

UCSF

UC San Francisco Previously Published Works

Title

Climate Change and Health: Occupational and Environmental Medicine at the Frontlines.

Permalink

<https://escholarship.org/uc/item/4hz1x27h>

Journal

Journal of Graduate Medical Education, 16(6 Suppl)

ISSN

1949-8349

Authors

Khan, Alya
Berenji, Manijeh
Cloeren, Marianne
[et al.](#)

Publication Date

2024-12-01

DOI

10.4300/jgme-d-24-00080.1

Peer reviewed

Climate Change and Health: Occupational and Environmental Medicine at the Frontlines

Alya Khan , MD, MS, FACOEM

Manijeh Berenji, MD, MPH, CMLE, QME, FACOEM, FACPM, FIAIME

Marianne Cloeren, MD, MPH, FACOEM, FACP

Gina Solomon, MD, MPH

Rose Goldman, MD, MPH, FACPM

Introduction

A 45-year-old man presents to his physician for potential adjustment of his blood pressure medications. He mentions that he has been having worse headaches recently. Concerned, he went to the emergency department, where he was evaluated and advised to follow up with his physician for further assessment of his hypertension and to optimize his current medication regimen. The weather has been unusually hot, and given the increasing recent heat waves, the physician is now routinely asking patients if they have a way to stay cool at home or at work on hot days. The patient states he has air-conditioning at home but has difficulty staying cool at work while working as a roofer. He explains that he gets a water break every 2 hours and has access to shade only during lunch breaks.

Often patients do not recognize the relationship between symptoms and their environment, and even when recognized, may not have the ability to change their environments. Clinicians across specialties often see patients with heat-related illnesses, but they may have lacked training during residency or fellowship, and may still lack resources to adequately diagnose and counsel patients. Clinicians who are able to recognize and manage heat-related illnesses could provide guidance for this patient, including recommendations on best cooling practices and hydration. While health effects of climate change affect almost every medical specialty, occupational and environmental medicine (OEM) specialists bring specific expertise about the impacts of environmental exposures on health and can offer targeted individual and population solutions to manage and prevent conditions caused or exacerbated by climate change.^{1,2}

Role of OEM Physicians in Workplace Mitigation and Adaptation to Climate Change

OEM is an Accreditation Council for Graduate Medical Education–accredited medical specialty that

focuses on health outcomes linked to workplace and environmental exposures, including climate change. The specialty encompasses the fields of public health, epidemiology, toxicology, and industrial hygiene to assess, manage, and prevent occupational health issues, including work causation, fitness for work, impairment assessment with suggested reasonable accommodations, surveillance for work conditions, and preventive measures like immunizations and personal protective equipment (PPE).³ OEM training also includes considerations of community environmental health, environmental and social justice, and attention to the broader ecological and planetary context. OEM residency training requires at least an initial clinical training year accredited by the ACGME before entering the 24-month residency program. Training consists of a mixture of clinical and practicum experiences to address OEM competencies. Trainees are required to complete a Master of Public Health or equivalent degree as part of their training if they do not already hold one.

OEM specialists identify and mitigate workplace hazards and collaborate with stakeholders (workers, employers, and relevant agencies) to ensure a safe working environment. This includes knowledge of the federal and state laws and regulations that protect worker health and the environment, as well as public health guidelines.^{1,2} OEM specialty training teaches a unique set of skills critical for addressing climate-related health impacts through a population health lens.

OEM specialists assess worksite and community exposures using a “hierarchy of controls” (HOC) to reduce and prevent risk (see FIGURE).⁴ This HOC may involve redesigning the work environment where possible, implementing engineering and administrative measures, developing medical surveillance programs, and educating workers and supervisors on the use of PPE and other control measures. Fundamentally, the HOC incorporates the concept of various levels of prevention. In climate-related health conditions, “elimination” of the hazard could involve greenhouse gas reduction at the highest possible level. It could also include strategies to cool communities by addressing

DOI: <http://dx.doi.org/10.4300/JGME-D-24-00080.1>

Editor's Note: The online supplementary data contains a visual abstract.

