Climate Change and Human Health

The Role of Nurses in Confronting the Issue

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Climate change will impact human health in various ways as the ecology of our planet changes. Environmental changes such as increased heat waves, sea-level rise, and increased drought around the globe will aggravate already-existing health problems, increase the onset of new health problems, and, in some cases, cause premature death. Catastrophic events associated with these environmental changes, such as floods, and increases in hospital and routine clinic visits will have nurses on the front lines tending to those in need. Climate change needs to be reframed as a public health issue, and the importance of nurses to be educated and engaged cannot be overstated. Nurses can be instrumental in communications with patients and families, working with their hospitals and health systems to reduce emissions and influencing the adoption of strategies to better prepare our health care facilities and our communities for the health impacts of climate change.

Key words: adaptation, climate change, clinical education and advocacy, emissions reduction, energy, health impacts, mitigation

Climate change is the biggest global health threat of the 21st century . . . the impacts will be felt all around the world—and not just in some distant future but in our lifetimes and those of our children.1

—The Lancet

Climate change is not just about changes in the ecology of our planet. It is about the human health impacts that result from those changes in our natural environment. In November 2009, the Lancet and the University College London, United Kingdom, released a report about the health impacts of climate change in future decades along with some solutions that can be implemented in the short and medium terms to mitigate those health impacts. It examined the most serious direct and indirect consequences of climate change including “changing patterns of disease, water and food insecurity, vulnerable shelter and human settlements, extreme climate events, and population migration.” The article emphasizes that “the health sector can play a key role in helping societies adapt to the effects of climate change and the risk it poses to human health.”1

Nurses and other health care providers will be on the front lines of all climate-related health impacts, whether the direct result of catastrophic disasters such as floods, or indirect effects such as increases in emergency department visits over time. The need to treat climate-related illness and disease will continue to increase as climate change accelerates. At the same time, the health care
industry will experience the climate crisis in its own operations, characterized by increasing energy costs, projected instability in the electric service provision grid, and intensified stressors placed on community health services. It is crucial that the health care sector develop a strong, unified voice to reduce both environmental and public health impacts of climate change. The nursing community can mobilize around the issue by fully understanding the science, preparing for health impacts that we are already experiencing around the globe, and working within the health care sector to reduce its environmental impact. These steps will integrate the health care sector as a major contributor to a multifaceted solution.

WHAT IS CLIMATE CHANGE?

The Earth has a natural temperature control system. Certain gases such as water vapor, carbon dioxide, ozone, methane, and nitrous oxide are critical to this system and are known as greenhouse gases. As it absorbs solar radiation, Earth’s surface heats up and emits infrared radiation. The greenhouse gases trap the infrared radiation, thus warming the atmosphere. Although many greenhouse gases are naturally occurring on the planet, scientific data demonstrate that the amount of greenhouse gases created by human activities has increased by about 40% in the past 150 years. The Intergovernmental Panel on Climate Change concluded that “warming of the climate system is unequivocal” and that human activity has very likely been the driving force of that change over the last 50 years. Burning coal, oil, and other fossil fuels and land use changes like deforestation have been the largest sources of these greenhouse gas emissions.

Understanding the link between environmental events and their impact on health outcomes is essential for nurses and other clinicians who will be leading the treatment and prevention responses to climate change. Here are some examples.

Heat waves

Climate change is expected to cause more intense, longer lasting, and more frequent heat waves. Heat can aggravate chronic health conditions such as cardiovascular, renal, and respiratory disease; diabetes; and nervous system disorders. Heat waves have the highest mortality and morbidity of climate change-related environmental impacts. Increased severity and frequency of heat waves translate into increased incidents of heat cramps, heat exhaustion, and heat stroke, particularly in vulnerable populations. In 2006, in the 2-week heat wave in California, emergency department visits topped 16,000 with more than 1,000 people hospitalized, and nearly 140 people died. The situation was much more severe in the European heat wave of 2003, with a death toll of more than 52,000.

