Cardiovascular Disease and Heat

Providers

Exposure to high ambient temperatures can increase morbidity and mortality from cardiovascular-related events, including myocardial infarction, heart failure, and arrhythmias.[1]

Heat Exposure Risks for Patients with Cardiovascular Disease

Myocardial Infarction

A 2018 meta-analysis of 23 studies showed that the relative risk of MI hospitalization was 1.016 for each 1°C increase in ambient temperature.[2] A study of older adults in New York State between 2005 and 2013 found a 7% greater risk of ischemic heart disease on the same day of extreme heat exposure.[3] Rising core body temperature increases oxygen consumption which could result in cascades of demand ischemia or plaque rupture. Additionally, volume depletion and insensible body water losses lead to hemoconcentration and hypercoagulable states. This can further increase the risk of thrombosis and myocardial ischemia.

Congestive Heart Failure

The majority of published studies evaluating the relationship between congestive heart failure (CHF) admissions and environmental exposures have focused on seasonality, rather than extreme heat. Therefore, the evidence for exacerbations of CHF attributable to heat exposure is mixed; some studies suggest that individuals with CHF, especially those who receive diuretics, may have a poorer prognosis, possibly due to severe volume depletion and potentially hypovolemic shock.[4]

Arrhythmias

Acute onset of atrial fibrillation has also been linked with heat exposure. The evidence, albeit limited, suggests that the incidence of new atrial fibrillation increases following exposure to hot temperatures, and that those with pre-existing atrial fibrillation have a higher risk of dying during extreme heat exposure.[5,6] In the Veterans Affairs Normative Aging cohort, for each 1°C increase in ambient temperature, a 10% increase in ventricular ectopy was identified on electrocardiograms.[7] Fluid shifts can disturb electrolyte balance (specifically, potassium and magnesium), increasing risk of arrhythmias in susceptible individuals.

Comorbidities

More than 70% of adults 70 years of age and older develop cardiovascular disease (CVD). More than two-thirds of patients with CVD also experience non-cardiovascular co-morbidities, including diabetes, which further increases risk of heat-related harm.[8,9]

Medication Considerations

Findings show that the use of several medications used to manage CVD increase the risk of heat-related hospitalizations during warmer months. While more research is needed, several studies have found the following classes of medications increase the risk of hospitalization: ACEIs, ARBs, beta blockers, loop diuretics, antipsychotics, and SSRIs.[10–12]

No trials have been conducted to guide clinical decision making in light of these increased risks. Limited research has found that statins, which are often used to treat dyslipidemia as a comorbidity in cardiovascular disease, may be protective against heat exposure.[13]

Temperatures of Concern

The temperatures that increase risk of harm for patients with CVD may be far lower than those considered dangerous to many people. For most cities in the United States, the minimum mortality temperature (the temperature above which mortality rates increase) is often just below the 80th percentile of the annual temperature range for American cities.[14]

Temperatures tend to peak in mid to late afternoon. The time of day with highest temperatures can be found at weatherspark.com.

The National Weather Service (NWS) issues heat advisories, excessive heat watches and excessive heat warnings. To see if a heat alert has been issued for your location, check the weather app on your smart phone, or go to weather.gov and click on your county or type in your zip code. For more details on how to access NWS alerts for heat (and other weather extremes), as well as the differences between heat watches and warnings, see the accompanying toolkit document titled “Accessing Weather Alerts”.

Built Environment

The forecast temperature available to patients may not accurately represent the temperature they are exposed to in their home or community. The upper levels of multi-story buildings, especially those without air conditioning, may be much warmer than lower levels.

Urban heat islands can result in temperatures more than 4°F higher than reported due to factors such as fewer trees and parks, more asphalt and concrete, and more traffic. Black American, Hispanic, and lower-wealth communities often live in neighborhoods with greater heat island effects.[15] Homeless individuals are at particularly high risk of heat exposure.

Heat Action Plans for Patients with CVD

Appropriate guidance for people with CVD should be based upon an assessment of the severity of their disease, comorbidities, occupation (especially if outdoors), access to air conditioning at home, and excess heat exposure from an urban heat island or the home environment.

Prior to a heat event, you can work with a patient’s primary cardiologist or care team to develop a plan. We recommend that you familiarize yourself with the “Heat Action Plan” provided in the toolkit and review it with patients. The action plan can be provided during care visits and can be the basis for a discussion around safety planning and care management in the event of extreme heat. Action plans should be completed in advance of heat season in your locale.

Anticipatory Guidance for Providers to Give to Patients

Anticipatory guidance for hot days may contribute to improved health outcomes. The strategies and resources below may be helpful for you to provide to patients who are at risk from excessive heat and reflect the “Heat Tip Sheet – CVD” available in the toolkit, which we encourage you to share with patients.

1. Before going outside, check the weather forecast on your phone, television, radio, or online (e.g., at weather.gov or weather.com).
2. If a patient does not have a thermostat or thermometer that measures room temperature in their home, they can be bought for a few dollars at hardware stores or online. Consider having inexpensive thermometers available in your clinic to distribute.

a. Indoor temperatures in the patient's home should ideally remain <80°F. If they cannot keep the temperature below 80°F, they should use a fan or consider moving to an air-conditioned space until the temperature cools.

3. When a heat advisory or heat alert has been announced by the NWS (see "Accessing Weather Alerts" for more information), advise patients to:
   a. Follow their heat action plan (see "Establishing a Heat Action Plan" for guidance)
   b. If a heat advisory is issued, patients should preferably stay indoors in an air-conditioned space. If going outside is necessary, limit outdoor activities especially during the hottest part of the day (typically 11AM to 3 PM).
   c. If an excessive heat warning is issued, patients should remain in air-conditioned spaces until the warning expires.

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