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What Methods can the Health Care Industry Implement to Reduce Energy Consumption and  
Waste Production From Patient Care to Limit Greenhouse Gas Emissions?

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An Honors College Project Presented to  
the Faculty of Undergraduate  
College of Health and Behavioral Sciences  
James Madison University

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By Danielle Hazel Star Good

December 2020

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Accepted by the faculty of the School of Nursing, James Madison University, in partial fulfillment of the requirements for the Honors College.

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PUBLIC PRESENTATION

This work is accepted for presentation, in part or in full, at Honors College Symposium on December 11, 2020.

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## Abstract

*Purpose:* Climate change is a growing issue all around the world and has negative impacts on the environment and human health. The health care industry is a significant contributor to greenhouse gas emissions amplifying climate change. Health care establishments are in place to improve health but are inadvertently harming it at the same time. *Methods:* A review of the literature was conducted to determine the impact the health care industry has on climate change and what can be done to limit the impacts on the environment. Resources were collected from trusted organizations databases such as Healthcare Without Harm, Alliance of Nurses for Healthy Environments, the Center for Disease Control and Prevention, and a selection of scholarly articles including *The Lancet*. *Results:* The literature indicated that the health care industry was a significant contributor to greenhouse gas emissions and correlated with the amount of expenditure. According to data collected in 2018, the U. S. health care system makes up 17.7% of the nation's GDP, and therefore, produces a higher ratio of greenhouse gasses (Center for Medicare & Medicaid Services, 2019). Hospitals have been identified as the key contributor to greenhouse gasses from the healthcare industry. There are methods hospitals can implement to reduce their carbon footprint and it is possible to create a carbon-neutral healthcare system as Kaiser Permanente has achieved for the first time in the U.S. (Costa, 2020).

*Conclusion:* As global temperatures rise, there is a dire need to make a change in the ways humans affect the environment. The health care industry has the power to make a significant impact to improve environmental health if correct methods were put in place. Nurses make up the majority of the workforce in health care and can kindle the movement to make a difference in how their community perceives the impacts health care facilities have on the environment.

*Keywords:* health care, environment, climate change, nurses, public health

## **What Methods can the Health Care Industry Implement to Reduce Energy Consumption and Waste Production from Patient Care to Limit Greenhouse Gas Emissions?**

Climate change is a popular topic in today's society. Climate change is primarily caused by humans burning fossil fuels that lead to the release of greenhouse gasses that trap the sun's heat (National Research Council, 2001). As temperature increases, the poles of the world are warming causing ice caps to melt resulting in a cascade of events including rising sea levels, extreme weather, and changes in ecology (National Research Council, 2001). In the discussion of climate change, a lot of focus is based on who is responsible for the environmental effects and who should be working to change things. As everyone is impacted by the environment, everyone should share in the responsibility of taking care of it. However, the movement needs to begin with a trusted group who can spark motivation among others. A poll conducted by Gallup has voted nurses as the most trusted profession for 17 years in a row; therefore, they have the influence and voice to start a revolution of changes in how the health care industry can limit their environmental footprint (Brenan, 2018). There is no better place to implement environmentally conscious policies than in the same place that treats the human effects of climate change. "If the health sector were a country, it would be the fifth-largest emitter on the planet" (Karlner, Slotterback, Boyd, Ashby, & Steele, 2019, p. 4). Not only is climate change harming the environment in which we live, but it is also harming human health. If nurses push for change in the health care industry to be more environmentally friendly; the Earth's environmental health will improve along with the health of patients and their families. This literature review investigates methods hospitals can implement to reduce energy consumption and waste production from patient care to limit greenhouse emissions.

## Synthesis of the Literature

### Climate Change and Health Effects

Climate change is a global crisis that directly impacts the environment in which humans live. In global terms, the United States is ranked the second leading contributor of carbon dioxide, a major greenhouse gas, behind only China (BBC, 2020). However, when measuring overall emissions produced in the global health care sector, the U.S. is ranked first. Climate change is taking a toll on the environment and human health and the United States' health care industry is responsible for its contribution. NASA (2020) describes the effects of climate change to include a longer growing season, changes in precipitation patterns (varies by geographical location), more frequent droughts and heatwaves, stronger hurricanes, rising sea levels, and an increased chance of the Arctic to become ice-free.

