Mitigating the Effects of Climate Change on Health and Healthcare: The Role of the Emergency Nurse

Description

Earth's climate is changing more rapidly than at any other point in the history of modern civilization, and it is largely a result of human activity (United States Global Change Research Program, 2018; National Aeronautics and Space Administration, 2022; WHO, 2023). Climate change is no longer a distant or abstract issue; it is a present-day crisis directly contributing to a rising number of humanitarian emergencies around the world. From unprecedented heatwaves and increasingly destructive wildfires to more frequent and severe floods, tropical storms, and hurricanes, extreme weather events are growing in scale, frequency, and intensity. The impacts are far-reaching; disrupting ecosystems, destroying homes and infrastructure, displacing millions, and putting immense strain on already fragile health systems. According to the Intergovernmental Panel on Climate Change (IPCC), approximately 3.6 billion people, nearly half the world's population already live in areas highly vulnerable to the consequences of climate change (World Health Organization (WHO, 2023). This vulnerability is not equally distributed. People living in low- and middle-income countries, particularly those in the global south, are disproportionately affected due to weaker health infrastructure, limited access to resources, and lower capacity to adapt (WHO, 2023).

The impact of climate change, defined as the long-term change in average weather patterns, is being experienced globally and continues to intensify, increasing the impact on human lives (National Aeronautics and Space Administration, 2024a; Romanello et al., 2024). Climate change affects communities in many ways: the economy, social systems, quality of water, ecosystems, agriculture and food, infrastructures, oceans and coasts, tourism, human health, and quality of life (WHO, 2023). Between 2030 and 2050, climate change is projected to cause approximately 250,000 additional deaths each year, driven by four main health stressors: undernutrition, malaria, diarrheal diseases, and heat stress (WHO, 2023). These figures do not include deaths caused by indirect effects of climate change, such as mental health disorders, displacement-related trauma, or diseases arising from compromised food and water security meaning the true toll could be significantly higher (WHO, 2023).

Moreover, the direct damage costs to health excluding sectors like agriculture, water, and sanitation are estimated to range from $2 to 4 billion per year by 2030 (WHO, 2023). These costs reflect increased demand for healthcare services, loss of labor productivity, and the burden on emergency response systems. The economic strain will be particularly devastating in regions that are already under-resourced, lacking the infrastructure and investment needed to respond effectively (WHO, 2023).

Health systems in low- and middle-resource countries, where resilience is often limited, are at the greatest risk. Without substantial financial and technical support to adapt to these changes, these countries will continue to experience disproportionate harm (WHO, 2023). Vulnerable populations at the highest risk include children, the elderly, people with pre-existing health conditions, and those living in poverty (WHO, 2023).

The severity of the impact of future climate change will depend fundamentally on action taken to reduce greenhouse gas emissions and adapt to anticipated changes (Ahdoot et al., 2024; Romanello et al., 2024). Without proactive action and substantial changes, climate-related risks will continue to grow. However, climate change can be mitigated by transitioning to sustainable and efficient energy practices, conserving and protecting resources, designing climate-resilient infrastructure, and adopting methods of sustainable waste disposal and management practices (WHO, 2023).

Nurses play a critical role in mitigating the impact of climate change (Butterfield et al., 2021). It is important that emergency nurses understand climate warming is key to engaging change to recognize and anticipate climate-associated effects and participate in the development and effective implementation of prevention, mitigation, and adaptation strategies. Further, the emergency nurse can serve as a voice to mitigate climate change through advocacy, research, patient education, and community educational programs. In addition, emergency nurses are well positioned to engage others to assist in adaptation and mitigation strategies, increase awareness regarding the impact of climate change and health, support climate-friendly practices and initiatives in healthcare, and join others in the call for immediate action on climate change and policies that support climate adaptation and mitigation.

ENA Position

It is the position of the Emergency Nurses Association (ENA) that:

1. Climate change is a global public health problem.
2. Global action is needed to reduce greenhouse gas emissions and climate-related risks.
3. Emergency nurses advocate to promote nursing education, research, and outreach opportunities regarding the effects of climate change on the environment and health.
4. Emergency nurses provide evidence-based education to patients and the community about relevant climate change related disaster readiness to increase awareness of the threats, identify prevention strategies, and reduce the risk of chronic disease exacerbations.
5. Emergency nurses and administrators explore and implement strategies to plan and design healthcare facilities and infrastructures to reduce carbon emissions and the environmental impact and increase climate resilience.
6. Emergency nurses, administrators, and healthcare facilities seek ways to increase energy efficiency, reduce waste, incorporate renewable energy, and build collaborative opportunities within the community to address climate change.

