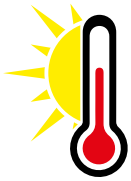


Practical Guidance for Health Care Providers on Prevention and Treatment of Heat Related Illness

Prevention of Heat-Related Illness

(See page 6)

- You can counsel patients on steps they can take to prevent heat-related illness, including awareness of dangerous heat conditions, access to cool locations, and guidance on hydration, electrolyte intake, and workplace safety.
- Patient handouts providing easy-to-understand information on how to stay safe during hot weather and when to seek medical attention are available.
- Some populations and types of patients are particularly at high risk of heat-related illness and may benefit from increased attention to the prevention of heat exposure. These include infants and small children, older persons, pregnant women, persons with disabilities, patients with diabetes, heart disease, previous history of stroke or coronary artery disease, kidney disease, lung disease, dementia or cognitive impairment, mental health conditions, or substance use disorders.

Diagnosis of Heat-Related Illness

(See page 8)

- Heat-related illnesses include heatstroke, heat exhaustion, heat-related syncope, heat cramps, heat rash, dehydration, and electrolyte abnormalities such as hyponatremia.
- **Heatstroke** is defined as severe hyperthermia (core body temperature greater than 40°C) due to heat exposure or exertion, combined with altered mental status. Patients may have seizures, coma, or other neurologic abnormalities.
- **Heat exhaustion** occurs when heat stress leads to depletion of fluid and electrolyte reserves. Symptoms may include headache, fatigue, weakness, dizziness, lightheadedness, nausea, and vomiting. There may also be mild to moderate increases in core body temperature.
- It is important to **measure a core body temperature using a rectal thermometer** in suspected cases of heatstroke. Other methods of measuring body temperature can be falsely reassuring.
- Heat-related illnesses can mimic a variety of other conditions, including infections, arrhythmias, strokes, hypoglycemia, and intoxication. It is important to **consider a broad differential diagnosis and maintain a high index of suspicion** for both heat-related illnesses and non-heat-related illnesses during hot conditions.

Treatment of Heat-Related Illness

(See page 8)

- **Patients with heatstroke should be immediately cooled to** a safe body temperature (less than 38.8°C). External cooling using **cold water immersion is the preferred approach;** providing evaporative cooling by **wetting the body and running powerful fans, or placing ice packs on the groin, armpits, and body** are also acceptable if other options are not available.
- Most patients with heatstroke will be dehydrated and will benefit from **IV fluid rehydration and correction of electrolyte abnormalities.**
- Heatstroke carries high mortality, and after initiating cooling treatments, **patients with heatstroke should be transported to a hospital** capable of comprehensive care for this condition, including monitoring for metabolic complications and organ injury.
- **Patients with heat exhaustion need fluids, electrolytes, and relief from the heat.** In healthy patients with mild-to-moderate symptoms, oral rehydration, eating a meal containing salt, and moving to a cool location are often enough to treat this problem. In patients with chronic illness, older persons, small children and babies, persons with severe symptoms, and people who do not improve with oral therapies, IV fluid rehydration in a hospital setting may be necessary.
- Patients with heat syncope should have standard syncope assessments performed by health professionals, as well as rehydration, and if necessary, cooling and correction of electrolyte abnormalities.

Heat is Getting More Dangerous in the Philippines

(See page 3)

- Climate change, also known as global warming, is leading to hotter temperatures in the Philippines. More patients are being exposed to dangerous heat than ever before.
- Studies conducted in the Philippines show that very hot weather is associated with increased morbidity and mortality.
- Cities where large numbers of older persons live are particularly high-risk settings.
- You can access information on the heat index and heat forecast from PAGASA.

Objective

This document is intended to provide health professionals with an overview of the relationship between heat and health in the Philippines and to provide a set of practical actions and information that can support good clinical practice and preventative medicine in the context of increasing heat exposure resulting from global climate change.

Contents

This document is divided into sections on the following topics:

Providers looking for guidance on the acute management of heatstroke should go to *(page 8)*.

High humidity reduces the effectiveness of sweating as a cooling mechanism, making conditions feel significantly hotter than the actual temperature displayed on the thermometer.

Prevalence of Heat-Related Illness and Burden of Disease
For Providers

Hot conditions are dangerous, and have been associated with increased morbidity, mortality, and health care utilization in a wide variety of settings around the world.

Epidemiology

The temperatures that increase the risk of harm for high-risk individuals may be lower than those considered dangerous by many people (Tobias et al, 2021). A study of the Philippines as a whole showed that overall mortality increases when it is hotter than about 25°C at night (Estoque et al, 2020); another study showed that mortality in Manila City increases at temperatures above 30°C (Seposo et al, 2015). A wide variety of diseases can be associated with hot weather; for example, in some parts of the Philippines, including Cagayan Valley, Tuguegarao City, and Isabela Province, the risk of hospitalization or death from enteric infections increases in hot weather (Chua et al, 2022).

At-Risk Populations:

Some Filipinos are at particularly high risk during hot weather, for example, older persons, women, and people with lung conditions (Seposo et al, 2015). After taking into account at-risk populations and other factors, population-level risk from heat is higher in some parts of the Philippines than others, as shown in this map of heat risk distribution (Vergara & Blanco, 2023). **See Figure 2 on page 5** for additional information on at-risk populations.

Physiologic Effects

Heat is dangerous to human health. When the body overheats, in a condition called heatstroke, internal organs can shut down and people can quickly die if they are not cooled down. Dehydration and loss of electrolytes can cause a condition called heat exhaustion, which can also be dangerous, particularly to people who already have problems with their heart or kidneys. In addition to the risk of **heatstroke** and **heat exhaustion,** people are at higher risk of heart attacks, strokes, hospitalization, and death during hot weather, due to a combination of dehydration, inflammatory and stress-related biochemistry, and resulting endothelial and end-organ injury.

Influence of Humidity

Higher humidity levels mean that the air is holding a larger proportion of moisture, and can interfere with the efficiency and effectiveness of sweating (perspiration) as a means to cool the body. The Philippines has high year-round humidity, meaning that it can be harder for patients to cool down by sweating. This also means that a given temperature is more dangerous to health than it would be in dry conditions. **See Figure 4 on page 8** for further information on how temperature and humidity interact to create dangerous heat conditions.