Climate change not only has a direct impact on the environment but can also harm humans' health. Certain populations that are at higher risk for these impacts include young children, the elderly, those living in underdeveloped countries or near a shoreline, people with preexisting conditions or are immunocompromised (e.g. chemotherapy patients), outdoor manual laborers, and communities that live in areas where vector-borne illnesses are endemic (Watts et al., 2018). The Centers for Disease Control and Prevention, or CDC, (2019) highlights the indirect consequences of climate change in relation to health in eight categories: air pollution, increasing allergens, changes in vector ecology, water quality impacts, food supply impacts, environmental degradation, extreme heat, and severe weather. Environmental degradation leads to forced migration, mental health impacts due to trauma, and possible civil conflicts (CDC, 2019). Extreme heat leads to heat-related illnesses such as heat stroke and cardiovascular failure, both of which can result in death (CDC, 2019). Severe weather results in injuries, deaths, and

mental health impacts related to the trauma and/or housing displacement (CDC, 2019). Air pollution has been linked to the rise of asthma and cardiovascular diseases (CDC, 2019). Changes in vector ecology lead to higher rates of mosquitos and disease-spreading insects, resulting in a higher incidence of malaria, Lyme disease, dengue, Zika virus, Chikungunya, and West Nile virus, among others (CDC, 2019). For example, the transmission of the infectious disease dengue caused by two species of mosquitos has increased by 3% and 5.9% since 1990 and 9.4% and 11.1% since 1950 (Watts et al., 2018). Increasing allergens leads to respiratory allergies and asthma while rising temperatures can have negative impacts on water quality leading to a higher incidence of bacteria and harmful algae blooms that can make freshwater undrinkable or cause illnesses if ingested (CDC, 2019; World Health Organization, 2018). Water and food supply is impacted by the changing climate and can also lead to malnutrition and diarrheal diseases (CDC, 2019). The World Health Organization (2018) predicts that “between 2030 and 2050, climate change is expected to cause approximately 250,000 additional deaths per year, from malnutrition, diarrhea, and heat stress.” The concern of these outcomes is even greater for developing countries that do not have advanced healthcare systems and technologies to manage or treat climate-related health conditions and depending on geographical location, will be more affected by climate change such as sub-Saharan Africa (Hussey & Arku, 2019). Climate change is an urgent matter and thousands of deaths will be a consequence if changes are not implemented fast.

### **Healthcare’s Contribution to Climate Change**

Health Care Without Harm is an international organization aimed at transforming the health care sector to be an advocate for patients and the environment by implementing environmentally sustainable practices (Karlner et al., 2019). In 2019, this organization



conducted the first-ever global estimate of the climate footprint of the health care industry and was a primary literature resource for this paper; 43 countries were analyzed in the study including the United States (Karliner et al, 2019). In 2013, the healthcare industry contributed to about 9-10% of total greenhouse gas emissions in the U.S (Eckelman & Sherman, 2018). However, “health care’s climate footprint is equivalent to 4.4% of global net emission” (Karliner et al., 2019, p. 4). The second most energy-intensive facilities are hospitals which use more than two and a half times more energy per square foot than other facilities (Health Care Without Harm & ANHE, 2019). The demand for water use in hospitals is ranked third behind senior care homes and hotels averaging up to 570 gallons of water used per occupied bed in one day (Schechter, 2015). This can be harmful to the environment because of the number of greenhouse gasses that are emitted during the process of distributing, heating, and treating the water (Health Care Without Harm & ANHE, 2019). Twenty-nine pounds of waste are produced during the patient care of one individual in one day (Health Care Without Harm & ANHE, 2019). An additional 32 pounds of waste is generated for every pound of manufactured products during the development process and transportation of products to the hospital (Health Care Without Harm & ANHE, 2019). The Lancet is a publication aimed at tracking the “progress on health and climate change and provides an independent assessment of the health effects of climate change” and the implications of actions aimed to improve climate change in relation to health (Watts et al., 2018, p. 581). Researchers involved with the *Lancet* also argue that health professionals are obligated and should be responsible for advocating for this public health movement (Watts et al., 2018). The response to climate change mitigation has been slow; however, in recent years more countries are committing to reduce their carbon emissions and many health care organizations are advocating for the necessary policy changes.

A few limitations were present in this review of the literature regarding climate change and the contribution the health care industry is making and how they can reduce their impact. There has been a significant increase in the past two years in the literature describing how hospitals and specific health care practices can take action to reduce greenhouse gas emissions including the publication of *The Lancet* which described the number of scientific papers on this topic has more than tripled since 2007 (Watts, et al., 2018). While the articles analyzed included similar figures and emphasized the importance of the health care industry as a large contributor of greenhouse gasses, this specific concept is fairly new, and some definitions do not encompass the same details as others. In addition, this research may not be all-inclusive as the environmental impacts of the health care industry is a new line of research and reporting by underdeveloped countries and/or rural areas may be behind. Most importantly, the data in this research is continuously changing over time and takes years to collect. Health Care Without Harm (2019) used data from 2014 and the current data most likely differs from the conclusions made at the time. More research and reporting is needed in this field of study. Additionally, creating a carbon neutral health care system takes time, money, and dedicated individuals to drive the movement; however, it is feasible. Kaiser Permanente is the largest nonprofit health system and has worked for the past 75 years to promote improved public health and is officially the first carbon-neutral health system in the United States (Costa, 2020). Kaiser Permanente recognizes the negative effects climate change has on humans' health and with their three-phased plan to become carbon neutral has eliminated "the organization's 800,000-ton annual carbon footprint, the equivalent of taking 175,000 cars off the road," (Costa, 2020). It may have been a challenge to accomplish; however, it is now known a carbon-neutral healthcare system is feasible

in the United States and as research continues, optimistically more hospital systems will embrace this possibility.