Background

Climate change is a global health problem that requires collaboration across various sectors to promote community climate resilience and sustainable, long-term transformation (Martins et al., 2024). Human activities such as the burning of fossil fuels and land use changes such as deforestation have caused a rapid acceleration in the atmospheric concentration of greenhouse gases (Environmental and Energy Study Institute, 2021; National Aeronautics and Space Administration, 2024a). Scientists have observed climbing temperatures over the past century, which are attributed to changes in greenhouse gas concentrations. The effects of a changing climate are linked to fundamental health issues and pose existential risks to everyone.

Heat waves have become more frequent and prolonged, and the number of extreme cold events has increased. Extreme heat has been associated with an increased risk of morbidity and mortality (United States Environmental Protection Agency, 2025b). According to the annual report from the National Oceanic and Atmospheric Administration (NOAA), 2024 was the warmest year on record (Lindsey & Dahlman, 2025). Kang et al. (2016) found that heat waves were significantly associated with increased risk of out-of-hospital cardiac arrest events during the afternoon when temperatures were at their highest. Researchers have shown that thermoregulatory mechanisms are impaired in the elderly, as well as those with chronic illnesses like diabetes, hypertension, and congestive heart failure (Kang et al., 2016; Ndlovu & Chungag, 2024; Schapiro et al., 2024). Globally, there is a shrinking of glaciers, decreasing the mass of

the Greenland and Antarctic ice sheets, and the sea level has risen because of these melting glaciers and thermal expansion of warmer water (IPCC, 2023).

A major contributor to climate warming is the healthcare sector, accounting for 8.5% of greenhouse gas emissions in the United States and 4.6% globally (Dzau et al., 2021; Eckelman et al., 2020). The main greenhouse gases responsible for climate change are carbon dioxide, methane, nitrous oxide, and fluorinated gases (United States Environmental Protection Agency, 2025a). These gasses trap heat while simultaneously absorbing solar radiation that is re-emitted to Earth's atmosphere, ultimately leading to surface warming (National Aeronautics and Space Administration, 2024b). Rising global temperatures are associated with more frequent and severe storms, intense heat, drought, worsening air quality, and changes in the distribution of pathogens and vector diseases (Ghazali et al., 2018; Khan et al., 2019; Ruszkiewicz et al., 2019; National Academies of Sciences, Engineering, and Medicine, 2020; WHO, 2023). Water scarcity, land degradation, and desertification also have accelerated in the past century due to natural disasters, environmental pollution, and destruction of green space (Food and Agriculture Organization of the United Nations, 2019; World Health Organization, 2023; Ghazali et al., 2018). More frequent and intense extreme weather and climate-related events, as well as changes in average climate conditions, are expected to damage infrastructure, ecosystems, and social systems that provide essential benefits to communities.

The physical environment where people live, learn, work, and play, is a social determinant of health impacted by rising global temperatures (Castner et al., 2019; U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion, n.d.). Future climate change is expected to further disrupt many aspects of life, posing challenges to the most vulnerable populations including children, older adults, individuals who are pregnant, some communities of color, immigrants, lower-income and under-resourced communities, and those with comorbidities (e.g., immunocompromise, allergies, respiratory disease) who have a lower capacity to prepare for and cope with extreme weather and climate-related events (Centers for Disease Control and Prevention, 2024; Ahdoot et al., 2024; Eckelman et al., 2020; Crowley et al., 2022; Romanello et al., 2024; Ruszkiewicz et al., 2019).

Ambient air pollution, or the presence of one or more substances in the air with the potential to produce adverse health impacts, contributes to 4.2 million premature deaths worldwide and is associated with increased morbidity from numerous illnesses (World Health Organization, 2024). More than 90% of children are subjected to fine particulate matter that exceeds health

standards, while perinatal exposure is associated with an increase in preterm births, low birth weight and stillbirths (Bekkar et al., 2020). Poor air quality also leads to emergency visits for asthma, chronic obstructive pulmonary disease, cardiovascular events, and mental health complaints (Ahdoot et al., 2024; Romanello et al., 2024). In 2018, a record number of older adults (220 million) were exposed to at least one heatwave with exposure to the stress of extreme heat causing nephropathy, electrolyte disturbances, cerebrovascular events, congestive heart failure, and preterm births (Carr et al., 2024; Ghazali et al., 2018; Romanello et al., 2024; The Medical Society Consortium on Climate & Health, 2020). Psychological stress due to displacement, socioeconomic consequences, and exposure to trauma is anticipated to rise with the increased prevalence of climate-related natural disasters (Ghazali et al., 2018). Providing education to patients and their families on climate change and disaster readiness may help them prepare for and mitigate these consequences.

As the Earth's climate continues to change, emergency nurses play an important role in educating patients and the community on the effects of global warming on health and mitigating factors. Emergency nurses are well positioned to increase awareness of the effects of climate change through research, education, and community outreach. Nurses are skilled managers of health-related resources and lead efforts to minimize healthcare waste, such as biohazards and pharmaceutical waste, while also reducing the industry's carbon footprint (Leffers & Butterfield, 2018). Emergency nurses should engage in practices within their workplace and communities that mitigate climate change.