Metro Manila logged its new hottest temperature in recorded history of 38.8 degrees Celsius at the PAGASA station April 2024

Photo from: charlesdeluvio-unsplash.com

Influence of Cities and Buildings

The forecast temperature may not accurately represent the temperature people are exposed to in their homes or workplaces. Urban heat island effects mean that cities can be hotter than rural areas, due to factors such as fewer trees, less greenspace, more concrete, and more traffic. In the Philippines, urban areas including Metro Manila, Cebu City, and Cagayan de Oro experience higher temperatures than the rest of the country; many of the Filipinos who are most vulnerable to heat, including older persons, are concentrated in these urban areas (Vergara & Blanco, 2023). Even within a city, the upper floors of multi-story buildings, especially those without air conditioning, may be much hotter than lower levels.

Daily Temperature Variation

Temperatures tend to peak in the mid-to-late afternoon. The time of day with the highest temperatures for your location can be found at PAGASA or from your local meteorological agency. Night-time temperatures are important for physiological recovery and elevated nighttime temperatures have been associated with higher mortality in the Philippines (Estoque et al, 2020). Night-time cooling is more limited in dense urban areas due to heat retention in concrete and masonry structures and surfaces.

Seasonal Temperature Variation

The Philippines is warm year-round, with an annual seasonal variation of about 3°C. The greatest risk of dangerous heat occurs in April and May (World Bank, 2020).

Long-Term Change

Temperatures in the Philippines are getting hotter because of climate change, and long-term warming of more than a degree Centigrade has already occurred (IPCC, 2023). While a difference of a degree may seem small, what is changing is the average temperature; even relatively small increases in average temperature can lead to dramatic increases in the number of dangerously hot days. Heat-related illness and mortality are expected to increase as climate change leads to increasing exposure to hazardous heat amongst the population of the Philippines.

Impacts on Infectious Diseases

Warmer conditions can alter the dynamics of infectious diseases and their vectors. These changes tend to be linked with changes in long-term average temperatures, rather than the occurrence of short spells of intense heat. There is some evidence from the Philippines linking the hatching of dengue vector Aedes aegypti eggs with warmer temperatures, which may allow transmission in new areas such as rural highlands (Edillo et al, 2022). A wide variety of diseases can be associated with hot weather; for example, in some parts of the Philippines, the risk of hospitalization or death from enteric infections increases in hot weather (Chua et al, 2022).

Figure 1

The urban heat island (UHI) effect occurs when cities experience significantly warmer temperatures than nearby rural areas. In the Philippines, it is prevalent in highly urbanized areas like Metro Manila, Cebu City, and Cagayan de Oro, which are crammed with highly concentrated structures and limited greenery experience.

