

Climate Change Curricula in US Graduate Medical Education: A Scoping Review

Adrian Cois¹, MD
Sara Kirkpatrick, DO
Rachelle Herrin, MD

ABSTRACT

Background Climate change threatens humanity's health and well-being. While climate change topics have been increasingly incorporated into undergraduate medical education, it is unclear to what extent they have been incorporated into graduate medical education (GME) curricula in the United States.

Objective To examine how climate change has been incorporated into GME curricula in the United States.

Methods We conducted a scoping review of published literature from January 2013 through November 2023. PubMed and Scopus were searched, with articles assessed by 3 reviewers in a blinded fashion. Resources were included if they described how climate change is incorporated into GME curricula in the United States, and if they discussed topics such as disaster medicine, mass casualty events, environmental medicine, public health, health policy, wilderness medicine, quality improvement, and sustainability. Articles were analyzed using descriptive numerical analysis and qualitative assessment to identify article characteristics and themes.

Results The inclusion criteria generated 17 articles that examined climate change incorporation into GME curricula and curriculum interventions covering topics used for inclusion. The most common type of article (5 of 17, 29%) employed surveys of program directors on the inclusion of climate-related topics.

Conclusions Published accounts of climate-related topics in US GME program curricula are few. More content is found in topics related to emergency medicine. Curricula frameworks have been proposed for pediatric and internal medicine residency programs, but we know little about their efficacy. Future scholarship should fill these gaps to educate learners to improve health care sustainability and resiliency.

Introduction

The effects of a warming planet contribute directly to illness, including pulmonary disease, heart failure, atrial fibrillation, infectious disease, and cardiac arrest, with effects on more organ systems that are yet to be well defined.¹⁻⁵ With more severe and frequent extreme weather events, there will be increased strain on hospital systems, with mass casualty events affecting health care delivery. Additionally, physicians need to understand how climate-related health disorders disproportionately disadvantage groups such as minoritized and low-income populations.^{6,7} Physicians are positioned to influence the social and policy landscapes to affect climate change.⁸ Patients can be empowered to understand the links between climate change and human health.³ The medical community must ensure that we educate future generations of physicians so that they understand their role in combating this threat. Ensuring trainees understand climate science

and its interconnectedness with health is the first step in this process.

To highlight the urgency of this threat, the American Medical Association,⁹ the American College of Physicians,¹⁰ the American College of Emergency Physicians,¹¹ the American Academy of Pediatrics,¹² and the Physicians for Social Responsibility¹³ have declared climate change to be a health emergency. There is a groundswell of activity at the undergraduate medical education (UME) level. However, little is known about graduate medical education (GME) climate change education.¹⁴

As the Accreditation Council for Graduate Medical Education (ACGME) has not included climate-related health competencies in its Common Program Requirements or specialty Milestones, programs may not perceive a need to address climate change within their curricula.^{15,16}

To explore this apparent gap, we conducted a scoping review to examine if and how climate health education has been incorporated into US GME curricula. This topic lends itself to a scoping review as climate change education in medicine has been gaining momentum as a recognized and important component that will affect health care delivery in the immediate future.

DOI: <http://dx.doi.org/10.4300/JGME-D-24-00086.1>

Editor's Note: The online supplementary data contains further data from the study and a visual abstract.

Methods

The methodology for this scoping review was informed by the 5-step framework outlined by Arksey and O'Malley: (1) identifying the research question; (2) identifying relevant studies; (3) selecting studies; (4) data charting; and (5) collating, summarizing, and reporting the results.¹⁷

Identifying the Research Question

This review sought to answer the question, "How is climate change being incorporated into US GME program curricula?" The question further asked, "Which frameworks are being utilized; how is climate change being taught, and what are the existing gaps?"

