# Chapter 21
# Sustainability and Healthcare: Expanding the Scope of "Do No Harm" Models of Success


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The dictum of "primum non nocere" has been the cornerstone of medical ethics for a millennia [1]. Each generation views it in a different light, often guided by the circumstances of the times. At some point, most healthcare providers find themselves asking what encompasses harm and how will that translate to their responsibility as an individual practitioner and at the institutions where they work. While it is obvious that first do no harm applies to clinical practice, which we as providers have some control over, it also can apply to behavior and the unintended consequences of providing healthcare.

A growing concern is how the energy-intensive practice of modern medicine is impacting the environment and how we as providers are accountable for that impact. Climate change and the delivery of healthcare are no longer separate issues. A possible relationship between the two is no longer abstract. The environmental impact of practicing medicine is measurable.

In addition, what is our responsibility to promote sustainable practices among all industries that potentially lowers the risk of environmentally induced disease. Now more than ever, it has become obvious that the changing environment is having a direct and increasing impact on our health.

Our first priority should be to determine and mitigate our own impact on the environment. Hospitals operate 24 hours per day, 7 days a week. Much of its operation is energy intensive and require carbon fuel as to run critical systems. The World's Healthcare systems produce as much CO2 as the seventh largest country.

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It is understandable that a generation of healthcare providers, raised in the context of severe climate change warnings and events, would be eager to incorporate sustainability not only in their personal lives but into their practices as well.

"Sustainable healthcare" refers to the goal of providing high quality care while having minimal or no environmental impact. This goal is achieved primarily through decreasing energy use reducing various types of waste and procuring clean energy. This includes all of the many downstream aspects of healthcare such as transportation, food production, and waste disposal. Healthcare is reliant upon a large and diverse infrastructure. Sustainable healthcare also considers healthcare's facilities immediate impact on the local community, such as in its impact on local air quality.

The medical industry and its support systems in the United States are responsible for approximately 10% of the world's carbon emissions [2]. In addition, a significant amount of local air pollution, primarily due to transportation can be attributed to healthcare operations. While many industries, such as the automotive, have made great strides in transitioning to sustainable practices, healthcare has ironically lagged behind. Market forces have not particularly pushed healthcare in that direction.

The most obvious hurdle to converting hospital systems to a sustainable framework is the initial financial cost, and making the argument that it is a cost-effective endeavor. There is an increasing body of literature that demonstrates this.

Guidelines for sustainable healthcare are just beginning to emerge. The World Health Organization has set parameters for creating healthcare systems that are environmentally sustainable while ensuring greater affordability [3]. The areas defined for interventions include workforce development, water use, sanitation, hygiene, waste management, sustainable energy, infrastructure, technology, and product procurement [3]. This document serves as one of the first to provide a major overview of the issues by an international organization. It sets out to define the healthcare industry's impact on the environment and gives advice on how to achieve remediation in each area.

At times, the healthcare industry has been slow to change and driven by custom and tradition. For this reason, sustainable healthcare is searching for inspirational solutions to foster a new way for health systems to operate. The new mantra of healthcare, one that does transform the traditional delivery of healthcare, is to meet the patient's needs where they live work and play. Addressing sustainability is key to this concept.

It is easy to point out concerns regarding sustainability in a medical setting, but it is hard to discover solutions that can be easily implemented with rapidly definable metrics. The road forward will require extensive research and an honest evaluation of our efforts, but the preliminary results are already promising. For example, investing in sustainable upgrades to a single operating room can save up to $56,000 annually [4]. Startup costs can be extensive, but this one example demonstrates that the financial best interest of the healthcare industry can be to move toward sustainability, even in short term.

As in other industries, sustainable initiatives have financial benefits in the long run due to decreasing energy, reducing waste, and minimizing transportation costs.

An obvious added component is the goodwill that is generated among patients and employs with these initiatives. Much of this can be translated into improved patient satisfaction and enhanced employee retention. Increasingly, employees have the expectation of a workplace that support sustainability. In a time of increasing climate change-related weather events, this can be reassuring.