Increased precipitation and flooding

As the amount of water vapor in the atmosphere increases, we can expect heavier snowfalls in some areas, more intense rain events, and increased flooding. The number of major flood events has increased on every continent throughout the past 50 years, consistent with climate models. The health impacts of increased flooding and catastrophic rain events include increases in injuries due to evacuation and death due to drowning, increased risk of infectious disease, contaminated water supplies resulting in an increased rate of water-borne illnesses, complications from mold exposure, and long-term psychological and physical effects of displacement when homes and communities are destroyed.

Increased drought and water scarcity

Changes within Earth’s water cycle will also mean more frequent and severe droughts in some regions of the world. According to the National Center for Atmospheric Research, the proportion of Earth’s land area stricken by severe drought has more than doubled since the 1970s, with human-caused warming
Identified as the primary cause. An estimated 5 million people, primarily children, die from water-related diseases each year. As climate change continues to shrink water supplies in water-stressed regions of the world and as populations become increasingly dependent on unsanitary water sources for all their basic needs, this global burden of water-related disease can only be expected to increase.

Increased drought will also reduce agricultural productivity and undermine food security in many regions of the world. In fact, the combined effects of rising temperatures and growing water scarcity on agricultural productivity could put 30 to as many as 200 million additional people at risk of hunger by middle to late century.

Sea-level rise

Rising sea levels will also lead to widespread coastal flooding as a result of climate change. Between 1961 and 2003, sea levels rose by about 1.8 mm per year. The Intergovernmental Panel on Climate Change projects that sea level will increase between 2 and 6 ft by 2100. A rise in sea level within this range puts nearly 634 million people, or one-tenth of the world’s population, at risk of flooding by coastal storm surges. The increase in salinity levels in surface and groundwater as a result of salt-water intrusion can threaten sources of fresh water for human consumption and agricultural production.

Increased ozone and poor air quality

Ozone can be both good and bad. In the second layer of the atmosphere, known as the stratosphere, ozone is produced naturally and helps to block harmful ultraviolet rays from the sun. However, in the lower atmosphere, ozone is a harmful pollutant. Ground-level ozone is formed when oxides of nitrogen and volatile organic compounds react chemically in the presence of sunlight and heat. Consequently, an increase in global temperatures increases the formation of ground-level ozone.

Ozone is already the most pervasive air pollutant in the United States. Adverse health effects of ozone exposure include reduced lung function and lung tissue damage, increased risk of asthma attacks, and aggravation of other lung diseases. Ozone is also known to affect the cardiovascular system and can increase the risk of heart arrhythmias. Ozone depletion in the upper atmosphere can cause increase in skin cancer and cataracts.

Increasing infectious disease

The spread of infectious disease is one example of a secondary effect of climate change that will impact health outcomes across the globe. Mosquitoes, which can carry malaria and other diseases, are highly sensitive to temperature changes. Higher temperatures boost their reproductive and biting rates, lengthen their breeding season, and shorten the time it takes for the malarial pathogen to mature to an infectious state. Increasing temperatures may also expand the viable ranges of mosquitoes to higher elevations and more northern latitudes, putting at risk previously unexposed populations. Along with rising temperatures, changes in precipitation can further exacerbate the spread of infectious diseases such as malaria, with flooding triggering outbreaks as vector-breeding sites are established in standing water.

From the moderate to the catastrophic, the impacts of climate change together constitute one of the gravest threats to public health that the world has ever confronted. The World Health Organization estimates that climate change is already responsible for 150,000 deaths and 5 million disability-adjusted life years.

Given these projections, the conversation within the clinical community needs to shift. It should not center on whether climate change is real or not. Instead, it should focus on what clinicians and health care facilities can do to prepare for the current and future health effects of climate change and how clinicians can mobilize the health care sector to...
prevent the acceleration of this phenomenon. Three crucial areas of focus for health care professionals are education, mitigation, and adaptation.

Education
Nurses, physicians, and other health practitioners are recognized as trusted experts on health-related issues not only in the examination room but also in the community-at-large. Two Gallup surveys in the past 5 years have shown that people tend to trust clinicians more than any other interest group when it comes to health issues. Nurses and other clinical professionals can play an important role in educating their colleagues about the health impacts of climate change, ways in which the health sector can reduce emissions, and providing anticipatory guidance information to patients and their families about how to avoid medical conditions brought on by climate-related events.