Identifying and Selecting Relevant Studies

With the assistance of a medical research librarian, we performed a literature search of English language articles from January 2013 to November 2023 using PubMed and Scopus. We chose this period as the United Nations extended the Kyoto Protocol in 2012 in response to a recognition of the urgency to act on climate change.¹⁸ The search terms and inclusion criteria are outlined in the online supplementary data Appendix 1 and were determined by an iterative process. The search was structured to capture articles that described topics relevant to climate change–related illness, policy, and quality improvement, in addition to incorporating terms to include education and curriculum design for US GME programs. Medical Subject Heading (MeSH) and controlled vocabulary terms were included as appropriate. Articles were not limited based on their type, and we included reviews, case reports, and descriptions of surveys. To ensure completeness, articles were included if they discussed curricula related to key topics relevant to climate change, including disaster medicine, mass casualty events, environmental medicine, public health, health policy, and wilderness medicine. As part of our iterative process, we also included articles that discussed quality improvement, climate resiliency, and sustainability.

To ensure adequate agreement for applying inclusion and exclusion criteria, 3 reviewers (A.C., S.K., R.H.) simultaneously assessed 20 randomly selected titles and abstracts. Disagreements were resolved by the senior reviewer (A.C.) after a discussion based on the inclusion criteria. This informed reiterations of our inclusion criteria for the review. During the first stage of the review, the 3 reviewers assessed the remaining titles and abstracts asynchronously, in equal proportion, and with articles blinded. During the second stage, A.C. reviewed the articles included

in full. After this step, additional articles were excluded for not meeting inclusion criteria.

Data Charting, Collating, Summarizing, and Reporting the Results

Three reviewers collaborated on relevant data points based on themes evident in the initial review of the articles. Data points included year of publication, type of article, method of data collection, country of origin, learner level, specialty, and specific topic(s) related to climate change. We stored these data in Microsoft Excel for descriptive analysis.

Articles were processed using Rayyan (Rayyan Systems Inc), and we utilized 2 distinct processes for collating and summarizing the charted data. First, a descriptive numerical analysis was performed for relevant data points, such as type of article, method of data collection, and topic(s) related to climate change. Second, the reviewers undertook a qualitative assessment of articles that described frameworks used to implement climate change curricula for GME programs. According to the methodology described by Mak and Thomas, stakeholder consultation is an important part of a scoping review.¹⁹ We chose a family medicine faculty member at an academic tertiary center in the Northwestern United States, who taught climate change and health in UME and GME. The insight gained from this stakeholder helped to inform the methods we chose for this scoping review. As a result of this consultation, we also included articles discussing sustainability initiatives as part of quality improvement.

Results

Our initial search yielded 265 results after duplicates were removed. Of these, 248 records were excluded as they did not meet the defined inclusion criteria. We found another 5 articles through citation review that were deemed appropriate for full review. In the second stage of full article review, 5 articles were excluded for not meeting criteria. The remaining 17 articles were used for the review (FIGURE 1).

The final articles included secondary publications: reviews, perspectives, expert consensus statements (based on primary sources and curricula proposals), and descriptions of surveys. The most common type of article (5 of 17, 29%) was a description of a survey of program directors regarding the content of curricula (FIGURE 2).^{20–24} The articles discussed climate change–related illness, public health, policy, disaster, environment, wilderness medicine, mass casualty incidents, quality improvement, and sustainability (TABLE).