In the United States, many hospital systems are taking formal steps toward increasing sustainability. Some have fully employed sustainability directors that report directly to the CEO. This position has become the norm for most other industries, and it is being seen in many of the major healthcare systems. The following are three examples of efforts of various sizes that have formalized their sustainability efforts.

## Kaiser Permanente: An Innovator of Sustainability Efforts in the Healthcare Industry

The United States's largest integrated healthcare system, Kaiser Permanente, has made significant strides toward sustainable healthcare. They are often viewed as the pioneer and leaders is this field, with a long history of innovation. Starting with limited goals, employees in 1970 at Kaiser Permanente Santa Clara Medical Center created an "Ecology Committee" to teach other employees about common ecology [5].

Kaiser Permanente has not only utilized but has invested in solar energy projects and infrastructure. It has a long history as one of the first adopters of solar energy on a large scale. In 1977, Kaiser Permanente Redwood City Medical Center began using solar energy for water heating. At the time, this was one of the first and largest solar projects at a US medical facility. Solar power was expanded in 1980 at Kaiser Permanente with the development of a solar thermal project in Silicon Valley at Santa Clara Medical Center [5]. Since that time, solar utilization has continued its expansion.

Hospitals require large amounts of produce and are one of the major purchasers in a given region. Many sustainability goals can be achieved by local sourcing. Kaiser Permanente Oakland Medical Center began the first farmers market at a United States hospital. This initiative has spread to over 50 farmers markets at hospitals associated with Kaiser Permanente [5].

In addition to developing sustainable energy sources, in 2010, Kaiser Permanente began evaluating all suppliers' environmental impact. This involves a scorecard that provides information on supplier's use of harmful chemicals and recycling policies. The goal of this endeavor is both to analyze the environmental impact of items purchased and to encourage suppliers to utilize more environmentally friendly ways of creating and sourcing products [5]. These initiatives all are developed with short-term achievable metrics.

More recently, Kaiser Permanente has set more aggressive goals and long-term initiatives. In 2010, Kaiser Permanente committed to reducing greenhouse gas emissions 30% by 2020. This goal was based off of the emissions recorded in 2008 [5]. A large step toward this goal involved investing in the construction and operation of wind and solar energy farms. By investing in these renewable energy projects, Kaiser Permanente generated 590 million kilowatt hours of power in a year. This is equivalent to the electricity used by 82,000 average American homes in a year.

Another major goal was set in 2016 when Kaiser announced it would be carbon neutral by 2020 [5]. This involved a more aggressive effort in investing in clean energy projects to reduce greenhouse gas usage, committing to recycling, reusing, and composting all non-hazardous waste, and acquiring all food from local farmers. The success of these initiatives shows the potential for a hospital institution to enact large-scale change. Kaiser's success demonstrates the abilities of healthcare systems not only achieve sustainability but to drive the green industry as a whole.

Kaiser Permanente has been officially recognized multiple times for their environmental endeavors. In San Diego, Kaiser Permanente opened the first LEED Platinum certified hospital [5]. This hospital produces its own electricity, cooling, and heating. The design reduces water usage and overall energy consumption. By 2020, 40 Kaiser Permanente building were LEED certified. The EPA awarded Kaiser Permanente the Green power Leadership Award in 2019 for their use of renewable energy. Kaiser Permanente achieved their goal of being the first carbon-neutral hospital system in the United States in 2020. Their work toward sustainability has been recognized on a national scale. Since 2002, Kaiser Permanente has received over 300 awards from the organization Practice Greenhealth for their environmental achievements.

Future goals remain ambitious as well. Having achieved success in their previous environmental initiatives, Kaiser is looking to the future to improve their facilities. By 2025, Kaiser Permanente plans to become carbon net positive, purchase all food locally, recycle 100% of non-hazardous waste, reduce water use by 25%, and collaborate with local organizations to reduce environmental impact on local communities [6]. The motivation behind this initiative stems from a concern for the rising impact of the environment on health and the disproportionate effects of climate change on marginalized communities. There is also a financial incentive to transition toward sustainability. Compared to their usage and cost of water and energy in 2013, Kaiser Permanente annually saves an estimated $19.6 million on energy and $2.8 million on water usage. The state of California has encouraged industries to become more sustainable and certainly much of its workforce has set that as an expectation for employment, but Kaiser has exceeded that expectation. Kaiser Permanente is the prime example of how a large hospital system with the urging of its workforce and cooperation of its administration can achieve sustainability, financial benefit, and an improved local environment.

