

Best practices that healthcare leaders can embrace to create sustainable hospitals (YEL2023)

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Introduction

Climate change is currently the greatest potential threat to the human species' health¹. As the world experiences rising temperatures from global warming, the negative impacts on population health are being experienced in the form of food insecurity incidents, droughts, heat and wildfire exposure, extreme weather events, and the consequent spread of infectious diseases². The resulting impact on healthcare and health systems is of significant consequence and drawing urgent attention worldwide.

Paradoxically, the health sector, whose mission is protecting and promoting health, is a major contributor to the climate crisis³. In fact, healthcare makes up more than 5.2% of net global climate emissions². If it were a country, it would be the fifth largest climate polluter on the planet³.

As such, the health sector has a significant role to play in reducing its impact on climate change. Health systems, organizations, and clinicians have been called on to lead efforts to reduce emissions. The concept of healthcare sustainability and “eco-friendliness” is increasingly being recognized as a domain of health quality^{4,5}. Sustainability metrics are increasingly being defined and monitored as a necessary element for achieving climate change targets. However, the large-scale need for change may not always be translatable to the hospital executive leader making day-to-day operational decisions. To empower healthcare leaders to embrace their roles in reducing the climate change footprint of their respective organizations, we propose best practices that can be easily adapted to create sustainable hospitals.

1. Support the healthcare workforce to embrace sustainable practices

The sustainability of hospitals is crucial for meeting the healthcare needs of future generations. To achieve this, focusing on sustainability within the **healthcare workforce** becomes paramount. Implementing best evidence practices is vital for guiding these efforts.

Education, training, and advocacy are important pillars of hospitals' sustainability. Engaging staff, patients, and the community through awareness campaigns regarding healthcare sustainability can drive behavioral change. Hospital leaders can **empower employees** to advocate for sustainability efforts. **Training** also plays a pivotal role in shaping understanding, awareness, and actions toward environmental, social, and economic issues. Integrating sustainability concepts into various training modules for healthcare workers and encouraging experiential learning through direct experiences enriches the learning journey.

Hospitals are expanding their commitment to sustainability beyond their premises by actively **participating in community projects**, volunteering for environmental causes, and supporting local sustainable businesses. These efforts foster community ties and amplify the impact of sustainability initiatives. Hospital leaders can empower their workforce to contribute to such activities. Additionally, hospitals can actively encourage staff to adopt sustainable methods of transportation to and from work, such as public transportation, carpooling, or electric vehicles (EVs), which will be further elaborated upon below⁶.

2. Establish an organizational culture of sustainable healthcare

Healthcare leaders have a significant role in building a culture of sustainability within the organization.

A first step for the organization is to consider appointing and supporting a **Chief Sustainability Officer (CSO)**, who can help guide the institution in its efforts to reduce environmental impact while improving the health of the community that it serves. The CSO's responsibilities could include evaluating the state of progress in the institution, developing an action plan, involving key stakeholders and the board, and ensuring a successful implementation of green strategies. The CSO can also contribute to improving the social determinants of health, implementing actions to reduce the environmental impact in all processes, areas, and operations, and delivering a net zero, resilient, and sustainable organization.

These actions could be implemented in different areas, such as food procurement and delivery, waste reduction and management, energy sources and consumption, material usage, facilities, medical devices, medicines, and procurement. Here are some best practices that a CSO could embrace in these areas:

1. **Sustainability strategy:** Develop a clear and comprehensive sustainability strategy aligned with the organization's goals and values, encompassing environmental, social, and economic aspects. It is suggested that the organization's strategic plan include an element of sustainability or "Environment, Social & Corporate Governance" (ESG), including defined goals, objectives, and measurable performance indicators⁷. Some organizations use frameworks like the Balanced Score Card, which is a great starting point to include non-monetary strategic objectives like ESG⁸, therefore, the CSO could drive the hospital leadership team to include sustainability as a key segment in such frameworks.
2. **Integration in business practices:** Work with all departments to embed sustainability principles into core business practices, supply chain management, and decision-making processes.
3. **Sustainability reporting:** Implement a robust sustainability reporting framework to track and communicate the organization's environmental and social performance.
4. **Innovation and research:** Foster innovation by exploring and implementing sustainable technologies, practices, and business models that reduce the organization's ecological footprint.
5. **Regulatory compliance:** Stay updated regarding sustainability regulations and standards, ensuring the organization complies with environmental and social requirements.
6. **Resource efficiency:** Optimize resource usage within the organization, such as energy, water, and waste, to minimize environmental impacts.
7. **Green supply chain:** Work with suppliers to promote sustainable sourcing, ethical labor practices, and environmentally responsible production methods.
8. **Sustainability training:** Conduct sustainability training for employees to enhance their understanding of sustainability principles and foster a culture of responsibility.

Establishing a comprehensive **organizational culture** that addresses burnout, cultivates resilience, and champions sustainability necessitates a multi-dimensional strategy. Central to fostering a culture of sustainability is the embodiment of sustainable practices and a focus on employee well-being by organizational leaders themselves. Securing buy-in from leadership serves as a cornerstone for instilling sustainable values throughout the organizational fabric. A comprehensive evaluation of the existing culture, encompassing communication strategies and key stakeholders, is pivotal in guiding this transformation.

The formation of internal **sustainability committees or task forces**, involving representatives from diverse departments, emerges as a powerful catalyst for propelling sustainability endeavors. These cross-functional teams not only drive sustainability initiatives but also facilitate the exchange of best practices and innovative ideas. This approach nurtures a collaborative spirit that resonates throughout the organization.

Engaging employees in sustainability initiatives is furthered through the organization of **green team activities**. These include environmentally focused endeavors such as clean-up initiatives, tree planting campaigns, and

awareness drives. Such activities actively involve employees in direct sustainability efforts, reinforcing a sense of collective responsibility and fostering a shared commitment to environmental stewardship⁹.

In parallel, the empowerment of employees to drive sustainability projects within both hospital settings and the wider community, coupled with the rewarding achievements, contributes to a culture that places a high premium on eco-conscious practices. This approach underscores the pivotal role hospitals play in catalyzing positive environmental transformation.

3. Embrace technology and innovation that supports environmental sustainability

In simpler terms, sustainability in a healthcare setting is to prioritize environmental sustainability and energy efficiency in the healthcare day-to-day operations. It involves the integration of available (and less capital-intensive) technologies and practices to reduce ecological footprint, conserve/reuse resources, and promote a sustainable culture. Key technologies prevalent in sustainable hospitals offer a range of innovative solutions that healthcare leaders can adopt to enhance their institutions.

Digitalization and smart technology reduce paper consumption and contribute to efficient data management¹⁰.

Telemedicine and virtual care allow patients to access medical expertise remotely, consequently minimizing the need for unnecessary travel^{11,12}. **Health Information Exchange (HIE)** facilitates the secure exchange of patient health information among various healthcare providers, promoting care coordination and minimizing redundant tests, thereby aligning with sustainability goals by reducing paper usage and its associated environmental impact¹³. Moreover, healthcare institutions are harnessing the power of **cloud computing**. By moving data and computing resources to the cloud, hospitals are reducing their dependency on energy-intensive on-premises infrastructure. This transition aligns with the broader sustainability goals by conserving energy and minimizing the environmental impact associated with traditional computing models¹⁴.

Wearable devices for patient monitoring support efficient healthcare delivery. Equipped with sensors and connectivity capabilities, these devices enable remote patient monitoring and real-time data collection. This innovative approach reduces the need for unnecessary patient visits, optimizing the use of healthcare resources, and makes the hospital more sustainable by reducing the production of repetitive medical records¹⁵.