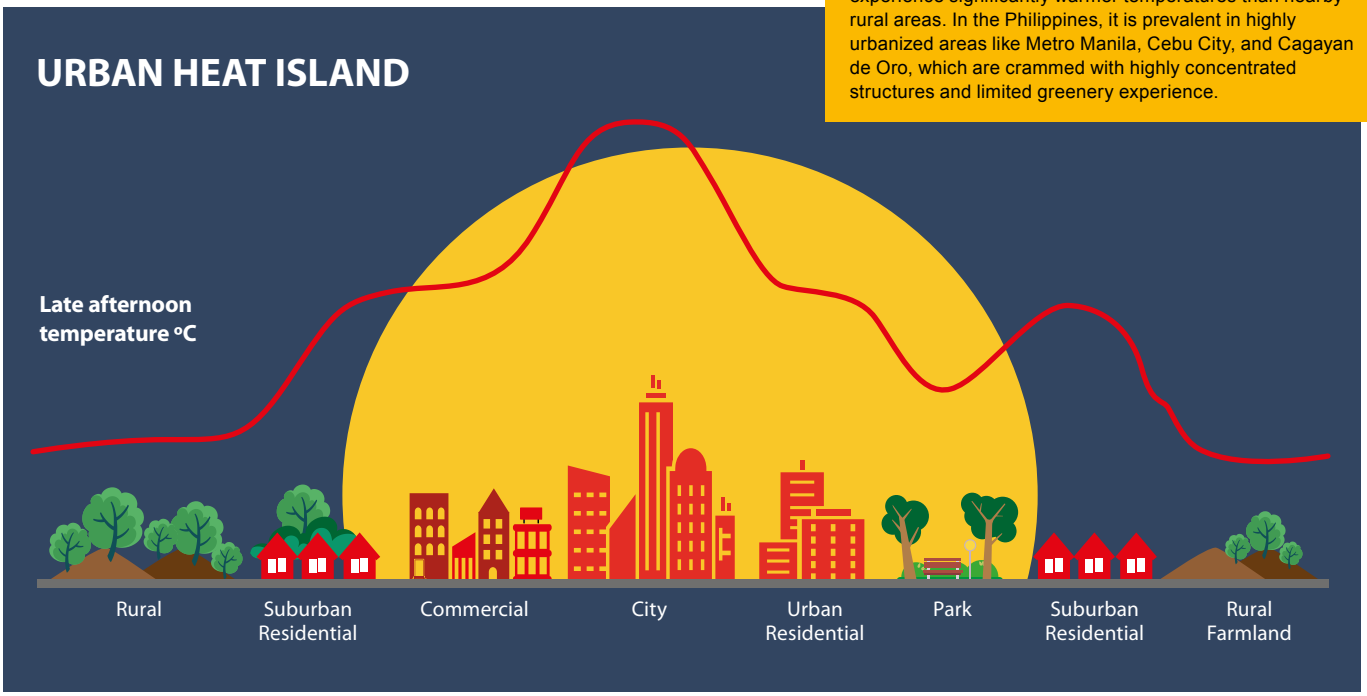
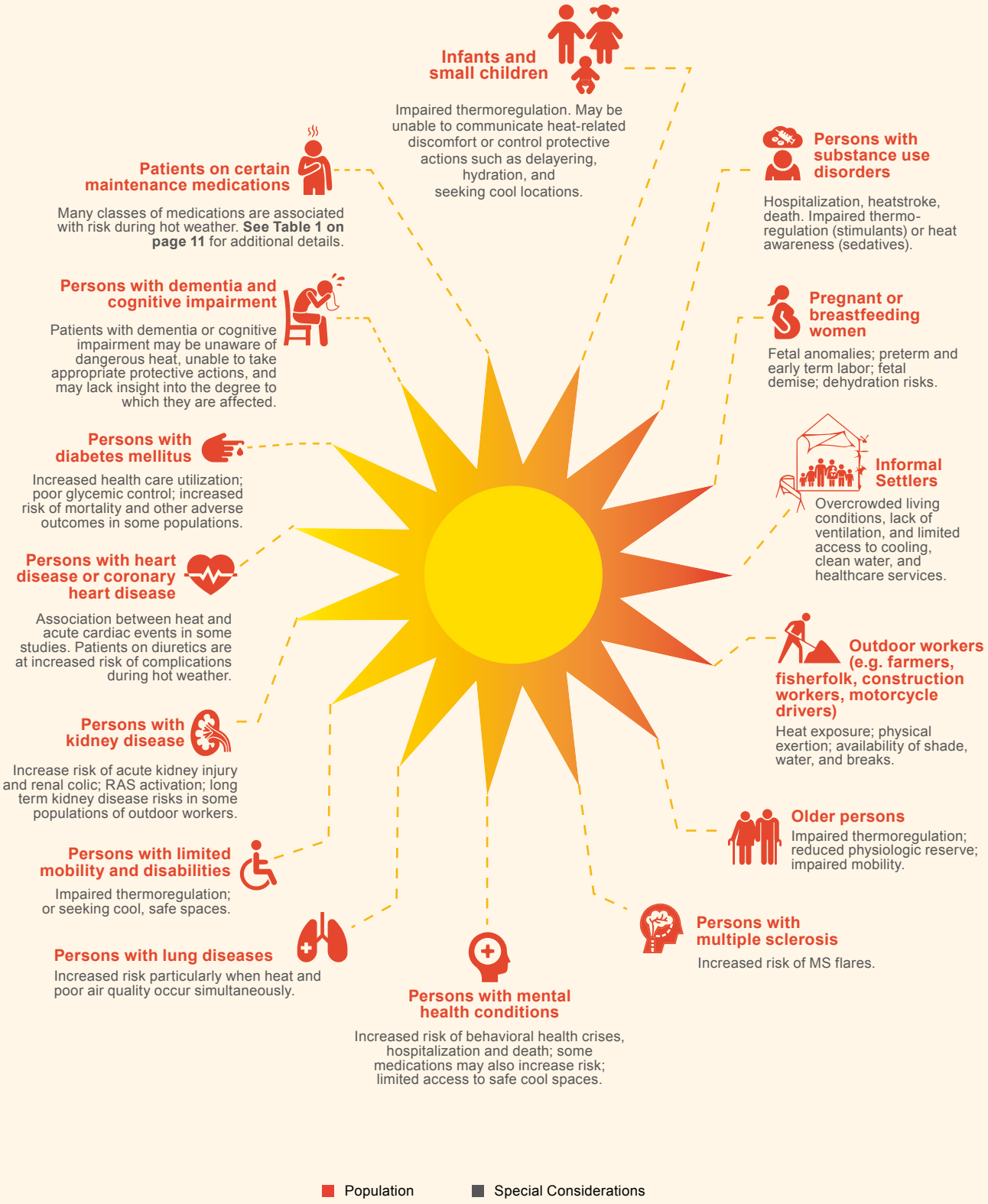


Figure 2

Special populations that have been found to be at increased risk of health harms during hot weather conditions in the Philippines and in other settings around the world.



Prevention of Heat-Related Illness For Providers

Many cases of heat-related illness can be prevented through education, access to hydration and cool spaces, and early recognition of potentially concerning symptoms or situations and actions to address these. Anticipatory guidance and development of personalized heat risk assessments can help patients know which actions to take on hot days. The following information, strategies, and resources can help you educate and guide patients who are at risk from heat on steps they can take to prevent heat-related health harms.

Outdoor Temperature

Outdoor temperature and humidity in the Philippines are becoming increasingly dangerous, particularly in April and May. Before going outside or performing a heavy physical activity such as exercise or outdoor work, patients can check weather forecasts via phone, television, radio, or the Internet. Risk increases with higher temperatures and humidity **(See Figure 4 on page 8** for specific temperature-humidity thresholds).

Indoor Temperature

Studies performed outside the Philippines suggest that temperatures in a patient's home should ideally remain below 27°C, and that if they cannot keep the temperature below 27°C, they should use a fan or consider moving to an air-conditioned space until the temperature cools. Indoor temperature guidelines specific to the Philippines may become available in the future.

If a patient does not have a thermostat or thermometer that measures room temperature in their home, they can be bought for a small amount of money at local stores or online. Consider distributing inexpensive thermometers in your clinic.

Heat Advisories and Heat Alerts

When a public health advisory has been announced, advise patients to follow their heat risk assessment **(See Figure 3 on page 7)**. Patients should stay indoors in an air-conditioned space when possible or may utilize shaded outdoor areas if necessary; it is particularly important for members of the groups listed in **Figure 2 on page 5** to seek shelter from the heat. If going outside is necessary, limit outdoor activities and avoid intense activities. Stay in shaded areas or seek shelter with shade, and wear protective gear like wide-brimmed hats and sunshades, especially during the hottest part of the day, typically from 10 a.m. to 3 p.m.

Establishing a Heat Risk Assessment

Some patients may benefit from a detailed heat risk assessment. Guidance should be based on their disease severity, comorbidities, access to air conditioning, and exposure to dangerous heat in their community, workplace, or home. The action plan can be updated during clinic visits and form the basis for both individual protective actions and clinical management of their care in the event of extreme heat.

