



The Climate Crisis and Clinical Practice

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“A wave of heat hit us as we opened the door,
like we were in the Sahara Desert!”

Sweat was beading on the forehead of the emergency medical technician as he wheeled in an elderly man with a reported fever, whose apparent confusion had led his wife to call 911. In the midst of a record-breaking heat wave, the pair was found in a top-floor apartment with no air conditioning and only one partially open window. The man was transferred to a bed, where a rectal thermometer registered nearly 106°F. We diagnosed heatstroke and rushed him to our highest-urgency area to begin cooling him.

Increasingly, such patients are becoming the human face of the climate crisis, as recognition of its health harms grows.¹ This knowledge has led to fledgling efforts to develop public health solutions to help populations prepare and adapt, and plenty of fundamental work remains to be done. But clinicians spend our days working with individual patients, and we’ve

heard little discussion of the implications of the climate crisis for our daily practice.

Effects that climate scientists have been warning us about for decades are now clearly visible in the headlines — the Australian wildfires are only the latest catastrophe. The climate crisis is a quintessential metaproblem and threat multiplier, with frighteningly broad health implications, ranging from climate-sensitive waterborne and foodborne illness to worsening mental health. It is making it more difficult for all of us in medicine to do our job of preventing harm and improving health, one patient at a time. There is thus a profound and urgent need to implement clinical practice improvements that will safeguard the health of our patients and the resilience of our care delivery system in the face of growing climate-related challenges.

Record-breaking heat waves

and extreme weather events may fill our news feeds,¹ but less visible types of exposure to climate change also have health implications — such as rising pollen levels and decreasing nutritional value of food. And combined insults can compound harms. Such exposures suggest that there are vast opportunities to identify necessary improvements in clinical practice. These improvements may vary by geographic area, medical specialty, and local practice characteristics.

The pathways by which people are exposed to the effects of climate change vary dramatically by region — such as vibrio species in the coastal northeastern United States and wildfires in the West. The situation is dynamic, however, with old threats popping up in new locations or seasons, as exemplified by the spread of vectorborne diseases. And even universal threats, such as heat stress, may vary by region: different regions, for instance, have distinct temperature thresholds at which the rate of heat-related hospital-

Suggested Clinical Practice Improvements for Heat Stress in Emergency Medicine.*	
Domain	Possible Improvements
Emergency medical services	Measurement of rectal temperature and initiation of cooling in the prehospital setting Provision of patient education on avoiding heat-related illness for patients who choose not to be transported to the hospital
Triage protocols	Daily alert to clinical teams regarding extreme heat capable of resulting in peak burden of heat-related illness (e.g., approximately 86°F for the Northeast ²) Implementation of heatstroke pathway for quick identification and treatment (e.g., obtain heat exposure and exertion history and rectal temperature for patients with fever)
Patient screening	Flagging in electronic medical record for patients with high-risk medical conditions (e.g., cardiovascular or renal disease) and heat-sensitive medications Screening for access to cool home environment (e.g., air conditioning units and financial means to operate them) or participation in high-risk occupation (e.g., outdoor work)
Interventions	Ensuring easy access to cooling equipment (e.g., immersion chambers, fans, and water-dispersion devices) in the emergency department Considering changes to high-risk medications (e.g., antihypertensives, SSRIs), weighing benefit against theoretical risk
Patient education and discharge	Follow-up calls or home visits after discharge for patients at high risk for heat-related illness Provision of heat-index education and direction of patients to real-time updates to inform behavior Instruction on risk factors for heat-related illness and on care of heat-sensitive medication (e.g., albuterol) Development of backup plan for cooling and electricity-dependent medical supplies at home or work in case of power outage
Health care delivery	Implementation of team drills for clinicians and staff that simulate the limited-resource environment created by a backup generator or complete loss of power with generator failure Analysis to identify future supply-chain vulnerabilities to proactively prepare treatment alternatives

* Improvements will vary according to the climate-change exposure pathway and by geographic area, medical specialty or health discipline, and local practice characteristics. SSRI denotes selective serotonin-reuptake inhibitor.

izations peaks.² Historically hot Arizona hits a hospitalization spike beginning around 101°F, whereas cooler Oregon starts seeing a spike at 81°F — well below temperatures that trigger heat alerts.²

Though the implications for certain specialties — and other health disciplines, such as social work — are clearer than others, every specialty will see practice consequences. Even radiation oncologists may see more patients die if treatment is disrupted by climate-sensitive hurricanes.³ Improving clinical practice requires consideration of factors such as local patient demographics, social determinants of health, and health care infrastructure.