### **Conclusion and Future Study**

Overall, the United States itself is a major contributor to greenhouse gasses and within the industry sectors, health care manifests its fair share of the emissions total. If nurses became the voice behind the change and became involved in organizations such as the Alliance of Nurses for Healthy Environments, a difference could be made within the health care facilities in which they work and the homes of the patients they treat. Nurses can also advocate for health policy changes in their local, state, or federal government. The environment will be a healthier place to live and humans will have fewer adverse health problems caused by the effects of climate change such as air pollution.

More research will be conducted in this field of science as this is an ongoing process. Collecting conclusive data that is described in the same terms from country to country is time-consuming and can take years. The hope is that as new data is generated, it will inform public policy and significant changes will be made. In addition, more research needs to be conducted regarding how underdeveloped countries should go about implementing policies to reduce their carbon footprint and if developed countries should claim responsibility in providing financial or technological aid. There is a lot of areas for future research as there are a lot of components affecting climate change.

### **Recommendations**

The health care industry has a significant impact on the environment; however, there are interventions that can be implemented to limit their waste and energy consumption. The majority of waste produced in health care settings can be sustainably disposed of or recycled without

being a risk to public health. Of all waste produced in hospitals, 75% is considered nonhazardous and therefore not a threat to others' health if recycled (WasteCare Corporation, 2013). A reduce, reuse, and recycle program can be instituted that aims to reduce physical waste, electricity, and excessive water use. Paper contributes to being the majority of the physical waste produced in hospitals followed by plastics, food waste, and disposable linens (WasteCare Corporation, 2013). All of these items can be recycled or disposed of in a more sustainable manner such as a food compost. To protect patient privacy, paper with personal information can be shredded and privacy agreements can be established between the health care and recycling facilities. Paperless documentation can be implemented and would reduce some of the paper waste created. Management of health care facilities can implement personnel responsible for managing supply orders and encourage bulk deliveries of only items needed. Ordering all supplies at once limits the emissions produced in the transportation of the items. Purchase of reusable supplies such as operating room equipment that can be sterilized or cloth diapers will reduce physical waste that is more difficult to safely and sustainably dispose of. Health care professionals should be encouraged to only bring needed supplies to patients' rooms and limit the washing of linens unless soiled.

Single-use plastic is another large contributor to hospital waste that is negatively impacting the environment. A figure from 2002 estimates that 20-25% of 14,000 tons of medical waste is plastic (Leissner & Ryan-Fogarty, 2019). Production of plastic requires the use of petroleum consuming 8% of global oil and gas (Chidambarampadmavathyac et al., 2017). Plastic is made with complex polymers that are difficult to destroy and can remain in the environment for thousands to millions of years (Chidambarampadmavathyac et al., 2017). Recycling is an alternative to disposal in landfills; however, can be challenging due to components mixed in

plastic that cannot be recycled or the requirement of sorting different types of plastics and the financial costs associated with that (Chidambarampadmavathyac et al., 2017). For now, hospitals should be encouraged to research the products they use containing plastic and the best methods of recycling while research is conducted to create bio-plastics more sustainable for the environment. Plastic production and the inability to recycle the plastic in combination with the use of fossil fuels to power the electricity of hospitals is a large contributor to the production of greenhouse gasses and their effect on public health.

Additionally, health care facilities should be encouraged to purchase local foods and to compost to reduce food waste. Greenhouse gasses emitted from the livestock industry consists of 14.5% of all emissions; therefore, hospitals can reduce the portions of protein and provide alternative protein sources such as beans (Health Care Without Harm & ANHE, 2019). The health care industry is constantly growing, and new facilities are being built or remodeled every day. The government provides tax credits for the agriculture industry when farmers implement best management practices aimed at preserving the environment (Virginia Department of Taxation, 2020). Therefore, nurses could lobby for a policy in which a similar credit is offered specifically to health care organizations. One intervention that could qualify for the tax credit could be installing alternative energy sources such as solar panels or windmills. Water-efficient appliances such as dishwashers and washing machines could also apply for credit. Lastly, education is a nurse's priority and the hospital as a whole can emphasize educating employees, patients, and the community on how to take small steps in reducing waste and energy use to benefit the environment. By implementing the proper practices, climate change can be prevented, and health outcomes improved.

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