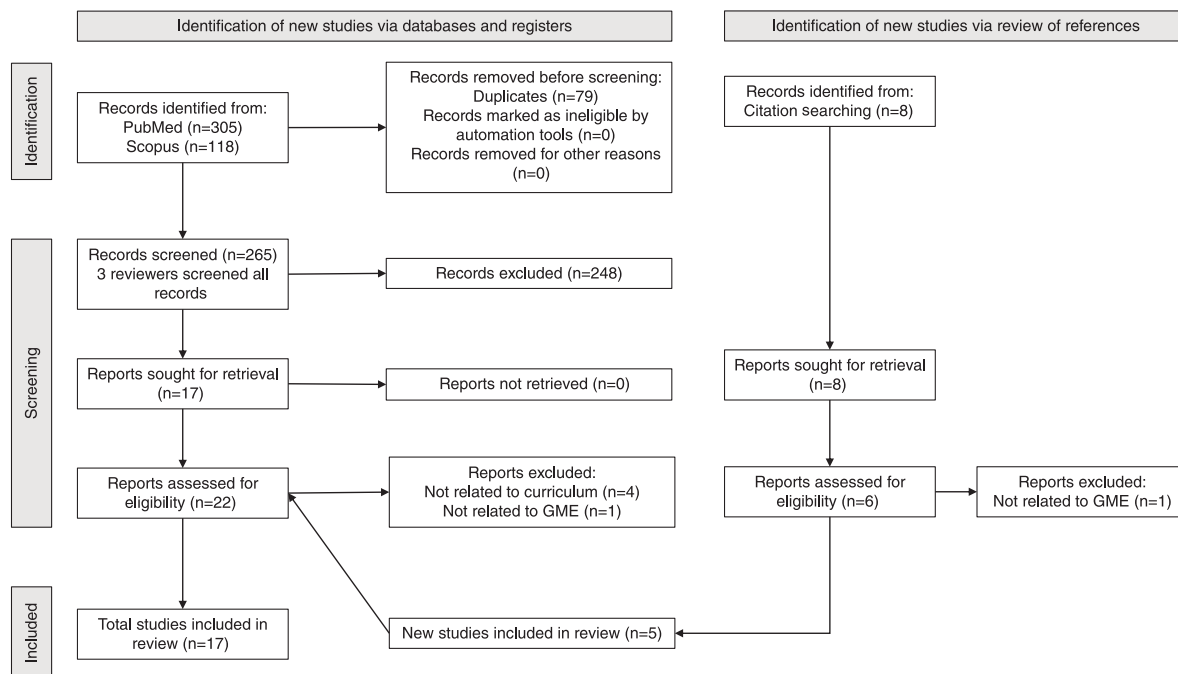


FIGURE 1
Review Process

Abbreviation: GME, graduate medical education.

Ten articles specifically mentioned climate change.^{1,3-5,22,25-29} Seven did not mention climate change specifically but discussed a topic pertinent to climate change, such as disaster or tactical medicine (medical direction of law enforcement special operations).^{20,21,23,24,30-32}

Specialty and Intervention

Emergency medicine was the most common specialty, with 8 included articles discussing how emergency medicine can incorporate climate change into curricula frameworks.^{3,20-24,29,32} For disciplines, the next most common article group did not discuss a

specialty but rather how climate change should be discussed in GME programs more broadly^{4,5,27,30,31} (online supplementary data Appendix 2).

Three of the included articles reported outcomes from the described education or intervention.^{1,22,28} One article discussed anecdotally positive experiences with generic climate change education.¹ Another discussed the increase in training opportunities in tactical medicine,³¹ and a third reported quantitative outcomes of changes associated with improved health care sustainability.²⁸

Vacharathit et al described how their continuous quality improvement curriculum had improved the hospital's sustainability after 5 years of the program.²⁸

