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Occupational Heat-Related Illness

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Individuals who perform physically demanding work in hot environments are at risk of heat-related illness,[1] and this risk may increase as the frequency, duration, and intensity of extreme heat events increase with climate change. For example, in 2021 a "heat dome" developed over the Pacific Northwest, in which high atmospheric pressure trapped heat, causing record-breaking temperatures and an occupational heat-related illness rate of 3.97 (95% CI, 3.26-4.80) per 100 000 workers in British Columbia, Canada, a 327% increase from comparable historical periods.[2] From 2011 to 2022, a total of 479 US workers died of heat exposure, with the highest 2000-2010 rates in the agricultural and construction industries (annual mortality rates of 3.1 and 1.1 per 1 million workers, or 35 and 13 times the risk compared with all other industries, respectively).[1] Socioeconomic and structural barriers are common among workers at risk for heat-related illness. For example, approximately one-third of US construction workers are not born in the US and 58% have reported earning less than $36 000 per year. Approximately 40% of US agricultural workers are not born in the US and 78% reported earning less than $36 000 per year. Only one-third of US construction workers and 16% of agricultural workers reported having paid sick leave benefits.[3]

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Occupational heat-related illnesses can occur in young, healthy workers and include fatal exertional heat stroke, characterized by a body temperature above 104 °F (40 °C), and central nervous system dysfunction such as delirium, seizures, or coma.[4] Occupational heat exposure is associated with acute kidney injury, exacerbation of chronic diseases such as cardiovascular disease and diabetes, and traumatic injury such as falls from ladders.[1] Heat exposure can increase the absorption of pesticides through the skin and increase metabolism of these chemicals and has been implicated as a potential risk factor for chronic kidney disease of unknown etiology, including among workers in Central America and South Asia.[1] Heat exposure, which generates a thermoregulatory response that can cause cardiopulmonary strain, can co-occur with wildfire smoke exposure, which can increase the risk of cardiopulmonary disease exacerbations through oxidative stress and inflammation. Occupational heat-related illnesses are preventable, and this article proposes solutions to help reduce the risk of heat-related illnesses among workers.

Risk Assessment

Health care teams can assess patient risk of occupational heat-related illness, which is the first step in preventing heat-related illness. A heat stress awareness program that included risk assessment and counseling was demonstrated among municipal workers in Texas to result in lower heat-related illness risk (91% decreased odds; odds ratio, 0.092 [95% CI, 0.034-0.250]) and 50% lower median workers' compensation costs.[5] Important information to assist clinicians with identifying risk of heat-related illness follows.

Workplace and Environmental Factors

High-risk workplaces may include those in agriculture, construction, disaster clean-up, kitchen, postal service, warehouse, transportation, foundry, mining, and grounds keeping industries and settings. Heat stress is affected by ambient temperatures, humidity, radiant heat (eg, from the sun), hot equipment or work surfaces, and metabolic heat generated by physical exertion. Common workplace risk factors for occupational heat-related illness include use of nonbreathable personal protective equipment (such as vapor-barrier chemical-resistant suits that prevent evaporative heat loss), piece-rate payment (ie, payment by the amount of work completed, such as the amount of crop harvested, which incentivizes faster, more intense work), and insufficient heat controls (such as hydration provided for workers, rest breaks, shade, and heat acclimatization).[1,4] Acclimatization, in which physiological adaptations allow work at lower core body temperatures and heart rates, requires up to 2 weeks to develop and can be lost after approximately 1 week away from work. In the US, from 2011 to 2016, 73% of worker heat-related deaths occurred during the first week on the job, when workers were likely not acclimatized.[6] People who work alone in remote areas, or for whom there are barriers to rapid recognition of heat stroke and institution of cooling therapy, are at higher risk of adverse outcomes and mortality.[1]

Medical Factors

Medical risk factors for heat-related illnesses include cardiopulmonary disease, diabetes, low fitness or obesity, pregnancy, and previous heat-related illness.[4] Medications and illicit drugs associated with increased risk of heat-related illnesses[4] include those that are associated with dehydration (eg, ethanol, diuretics, laxatives), increase body heat production (eg, amphetamines, cocaine, heroin, phencyclidine, 3,4-methylenedioxymethamphetamine, thyroid hormone replacement therapy), or limit cooling or thermoregulation (eg, anticholinergics, β-blockers, calcium channel blockers, antipsychotics, antidepressants such as serotonin-reuptake inhibitors and tricyclic antidepressants).