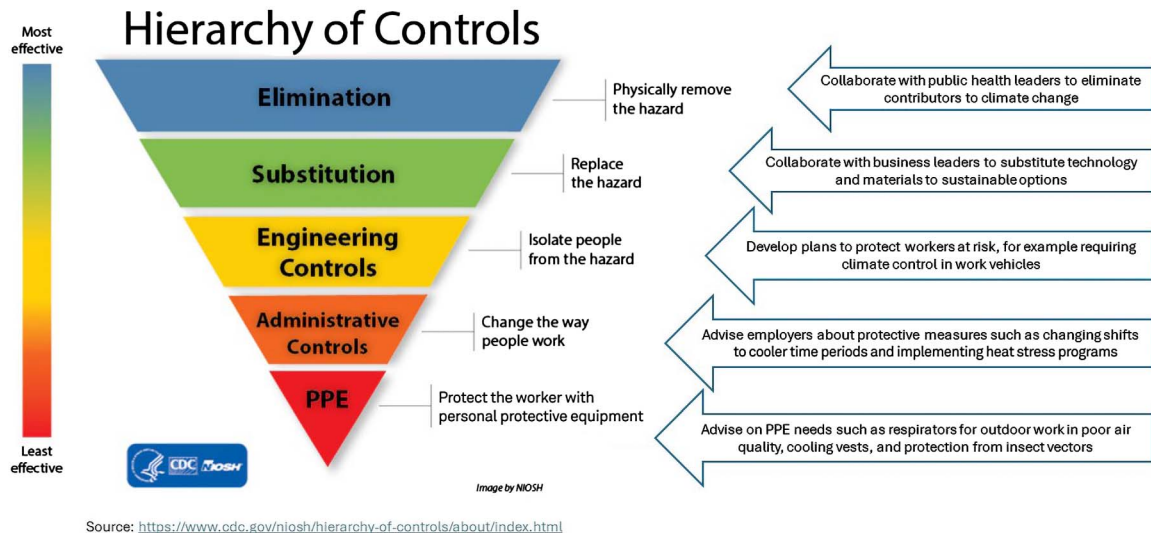


FIGURE
 NIOSH Hierarchy of Controls With Climate Change Examples
 Abbreviations: NIOSH, National Institute for Occupational Safety and Health; PPE, personal protective equipment.

the urban heat island effect, such as increasing tree canopy or using cool pavements.

Our case: The physician is concerned about the patient's working conditions but is not sure about the regulatory norms in the roofing industry or how to approach the employer with these health and safety concerns. The physician refers the roofer to an OEM specialist for assistance with worker accommodations. The OEM physician takes a comprehensive medical history, including an occupational and environmental health history. They determine that the patient has been having symptoms of heat-related illness and is at risk for a more severe heat injury due to underlying hypertension. They are also aware that the patient's coworkers are at risk for heat-related illness and that their state recently passed an occupational heat stress standard that requires proactive measures to protect workers from heat-related illness. The OEM physician prepares medical documentation to support all the necessary actions to prevent a heat-related illness, notifies the employer about the heat stress standard, and provides specific recommendations consistent with the new law, requiring shade, water, and rest when the temperature reaches specific thresholds, to protect all the workers. A heat stress "toolbox talk" is shared by the OEM physician with the employer to use to educate supervisors and workers, as well as information about the Occupational Safety and Health Administration–National Institute of Occupational Safety and Health (OSHA-NIOSH) Heat Safety Tool app that can be downloaded to a smartphone, which offers real-time outdoor heat and humidity readings, warning levels, symptom lists, and first aid measures.⁵

Integration of Climate Health Education Into Graduate Medical Education

All graduate medical education (GME) programs should systematically address climate health education by advocating for program-specific competencies and milestones. Utilizing the Global Consortium on Climate and Health Education core physician competencies, additional language can be proposed to relate to specialty-specific domains.⁶

OEM specialists can be a resource to GME programs by creating and integrating climate health curricular topics and by helping develop competency frameworks for hazardous exposures from climate events. OEM training programs can also provide specialized training to other GME programs on risk assessment and applying the HOC approach.