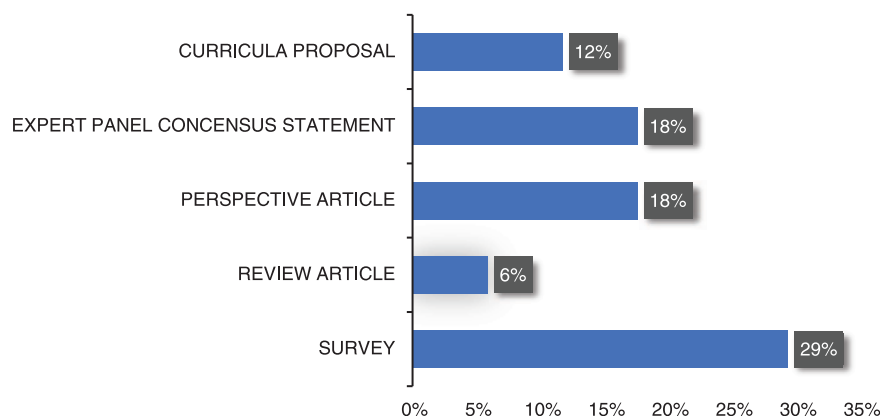


FIGURE 2
Article Types

TABLE 1

Summary of Included Articles

Author	Article Type	Topic Type	Climate Change	Article Details	Specialty
Colbert (2022) ⁵	Perspective article	Graduate medical education	Yes	Review article which assesses the impact of climate change on health and the challenges of helping the physician workforce to deal with the impending crisis. Outlines disease states that are exacerbated by climate change. Calls for the need to incorporate climate change education into GME curricula and to align this education with the core competencies outlined by this organization. The article also calls for transdisciplinary education and action to better prepare the physician workforce to be advocates and patient educators, particularly for ambulatory clinic and community-based rotations.	Not specified
Cornelius (2018) ²⁰	Survey description	Disaster medicine	No	The authors performed a review of the 18 most common topics addressed by disaster medicine in the literature since 2016. They then surveyed emergency medicine programs to assess which of these topics they addressed and in which formats. The most common topics were didactic/lectures, and least common were journal club and podcasts.	Emergency medicine
Gauthier (2023) ²⁵	Expert panel consensus statement	Clinical pathology	Yes	The authors recommend 3 main areas of focus: vulnerability screening, anticipatory guidance, and participation in advocacy through membership in groups, and supporting green initiatives within their own hospital systems.	Pathology
Giudice (2023) ³	Perspective article	Emergency medicine	Yes	Highlights the importance of educating patients on the link between climate change and health and delivering high-yield verbal or written education focused on how to improve personal resilience and minimize risk. Outlines the opportunity for bedside preventative health education as a profound area for growth and improved patient care. This is within the scope of the Knowledge, Skills, and Abilities statements on prevention and education put forward by the American Board of Emergency Medicine. They also outline 2 case studies where emergency physicians can incorporate climate education into their bedside interactions with patients.	Emergency medicine
Goshua (2023) ²⁶	Review article	Pediatric residency	Yes	Review article that assesses undergraduate reporting of climate change inclusion in curricula and pediatric residency inclusion. The authors show an increase in reporting at the undergraduate level and show no reporting at the postgraduate level. They provide a range of topics for education in pediatric training specifically including inequities, asthma/allergies, mental health, toxins/infections, nutritional deficiencies, medication management, and health system resilience. They outline that there is limited published literature on how climate change education has been incorporated into pediatric residency education and note that specific electives at institutions such as Seattle, Stanford, and Emory have included elements of climate change education.	Pediatrics

TABLE 1

Summary of Included Articles (continued)

Author	Article Type	Topic Type	Climate Change	Article Details	Specialty
Jacquet (2014) ²¹	Survey description	Postgraduate residency education	No	This article looked at fellowships for international graduates at 5 GME-accredited academic emergency medicine programs in the United States. The authors found a discrepancy between the perception of coverage of the core curriculum and what is actually covered. They felt that extending the program to 3 years instead of 2 would allow them to more adequately cover the required content.	Emergency medicine
Kuczmarski (2021) ¹	Curricula proposal	Internal medicine	Yes	Organizes a curriculum for internal medicine structured on organ systems and subspecialty. Recommends that specialty-specific climate and health content be woven into preexisting didactic lectures. The authors developed slides using PowerPoint to be included in ambulatory didactic lectures and to educate the lecturer about the content and ask that they integrate the preexisting content into their content. They found that this model is well received anecdotally by presenters. The content satisfies the ACGME Core Competencies.	Internal medicine
Lemery (2020) ²⁷	Perspective article	Postgraduate education	Yes	Perspective article calling for education in postgraduate medical education including better understanding of how disease is exacerbated by climate change, health care sustainability and resilience, and policy/patient advocacy.	Not specified
Newman (2019) ³⁰	Case report	Disaster medicine	No	The authors recalled their institution's response to Hurricane Harvey and recounted some lessons that they can incorporate into future planning, without specific mention of climate change. Areas for improvement noted included adequate staffing, adequate resources, safe evacuation, thorough planning, optimal team structure, and effective communication. Overall, they recommended that a new emergency preparedness plan should include a GME physician leader and advanced preparedness to better educate residents for future disaster events.	Not specified
Petit (2019) ³¹	Survey description	Tactical medicine	No	The authors did not incorporate climate change education.	Not specified
Philipsborn (2021) ⁴	Curricula proposal	Postgraduate education	Yes	Suggests a curriculum for delivery of climate change education in postgraduate medical residencies. Organizes the curriculum based on the effects of climate change by illness state including heat related illness, air quality/respiratory illness, malnutrition and food insecurity, infectious diseases, injuries/toxic exposures, mental health disorders, policy and health care delivery changes, physicians as climate advocates, and reducing health care's contribution to emissions/pollution-related morbidity and mortality.	Not specified