Kaiser has a well-developed infrastructure to promote its sustainability operations. It has created and empowered the position of chief environmental officer. This position goes beyond sustainability issues, to examine healthcare's overall

interaction and influence with the environment: a concept that is increasingly being recognized as essential to the future of healthcare.

## Boston Green Ribbon Healthcare Working Group: Cooperation and Competition Among Healthcare Systems

In contrast to the example of Kaiser Permanente, which is one hospital system, the Boston Green Ribbon Healthcare Working Group unites multiple hospitals in a mutual goal of pursuing sustainability. This group is part of Boston Green Ribbon Commission which is composed of business, institutional, and civic leaders in the city of Boston, MA, working in coordination with the City’s Climate Action Plan to fight climate change and achieve city-wide carbon neutrality by 2050 [7]. By working with a variety of hospitals in Boston, they have reduced greenhouse gas emission by 33% in 2020. An impressive goal as the average US hospital has increased emissions by 1.5% yearly [7]. This was achieved through smaller changes made in coordination with the individual hospitals as well as by purchasing renewable energy options. This achievement came with corresponding financial savings. This initiative benefitted from close ties to the city government which controlled and regulated much of the energy industry. No one system in Boston is as large as Kaiser and thus does not have the ability to develop large-scale energy projects on its own. Also eliminated was much of the competition and individual bargaining for energy resources among healthcare systems.

These goals were achieved predominantly by initiatives and limited beneficial competition among individual hospitals, which often set goals that could be rewarded. For example, Beth Israel Deaconess Medical Center was converted to energy-efficient labs which lowered greenhouse gas emissions by 38% in one building. This achievement earned the medical center an award that funded an energy-efficient freezer program [7]. Area hospitals often utilized the expertise and enthusiasm of local academic institutions. Boston Medical Center constructed a 60-megawatt solar farm with MIT in North Carolina. By purchasing 26% of the power, Boston Medical Center moved to carbon neutrality in 2020 [7]. Similarly, by 2018, 80% of Partners HealthCare’s energy came from zero-emission generators and the entire facility will be carbon positive by 2025.

In addition to reducing the environmental impact of hospitals, the Healthcare Working Group aims to assess current environmental threats and help hospitals prepare for a potential environmentally driven crisis [7]. This was achieved through an assessment of the impact of an environmental crisis would have on healthcare with an emphasis on unexpected conditions arising from climate change. The goal of this assessment was to define areas of need to ensure socially equitable improvements to community health [7]. This initiative represents the potential of sustainable medicine to support community health in high-risk areas. Another part of this goal is to prepare the infrastructure of hospitals for potential environmental catastrophes such

as storms, heavy wind, and storm surge. The waterfront Spaulding Rehabilitation Hospital, part of Partners HealthCare, was designed with this in mind. The rehabilitation gardens double as storm surge barriers protect the raised ground floor. Additionally, mechanical and power systems are placed on rooftops to protect against potential flooding. Functional windows allow for ventilation and storm surge water is captured and reused [7]. Not only do these initiatives reduce waste, but they ensure the facility will be functional in the event of a large storm.

While most of these initiatives have long-term energy savings, start-up costs were considerable. Boston's Newton-Wellesley Hospital spent $50 million for a mechanical, electrical, and plumbing upgrade that included cooling towers and automated building controls. This reduced electric consumption by 44%, reduced demand by 51%, and reduced natural gas consumption by 40% [7]. Much of this expenditure was justified to administration by having the technical support of the Green Ribbon Commission Healthcare Working Group. The group also connected hospitals with unique funding options. This collaboration of hospitals has proven to be a great success. Many of the issues of sustainability require the coordination of many civil and private entities. This along with some friendly competition has been the path forward in Boston.