A unique feature of OEM training programs is the incorporation of worksite or environmental site visits for direct observations of occupational and environmental practices in various industries, which can include assessments of work practices relevant to climate change mitigation. GME programs could partner with OEM programs in joint worksite visits, to foster interprofessional discussion around climate change effects and mitigation.

OEM physicians work closely with industrial hygiene, safety, nursing, epidemiology, and public health professionals; therefore, many OEM programs have developed interdisciplinary conferences to review clinical cases and discuss best practices. This model can be expanded to other GME programs in collaboration with OEM faculty, to focus on climate change and health. The shortage of knowledgeable faculty is a

TABLE
Suggested Initiatives to Integrate Climate Health Education Into GME

Initiative	Description
Sustainability projects/rotations	Develop rotations to collaborate with corporations, safety professionals, and industrial hygienists on sustainability projects. Learners gain practical experience in tackling climate change issues from a corporate perspective. These opportunities enhance interdisciplinary collaboration and help GME programs integrate climate change awareness and resilience into their curricula.
Quality improvement projects	Implement projects addressing climate change health disparities and sustainability challenges to streamline health care operations in an environmentally responsible manner, addressing vulnerable populations' needs and educating future physicians.
Site visits	Utilizing OEM's model of worksite visits, expand to areas impacted by climate change, where there are needs or examples of mitigation. Learners gain firsthand insights into the consequences of climate change and the organizations working on mitigation/adaptation efforts.
Advocacy and policy education	Integrate advocacy and policy training for influencing climate and health policies at local and national levels. Implement through modules or rotations in institutions promoting climate change policies.
Community partnerships	Partner with community organizations and public health departments on community-based projects, fostering grassroots engagement, and linking medical education with real world needs.
Interdisciplinary conferences	Modeling some OEM interdisciplinary conferences, expand conferences for trainees from diverse specialties to share project outcomes, research findings, and challenging clinical cases related to climate change and health.
Roundtable discussions	Include diverse perspectives from researchers, public health experts, safety professionals, and other relevant fields in roundtable discussions on climate change and health.
Outreach to primary care physicians and other clinicians	Establish protocols for specialty referrals regarding health effects of climate and other environmental change.

Abbreviations: GME, graduate medical education; OEM, occupational and environmental medicine.

barrier to adding residency curricula on climate-related health effects, and collaborations with OEM faculty and trainees may address this barrier.⁷

Trainees in other residency pathways could work with OEM faculty and trainees on joint quality improvement projects, offering synergy and broadening perspectives. Projects could address sustainability, develop clinician educational programs, and target vulnerable populations' needs. Additional suggestions are provided in the TABLE.

OEM is at the forefront of transforming climate health education with expertise in working with communities, workplaces, and public health. The evolving climate crisis offers numerous, largely untapped opportunities for OEM faculty and trainees to partner with other specialties in developing curricula and clinical experiences. With OEM collaborations, other GME programs will gain resources for training future physicians to prevent and mitigate climate-related illness, be a resource to patients in adapting to climate change, and promote well-being by leveraging technology, environmental awareness, and collaboration between health care, workplaces, and communities.

References

1. Tustin AW, Cannon DL, Arbury SB, Thomas RJ, Hodgson MJ. Risk factors for heat-related illness in U.S. workers: an OSHA case series. *J Occup Environ Med.* 2018;60(8):e383-e389. doi:10.1097/JOM.0000000000001365
2. Tustin A, Sayeed Y, Berenji M, et al. Prevention of occupational heat-related illnesses. *J Occup Environ Med.* 2021;63(10):e737-e744. doi:10.1097/JOM.0000000000002351
3. Hartenbaum NP, Baker BA, Levin JL, et al. ACOEM OEM core competencies: 2021. *J Occup Environ Med.* 2021; 63(7):e445-e461. doi:10.1097/JOM.0000000000002211
4. Ajslev JZN, Møller JL, Andersen MF, Pirzadeh P, Lingard H. The hierarchy of controls as an approach to visualize the impact of occupational safety and health coordination. *Int J Environ Res Public Health.* 2022;19(5):2731. doi:10.3390/ijerph19052731
5. Centers for Disease Control and Prevention. OSHA-NIOSH Heat Safety Tool App. Published August 12, 2022. Accessed January 7, 2024. <https://www.cdc.gov/niosh/topics/heatstress/heatapp.html>

