Interactive Workshop on Identifying Health Effects of Climate Change in the Clinical Setting

An Occupational and Environmental Health Solution

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Objective: The aim of the study was to provide clinicians an occupational framework to assess climate-related health conditions, determine at-risk workers, and devise solutions. **Methods:** An interactive workshop was presented at the 2022 American Occupational Health Conference. Six climactic events related to occupational health were chosen with corresponding cases from National Institute of Environmental Health Sciences. Participants answered and discussed scripted questions. A 5-point Likert scale utilized by the American Occupational Health Conference evaluated the workshop's quality and utility, and the audience's ability to apply the knowledge. **Results:** Sixty-one ($N = 66$) participants ranked the workshop highly (4.4–4.6/5). Most participants (90%) reported incorporation of practical knowledge gained, increased advocacy capacity, and ability to teach about the issue. **Conclusions:** Successful integration of engaging interactive sessions in clinician education on climate change and health is critical as climactic conditions can increase patient vulnerability in their role as workers.

Keywords: extreme heat and climate change, air pollution & allergens, climate-related food poisoning, vector-borne diseases, flooding & environmental contamination, climate related mental distress, occupational and environmental medicine, worker health

LEARNING OUTCOMES

- To present a process to guide occupational and environmental medicine (OEM) professionals in eliciting relevant information on climate and weather events, responsible for multiplying the risk of occupationally related health conditions
- To present an interactive model that OEM educators can utilize to teach about the hazards resulting from climate-related events and that can influence various labor sectors
- To provide clinicians a series of questions relevant to diagnosing and treating illnesses and injuries faced by workers that have become increasingly more common as a result of a changing climate.
- To learn how to utilize the OCAREER© mnemonic.

Climate change is one of the most critical threats affecting global health.[1,2] Climate-driven impacts such as severe weather, emerging microbial pathogens like Zika virus,[3] and the Coronavirus-2019[4] are increasingly placing demands on healthcare systems[5] and clinicians. Healthcare workers' lack of knowledge, including those in training, in identifying the effects of climate on health[6] in their patient presentations can delay diagnosis, treatment, and prevention. Millions of people spend a major portion of their daily lives at work,[7] and various industries will be affected differently by climate disruption.[8] Hence, knowledge of health effects of a changing climate on occupational and environmental health will better equip clinicians to assess presenting signs and symptoms, render diagnoses, and arrive at integrated solutions.

This interactive workshop provided clinicians a basic framework around main health effects of climate change and the occupations most at risk, by dissecting specific climactic event scenarios. The six climactic event scenarios discussed are as follows: 1. extreme heat; 2. air pollution & allergens; 3. food and nutrition; 4. vector-borne diseases; 5. flooding and waterborne infections; and 6. mental health. The workshop started with a didactic component. Structured questions were provided along with the didactics. The participants discussed these questions and applied their clinical knowledge to identify the situations in which the effects of a changing climate may be causative.

METHODS

This 90-minute, invited, case-based workshop was presented in 2022, at the American Occupational Health Conference, the largest gathering for Occupational and Environmental Medicine professionals (OEM) in the United States. Participants included OEM and preventive medicine physicians, trainees, and advanced practice providers. The objectives of the workshop were for participants to be able to 1. Understand the science behind climate change; 2. Identify three effects of climate change on worker health; 3. Create three questions, based on the cases presented, that would elicit relevant information from patients making the link between climate change and health; and 4. Develop three recommendations for mitigating the impact of climate change on worker health. The format of the workshop was designed specifically with resident education in mind so that it can be incorporated into teaching programs in various settings.