Additionally, the adoption of **Medication Management Systems** automates and streamlines the medication administration process, minimizing medication errors and waste. Incorporating features such as barcode scanning, electronic prescribing, automated dispensing cabinets, and medication reconciliation tools, these systems enhance patient safety and contribute to sustainable healthcare practices by reducing unnecessary waste of resources¹⁶.

Digital imaging has streamlined the accessibility of medical images and has supported remote consultations and collaborations. This technology contributes to sustainable practices by curbing the use of chemicals associated with traditional film-based imaging¹⁷. Additionally, given the significant energy demand associated with MRI equipment, **sustainable MRI solutions** such as eco modes are employed to automatically power down components when not in use. Moreover, AI-driven reductions in scan cycle times and decreased start-up times lead to substantial energy savings. Strategies like reducing helium refills and incorporating refurbished materials further contribute to sustainability efforts. These advancements address energy-intensive concerns while continuing to provide essential medical services¹⁸.

Digital twins for facility optimization holds immense potential for sustainable hospitals. By creating virtual replicas of physical assets and infrastructure, real-time monitoring, simulation, and optimization become possible. It helps to optimize energy consumption, manage building systems, and enhance maintenance processes, resulting in streamlined operations and reduced environmental impact¹⁹. **Healthcare as a service** is another innovative model that is transforming how healthcare institutions access and utilize equipment. The hospitals have a choice to reduce their operational costs by subscribing to a fee-based model which depends on their usage. This reduces carbon emissions, limits wastage, and helps in efficient operations, as the providers choose only the equipment they use, rather than maintaining an inventory²⁰.

In embracing these technologies, healthcare leaders can shape a more sustainable future for healthcare institutions, improving patient care, operational efficiency, and environmental impact simultaneously.

4. Adopt environmentally conscious regulatory frameworks

Specific global regulations are important in driving environmentally conscious practices and reducing the environmental footprint of the healthcare sector. These regulations offer guidance and standards that healthcare leaders can leverage to shape sustainable practices. Several reference frameworks are available to support these efforts:

The "**WHO Guidelines on Health Care Waste Management**" guidelines offer a blueprint for the proper disposal of medical waste, safeguarding against environmental contamination and health hazards²¹. Another instrumental framework is the "**ISO 50001 Energy Management Standard**." Institutions that align with this standard are positioned to integrate renewable energy sources and upgrade their equipment. This approach not only reduces carbon emissions but also trims operating costs, highlighting a synergy between environmental sustainability and fiscal responsibility²².

International certifications, such as "**LEED for Healthcare**," offer a robust platform for leaders to spearhead the development of eco-friendly infrastructure. This framework prioritizes patient comfort and well-being while promoting sustainable building practices. By embracing LEED certification, healthcare leaders advance not only environmental stewardship but also elevate the quality of patient care through enhanced facilities²³.

"**The United Nations Global Compact**" provides a comprehensive framework for responsible sourcing and the adoption of eco-friendly products and devices. Through this initiative, leaders can champion a reduction in packaging waste and promote the use of sustainable materials. By aligning with these guidelines, healthcare institutions take tangible steps toward minimizing their ecological footprint²⁴.

Water-efficient practices are championed by "**The Alliance for Water Efficiency**." By embracing this approach, healthcare leaders advocate for responsible water consumption, effectively minimizing waste and bolstering sustainability in operational practices. This commitment to water efficiency underscores the sector's dedication to holistic environmental stewardship²⁵.

"**The US EPA's Pharmaceutical Waste Rule**" serves as a guiding principle for proper pharmaceutical disposal. Healthcare leaders, by adhering to this rule, establish policies that mitigate the risk of environmental pollution while safeguarding public health. This commitment to responsible pharmaceutical waste management aligns with a broader mission of environmental protection²⁶.

Within the realm of electronic waste, the "**WEEE Directive**" comes into play. Healthcare leaders can navigate this directive to ensure the safe disposal of electronic medical equipment, contributing to a reduction in electronic waste and its associated environmental impact²⁷.