TABLE 1

Summary of Included Articles (continued)

Author	Article Type	Topic Type	Climate Change	Article Details	Specialty
Sandifer (2023) ²²	Survey description	Disaster medicine	Yes	Surveyed GME programs and the recommended SAEM disaster medicine topics that were covered. There was no specific report of climate change teaching specifically as this was taught under the umbrella of public health and disaster medicine. Seventy-nine percent of EMS fellowship respondents reported this curriculum topic was covered, and 37% of EM residency programs reported not covering this topic.	Emergency medicine
Sarin (2017) ³²	Survey description	Disaster medicine	No	Survey of EM residency program directors (75 of 183 [41%] responded) suggesting that there was no uniformity across programs in how they taught the topic. The authors found potential for creation of a standardized model for resident education in disaster medicine.	Emergency medicine
Sarin (2019) ²³	Expert panel consensus statement	Disaster medicine	No	Expert panel used Delphi methodology to develop consensus guidelines to recommend which core curriculum items should be included in core competencies for disaster medicine in emergency medicine residency training.	Emergency medicine
Sena (2021) ²⁴	Case report	Disaster medicine	No	Used a simulation-based tabletop method of managing a mass casualty incident to help emergency medicine residents better understand management of the MCI process. No mention of climate change, but it was noted to be an effective, no-cost tool that increased the authenticity of the program's simulations.	Emergency medicine
Vacharathit (2022) ²⁸	Case report	Health care sustainability	Yes	Case report discussing interim results of a novel resident-focused fellowship program in health care sustainability. Projects were undertaken as part of the fellowship with responsibility to reduce the carbon footprint of the operating room. Projects were aimed at reducing water waste, along with plastics recycling and electrical energy usage reduction (717 mT of CO2 equivalents per year).	General surgery
Wexler (2023) ²⁹	Expert panel consensus statement	Disaster medicine	Yes	Expert panel of disaster medicine fellowship directors using modified Delphi technique to determine SAEM disaster medicine fellowship curriculum. The final ratification included climate change as part of the core curriculum. No mention of the content, but climate change was housed under the "mass care and environmental disasters" core competency.	Emergency medicine

Abbreviations: GME, graduate medical education; EM, emergency medicine; SAEM Society for Academic Emergency Medicine; EMS, Emergency Medical Services; MCI, mass casualty incident.

Projects were broken into 3 categories: water waste reduction, regulated medical waste reduction/pre-incision plastics recycling, and electrical energy usage reduction. As a result, they saved 20% of water waste, diverted

1 million pounds of plastics from landfills, and reduced CO2 equivalents per year by 717 metric tons over 5 years.²⁸ This article should serve as a standard for quantitative assessment for future sustainability projects.

Calls to Action

Four articles served as calls to action for educators by describing content to be included in climate change curricula for GME programs, faculty, and trainees.^{1,4,5,26} Each noted the importance of including climate change in GME training and used context through the lens of specialty ACGME core competency frameworks. Colbert et al outline how providing education in a transdisciplinary fashion will help to improve hospital-wide sustainability.⁵ Kuczmarski et al presented a novel framework that addresses climate change-related illness using an organ system approach, in order to be more easily incorporated into the existing internal medicine curriculum.¹ The article provided details on the evidence base to support the learning objectives. Kuczmarski et al also found that guest lecturers anecdotally reported positive experiences of the generic climate-related slides given to them to present during didactics.¹ Philipsborn et al provided a broad outline of the topics, with context, that should be included in the climate change curriculum and provides context for their inclusion.⁴ This article could serve as a resource for programs looking to build a curriculum in climate change and health.⁴ Goshua et al discuss the need to include climate change education in GME pediatric programs.²⁶ Similar to the other articles, they provide a comprehensive assessment of the topics that should be included in the curriculum for pediatricians. They also gave examples of how some US GME programs incorporate climate change education into their curricula.²⁶

Discussion

In this scoping review of literature related to GME curricula in the United States, we identified numerous gaps in the literature so that future research teams can focus on projects to understand how best to incorporate climate change education into US GME programs.