The first 30-minute workshop was didactic and started with a lecture on the science of climate change. The pathways, health impacts, and high-risk groups associated with the six designated climactic event scenarios were also presented. During the second half of the workshop, participants formed six small groups. Each group was assigned one of the six climactic event scenarios, each event was adopted from educational materials for students and health professionals from National Institute of Environmental Health Sciences.[9] The groups had 30 minutes to read and discuss the scenarios, focusing on their greatest impact on the workplace and worker health.[10] In responding to each question, participants were asked to think about the framework of the climactic event as described during the lecture delivered in the first half of the session. The 10 scripted questions/statements were as follows:

1. Share past personal experiences in the context of your assigned climate condition

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Funding sources: None declared.
Conflict of interest: None declared.
Data Availability: The data that support the findings of this study are available from the corresponding author, [PS], upon reasonable request.
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DOI: 10.1097/JOM.0000000000003331

2. Imagine a work scenario where this climate condition is happening
3. How would you evaluate the situation?
4. What factors are important to know or uncover?
5. What questions would you ask the worker?
6. What categories of workers are at-risk or vulnerable?
7. What would you want to know about the workplace?
8. How would you advise management to keep employees safe and business viable?
9. Make recommendations for the impacted population you chose?
10. Give top 3 recommendations for OEM colleagues and/or trainees

During the last 30 minutes, each small group reported out to the larger group summarizing their climate event, the discussion, and recommendations. The moderators highlighted key points for each case, fielded questions, and introduced practical solutions using the OCAREER© mnemonic,[11] which was created to assess health impacts of climate change (Table 1).

The workshop was evaluated by the American Occupational Health Conference administrators, using a 5-point Likert Scale regarding whether the presentation met objectives, and regarding its utility and relevance to education and to the clinical practice of OEM.

This manuscript met the eligibility criteria for institutional review board review exemption and was considered such as authorized by 45 CFR 46.104, category 4 by the University of Pennsylvania Institutional Board Review.

RESULTS

There were 61 respondents; each small group had about 10–11 participants. The overall average rating of the speakers was 4.5/5 and 4.6/5. The rating regarding whether the presentation objectives were met was 4.4/5. The average rating was 4.4/5, in response to "gaining confidence in relating climate change to real life health implications through role play and arriving at viable solutions." In response to "the information will influence my care of patients" the average rating was 4.3 where 85% (51/61) agreed or strongly agreed. Ninety percent of respondents agreed or strongly agreed (55/61) that the overall content was valuable (Table 2).

Some themes arose regarding free text responses. In response to "what are you going to do differently in your practice as a result of attending this session" responses included that they would educate workers, employers, and patients, initiate or increase advocacy efforts, and carry out specific awareness raising activities such as checking the air quality index. When overall feedback was elicited, most of the respondents noted appreciation for the interactive approach, appreciation for the session, and recommended more of such "timely" sessions at the conference.

TABLE 1. OCAREER©—A Mnemonic to Assess Health Impacts of Climate Change

Category	Sample Questions
Occupation and work	What do you do professionally? What is your workplace like (outdoor vs indoor, stationary vs mobile) Have you ever been in the military, worked on a farm, done volunteer or seasonal work?
Conditions/health: medications and mental health	Do you have any chronic medical conditions? Are you currently being treated? If so, for what disease/symptoms? What medications do you take prescribed, over-the-counter, and herbal?
Activities: food and food access, transportation and travel, hobbies	What activities do you and your family engage in? What hobbies do you or your family have? How do you get to work or other places? What methods of transportations are available to you? How often do you travel? By what methods? How close are food/ grocery sources to you?
Residence: home, habitat, community, region	In what kind of location do you live (urban, rural, farmland)? In what kind of habitat do you live/stay in? When was your residence built? What type of heating/cooling systems do you have?
Environmental concerns	Are there environmental concerns in your neighborhood? Where does your drinking water come from? Are there air quality concerns? What types of industries or farms are near your home including auto repair and gas stations? Do you live near a hazardous waste site or landfill?
Educate and advocate	Are materials available to educate the patient? Are alternatives available to minimize the risk of exposure?
Referrals and resources	Have prevention strategies been discussed? What is the plan for follow-up? What resources are available? What categories of referrals are appropriate?

DISCUSSION

Assessment of this educational intervention revealed that the interactive 90-minute workshop had a positive impact on participants' self-reported knowledge of health effects of climate change. Most respondents agreed or strongly agreed that they would incorporate the information in their practice. Overall, the ratings were high with a comment to continue with this kind of offering at national meetings. Respondents endorsed teaching others, for example in the form of discussing with patients, and advocacy on the issue to reduce health impacts of climate change on workers.