Climate change mitigation in health care
The health care sector can play an important role in climate change mitigation by reducing its own climate footprint and leading by example. With medical centers spending $5.3 billion annually on energy, and the health care sector representing one-seventh of the US economy, reducing the sector’s greenhouse gas emissions is a task of national importance. Clinicians can emphasize the importance of a health system’s commitment to reducing energy consumption to reduce the negative health impacts due to climate change. They can also work toward tangible changes in all aspects of facility operations by participating in organized green teams or sustainability committees being established within health care facilities to assist the move toward more sustainable operations. The participation of leading nurses in these teams is a valuable asset.

Health care’s response to climate change requires a multifaceted, practical approach because of the diversity of energy use within a system’s operation. Health Care Without Harm and World Health Organization jointly developed a Healthy Hospitals, Healthy Planet, Healthy People guide, which identifies 7 areas of operations where mitigation strategies can be implemented to reduce the health care sector’s climate footprint. Following is an outline of those 7 areas and recommended energy-reduction measures.

Transportation
The health care sector relies heavily on transportation systems to move patients, employees, supplies, and waste. Transportation contributes 27% of the US greenhouse gas emissions and is the most rapidly growing sector. Reducing total vehicle miles traveled or using low emissions vehicles and fuels decreases both greenhouse gases and other pollutants that affect human health.

What your health care facility can do:
• Reduce hospital fleet emissions by effectively programming medical care delivery to avoid excess or unnecessary trips.
• Encourage hospital staff and patients to use public transportation, carpools, and bicycles. Hospitals can commission their own buses to transport staff to and from work, offer discounted bus passes to employees, provide interest-free bicycle loans, and promote car-share programs throughout the facility.
• Purchase goods and enter into contracts with local suppliers and choose suppliers with progressive fuel efficiency and/or alternative fuel standards.

Energy conservation and efficiency
Energy consumed in health care facilities for heating, cooling, and controlling humidity in buildings, heating water, providing light, and ventilation is a significant source of greenhouse gas emissions. The US Environmental Protection Agency estimates that 30% of the health care sector’s current energy use, or $1.95 billion, could be reduced without sacrificing quality of care through a shift toward energy efficiency and renewable energy sources.
What your health care facility can do:

- Install a combined heat and power facility on site to reduce emissions and spending on electricity. Facilities generate on-site electricity and capture waste heat from the generation process as thermal energy. This can double energy efficiency by eliminating losses associated with the grid delivery of electricity.

- Switch to compact fluorescent and light emitting diode light bulbs, turn thermostats down by a few degrees in the winter and up in the summer, and purchase energy-efficient refrigerators, air conditioners, and washing machines.

- Make building operations more energy efficient by dedicating personnel and programs to energy conservation. Educate staff to turn off lights and computers and to unplug electronic devices when they are not in use.

- Purchase green power. It is possible to offset 50% to 100% of power use by purchasing electricity generated by a renewable source.

**Alternative energy generation**

Hospitals can use alternative energy sources for lighting, generating heat, and pumping and heating water. Health facilities with alternative sources of energy are less vulnerable to energy disruptions in the event of a disaster. The health care sector could play an important role in shifting the economics of scale and help to make alternative energy economically viable for everyone.

What your health care facility can do:

- Install on-site renewable energy capability. Solar photovoltaic panels can generate a portion of your facility’s electricity or power a solar thermal hot water system.

- Consider a biomass boiler that runs on locally harvested and renewable woodchips, which could be supplemented by an on-site heat and power plant.

**Green building design**

Incorporating sustainability principles into the design and construction of a hospital’s built and landscaped environment reduces energy use and greenhouse gas emissions. Site decisions for new buildings can help cut down transportation-related emissions. Carefully selecting and purchasing materials can protect natural resources that are important for carbon sequestration and by reducing fossil fuel consumption.

What your health care facility can do:

- Utilize design components to reduce energy needs, such as natural day lighting; low-flow water fixtures; automated systems to control heating, ventilation, and air conditioning; sun shades; and reflective roofing systems.

- Plant trees and native vegetation to reduce the urban island heating effect and watering needs.

- Avoid developing on Greenfield sites.

