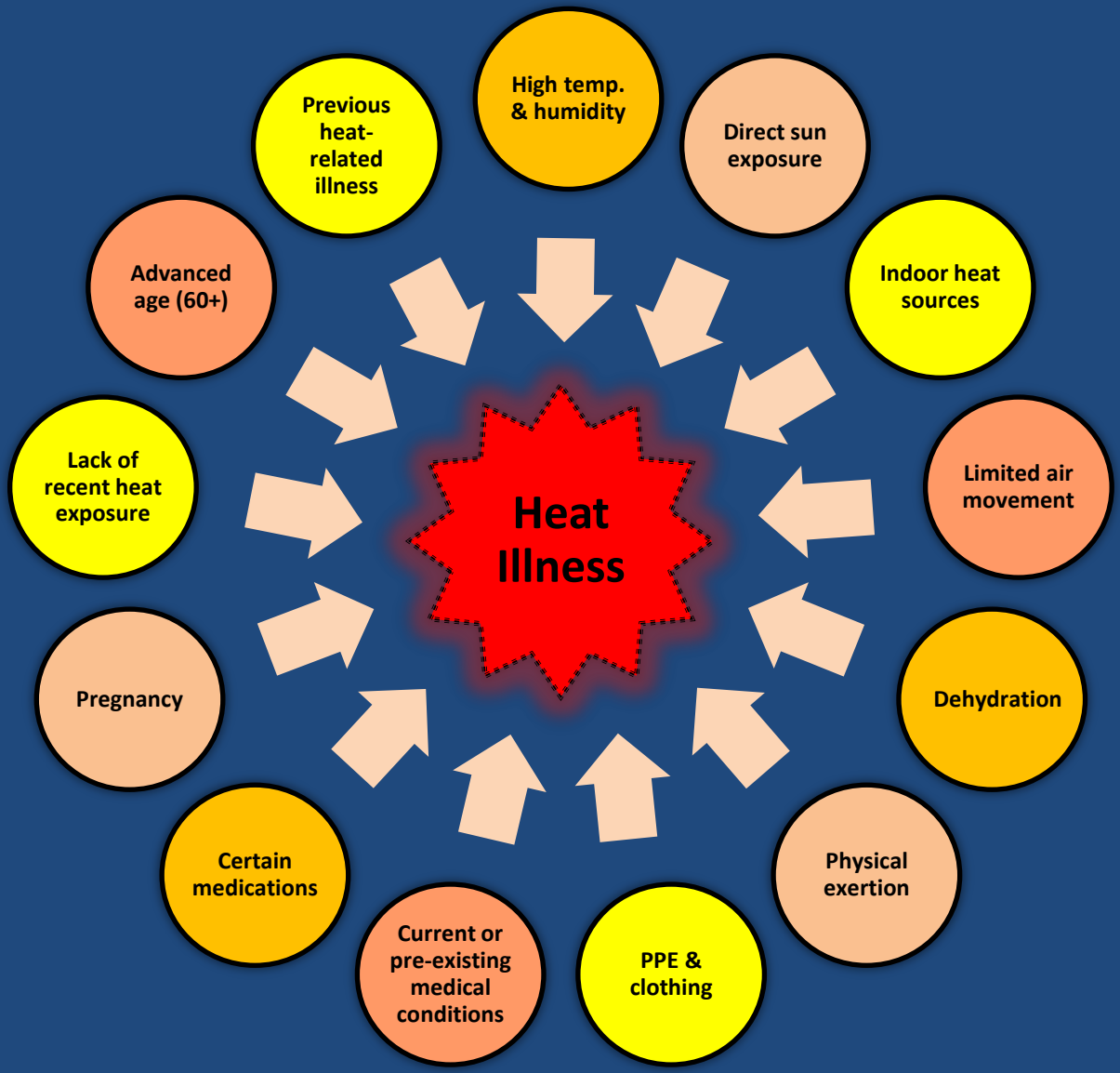
- *Wearing PPE increases your risk for heat-related illnesses.*

- PPE:
  - Reduces or eliminates exposure to hazardous chemicals, physical hazards, and disease-causing organisms such as Ebola.
  - Reduces the body's normal way of getting rid of heat by sweat evaporation.
  - Holds excess heat and moisture inside PPE, making the worker's body even hotter.
  - Increases the physical effort to perform duties while carrying the extra weight of the PPE.

Photo courtesy of Kimberly-Clark

Examples of PPE you may be required to wear.