This scoping review found that the field of climate-related health curricula is in its infancy, with few relevant publications. Articles were predominantly surveys of program directors, descriptions of curricula, and calls to action. Overall, the quality of the existing information is considered low at this time. For example, the few articles that address the effectiveness of curricula do so through learner satisfaction assessments rather than external assessments. The 4 articles that we defined as calls to action give examples of how programs could utilize curricula but are missing objective assessment of effectiveness in helping learners better understand climate change and health. They are similar in that they give a structured way to discuss the relevant components of climate change as it relates to health and could serve as a standard for creation of curricula in GME programs; however, without outcome data on learner knowledge improvement to support efficacy, recommendations to utilize these frameworks remain difficult.

Climate change and health is a fast-moving field that prominent medical organizations have identified as an area of urgent need to address. Based on this scoping review, there are limited accounts of how incorporating climate change curricula into GME programs has been done, let alone reporting on the knowledge improvement for learners. Climate change can be an abstract topic for programs to incorporate into already busy curricula schedules. We must work as a field to keep pace with up-to-date literature to educate learners to face the challenges of climate change as it relates to health.

This review is limited by the focus on English language and US programs, which may omit important international work in GME and climate-related health. Also, there may be key articles published since the fall of 2023, as well as other topics relevant to climate change that were not included in this review. The lack of formal program evaluations of GME curricula related to climate change and health limits this review.

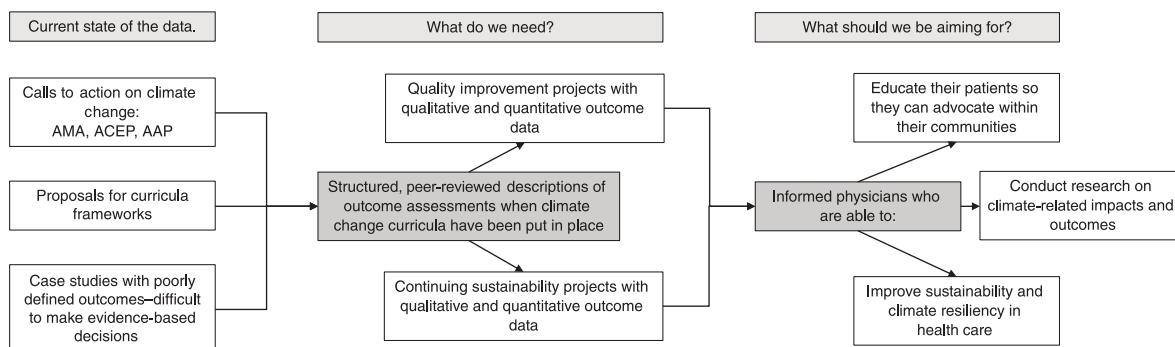


FIGURE 3

Review Summary

Abbreviations: AMA, American Medical Association; ACEP, American College of Emergency Physicians; AAP, American Academy of Pediatrics.

The articles that address the effectiveness of their curricula do so through learner satisfaction assessments, a relatively weak way to assess the efficacy of a curriculum. This limitation highlights an avenue for future scholarship in that researchers and educators should seek to assess how effective climate change curricula are at improving learners' knowledge before and after incorporating changes.

Future scholarship should focus on reporting how climate change is incorporated into GME curricula. These reports should include examinations of feasibility, acceptability, and assessments of how curriculum changes improve learners' knowledge and skills in the area of climate change and health. Examples include formal program evaluations examining the efficacy of curricular changes, well-designed studies examining learners' knowledge and skill related to climate and health, and reports on the results of quality improvement projects focusing on sustainability. FIGURE 3 summarizes the findings of this scoping review with a wide lens to allow readers to use this work as a launch pad for future endeavors.

Conclusions

This scoping review found few descriptions of curricula and few evaluations of these curricula in US GME programs. The specialty of emergency medicine was the target for nearly one-third of articles. Most articles were surveys of program directors, and most articles suggested that climate change will create significant challenges for providing high-quality health care. The direction of future research should focus on the efficacy of climate and health curricula by using measurable outcomes to aid GME programs in the creation, adoption, and implementation of such curricula.