- Plan for public transportation, pedestrian and bicycle access to and between facility buildings.

- Reduce energy required to transport materials to construction sites by sourcing locally/regionally.

**Waste disposal and management**

Hospitals and health facilities generate significant amounts of waste. Both waste disposal and transport of waste from facilities to disposal sites generate significant amounts of emissions. A comprehensive approach to facility waste management, including diversion of construction and demolition debris, material recycling, composting of food waste, reuse, and donation can reduce these emissions.

What your health care facility can do:

- Recycle materials whenever possible, including everything from electronics to anesthetic gases.

- Establish a composting program for food service.

- Purchase products that are reused, recycled, and have minimal packaging.

- Dispose of waste locally.

- Disinfect and landfill potentially infectious waste as an alternative to incineration, which produces high quantities of
greenhouse gases in addition to toxic pollutants such as dioxins.

**Food service**

Our industrialized food system in the United States relies on massive inputs of fossil fuels for farm operations, food production, processing, and transportation. The UN Food and Agriculture Organization estimates that the livestock sector alone generates 18% of all global greenhouse gas emissions. In the United States, agriculture and food account for up to 30% of the goods transported on our roads. Food waste also contributes significantly to the waste stream, comprising 12% of the total municipal solid waste stream in the United States.

What your health care facility can do:

- Reduce the amount of meat protein served on hospital menus.
- Buy locally grown, seasonal food whenever possible.
- Grow food on-site in hospital gardens.
- Compost food waste and use compostable dishes and serviceware.
- Purchase organic food, which is grown using fewer fossil fuel-derived pesticides and fertilizers.
- Conduct on-site farmers markets for staff and visitors to access local food sources.
- Encourage nurses to serve as role models and educators by promoting nutritious foods from sustainable local food systems.

**Water conservation**

Access to clean drinking water is an ever-increasing issue of global importance, which climate change only exacerbates with increased droughts, glacier melt, and aquifer depletion. Health care facilities use vast amounts of water and can play an important role in water conservation worldwide.

What your health care facility can do:

- Monitor water use and install low-flow and other water-efficient technologies.
- Plant drought-resistant trees and vegetation in landscaping.
- Collect and store rainwater and other recycled water for nondrinking purposes.
- Repair leaks in old water systems.
- Eliminate the purchase, sale, and facility-wide use of bottled water.

**Adaptation strategies for health care**

Implementing steps to reduce greenhouse gas emissions and reduce the health care sector’s carbon footprint is only half of the challenge of addressing climate change for health care practitioners. Scientific evidence indicates that even if greenhouse gas emissions were to be stabilized at current levels, Earth is already committed to warming between 1.4 and 4.3°C by the end of the century.20 A localized, bottom-up approach is imperative to best prepare communities to adapt to climate change. Leading nurses can play a vital role in local and regional climate adaptation strategies by preparing their patients, medical facilities, and communities to be resilient and best cope with the anticipated health impacts of climate change.

Health care providers can lead adaptation efforts through 3 important channels: partnerships with local decision makers, guidance to patients and their families, and health care facility preparations.

**Partnerships with local decision makers**

In conjunction with local health and government officials, nurses can play a key role in identifying the most vulnerable demographic and geographic areas, monitoring current and future threats in those targeted populations and areas, and then tailoring emergency preparedness and response plans accordingly. Once the vulnerabilities are identified, it is important to set up a system to monitor current and future health threats such as infectious diseases, mortality, and morbidity.

**Provide anticipatory guidance to patients and families**

Because nurses are trusted and credible voices in society, they can help prepare communities by stressing the important...
prevention and preparation aspects of climate adaptation. Nurses can educate patients through a variety of media from posters and educational materials in waiting rooms, direct guidance to patients, to e-mail and phone alerts advising patients and their families about how to best deal with extreme temperature or poor air-quality events.

**Lead efforts to prepare health care facilities for increased patient demand**

With increased floods, wildfires, heat waves, and other environmental hazards incited by climate change, hospitals and medical facilities will experience a surge in patient demand and emergency department visits. Hospitals must take important steps to prepare for this influx of patients. Facilities must be equipped with enough staff members and equipment. Nurses, physicians, and other practitioners should be educated about the most likely climate risks in the region and how those risks directly impact patient health. In the event of a power failure, hospitals should have backup generators and contingency plans. Hospitals will need to have emergency transportation plans to enable workers to get to work in the event of inclement weather events.