## Cleveland Clinic

Kaiser Permanente operates in many different cities in California and neighboring states. The Boston Green Ribbon Healthcare Working Group guides potentially all of Boston's hospital systems. In contrast, the Cleveland Clinic provides an example of how a single system, albeit large, can make sustainability an essential part of their mission.

The Cleveland Clinic's Office for a Healthy Environment stated its focus is on limiting the impact of climate change and its corresponding effects on human health [8]. Their green initiatives focus on four categories: buildings, operations, buying, and involvement.

The design of Cleveland Clinic Buildings is influenced by the United States Green Building Council's Leadership in Energy and Environmental Design (LEED) system. Thirteen of Cleveland Clinic's projects have been LEED certified, and all new major construction projects aim for certification as a minimum and silver certification as a larger goal [8]. Additionally, the "Operations" aspect of their environmental initiative aims to combat sustainability issues related to waste, transportation, energy, food, toxics, climate, and water. By working with supply chains, Cleveland Clinic hospital's landfill diversion rate was above 30% in 2010 [8]. Much of the landfill diversion comes from changes made in their operating room. Cleveland Clinic has standardized their operating room recycling program and offers it to hospitals across the nation. Unable to find an existing way to recycle operating room waste, Cleveland Clinic found a market for recycling operating room packaging and connected their waste hauler to this market in a way that ensured safety from

contamination. To combat waste from transportation, Cleveland Clinic has invested in alternative fuel vehicles and instituted a "No Idle Zone" in their parking areas.

They have also addressed the significant carbon footprint of employee transportation. They offer a carpooling match program for employees with preferred parking for carpoolers and discounted parking for low-emission vehicles. They have also addressed small issues where they can be found, for example, switching from a badge swipe to an automated sensor in parking.

Direct energy consumption use accounted for 80% of Cleveland Clinic's carbon emissions in 2008 [8]. They were instrumental in the development of Ohio Cooperative Solar, now called Evergreen Energy Solutions, by investing in solar panels in 2010 that provided 9% of their Main Campus hospital energy needs: an example of how healthcare can drive green industry.

To reduce waste from food production, Cleveland Clinic utilizes farmers markets and hospital kitchen gardens and aims to procure food within 200 miles of Cleveland. This involves working with local farmers and is celebrated with a mark on the food signs in the cafeteria indicating how far the food travelled. To reduce toxicity exposure and make environmentally friendly changes, Cleveland Clinic uses Green Seal-certified cleaning products, maintains a mercury-free environment, and reduces plastic to food.

## Practice Greenhealth

A study by the *Commonwealth Fund* found that despite the initial cost of moving toward sustainable initiatives, healthcare institutions through green initiatives could save up to $5.4 billion in 5 years and $15 billion in 10 years [9].

There is no one way for healthcare systems to move toward sustainability and different institutions will take different routes. One of the greatest challenges is quantifying sources of waste and finding scalable solutions that fits the financial resources of the institution. Some may pursue local solutions while others may go as far as investing in energy generation plants, such as solar and wind farms. Globally, there are several organizations of various sizes that can serve as guides for converting to sustainable healthcare.

In the United States, *Practice Greenhealth* provides the framework for health systems aiming to transition toward sustainability. They offer achievable goals and guidelines that can apply to institutions of any size and financial ability. *Practice Greenhealth* aims to work with hospital systems by disseminating solutions to the many challenges of greening the healthcare system while maintaining public health standards [10]. For example, through their Greening the Operating Room initiative, *Practice Greenhealth* will assess operating rooms, identify short-term and long-term sources of waste reduction, and provide a financial assessment of these changes. Operating rooms are a source of opportunity because a typical one consumes more energy per square foot than any other part of a hospital and can produce up to 33% of a facility's waste [4]. Cleveland Clinic and *Practice Greenhealth* have

worked together to "green the OR" in Cleveland and have marketed this initiative to other hospitals.

On a global scale, the organization *Healthcare Without Harm* advocates for sustainable healthcare. A promotional video created by *Healthcare Without Harm* outlines the argument that it is hypocritical of a healthcare system to be the cause of the health issues that it aims to cure. Sustainable medicine is a form of preventative care and has the potential for a substantial impact on slowing or reversing climate change [11].