References

1. Kuczmarski TM, Fox J, Katznelson E, et al. Climatizing the internal medicine residency curriculum: a practical guide for integrating the topic of climate and health into resident education. *J Clim Change Health*. 2021;4:100067. doi:10.1016/j.joclim.2021.100067
2. Sorensen CJ, Salas RN, Rublee C, et al. Clinical implications of climate change on US emergency medicine: challenges and opportunities. *Ann Emerg Med*. 2020;76(2):168-178. doi:10.1016/j.annemergmed.2020.03.010
3. Giudice C, Rublee CS. Climate change and health: addressing gaps through patient education in the emergency department. *Ann Emerg Med*. 2023;82(5):611-614. doi:10.1016/j.annemergmed.2023.05.015
4. Philipsborn RP, Sheffield P, White A, Osta A, Anderson MS, Bernstein A. Climate change and the practice of medicine: essentials for resident education. *Acad Med*. 2021;96(3):355-367. doi:10.1097/ACM.0000000000003719
5. Colbert CY, French JC, Brateanu A, et al. An examination of the intersection of climate change, the physician specialty workforce, and graduate medical education in the U.S. *Teach Learn Med*. 2022;34(3):329-340. doi:10.1080/10401334.2021.1913417
6. Bernstein AS, Stevens KL, Koh HK. Patient-centered climate action and health equity. *JAMA*. 2022;328(5):419-420. doi:10.1001/jama.2022.12404
7. Levy BS, Patz JA. Climate change, human rights, and social justice. *Ann Glob Health*. 2015;81(3):310-322. doi:10.1016/j.aogh.2015.08.008
8. Howard C, MacNeill AJ, Hughes F, et al. Learning to treat the climate emergency together: social tipping interventions by the health community. *Lancet Planetary Health*. 2023;7(3):e251-e264. doi:10.1016/S2542-5196(23)00022-0
9. American Medical Association. AMA adopts new policy declaring climate change a public health crisis. Accessed October 20, 2024. <https://www.ama-assn.org/press-center/press-releases/ama-adopts-new-policy-declaring-climate-change-public-health-crisis>
10. Crowley RA. Health and Public Policy Committee of the American College of Physicians. Climate change and health: a position paper of the American College of Physicians. *Ann Intern Med*. 2016;164(9):608-610. doi:10.7326/M15-2766.
11. American College of Emergency Physicians. Impact of climate change on public health and implications for emergency medicine. Accessed October 20, 2024. <https://www.acpjournals.org/doi/10.7326/m15-2766>
12. American Academy of Pediatrics. Global climate change and children's health: AAP recommendations. Accessed October 20, 2024. https://www.aap.org/en/patient-care/climate-change/global-climate-change-and-childrens-health-aap-recommendations/?srsId=AfmBOorZCh__TFxILNBcFL_-0SBsNS4Gyba9JuWIDWuLNgDrOUKzMTg
13. Physicians for Social Responsibility. Health Leadership on Climate. Accessed October 20, 2024. <https://psr.org/issues/environment-health/climate-change/>
14. Wellbery C, Sheffield P, Timmireddy K, Sarfaty M, Teherani A, Fallar R. It's time for medical schools to introduce climate change into their curricula. *Acad Med*. 2018;93(12):1774-1777. doi:10.1097/ACM.0000000000002368
15. Accreditation Council for Graduate Medical Education. Milestones by specialty. Accessed January 5, 2024. <https://www.acgme.org/milestones/milestones-by-specialty/>
16. Accreditation Council for Graduate Medical Education. Common program requirements. Accessed September 4,