All climate pathways have implications for the practice of emergency medicine and thus need to be considered when we're identifying improvements. My encoun-

ter with the elderly man with heatstroke prompted me to think through one set of possible systemic and patient-level improvements — just one example of such a step, focused on heat stress and key care delivery disruptions in the Northeast (see table).

These suggested practice and care delivery improvements highlight certain fundamental principles for emergency medicine, such as serving as a health safety net for vulnerable people who are disproportionately harmed by the climate crisis. Screening for access to cool environments or high-risk occupations should occur in the primary care physician's office. But emergency departments play an important role during periods of extreme heat: by the time patients see their primary care provider, if they have one, the harm may already have been done.

In the case of heat stress, clinicians also need to determine whether patients are taking medications that may affect the risk of, or may be affected by, heat-related illness. Certain medications, such as diuretics and selective serotonin-reuptake inhibitors, can put patients at higher risk for heat-related illness, though data are relatively sparse.¹ In addition, medications (including lifesaving medications) frequently have optimal storage temperatures for maximal efficacy. Albuterol inhalers have been shown to have decreased efficacy when exposed to temperatures of 140°F — a temperature that may be reached inside a car during periods of extreme heat.⁴ The data on epinephrine also give cause for concern for degradation in extreme heat. There are thus critical research and education gaps to be filled.

Improvement of health care delivery to minimize disruptions is another important area that requires more research.¹ Power outages during extreme heat can create dangerous situations in which patients may lose access to cooling equipment or electricity-dependent medical supplies at home. Hospitals must rely on backup generators that may power only certain aspects of operation, resulting in technological complications and turning normally high-tech hospitals into limited-resource environments. Recently, nearly 250 hospitals were affected by the intentional power outages in California, undertaken to reduce the risk of wildfires. Many of the events that expose us to the effects of climate change can also result in supply-chain disruptions like those that have caused shortages of intravenous saline.¹ Such disruptions further hinder clinicians' ability to provide care, and they present a significant opportunity to proactively prepare instead of reflexively reacting to each individual crisis.

Despite the irony, I often describe our current knowledge of the health effects of climate crisis as an iceberg. Though we see a peak above the water's surface,

there is much more to fear from the larger mass beneath — the effects that we haven't yet identified. For example, rising temperatures were recently linked to increasing bacterial resistance to antibiotics.⁵ The full health implications of the climate crisis may be far more immense and insidious than we have so far imagined. Although dedicated climate and health research is needed, this gap can be addressed more rapidly by adding a climate-change lens to existing lines of research.

Transitioning from theoretical discussions to practical applications will require multidisciplinary collaboration and sharing of best practices. We will need to learn from health professionals and systems that have already been facing dynamic climate threats that will increasingly affect other regions. Collaboration is the driving force behind the Climate Crisis and Clinical Practice initiative that is being launched in Boston on February 13, 2020, with the first of what we, the organizers, hope will be numerous symposia held throughout the United States and elsewhere. The initiative aims to highlight this critical need and provide an online forum to promote conversation. Although ulti-

mately the best medicine for the climate crisis is preventive — the urgent reduction of greenhouse gases — we cannot ignore the myriad ways in which our patients' health is already being harmed and our responsibility to improve our practice.

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Modernizing Scope-of-Practice Regulations — Time to Prioritize Patients

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Ongoing payment reforms are pressing health systems to reorganize delivery of care to achieve greater value, improve access, integrate patient care among settings, advance population health, and address social determinants of health. Many organizations are

experimenting with new ways of unleashing their workforce's potential by using telehealth and various forms of digital technology and developing team- and community-based delivery models. Such approaches require reconfiguring of provider roles, but

states and health care organizations often place restrictions on health professionals' scope of practice that limit their flexibility.¹

These restrictions are inefficient, increase costs, and reduce access to care. As leaders of public and private research centers