Our experience reflects similar findings regarding interactive sessions in other medical education settings. Students note that the "discussion format not only allowed sharing of ideas and experiences, but also allowed collaborative conversations among their peers."[12] Flipped classrooms that allow class discussion have been shown to be preferable by trainees as it results in "increased knowledge and self-reported prescribing changes."[13] However, the positive self-reported experience with this workshop by participants at the national conference may be partially due to excitement at seeing peers or being away from their usual environment. Follow-up study is needed to assess whether this reported knowledge integration endures.

While this workshop on this emerging topic was designed to be conducted in a resident teaching setting, given the successful pilot to a national audience that included residents, practicing physicians, and midlevel providers, and the enthusiasm generated by participants who reported gained confidence in addressing health effects of climate change, it can likely be generalizable to practicing physicians, midlevel providers, and even medical students in the clinical years. The training can be applicable to any medical specialty.

Future directions include further assessing the impact of this educational intervention such as utilizing a follow-up survey of attendees to see if they employ tools and strategies provided during the workshop. Examples include incorporation of practical clinical solutions such as the OCAREER© mnemonic into a clinical practice, use of this educational model for OEM residents, or increase in

TABLE 2. Workshop Attendee Evaluation of Presentation

Did the Presentation Meet the Objectives of the Session		
Question	**Average Score***	***n***
Describe the science of changes in the climate and resulting environmental impacts.	4.4	61
Identify 6 major pathways through which climate change will impact human health.	4.5	61
Gain confidence in relating climate change to real life health implications through role play and arriving at viable solutions.	4.4	61
Utility and Relevance to Education and Clinical Practice		
Question	**Average score***	***n***
Overall, the content of this activity was valuable to me.	4.4	61
This information will influence my care of patients.	4.3	61

*Likert Scale 1–5, 1 = not at all and 5 = completely.

1 = disagree, 2 = somewhat disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

awareness raising efforts. The increasing relevance of climate-related occupational health information highlights the importance of assessing the effectiveness of teaching tools for both current and rising OEM professionals.

LIMITATIONS

The exact number of attendees was not recorded, but as each group had about 10–11 participants, the number who did not complete the survey may have been around five. Hence, the assumption is that over 90% of attendees completed the survey. Not having the exact number is a limitation of this work. Another limitation is lack of data on participant knowledge base on the presented information prior to the workshop, which could have been assessed using a pre- and post-test type analysis. We also were not able to assess whether participants retained information in the long term.

CONCLUSIONS

This interactive workshop format applied case-based learning to raise awareness and provide information on this topic. It was successful in teaching content and providing clinicians a way to approach the nuanced occupational health conditions related to climate change. It also raised their awareness to consider these conditions in patient care delivery. By integrating existing experience with presented information about health effects of a changing climate, participants better understood the challenges introduced to the environment of their patients as workers. As climate changes, there will be an increase in the number of workers who present with related health effects. It is increasingly important that clinicians not just recognize but ideally treat, prevent, and mitigate. Creating engaging interactive sessions increases participant engagement, learning, and satisfaction. Aligning education about current health impacts of climate change with topics in graduate medical education can prepare trainees in anticipation of potential future medical board certification in climate change and increased effectiveness in emerging global job markets.[14]

ACKNOWLEDGMENT

Pouné Saberi, MD, MPH, codesigned and co-organized the workshop and cowrote and coedited the article. Judith Green-McKenzie, MD, MPH, codesigned and co-organized the workshop and cowrote and coedited the article. The authors thank the American College of Occupational and Environmental Medicine for providing outcomes evaluation data and the National Institute of Environmental Health Sciencesfor the source of cases presented.

No AI was utilized at any stage during research development & design, data collection, and manuscript preparation.

This manuscript met the eligibility criteria for institutional review board review exemption and was considered such as authorized by University of Pennsylvania Internal Review Board.

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