2024. <https://www.acgme.org/programs-and-institutions/programs/common-program-requirements/>
17. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol*. 2005;8(1):19-32. doi:10.1080/1364557032000119616
 18. Harrabin R. UN climate talks extend Kyoto Protocol, promise compensation. *BBC News*. Published December 8, 2012. Accessed May 6, 2024. <https://www.bbc.com/news/science-environment-20653018>
 19. Mak S, Thomas A. Steps for conducting a scoping review. *J Grad Med Educ*. 2022;14(5):565-567. doi:10.4300/JGME-D-22-00621.1
 20. Cornelius AP, Andress WK, Ajayi R, et al. What and how are EM residents being taught to respond to the next disaster? *Am J Disaster Med*. 2018;13(4):279-287. doi:10.5055/ajdm.2018.0307
 21. Jacquet GA, Vu A, Ewen WB, et al. Fellowships in international emergency medicine in the USA: a comparative survey of program directors' and fellows' perspectives on the curriculum. *Postgrad Med J*. 2014;90(1059):3-7. doi:10.1136/postgradmedj-2012-131714
 22. Sandifer SP, Wexler BJ, Flamm A. Comparison of disaster medicine education in emergency medicine residency and emergency medical services fellowship in the United States. *Prehospital Disaster Med*. 2023;38(3):378-383. doi:10.1017/S1049023X23000407
 23. Sarin RR, Biddinger P, Brown J, et al. Core Disaster Medicine Education (CDME) for emergency medicine residents in the United States. *Prehospital Disaster Med*. 2019;34(5):473-480. doi:10.1017/S1049023X19004746
 24. Sena A, Forde F, Yu C, Sule H, Masters MM. Disaster preparedness training for emergency medicine residents using a tabletop exercise. *MedEdPORTAL*. 2021;17:11119. doi:10.15766/mep_2374-8265.11119
 25. Gauthier SJ. Changing degrees: incorporating the impacts of climate change on health into pediatric residency education and practice. *Yale J Biol Med*. 2023;96(2):227-232. doi:10.59249/BSGY1262
 26. Goshua A, Gomez J, Erny B, et al. Child-focused climate change and health content in medical schools and pediatric residencies [published online ahead of print April 20, 2023]. *Pediatr Res*. doi:10.1038/s41390-023-02600-7
 27. Lemery J, Balbus J, Sorensen C, et al. Training clinical and public health leaders in climate and health: commentary explores training clinical and public health leaders in climate and health. *Health Aff (Millwood)*. 2020;39(12):2189-2196. doi:10.1377/hlthaff.2020.01186
 28. Vacharathit V, Walsh RM, Utech J, Asfaw SH. Action in healthcare sustainability is a surgical imperative: this is a novel way to do it. *J Surg Educ*. 2022;79(2):275-278. doi:10.1016/j.jsurg.2021.09.002
 29. Wexler BJ, Schultz C, Biddinger PD, et al. The 2023 Model Core Content of Disaster Medicine. *Prehospital Disaster Med*. 2023;38(6):699-706. doi:10.1017/S1049023X23006556
 30. Newman B, Gallion C. Hurricane Harvey: firsthand perspectives for disaster preparedness in graduate medical education. *Acad Med*. 2019;94(9):1267-1269. doi:10.1097/ACM.0000000000002696
 31. Petit NP, Stopyra JP, Padilla RA, Bozeman WP. Resident involvement in tactical medicine: 12 years later. *Prehospital Disaster Med*. 2019;34(2):217-219. doi:10.1017/S1049023X19000013
 32. Sarin RR, Cattamanchi S, Alqahtani A, Aljohani M, Keim M, Ciotton GR. Disaster education: a survey study to analyze disaster medicine training in emergency medicine residency programs in the United States. *Prehospital Disaster Med*. 2017;32(4):368-373. doi:10.1017/S1049023X17000267



Adrian Cois, MD, is Assistant Professor, Department of Emergency Medicine, Oregon Health & Science University (OHSU), Portland, Oregon, USA; **Sara Kirkpatrick, DO**, is a PGY-3 Resident, Department of Emergency Medicine, OHSU, Portland, Oregon, USA; and **Rachelle Herrin, MD**, is a PGY-3 Resident, Department of Emergency Medicine, OHSU, Portland, Oregon, USA.

Funding: The authors report no external funding source for this study.

Conflict of interest: The authors declare they have no competing interests.

The authors would like to thank medical librarian Laura Zeigen, MA, MLIS, MPH, who helped the team develop and conduct the search strategy, and Lalena Yarris, MD, MCR, for reviewing the manuscript and providing advice on composition and structure to improve the rigor of our submission.

Corresponding author: Adrian Cois, MD, Oregon Health & Science University, Portland, Oregon, USA, cois@ohsu.edu, X @dr_cois

Received January 17, 2024; revisions received May 13, 2024, and August 26, 2024; accepted August 27, 2024.