The following questions can help you assess the risk to your patients posed by extreme heat and can provide a template through which you can provide guidance on actions they can take to reduce their risk during hot weather.

Figure 3

Heat Risk Assessment

Assess access to weather and temperature information

How do you know how hot it is outside?

If the patient does not know where to look, you can suggest their phone weather app, a radio station with frequent weather reports, or PAGASA weather forecasts.

Can you measure the temperature inside your home?

If the patient does not have a thermometer or thermostat, consider providing one or suggest that they can be purchased.

Assess the risk of exposure to excessive heat at home and at work

Do you live in a building with many floors?

If so, what floor do you live on?

Are your windows in your home able to open?

Do you have a job in which you work outdoors or work near hot machinery such as ovens, grills, or boilers?

If a patient lives on an upper floor, has a unit without functional windows, or has occupational risks, these all increase the risk of heat exposure and should be considered when developing a heat risk assessment.

Assess access to air conditioning and cool indoor spaces

Are you able to cool down your home (or rooms) when it gets hot out?

Do you have air conditioning or fans at home?

Are there air conditioners or fans in the rooms where you sleep?

Are you concerned about how much air conditioning or fans will cost if you use them?

If a patient states that they have no access to air conditioning in their home, or if their air conditioning does not adequately cool the home, or they are worried about air conditioning costs, then ask if there is somewhere they can go that has air conditioning. Examples include a place of worship such as a church, a neighbor's home, a library, a community center, or a commercial building. If they do not have any place they would go with air conditioning, consider providing them with a list of air-conditioned locations they may be able to access in their community.

Consider risks related to health conditions and medications

Do you have health conditions that increase your risk during hot weather? **(Refer to Figure 2 on page 5).**

Do you take medicines that increase your risk during hot weather? **(Refer to Table 1 on page 11).**

Where do you store your medications?

Many patients take medications that affect sweating, urination, and thermoregulation which may be associated with risk of harm during heat events. They should be advised to seek cooler environments whether indoors or outdoors (e.g., in shade). **Refer to Table 1 on page 11** for more details.

Provide guidance on managing air pollution risks

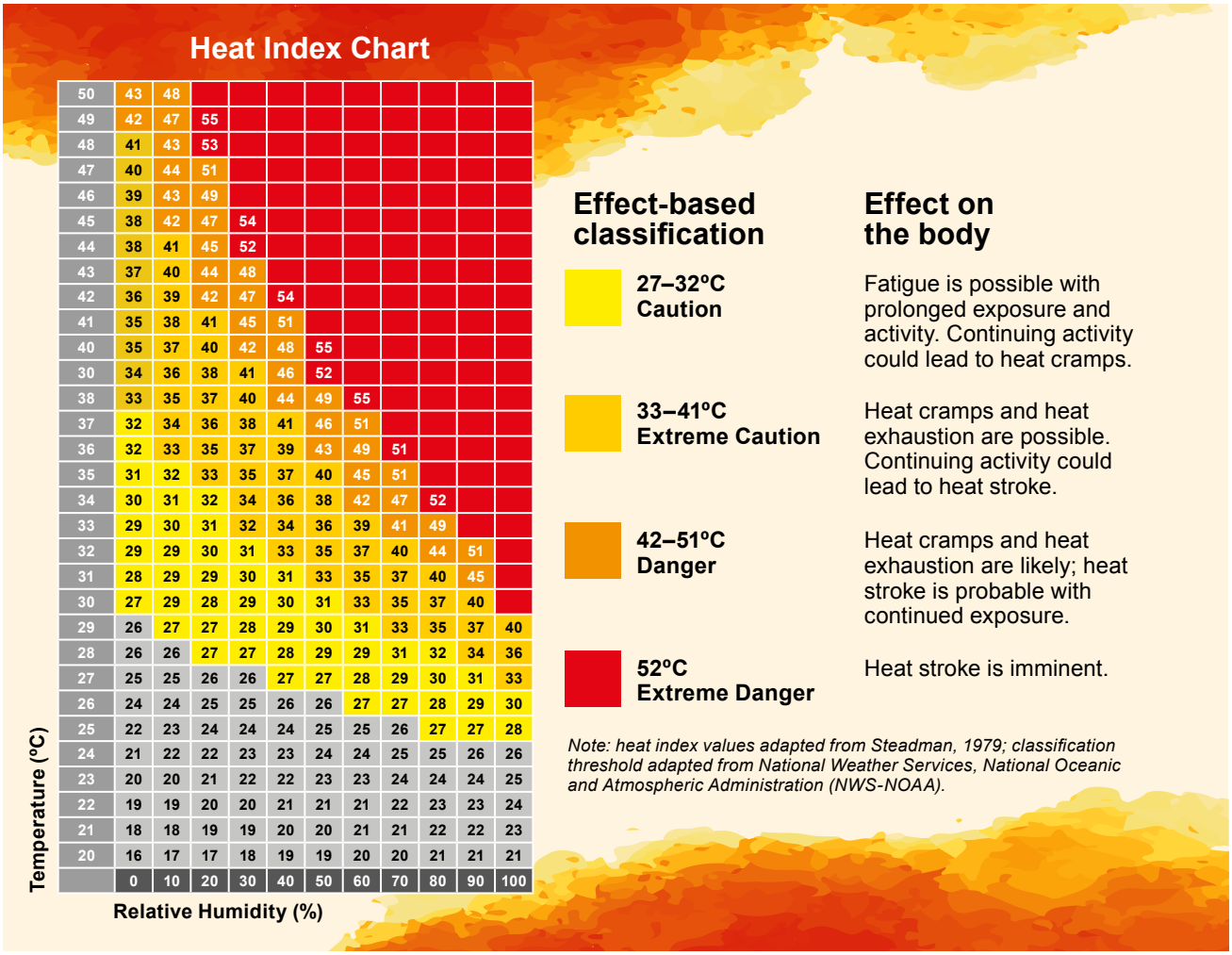
Do you use an air filter in your home?

If so, what kind is it and where does it sit?