To address the complex challenge of climate change, healthcare leaders can develop adaptation and mitigation strategies aligned with "**The Paris Agreement**." This international accord outlines the necessity of addressing climate risks and underscores the health sector's vital role in this endeavor²⁸.

By adhering to the "**ISO 20400 Sustainable Procurement**" guidelines, healthcare leaders propel sustainable product procurement. This approach fosters a circular economy by prioritizing the acquisition of eco-friendly products, thereby minimizing environmental harm, and promoting responsible consumption²².

Lastly, regulations encourage healthcare providers to engage in educational campaigns such as "**The Green Nudge Campaign**." These initiatives promote environmentally responsible behaviors among both patients and staff, creating a culture of sustainability²⁹.

Lastly, but quite importantly, the **Joint Commission International** (JCI) has recently announced³⁰ that they are collaborating with the International Hospital Federation (IHF)'s **Geneva Sustainability Center**, to develop environmental sustainability standards for international hospitals outside of the USA. It would be important for the hospital leaders to track this initiative over time.

Embracing these regulations generates benefits that extend beyond the environment. Cost savings and improved patient care are among the positive outcomes, highlighting the inherent value of sustainability in healthcare. The convergence of environmental responsibility and operational excellence positions sustainability as a win-win pursuit for healthcare leaders.

5. Implement optimal waste management practices

A key principle of sustainability is that of waste management. The *Global Road Map for Health Care Decarbonization*'s high-impact actions include **implementation of circular healthcare and sustainable health care waste management** as a key strategy to procure supplies, deploy clean technologies, reduce the volume and toxicity of health care waste, and manage waste sustainably³¹. In healthcare, hospital waste is defined as “any waste which is generated in the diagnosis, treatment or immunization of human beings or animals or in research”³¹. Of the total amount of waste generated by health-care activities, about 85% is general, non-hazardous waste³². The remaining 15% is often hazardous material that may be infectious, toxic, or radioactive³³. For example, every year an estimated sixteen billion injections are administered worldwide, but not all the needles and syringes are properly disposed of afterwards. High-income countries generate on average up to 0.5 kg of hazardous waste per hospital bed per day, while low-income countries generate on average 0.2 kg³².

Hospital leaders can think about improving waste management through an administrative focus on reducing, reusing, and recycling with environmental awareness, while managing more complex wastes through safe disposal strategies to reduce environmental impact. The WHO defines key elements for improving health-care waste management³², which include promoting practices that **reduce the volume** of waste generated; developing strategies and systems to incrementally **improve waste segregation, destruction, and disposal** practices; favoring safe and environmentally sound **treatment of hazardous health care wastes**; building a comprehensive system to address **responsibilities and resource allocation** around waste, **raising awareness** of risks and safe practices; **selecting safe and environmentally-friendly waste management options**.

The WHO also defines eight types of waste³² that are identified in hospitals, laboratories, and other health facilities. These wastes are summarized in the below table with some suggested strategies for healthcare leaders to help mitigate, reduce, or eliminate these wastes.