Emergency nurses can advocate for the incorporation of climate resilient solutions into facility renovations and future designs. Chemicals used interiorly (e.g., cleaning supplies) and exteriorly (e.g., pesticides and herbicides) also can negatively affect water and soil quality. Including landscape features that reduce thermal stresses, using passive cooling and lighting techniques, and installing green roofs or reflective rods to reduce the heat-island effect. Facilities can protect and conserve water by transitioning to water-efficient equipment (e.g., low flow faucets and toilets), adopting water-recycling procedures (e.g., rainwater harvesting for landscape irrigation), and mitigating potential contamination of water sources (Health Care Without Harm, 2019; Or & Seppänen, 2024; Mwafy et al., 2025; National Academies of Sciences, Engineering, and Medicine, 2020). Bioswales, aquifer storage and recovery, and desalination are examples of sustainable stormwater management practices (Ekka et al., 2021).

Energy optimization is another strategy for reducing carbon emissions. Health care settings can upgrade to energy-efficient equipment, replace incandescent light bulbs with LED bulbs, and

install lighting control systems such as occupancy sensors (Or & Seppänen, 2024). Use of renewable and alternative energy sources (e.g., solar-powered photovoltaic, water pumps, wind) are additional means of reducing fossil fuel use (Or & Seppänen, 2024; Health Care Without Harm, 2019, 2024). Health care settings can further reduce transport emissions by supporting staff use of environmentally conscious forms of transport (e.g., cycling and rideshare) and advocating for and providing infrastructure for vehicles that are electric, use alternative fuel, or have zero-emissions (Ghazali et al., 2018).

Sustainable waste management is necessary to preserve resources and reduce greenhouse gas emissions (World Health Organization, 2025). Examples of sustainable approaches include reusing and recycling of industrial materials; composting; using alternative waste management technology (e.g., anaerobic digestion of organic waste); and disposing of electronics in environmentally conscientious ways (e.g., reusing, refurbishing, or recycling materials) (World Health Organization, 2025; Lattanzio et al., 2022). Health care settings, including the emergency department, also have the opportunity to reduce general (non-hazardous) and regulated waste.

Pharmaceutical management and disposal is a significant area of opportunity for reducing waste and preventing environmental contamination (Alnahas et al., 2020). Pharmaceutical take-back programs are ways organizations are already combatting this issue that could be further expanded (Alnahas et al., 2020). Health care settings also can adopt processes that promote efficient pharmaceutical use such as reducing storage redundancy and modifying purchasing habits (e.g., use of therapeutic alternatives, selecting two-part polyolefin intravenous devices that weigh up to one-third less, and when medically appropriate prioritizing non-intravenous routes of administration) (World Health Organization, 2025). They can also reduce their carbon footprint by looking at less carbon intensive pharmaceuticals, such shifting away from metered-dose inhalers that contain hydrofluoroalkane propellants to dry powder or soft mist inhalers (Feldman, et al, 2025). Using locally sourced food and on-site food production (e.g., rooftop gardens) are methods of reducing emissions from transporting supplies while modeling sustainable food practices. Moreover, enabling patients to choose their meals helps reduce food waste, while using reusable service ware such as plates and utensils instead of single-use items lowers a facility's carbon footprint (Or & Seppänen, 2024). In addition, emergency nurses can advocate for paperless systems and encourage a reduction in printing in their departments and throughout the healthcare facility.

Nurses play a vital role in all aspects of health promotion and patient care. Nurses can positively influence practice by supporting policies related to climate change, modeling healthy behaviors that promote sustainability, and taking measures to minimize waste (American Nurses

Association, 2023; Butterfield et al., 2021; Hastings, 2020). Emergency nurses are also in a position to educate patients and families on environmentally safe ways to dispose of regulated waste (e.g. unused medication, medical supplies). Integrating environmental health into nursing and educating emergency nurses on climate change are important components of the reduction of healthcare's carbon footprint.

Climate change is not universally accepted as a public health hazard by healthcare professionals in the United States despite being one of the greatest global health threats of this century (Romanello et al., 2024). However, there is hope and opportunity. Mitigating climate change by reducing greenhouse gas emissions can not only slow the progression of global warming but also generate significant health co-benefits. Improvements in transportation systems (e.g., promoting walking, cycling, and public transport), food systems (e.g., reducing meat consumption and food waste), and energy use (e.g., transitioning to renewable sources) can lead to cleaner air, more active lifestyles, and healthier diets (WHO, 2023). For example, sustainable energy and transport policies could prevent millions of premature deaths annually by reducing air pollution.

The path forward requires urgent and coordinated global action including investment in climate-resilient health infrastructure, early warning systems for extreme weather events, robust public health surveillance, and equitable access to health services. Policies that address the root causes of climate change while centering public health can create a healthier, more just, and more sustainable future for all. Climate change is a health crisis as much as it is an environmental and economic one.

Resources

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