Some patients may have indoor air filters. Portable indoor air purifiers have a wide range of capabilities in filtering out air pollutants. The filter should be the right size for the square meters of the room it operates in. Air purifiers typically come with either a MERV (minimum efficiency reporting value) rating or are HEPA-certified. Ideally, patients will have an air filter with a MERV rating of at least 13, which should remove at least 60% of particulate matter 2.5 microns in diameter or smaller. HEPA filters should be removed even more.

Monitor REAL-TIME Ambient Air Quality Monitoring of the DENR. If the AQI is over 50, closing windows may help prevent outdoor air pollution from getting inside, but this may also increase indoor heat exposure, especially if no air conditioning is available. This is a complicated decision that will need to balance risks from heat and from air pollution based on each person's situation.

Figure 4.
Both temperature and humidity affect how dangerous conditions are to human health, as shown in the following Humidex chart (Source: PAGASA Heat Index).



Recognition and Management of Acute Heat-Related Illness
For Providers

Heat-related illness spans a spectrum from heatstroke, which is immediately life-threatening, through moderate acuity conditions such as heat exhaustion and heat syncope, to low acuity conditions such as heat rash and mild dehydration. Likewise, the treatment of acute heat-related illness may range from basic interventions such as providing water and electrolytes to advanced, invasive critical care procedures performed in a referral hospital setting.

The following guidance consists of essential information and critical actions that should be understood by all health care professionals. Some techniques or interventions may be inappropriate in some settings. Health professionals are expected to practice at the level of their training or licensing, and to seek assistance or arrange transfer for cases that exceed their capabilities.

Figure 5.
Recognition and initial actions to treat heatstroke and heat exhaustion in out-of-hospital settings.
Source: Harvard / Americares Climate Resilience for Frontline Clinics Toolkit, 2024.

Heat Exhaustion vs. Heat Stroke

HEAT EXHAUSTION

Heat Exhaustion symptoms that need emergency medical attention include:

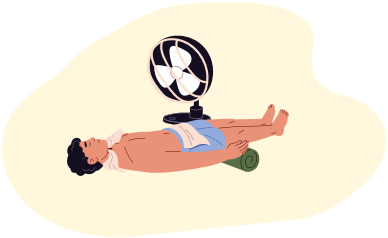
- Feeling weak or extremely tired
- Nausea
- Heavy sweating
- Feeling light-headed or as if you might pass out
- Heat cramps

HEAT STROKE

Heat stroke symptoms that need emergency medical attention include:

- Unconsciousness
- Convulsions or seizures
- Difficulty breathing
- Confusion or slurred speech
- Dry skin and very warm to touch

Heat stroke victims may look drunk. They need to be aggressively cooled immediately.



Treatment of Heat Stroke

GOOD

- Put ice packs or cold packs on the patient's neck, armpits, and groin
- Wet the patient's skin and sit in front of a fan

BETTER

- The TACO Method or Tarp-Assisted Cooling Oscillation, where you use a tarp or plastic sheet to cool the patient using cold water.
- TACO Method demonstration video: TACO Method Provides Rapid Cooling (Christopher Sampson, MD).

BEST

- Cold or ice water immersion
- Make sure to hold the patient up in the tub to protect their airway.
- Ice water demonstration video: Ice Water Immersion Video: Adding Ice to the Tub - Susan Yeargin | MedBridge - YouTube

Initial Assessment and Diagnosis

The initial assessment of ill-appearing patients presenting during hot conditions should proceed using standard prioritized assessment techniques, focusing on airway, breathing, circulation, disability status, blood glucose levels, body exposure, and assessment of environmental exposures. In patients suffering from acute heat-related illness, an exertional and/or exposure-related heat stressor is usually readily identifiable.

It is important to avoid early diagnostic closure and to recognize that non-heat-related emergencies will continue to occur during hot weather, while also recognizing that heat-related illness, particularly heatstroke, can initially mimic common conditions such as acute ischemic stroke, intoxication, or sepsis.

Core body temperature in confused or unresponsive patients who arrive during hot weather should be measured using a rectal thermometer when possible. Forehead, tympanic, and axillary temperatures may be lower than the core body temperature and thus falsely reassuring.

Diagnosis of heatstroke is established through the presence of a) hyperthermia as defined by an elevated core body temperature, typically above 40°C, and b) central nervous system dysfunction as evidenced by the presence of altered sensorium, altered mental status, seizures, coma, or other neurologic abnormalities.

Heat exhaustion is characterized by dehydration, electrolyte abnormalities, profound fatigue, and in some cases nausea, vomiting, or moist clammy skin, in patients who are awake and neurologically intact. This diagnosis is typically made clinically, although testing to assess for other conditions, such as hypoglycemia, is often indicated.

Heatstroke: Active Cooling

Actively cooling the patient, rather than relying on sweating/perspiration, is a mainstay of heatstroke treatment. Patients suffering from heatstroke should be actively cooled until their core body temperature is less than 38.8°C. Rapid cooling is essential, as the degree of end organ damage caused by heatstroke is related to the amount of time during which the patient is severely hyperthermic.

External Cooling: Placing the body in ice water or cold water is the preferred approach, as conductive heat transfer allows for rapid cooling. If ice water immersion is not feasible, evaporative cooling can be achieved by dousing the body with water and running powerful fans to circulate air. Packing the groin, axilla, and other areas with ice packs can also help cool the body.

Internal Cooling: While active external cooling is the mainstay of heatstroke management, administration of chilled IV fluids, continuous bladder irrigation with chilled fluid, and advanced internal cooling options may also be considered.

Heatstroke: Advanced Cooling Interventions

In some hospital settings, advanced cooling interventions may be considered. These may include the application of external cooling devices typically used for targeted temperature management in ICU patients, placement of endovascular cooling devices, placement of chest tubes to allow thoracic lavage with chilled saline, or use of dialysis or extracorporeal membrane oxygenation systems to allow for direct temperature management of the patient's bloodstream. Advanced interventions should only be attempted by properly trained specialists in settings with appropriate technical and institutional capabilities. The use of standard active external cooling techniques such as ice water immersion should not be delayed while awaiting the availability of more advanced interventions.