Type of waste	Description	Mitigating recommendations
Infectious waste	Waste contaminated with blood and other bodily fluids, cultures, and stocks of infectious agents from laboratory work, or waste from patients with infections.	There are numerous non-incineration technologies sold to treat infectious waste. They can be classified as thermal, chemical, biological, or irradiative technologies. The most common is autoclaving. This uses high pressure steam, usually at 121-134°C, to disinfect waste so that it can be either recycled or disposed of safely ^{3,34} .
Pathological waste	Human tissues, organs or fluids, body parts and contaminated animal carcasses.	Waste such as organs can contain or be filled with bodily fluids. Specific measures, such as double bagging, storing in appropriate plastic containers, or use of absorbents, may need to be taken to prevent leakage ³⁵ .
Sharps waste	Syringes, needles, disposable scalpels, and blades, etc.	Sharps can easily be autoclaved or disinfected with any of the technologies used for infectious waste. In addition, some waste treatment companies provide reusable sharps containers that can be disinfected with their contents and returned to use ³⁴ . Sharp infectious waste must be placed in rigid, puncture proof, and impermeable containers that bear the universal biologic hazard symbol and should be removed from use and discarded when the container is $\frac{3}{4}$ full ³⁶ .
Chemical waste	Solvents and reagents used for laboratory preparations, disinfectants, sterilant and heavy metals contained in medical devices and batteries.	Harmful chemical waste must be stored in leak-proof containers that are compatible with the harmful nature of the material ³⁷ .
Pharmaceutical waste (hazardous and non-hazardous)	Expired, unused, and contaminated drugs and vaccines.	Incineration preferred because of high burn temperatures and effective emission-control systems, preventing drugs from cycling back into the water ³⁸ .
Cytotoxic waste	Highly hazardous substances that are mutagenic, teratogenic, or carcinogenic such as cytotoxic drugs used in cancer treatment.	The Canadian Union of Public Employees provides recommendation for waste disposal of cytotoxic drugs in “plastic bags that are at least 2 mm thick (if polypropylene) or 4 mm thick (if polyethylene)” for contaminated materials. Such bags are to be properly color-coded and labelled with the cytotoxic warning label ³⁹ .
Radioactive waste	Products contaminated by radionuclides including radioactive diagnostic material or radiotherapeutic materials.	Foot operated waste collection bins with disposable polythene lining should be used for collecting solid radioactive waste and polythene carboys for liquid waste. Radioactive waste is disposed in the following ways: dilute and disperse; delay and decay; concentrate and contain, Incineration (Rarely used) ⁴⁰ .
Non-hazardous or general waste	Plastic packaging, clean glass and plastic, paper and cardboard, and office products.	Reduce, reuse, recycle.

6. Optimize supply chain management

An important best practice for hospital leaders to adopt to improve healthcare sustainability is the **optimization of supply chain management**. Most of the healthcare's climate impact is through supply chain related indirect emissions accounting for approximately 82% of healthcare emissions⁴¹. Since healthcare supply chain involves various products and involvement of several stakeholders, hospital leaders have the potential to exert considerable influence in this domain.

Healthcare supply chain management has the potential to increase efficiency across the process and improve agility and resilience. There are several effective actions hospital leaders and health systems can take to reduce the supply chain's environmental impact. One is to **assess the carbon impacts of products purchased** by the organization⁴². Another is to **leverage digital tools and technologies** to optimize supply chain systems and processes. Efficient actions can result in improvement of healthcare costs and resource utilization for health professionals (American Public University, 2023).

Further, the concept of the **Green Supply Chain** (GSC) amalgamates supply chain & environmental factors together, including waste reduction and greenhouse gas emissions, eco-design, green purchasing, sustainable packaging, and reverse logistics⁴². GSC can reduce the environmental impact of industrial activity without sacrificing quality, cost, reliability, performance, or energy utilization efficiency.

Supply chain strategies can be classified into **producers, purchasers, and providers**. Hospital leaders can implement policies to provide high weightage to producers who have sustainable practices built into their processes and can identify inter-industry synergies with other purchasers to optimize resources. As providers, hospitals can redefine policies that consider sustainable practices in their regular supply chain function⁴².

7. Maximize system efficiency and embrace sustainable practices

Another best practice that healthcare leaders can adopt to create sustainable hospitals is to **optimize health system efficiency and embrace sustainable practices**. Proposed frameworks for reducing the healthcare climate footprint all speak to the importance of this best practice. For example, the *Global Road Map for Health Care Decarbonization* includes the need to “establish greater health system effectiveness” by eliminating inefficient and unnecessary practices, linking carbon reduction and quality of care, and bolstering resilience as a high-impact action to reduce healthcare greenhouse gas emissions. In *Planetary Healthcare: a framework for sustainable health system* (2021), MacNeill et al. propose the need to match the supply of health services to demand, ensuring appropriate care and avoiding unnecessary investigations and treatment. Meanwhile, Choosing Wisely campaigns seek to ensure the appropriateness of care and reduce overuse as strategies that can be leveraged by clinicians to address the climate impact of their practice⁴³.