Other Risk Factors for Heat-related Illnesses



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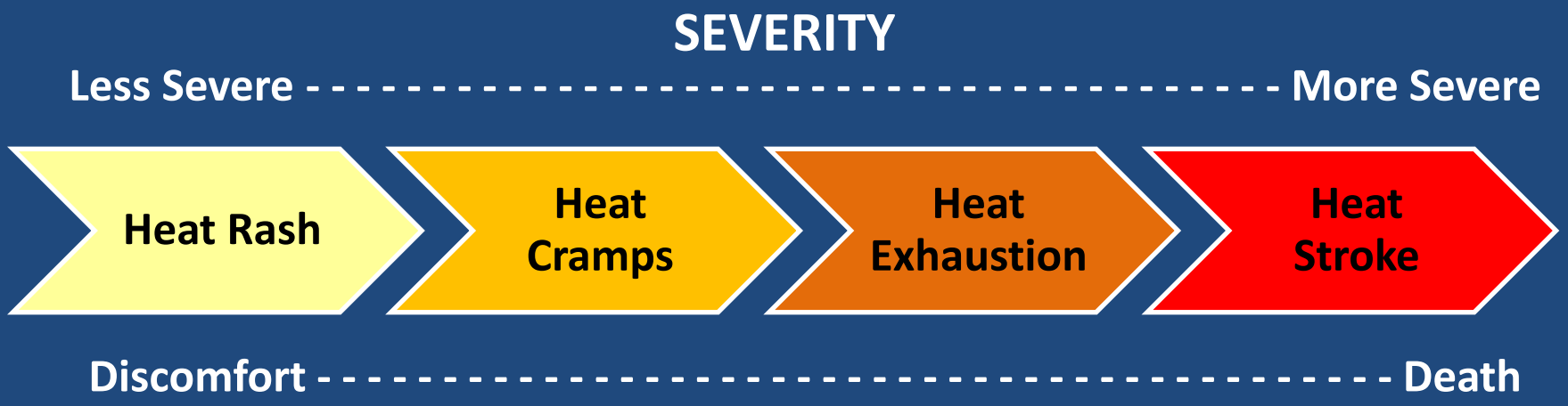
Heat-related Illnesses

- *Heat-related illnesses can vary in symptoms and severity.*



Heat Rash

☑ Symptoms

- Looks like red cluster of pimples or small blisters that usually appears on the:
  - neck
  - upper chest
  - groin
  - under the breasts
  - in elbow creases

✚ First Aid

- Keep rash area dry.
- Change out of sweaty clothes into fresh dry clothes frequently.
- Apply powder to increase comfort.
- Do not use ointments and creams.

Heat Cramps

☑ Symptoms

- Muscle cramps, pain, or spasms in the abdomen, arms, or legs

✚ First Aid

- Drink water and have a snack, and/or electrolyte-replacement drinks every 15 to 20 minutes.
- Do not take salt tablets.
- Get medical help if the worker:
  - has heart problems,
  - is on a low sodium diet, or
  - if cramps do not subside within one hour.

Heat Syncope (Fainting)

☑ Symptoms

- Fainting
- Dizziness
- Light-headedness during prolonged standing or suddenly rising from a sitting or lying position

✚ First Aid

- Sit or lie down in a cool place or remove worker that has fainted from hot area.
- Drink water or other cool liquids slowly.
- Use cool compresses.

Heat Exhaustion

☑ Symptoms

- Headache
- Nausea
- Dizziness
- Weakness
- Irritability
- Thirst
- Heavy sweating
- Elevated body temperature
- Decreased urine output

✚ First Aid

- Get medical evaluation and treatment for the worker.
- Remove worker from hot area and give cool liquids to drink.
- Remove PPE.
- Cool the worker with cold compresses or wet head, face, and neck with cold water.
- Seat the worker in an air-conditioned area or next to a misting fan.

Rhabdomyloysis
(breakdown of skeletal muscle)

☑ Symptoms

- Muscle cramps/pain
- Abnormally dark colored urine (tea or cola-colored)
- Weakness
- Exercise intolerance

✚ First Aid

- Stop activity.
- Drink water.
- Get immediate care at the nearest medical facility.
- Ask to be checked for rhabdomyolysis (blood/urine creatine kinase and myoglobin tests).

Heat Stroke

☑ Symptoms

- Confusion
- Loss of consciousness
- Hot, dry skin or profuse sweating
- Seizures
- Very high body temperature

Heat stoke may be fatal!

✚ First Aid

- Get professional medical care immediately.
- Move the worker to a shaded, cool area and remove PPE.
- Cool the worker quickly with a cold water bath. Keep the head out of the water.
- Wet the skin, place cold wet cloths on skin, or soak clothing with cool water.
- Circulate the air to speed cooling.
- Do not try to give oral fluids if the worker seems sedated or has slurred speech.

Recommendations for Preventing Heat-related Illness

- Take time to acclimatize.
- Stay well hydrated.
- Watch for signs/symptoms of heat-related illnesses.
- Take time to rest and cool down.