Social and Structural Factors

Certain states, including California, Washington, Oregon, Nevada, Maryland, Minnesota, and Colorado, have occupational heat illness prevention rules.[7] However, Texas House Bill 2127 and Florida House Bill 443 prevent adoption of basic local heat protections in Texas and Florida. Although state heat rules may cover all workers, including those who are undocumented, workers do not have direct control over workplace safety and may not be aware of their rights, for example, because of language barriers. A federal heat standard, which has been proposed but not adopted, would require employers to develop a heat injury and illness prevention plan and emergency response procedures, identify heat hazards, take preventive actions above heat exposure triggers, and train workers about heat hazards and prevention measures.[1]

Documentation

Documentation of the workplace, environmental, medical, social, and structural risk factors described above can inform appropriate patient prevention plans. For patients who develop heat-related illness or injury, documentation of workplace risk factors can help establish a link between heat exposure and the patient's work to support billing of medical services to appropriate insurers, such as workers' compensation. Health care delivery systems can adopt Occupational Data for Health informatics frameworks to support systematic and structured electronic health record collection of patient occupation health information for patient care, population health, and public health functions such as health surveillance.[8] Health plans can build on models such as Centers for Medicare & Medicaid Services Social Determinants of Health Risk Assessment for reimbursement of heat risk assessment and counseling. Clinicians can illustrate the need for reimbursement for preventive visits that incorporate heat risk assessment and counseling by sharing experience, data, and outcomes with health plan committees and advisory groups.

Prevention

Preventive actions should include patient counseling on heat-related illness risk factors. Resources such as the Occupational Safety and Health Administration–National Institute for Occupational Safety and Health heat safety tool[9] provide information on signs and symptoms of occupational heat-related illnesses and workplace prevention recommendations for local current and forecasted environmental conditions. Workplace recommendations include wearing loose-fitting clothing that allows air and moisture to pass through when possible, hydration with approximately 8 oz of water every 15 to 20 minutes when working in the heat, cool-down rest breaks in shaded areas, reduced work pace, lighter tasks, or organizing work to avoid the hottest parts of the day, and additional protections in more extreme conditions and for unacclimatized workers. The recommended frequency and duration of breaks depends on several factors, including the environmental conditions and intensity of work, and may be more or less than 10 minutes every 2 hours, depending on these factors. Breaks should be frequent and long enough for workers to recover from the heat.

Clinicians can participate in state or federal occupational heat rulemaking processes during public comment periods and hearings. Worker fear of employer retaliation or reduction in income from missed work due to illness may serve as barriers to worker reporting of safety and health concerns. Clinicians can help submit anonymous complaints about unsafe work conditions to state and federal Occupational Safety and Health Administration agencies when patients are not comfortable reporting concerns themselves but would like a complaint to be filed.[10]

Case managers, social workers, community health workers, or care coordinators, who facilitate communication and coordination between patients and health care professionals, can provide appropriate resources, including information about relevant state heat rules, worker benefits and rights, community cooling resources, and worker advocate contacts. Prevention plans should be revised based on periodic risk assessments and include consideration of coexistent exposures such as wildfire smoke. Clinicians can consult occupational and environmental medicine specialists with specific questions about job accommodations or prevention plans.

Conclusions

The risk of occupational heat-related illness will increase as extreme heat associated with climate change increases. Clinicians and health care systems should counsel workers about ways to identify and prevent heat-related illnesses to reduce their adverse effects on health.

ARTICLE INFORMATION

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