The **Choosing Wisely campaigns** have been a voice for reducing unnecessary tests and treatments. Choosing Wisely estimates that one-third of all healthcare offers no clinical value to patients⁴⁴. By reducing these unnecessary services, the efforts of Choosing Wisely campaigns can be leveraged for climate co-benefits. Meanwhile, streamlining services in such a way to reduce waste, minimize transportation, and optimize efficiency all serve the co-benefits of improved health quality and reduced climate impact. Individuals who serve in administrative or leadership roles within their own organizations can support quality improvement efforts to reduce overuse alongside green procurement policies and strategies to reduce waste⁴³.

Another way in which processes can be optimized is to embrace sustainable practices. The *Global Road Map for Health Care Decarbonization* suggests **incentivizing and producing low-carbon pharmaceuticals**, through reduction of unnecessary pharmaceutical use, substitution of high emissions products with more climate-friendly alternatives, and incentivizing the production of affordable green, climate-smart medicine. Healthcare leaders can embrace this best practice by ensuring the availability and prioritization of lower global warming potential medications by collaborating with vendors and pharmacies to reduce their carbon footprint. One

example of this is to ensure the availability and access to anesthetic gases and inhaled medications with lower carbon footprints while abandoning those with the highest footprints. For example, the United Kingdom's (UK) National Health Service committed to lowering the 2% of its carbon footprint generated by anesthetic gasses by 40% by shifting away from desflurane to lower carbon alternatives⁴⁵. In doing so, Scotland became the first country in the world to stop using desflurane⁴⁶. Meanwhile, in the UK's National Health Service, metered-dose inhalers contribute to 3.1% of healthcare emissions⁴⁷. Thus, a relatively significant impact on the environment could be seen by adopting existing recommendations regarding the optimal selection of such pharmaceuticals⁴⁸⁻⁵². Another example would be in advocating for pharmaceutical recycling programs to reduce the environmental impact of discarded medications⁴⁹⁻⁵².

8. Reduce high-emissions healthcare-related travel

Transportation, including business travel, operational transport, and supply chain logistics, constitutes about 7% of global healthcare emissions³. As such, healthcare leaders have the potential to exert organizational influence on this key area by adopting strategies that **reduce healthcare relation travel**. The *Global Road Map for Health Care Decarbonization* suggests a high-impact action is to “transition to zero emissions, sustainable travel and transport” by transitioning to low or zero-emission fleet vehicles and infrastructure, while encouraging active travel and public transport for patients and staff where feasible. Leaders can start by identifying where healthcare climate solutions may be more cost-effective than business as usual and invest in these (e.g., e-vehicles, virtual care, digitization of services).

Meanwhile, patient travel can have greenhouse gas emissions, particularly for patients traveling across large distances⁴³. Hospital leaders should work with primary care and community care to **ensure that care is delivered in the most appropriate setting**, given that hospital care is more resource-intensive and energy-intensive⁴³. An example of this is providing outreach services of specialist services in a community hospital setting to reduce patient-related healthcare travel while providing care closer to home⁵³. Additionally, leveraging virtual care tools and platforms, as clinically appropriate, can further support the adoption of this best practice, as discussed in the Technology section of this paper.