**OPPORTUNITIES FOR NURSES**

Nurses have ample opportunities to help reduce waste, energy, water consumption, and the health care sector’s overall carbon footprint. Education and assistance are required to make these opportunities a reality. Support is available and can range from one concerned individual to large member groups.

**Green teams**

Green teams are steadily becoming a part of workplace culture. Green teams are created by 2 or more people who are tasked with increasing corporate sustainability. Employee education, C-suite buy-in, interdepartmental inclusiveness, written policies, and creativity are all key components of a successful green team. Nurses are essential to green teams since they use recyclable products and packaging, work with chemicals, interact with and educate patients, make purchasing decisions, and are already engaged in health-promoting activities. If your facility or workplace does not currently have a green team, start one!

**Environmental health task forces**

Many state nurses associations offer the opportunity to participate in an environmental health task force. This task force offers nurses the chance to act on particular environmental challenges. Topics range from needed legislation reform to occupational concerns, community issues, public health needs, and educational needs on an environmental hazard. These task forces often host continuing education seminars or workshops. If planning such an event, nurses can consult the American Nurses Association’s Green Meeting Guide: [http://www.nursingworld.org/MainMenuCategories/OccupationalandEnvironmental/environmentalhealth/EnvironmentalResources/GreenMeetingGuide.aspx](http://www.nursingworld.org/MainMenuCategories/OccupationalandEnvironmental/environmentalhealth/EnvironmentalResources/GreenMeetingGuide.aspx).

**Additional opportunities**

Nurses can rely on their most powerful and helpful source of information, each other, by visiting [http://www.theluminaryproject.org/](http://www.theluminaryproject.org/). The Luminary Project highlights the efforts of environmentally concerned nurses around the globe that are meeting environment health challenges head-on and transforming the planet for the better. The Luminary Project is a collaboration among Health Care Without Harm’s Nurses Work Group, Lights (individual nurses), and Beacons (nursing organizations, including American Nurses Association).

The International Council of Nurses has developed a position on nurses, climate change, and health. The position statement acknowledges the importance of climate change for the nursing profession due to the impact on public health and nursing’s role in
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protecting and sustaining the environment from insults such as depletion, pollution, degradation, and destruction. The International Council of Nurses position addresses concerns of the direct public health impact of climate change as well as indirect impact. International Council of Nurses calls upon nurses to be part of measures to mitigate the impact of climate change with a special focus on populations particularly vulnerable to disease and injury. Nurses can assist and advocate for the development of national policies and action plans. Disaster preparedness teams are another way nurses can be engaged in mitigating climate change.

The American Nurses Association’s Principles of Environmental Health for Nursing Practice with Implementation Strategies address global climate change and chemical burden. Vulnerable populations discussed include children, the elderly, those who are immune-compromised, the urban poor, and those who do not have access to early preventive care.

The American Nurses Association adopted a resolution on global climate change in 2008. This resolution offers acknowledgment of global climate change and its challenges and provides additional guidance for nurses, calling upon a decrease in the contribution by the health care industry to global climate change, support of local policies that endorse sustainable energy sources, and reduction of greenhouse gas emissions. It calls upon nurses to speak out in a united voice and advocate for change on both individual and policy levels.

Student nurses and other future health care professionals must also be educated on the science of climate change, its impact, and strategies and actions to respond to the resulting impacts. They should be provided opportunities to learn about this in their educational settings so they can fully participate in the solutions surrounding global climate change adaptation.

Climate change is taking a toll on human health. Nurses are called to action to join forces with other health care professionals to help with mitigation, adaptation, and policy surrounding global climate change. Their leadership is a vital component to addressing and combating global climate change.

“The health sector must add its voice—loud and clear...we must fight to place health issues at the center of the climate agenda. We have compelling reasons for doing so. Climate change will affect, in profoundly adverse ways, some of the most fundamental determinants of health: food, air, water.” — Dr Margaret Chan, Director General of the World Health Organization, 2010.

REFERENCES