Heatstroke: Preventing Endogenous Heat Generation

Once heatstroke is identified and active cooling has been initiated, it is often desirable to also produce heat production by the body. Much of the heat produced by the human body in this situation is produced by the contraction of skeletal muscle, particularly during shivering. Benzodiazepines may be administered to reduce shivering. In patients who are unresponsive or are unable to protect their airway, endotracheal intubation may be performed and the patient placed on a ventilator, after which chemical paralysis can definitively prevent skeletal muscle contraction. Mechanical ventilation has the added benefit of reducing heat generation related to respiratory activity.

Fluid and Electrolyte Management

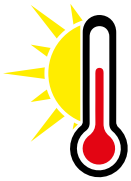
Patients experiencing heatstroke and heat exhaustion are typically volume depleted and are likely to benefit from fluid administration. In awake patients, including most patients with heat exhaustion, oral fluid and electrolyte repletion is typically effective. Patients with altered sensorium, including most patients with heatstroke, are likely to benefit from IV fluid administration if available. It is important to consider that in addition to water losses, some patients may experience hyponatremia due to insufficient intake of solutes. Altered mental status in a patient with normal body temperature should prompt evaluation of chemistries to assess for hyponatremia, which should be carefully corrected in accordance with local protocols to prevent brain injury from rapid sodium correction.

Supportive Care

Once heat-related illness has been identified and critical actions such as rapid cooling have been initiated, if appropriate, supportive care becomes a major focus of treatment. Airway management, if indicated, can prevent aspiration and reduce metabolic load. Maintaining adequate intravascular volume can help support organ function, address acute kidney injury when present, and treat rhabdomyolysis in the subset of exertional heatstroke patients who develop elevated creatine kinase levels. A small proportion of patients with severe heatstroke will go on to develop liver failure, and can benefit from transfer to a liver transplant center if available; liver function tests should be monitored in patients who require hospitalization for heatstroke. Persistent neurologic abnormalities including cerebellar dysfunction have been observed in survivors of heatstroke; referral of affected individuals for appropriate neurologic evaluation and physical or occupational therapy services may be beneficial.

Information sources

The Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) issues weather forecasts, advisories, and warnings. During hot conditions, details on dangerous heat conditions including heat index information may be available. Information on long-term changes in heat exposure in different parts of the Philippines, including the implications of climate change, can be obtained from the WHO/WMO, the Philippine Climate Change Assessment, and recent reports from the Intergovernmental Panel on Climate Change.



Reference Materials For Providers

The following materials provide additional technical detail that may be relevant for physicians, nurses, pharmacists, and other health care professionals involved in the care of persons whose health may be affected by exposure to extreme heat.

Medications

Evidence to guide specific dosing or medication changes specifically to reduce risks during extreme heat is very limited, and guidance should typically focus on behavior emphasizing seeking safe, cool locations for patients on the following medications.

Regular comprehensive medication reviews, including evaluation of over the counters and supplements, can help identify these medications, assess patient risk, and proactively address potential medication-related issues. It should also be noted that hot temperatures can degrade or damage medicines and medical devices. Patients should be advised on proper storage methods to protect their medications and medical devices during high temperatures. This applies to medications like inhalers, epinephrine, and insulin as well as equipment like blood glucose meters and test strips.

Table 1.
Medications associated with increased risk during hot weather. Adapted from Medications and Heat, by Hayley Blackburn Pharm.D, Americares, and Harvard C-CHANGE (2024).

Medication Class	Effect on Thermoregulation and Heat Sensitivity
SSRIs and SNRIs	Impaired central thermoregulation, increased sweating and increased risk of dehydration and electrolyte abnormalities
Tricyclic antidepressants	Impaired central thermoregulation, decreased sweating; Sedation or altered cognition impacting behavioral response to heat
Antipsychotics	Impaired central thermoregulation and impaired sweating; increased sedation, cognitive effects may lead to reduced alertness, judgment, and perception of hot weather which impact behavioral responses to heat. Antipsychotics with increased anticholinergic effects (e.g., clozapine, olanzapine, quetiapine) may have additive blunting of thermoregulation and increased risk
Stimulants	Impaired central thermoregulation, increased metabolic rates leading to excess heat production and hyperthermia, and altered heat perception
Benzodiazepines	Sedation, altered cognition impacting behavioral response to heat
Mood stabilizers such as Lithium	Electrolyte imbalances; risk of toxicity in the setting of dehydration

Medication Class	Effect on Thermoregulation and Heat Sensitivity
Opioids	Sedation, altered cognition impacting behavioral response to heat; potential for misdiagnosis of opioid overdose vs heat stroke delaying appropriate treatment
Diuretics	Increased risk of dehydration and hypovolemia; risk of electrolyte abnormalities; risk of hypotension and fainting/falls
ACEi and ARB	Suppressed thirst sensation impacting fluid intake behaviors and increasing risk of dehydration; increased risk of renal injury with dehydration; increased risk of hyperkalemia and other electrolyte abnormalities; risk of hypotension and fainting/falls
Beta-blockers	Disrupted thermoregulatory response through inhibition of cutaneous vasodilation and decreased sweat response; risk of hypotension and fainting/ falls
Calcium channel blockers	Increased risk of hypotension and fainting/falls; risk of electrolyte abnormalities
Antiplatelets	Both aspirin and clopidogrel have been shown to impair thermoregulatory responses during passive and exertional heat stress by reducing skin blood flow and possibly suppressing sweat responses
Insulin	Altered thermoregulatory response; increased subcutaneous absorption of insulin leading to hypoglycemic emergencies
SGLT2i	Increased osmotic diuresis and increases the risk of dehydration; dehydration may increase the risk of euglycemic DKA with SGLT2i use
Metformin and GLP-1 RA medications	Increased GI disturbances and diarrhea upon drug initiation or dose increase, leading to increased risk of dehydration

Management of Heat-Related Illness

The management of heat-related illness is focused on early diagnosis of heatstroke or heat exhaustion, and early intervention to correct core body temperature, volume depletion, electrolyte abnormalities, and organ dysfunction. Algorithms have been developed to guide management in various settings; the algorithms presented here include an approach to diagnosis and treatment in low-resource settings **(See Figure 6 below)** and a pathway that provides additional detail on diagnostic, cooling, and supportive care actions that can be taken in higher-resource settings **(See Figure 7 on page 13)**.