9. Rethink the concept of green hospitals

The concept of Green Hospitals is the practice of designing, constructing, operating, maintaining, and removing buildings in ways that conserve natural resources and reduce pollution⁵⁴. A Green Hospital includes the environment as part of its quality services and pays attention to the sustainable design of buildings⁵⁵. Healthcare leaders can work with their organizations to adopt the best practices of Green Design. This can be accomplished through a commitment to the high-impact actions we have presented thus far, including embracing renewable electricity, investing in zero-emission buildings and infrastructure, providing sustainably grown food, transitioning to sustainable transport, and implementing optimal waste management³. For example, some hospitals, like Sírío-Libanês in São Paulo (Brazil), have implemented various initiatives to reduce the carbon footprint across areas⁵⁶, such as:

1. **Energy:** Implementation of solar power plant.
2. **Climate change:** Expansion of transport with low greenhouse gas emissions (electric vehicles and charging points). Another example is the “reduction of medical gasses and refrigerant emissions.”
3. **Waste management:** One example is the “*Recicla project*”: a reverse logistic and recycling project where certain syringes will be recycled, removing around twenty-five tons/year of plastic waste from traditional disposal.
4. **Use of natural resources:** Reactivation of the sewage treatment plant
5. **Supplier management:** Develop and recognize suppliers with sustainable practices.

Another unique example is the construction materials used in delivery containers attached to the hospital's fleet of motorcycles used for transportation. They were manufactured with recycled polyethylene terephthalate

(PET) bottle caps, avoiding the consumption of raw materials and the emission of Greenhouse Gases in the production process.

Leaders can be influential in adopting an organizational approach to implement these best practices in a unified way to support Green Design as a hospital philosophy. Investing in Green Design has several benefits for hospitals, including optimization of value, reduction of future risks related to energy costs and building management, and positive impacts on the health and well-being of patients, staff, and visitors, with extension to the community and beyond. While there can be upfront barriers to adopting Green Design, including budgetary constraints, competing priorities, challenges with coordination and integration of green practices, and educational requirements that accompany such organizational-wide shifts, hospital leaders are in the position to provide the vision for long-term hospital sustainability.

10. Enhance patient awareness

For the healthcare sector to achieve improved climate impacts, it will require cooperation and engagement from the patient population it serves. By informing patients about how their healthcare interactions can affect the environment, healthcare institutions can encourage responsible behaviors.

Increasing awareness of sustainability among patients in healthcare requires a thoughtful and strategic approach⁵⁷. Healthcare institutions can integrate sustainability messaging into **patient communications**, such as appointment reminders, newsletters, and informational materials. By providing information about eco-friendly practices, such as reducing paper waste by opting for electronic communications, patients can become more conscious of the environmental impact⁵⁷.

Healthcare facilities can also visibly **highlight** their commitment to sustainability within their premises. Placing informational posters or displays in waiting rooms and shared areas can capture patients' attention and prompt them to consider the environmental implications of their choices. Sharing success stories and initiatives related to waste reduction, energy conservation, and recycling within the facility can inspire patients to participate in similar practices⁵⁷.

Healthcare professionals themselves play a crucial role in spreading sustainability awareness. During patient consultations, doctors, nurses, and other healthcare staff can engage in conversations about environmentally responsible healthcare practices. For instance, discussing the importance of properly disposing of medications or suggesting reusable options for medical supplies can prompt patients to adopt greener habits⁵⁷.

Digital platforms provide an effective avenue for raising sustainability awareness. Healthcare organizations can leverage their websites, social media channels, and patient portals to share articles, infographics, and videos on sustainable practices. Offering tips for reducing healthcare-related environmental impacts, like minimizing unnecessary medical tests, can motivate patients to make more mindful choices^{43,57}.

Lastly, **incentivizing sustainable behaviors** can create a positive feedback loop. Healthcare institutions can introduce reward programs or recognition for patients who actively participate in eco-friendly initiatives, such as returning unused medications or adopting reusable medical equipment. These incentives can enhance patient engagement and contribute to a culture of sustainability within the healthcare community⁵⁷.