Take Time to Acclimatize

- **Gradually increase work** time in hot environmental conditions over a 7-14 day period.
  - If not possible, implement shorter work shifts for workers until they are adjusted to the heat.

- For **workers new to the climate,** schedule no more than 20% of the usual work shift on day 1 and a no more than 20% increase on each additional day.

- For **workers with previous experience** with the job in this climate, schedule no more than a 50% of the usual work shift on day 1, 60% on day 2, 80% on day 3, and 100% on day 4.

Stay Well Hydrated

- Arrive for your shift well hydrated.
- **Drink frequently** enough that you do not feel thirsty.
- Rehydrate during **every** rest break.
- **Tell your supervisor** and **do not start your shift** if you have recently vomited or had diarrhea.
- **Do not** use caffeine, alcohol, and other stimulants.

Stay Well Hydrated (continued)

- **Consider keeping a weight scale in the rest area.**
  - Weigh yourself before putting on PPE at the beginning of your shift and after removing it (and removing sweat-soaked scrubs) on the last shift of the day.
  - Record your body weight changes.
    ≥ 2% body weight loss = possible decreased heat tolerance
  - Alert your supervisor if you have lost body weight during a shift.
    Example: If starting weight is 150 lbs., then a 2% loss would be 3 lbs.
    (150 lbs. X 0.02 = 3 lbs.)

Watch for Signs/Symptoms of Heat-related Illness

- **Avoid working alone. Designate a buddy.**
  - Ask your buddy how he feels periodically, and encourage rest and water breaks as needed.
  - Tell your buddy if you do not feel well.
  - Follow emergency procedures if someone has heat-related symptoms.

Watch for Symptoms of Heat-related Illness (continued)

- **Assign a trained person who knows first aid to monitor the rest area for symptoms of heat-related illness.**

  Additional monitor duties may include:

  – Doing a mental health assessment on those entering and leaving the rest area. *Asking them to answer basic questions like their name, etc.*

  – Using an infrared thermometer to assess aural (ear canal) temperature.
  Temperature ≥ 102.2°F (39°C) means they should not return to work. Return to work only after temperature decreases to 100.4°F (38°C).

  – Telling workers it is time for their break.

  – Ensuring that the rest area is well stocked with water and electrolyte replacement fluids and that cooling devices work properly.

Take Time to Rest and Cool Down

- The rest area should include:
  - Shaded area, chairs, and cots.
  - Electric fans with misters or squirt bottles.
  - Bottled water and electrolyte replacement fluids.
  - Basic first aid equipment, bucket containing cool water to quickly cool down a person, and spare communication equipment to call for evacuation.
- Follow all local emergency plans and procedures if an evacuation is needed.
- Consider keeping a change of scrubs in the rest area to change out of sweaty scrubs.
- Arrive for your shift well rested.

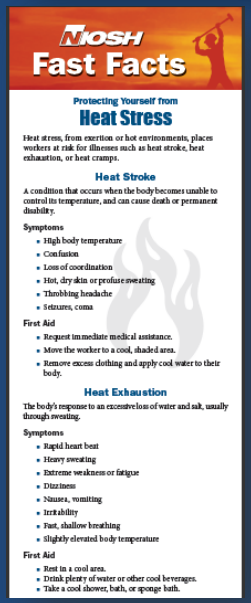
Key Points

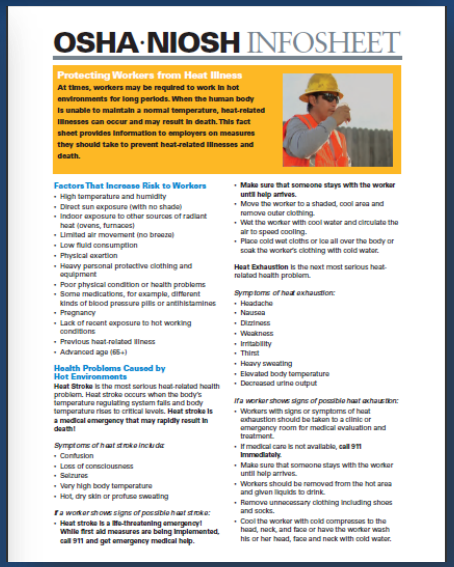
- Wearing PPE will increase your risk for heat-related illnesses.
- Take time to acclimatize.
- Stay well hydrated.
- Watch for symptoms of heat-related illnesses.
- Take time to rest and cool down.

Additional Resources

NIOSH Heat Stress Topic Page
http://www.cdc.gov/niosh/topics/heatstress/

OSHA-NIOSH INFOSHEET: Protecting Workers from Heat Illness
http://www.cdc.gov/niosh/docs/2011-174/





NIOSH Fast Facts: Protecting Yourself from Heat Stress
http://www.cdc.gov/niosh/docs/2010-114/pdfs/2010-114.pdf