Figure 6.
The Wilderness Medical Society's 2024 heat illness treatment algorithm, designed for the diagnosis and management of heat-related illness in austere environments.

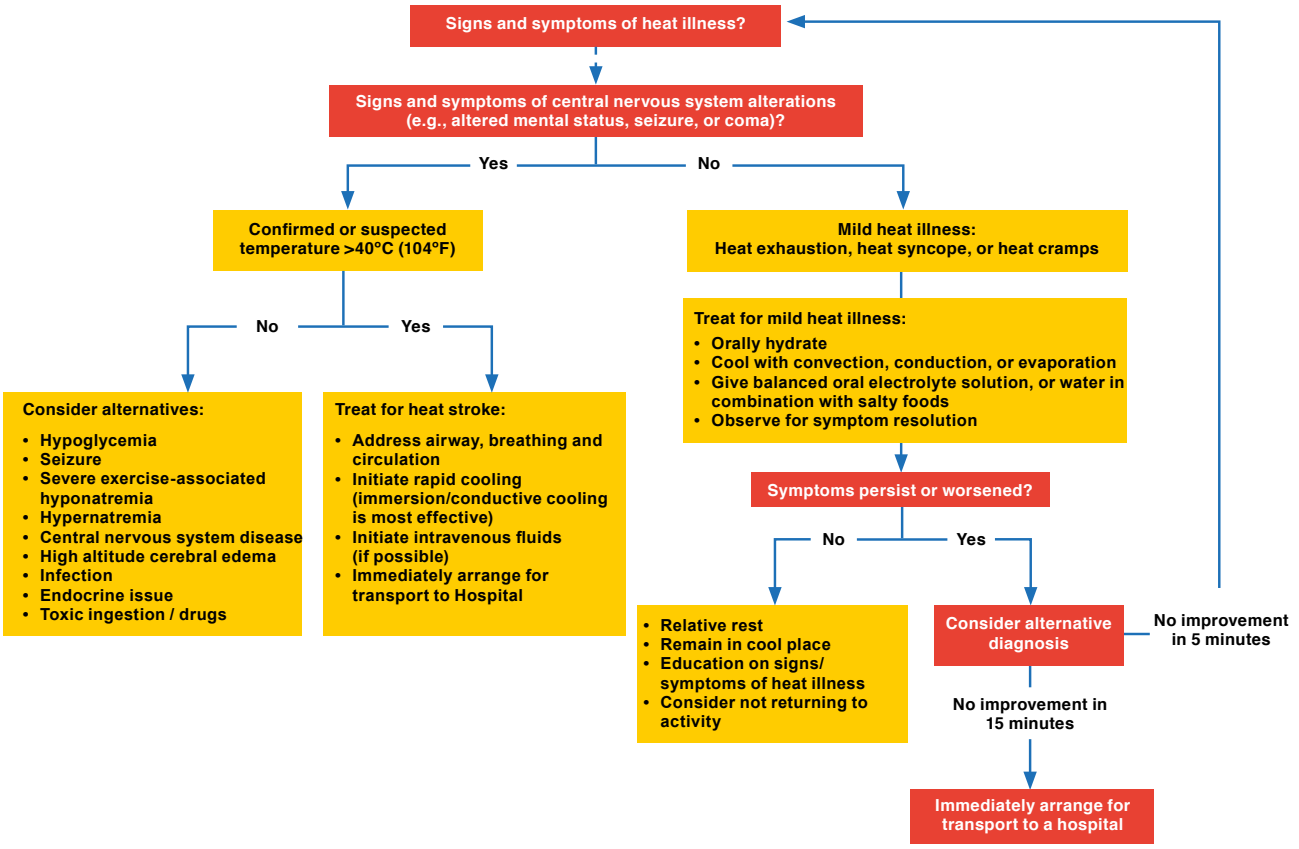
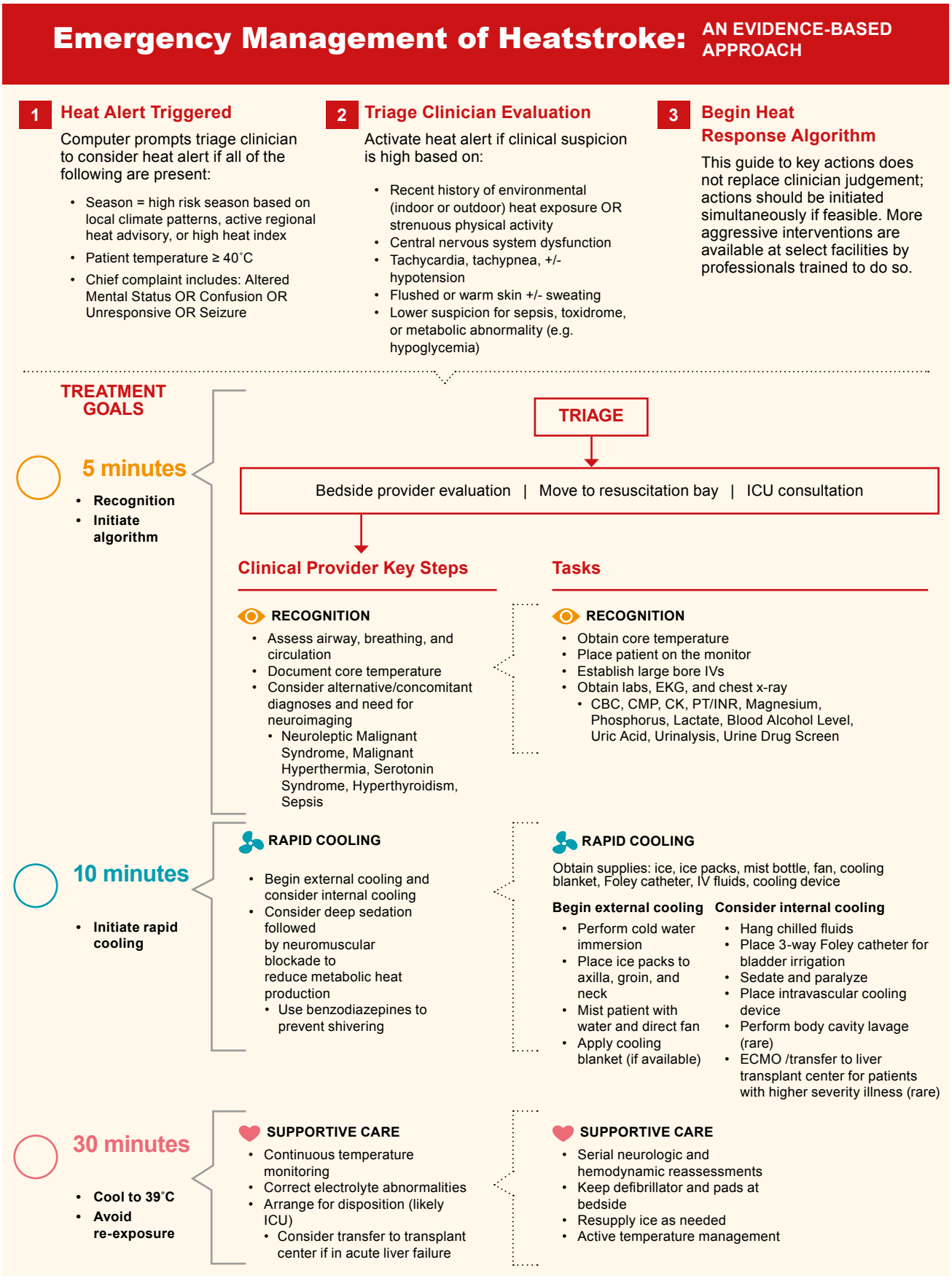