## Conclusion

In our challenge to mitigate the effects climate change, time is limited. I believe the previous described efforts represent some of our best efforts so far and can serve as guide to jump start efforts. This statement by Dr. Dana Hanson, president of the World Medical Association summarizes the effects of climate change on the delivery of healthcare:

"Climate change represents an inevitable massive threat to global health that will likely eclipse the major pandemics as a leading cause of death in the 21st century." In the midst of the current suffering endured during the current pandemic, it is difficult to comprehend those consequences that climate change may bring.

The healthcare system is transitioning. It strives to provide care patients where they live, work, and play. A key component of this will be addressing our environmental impact on the communities we serve and that impact is measurable and considerable.

We are at an inflection point on our efforts to reduce carbon emissions and that is good. There is an almost a universal consensus that action is needed now. But time has become our enemy. According to the authors of the landmark report by the UN Intergovernmental Panel on Climate Change released in October of 2018, 10 years is what we have to reverse carbon emissions to prevent significant environmental-driven emergencies. The report states urgent and unprecedented changes are needed to limit temperature elevations 1.5C and 2C, as compared to the pre-industrial era. Exceeding a 2C elevation will lead to global adverse events at an unprecedented level [12].

I am optimistic and believe this will be the decade of action. If anything can be said positive about the current COVID-19 pandemic is that we have collectively come to realize how fragile our existence is. A new awareness has developed that better understands humankind's interaction with the environment. Our challenge is to convert this opportunity into action.

Carbon neutrality as demonstrated by Kaiser Permanente is achievable in the healthcare sector and should be our immediate goal. It can drive economic development locally by its implementation, and it can engage the community in environmental stewardship efforts to a level not yet seen. But time is of the essence, and worldwide leaders of these efforts are needed now. We have passed the time when

our actions are concentrated on convincing stakeholders of the problems. We must transition to practical, meaningful, and rapidly developed solutions.

Healthcare is one of the few industries that has the economic size, the scientific background, community engagement, and perhaps most importantly the motivations to “first do no harm” that could lead a national if not a global transformation in environmental stewardship among all industries. It is our duty to be leaders in these efforts and make it one, if not our most important priority.

## References

1. Hippocrates. Hippocratic Oath. 275 CE.
2. Cummings. Healthcare industry is a major source of harmful emissions. Yale; 2019. https://news.yale.edu/2019/08/02/healthcare-industry-major-source-harmful-emissions.
3. WHO Guidance for climate resilient and environmentally sustainable health care facilities. https://www.who.int/publications-detail-redirect/climate-resilient-and-environmentally-sustainable-health-care-facilities. Accessed 9 Feb 2021.
4. Greening the OR | Practice Greenhealth. https://practicegreenhealth.org/topics/greening-operating-room/greening-or. Accessed 9 Mar 2021.
5. The road to carbon neutral. https://about.kaiserpermanente.org/community-health/improving-community-conditions/environmental-stewardship/the-road-to-carbon-neutral.
6. Pledging bold environmental performance by 2025. https://about.kaiserpermanente.org/community-health/news/kaiser-permanente-pledges-bold-2025-environmental-performance-to. Accessed 9 Feb 2021.
7. Health Care Working Group. Boston Green Ribbon Commission, https://www.greenribboncommission.org/work/health-care-working-group/. Accessed 22 Mar 2021.
8. About The Office for a Healthy Environment. Cleveland Clinic, https://my.clevelandclinic.org/about/community/sustainability/about. Accessed 24 Mar 2021.
9. Sustainability efforts could save healthcare industry $15B over 10 years. Healthcare Finance News, https://www.healthcarefinancenews.com/news/sustainability-efforts-could-save-healthcare-industry-15b-over-10-years. Accessed 9 Feb 2021.
10. Topics | Practice Greenhealth. https://practicegreenhealth.org/topics. Accessed 9 Feb 2021.
11. Home | First, Do No Harm. https://healthforclimate.org/. Accessed 9 Feb 2021.
12. Special report on global warming of 1.5°C (Report). Incheon: Intergovernmental Panel on Climate Change (IPCC); 2018. Retrieved 7 Oct 2018.