6. Sorensen C, Campbell H, Depoux A, et al. Core competencies to prepare health professionals to respond to the climate crisis. *PLOS Climate*. 2023;2(6):e0000230. doi:10.1371/journal.pclm.0000230
7. Blanchard OA, Greenwald LM, Sheffield PE. The climate change conversation: understanding nationwide medical education efforts. *Yale J Biol Med*. 2023;96(2):171-184. doi:10.59249/PYIW9718



Alya Khan, MD, MS, FACOEM, is Associate Clinical Professor, Department of Environmental and Occupational Health, University of California, Irvine Joe C. Wen School of Population and Public Health, Irvine, California, USA; **Manijeh Berenji, MD, MPH, CMLE, QME, FACOEM, FACPM, FIAIME**, is Health Sciences Associate Clinical Professor, Division of Occupational and Environmental Medicine, Department of Medicine, University of California Irvine School of Medicine, and Department of Environmental and Occupational Health, University of California, Irvine Wen School of Public Health, Lead, Academic and Community Partnerships, University of California Center for Climate Health and Equity, Irvine, California, USA, and Associate Clinical Professor, Department of Medicine, Charles R. Drew University College of Medicine, Los Angeles, California, USA; **Marianne Cloeren, MD, MPH, FACOEM, FACP**, is Associate Professor of Medicine, Division of Occupational and Environmental Medicine, University of Maryland School of Medicine, Baltimore, Maryland, USA; **Gina Solomon, MD, MPH**, is Chief, Occupational, Environmental, and Climate Medicine, University of California, San Francisco, San Francisco, California, USA; and **Rose Goldman, MD, MPH, FACPM**, is Associate Professor of Medicine, Harvard Medical

School, Associate Professor of Environmental Health, Harvard T.H. Chan School of Public Health, Boston, Massachusetts, USA, and Director of Faculty Affairs, Department of Medicine, and Occupational and Environmental Health Physician, Cambridge Health Alliance, Cambridge, Massachusetts, USA.

The authors would like to acknowledge the following individuals, who helped formulate the ideas presented in this article, and who continue to help develop specific recommendations for modifications to the curriculum of Occupational and Environmental Medicine residents to prepare them to lead climate change-related health efforts: Stefan Wheat, MD, Assistant Professor of Emergency Medicine, University of Washington School of Medicine; Oladele Ogunseitan, PhD, MPH, Distinguished Professor, Department of Population Health and Disease Prevention, and Department of Environmental and Occupational Health, University of California, Irvine; Samantha Ayoub, MD, MS, Addiction Medicine Fellow, Department of Preventive Medicine, Loma Linda University; Peter Rabinowitz, MD, MPH, FAAFP, Professor, Department of Environmental and Occupational Health Sciences, Department of Global Health, University of Washington School of Public Health, Department of Family Medicine, University of Washington School of Medicine; Bhargavi Chekuri, MD, Co-Director of Climate and Health Science Policy Fellowship, Co-Director of Diploma in Climate Medicine, Assistant Professor of Family Medicine, University of Colorado School of Medicine; and Cecilia Sorenson, MD, Director, Global Consortium on Climate and Health Education, Columbia University, Associate Professor, Department of Environmental Health Sciences, Mailman School of Public Health, Associate Professor, Department of Emergency Medicine, Columbia University Irving Medical Center.

Corresponding author: Alya Khan, MD, MS, FACOEM, University of California, Irvine, Irvine, California, USA, alyak@hs.uci.edu