Figure 7.
Heatstroke management algorithm developed by Rublee, Dresser, Giudice, et. al. (2021) for diagnosis and management of heatstroke in emergency care settings.



Sources Cited and Relevant Literature

Sources Cited and Relevant Literature

Heat-Related Illness and Mortality

Tobias A., et al., "Geographical Variations of the Minimum Mortality Temperature at a Global Scale," 2021, doi: 10.1097/EE9.0000000000000169.

Vergara D, Blanco A. Surface Urban Heat Islands and Related Health Risk in the Philippines: a Geospatial Assessment Using Modis Data. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume XLVIII-4/W6-2022, 2023, pp.451-456.

Seposo XT, Dang TN, Honda Y. Evaluating the effects of temperature on mortality in Manila city (Philippines) from 2006–2010 using a distributed lag nonlinear model. International journal of environmental research and public health. 2015 Jun;12(6):6842-57.

Seposo XT, Dang TN, Honda Y. Exploring the effects of high temperature on mortality in four cities in the Philippines using various heat wave definitions in different mortality subgroups. Global Health Action. 2017 Jan 1;10(1):1368969.

Seposo XT, Dang TN, Honda Y. How Does Ambient Air Temperature Affect Diabetes Mortality in Tropical Cities? Int J Environ Res Public Health. 2017 Apr 5;14(4):385. doi: 10.3390/ijerph14040385. PMID: 28379204; PMCID: PMC5409586.

Estoque RC, Ooba M, Seposo XT, Togawa T, Hijioka Y, Takahashi K, Nakamura S. Heat health risk assessment in Philippine cities using remotely sensed data and social-ecological indicators. Nature communications. 2020 Mar 27;11(1):1581.

Heat and Enteric Infections

Chua PL, Ng CF, Madaniyazi L, Seposo X, Salazar MA, Huber V, Hashizume M. Projecting temperature-attributable mortality and hospital admissions due to enteric infections in the Philippines. Environmental health perspectives. 2022 Feb 21;130(2):027011.

Chua PL, Ng CF, Rivera AS, Salva EP, Salazar MA, Huber V, Hashizume M. Association between ambient temperature and severe diarrhea in the national capital region, Philippines. International journal of environmental research and public health. 2021 Aug 2;18(15):8191.

Heat and Vector-Borne Disease

Xu Z, Bambrick H, Yakob L, Devine G, Frentiu FD, Salazar FV, Bonsato R, Hu W. High relative humidity might trigger the occurrence of the second seasonal peak of dengue in the Philippines. Science of the total environment. 2020 Mar 15;708:134849.

Edillo F, Ymbong RR, Bolneo AA, Hernandez RJ, Fuentes BL, Cortes G, Cabrera J, Lazaro JE, Sakuntabhai A. Temperature, season, and latitude influence development-related phenotypes of Philippine Aedes aegypti (Linnaeus): Implications for dengue control amidst global warming. Parasites & Vectors. 2022 Mar 5;15(1):74.

Management of Heat-Related Illness

Eifling KP, Gaudio FG, Dumke C, Lipman GS, Otten EM, Martin AD, Grissom CK. Wilderness Medical Society Clinical Practice Guidelines for the Prevention and Treatment of Heat Illness: 2024 Update. Wilderness Environ Med. 2024 Mar;35(1_suppl):112S-127S. doi: 10.1177/10806032241227924. PMID: 38425235.

Rublee C, Dresser C, Giudice C, Lemery J, Sorensen C. Evidence-Based Heatstroke Management in the Emergency Department. West J Emerg Med. 2021 Feb 26;22(2):186-195. doi: 10.5811/westjem.2020.11.49007. PMID: 33856299; PMCID: PMC7972371.

Climate Change and Health in the Philippines

Philippine Climate Change Assessment: Impacts, Vulnerabilities and Adaptation. Climate Change Commission and Oscar M Lopez Center; 2017 https://climate.gov.ph/files/PhilCCA-WG2.pdf

Health and climate change: country profile 2015: Philippines. WHO / UNFCCC. 2015. https://www.who.int/publications/i/item/WHO-FWC-PHE-EPE-15.14

IPCC, 2023: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 35-115, doi: 10.59327/IPCC/AR6-9789291691647.