By integrating sustainability messaging into patient interactions, leveraging healthcare professionals' influence, conducting education programs, utilizing digital platforms, and providing incentives, healthcare companies can effectively raise awareness and inspire patients to make sustainable choices in their healthcare journey⁵⁸.

Best practices in practice

There are many excellent examples of sustainable practices being implemented in healthcare around the world. Here, we provide a few specific cases of how health systems globally are implementing climate friendly initiatives that health system leaders can draw from in tackling their own institutional sustainability agenda.

We previously shared the example of the Hospital Sírio-Libanês in São Paulo, Brazil, which has implemented initiatives that span several of the suggested best practices in this article, including optimized waste management (Best Practice #5), implementation of Green Design practices including a solar power plant (Best Practice #9), expansion of low greenhouse gas emission transportation (Best Practice #8), and preferential recognition of suppliers with sustainable practices within the supply chain (Best Practice #6). Through these efforts, it has become the first carbon neutral healthcare institution in Brazil, having reduced CO₂ emissions by 40% from 2019 to 2023⁵⁶.

The Hospital Outpatient Pharmacy Proximity (HOPP) at Centro Hospitalar Universitário Lisboa Central, Portugal, was implemented in 2020 to facilitate the access to hospital medications through local pharmacies (Best Practice #6). Preliminary analysis estimates these savings at €271.6/patient/year and a reduction in the carbon footprint corresponding to a 70km per trip/dispensing of drugs (Best Practices #6,7,8)⁵⁹.

In the United Kingdom, surgical teams completed a Green Surgery Challenge in 2021, through which they reduced the carbon footprint of surgery by creating new devices (Best Practice #3), streamlining procedures (Best Practice #7), switching to reusable equipment (Best Practice #5), and altering the type of anesthetics used (Best Practice #7)⁶⁰.

In France, the Centre Hospitalier Universitaire of Rennes, in partnership with Philips, conducted a life cycle analysis of a neuroradiology tool used in vascular and cardiac interventions, which identified opportunities for improvement in raw materials and components of production, packaging, usage, and more. The resulting improvements correspond to expected greenhouse gas reductions between 1.7 - 2.4 tons CO₂e savings/year due to energy savings, circular upgrades, and refurbishment⁶¹.

In Switzerland, the Geneva University Hospital has tackled the climate impact of high-emissions healthcare-related travel through a multifaceted approach (Best Practice #8). They worked with local public transport operators and the Swiss and French railways to offer its workforce a yearly travel subsidy; reserved parking spaces in the streets near hospital buildings for two-wheelers; set up bike-sharing and car-sharing subscriptions; and facilitated workforce discounts on bicycles from local sales partners (Best Practices #1,2). In doing so, carbon emissions generated from the workforce commute decreased by more than 8% and 60% of the workforce gave up individualized motorized transport⁶².

In Canada, Choosing Wisely Canada is the national voice for reducing unnecessary tests and treatments, with goals of reducing harm, improving efficiency, and reducing the impact on the climate crisis. The campaign encourages clinicians and patients to engage in conversation about what is appropriate and necessary treatment and offers tangible steps for individual clinicians to curb their climate impact in practice (Best Practices #7,10)⁶³.

Conclusion

In conclusion, there are several practices that healthcare leaders can embrace to create sustainable hospitals. Through our research with the International Hospital Federation, and with the support of the Geneva Sustainability Centre, we present a series of best practices that are applicable to a wide range of institutions globally and can be adapted to local contexts. The health sector has a significant role to play in reducing its impact on climate change, both to provide efficient and optimal healthcare to its current patients, but also to be caretakers of the global environment to reduce the impact of climate change on the entire human species, aligned to the Sustainable Development Goals of the United Nations. While it is recognized that there are competing priorities for healthcare organizations in a resource-limited world, hospital leaders need to create a

“sustainable conscience” to ensure the optimal efficiency of available resources to benefit the health of all human beings. After all, “The greatest threat to our planet is the belief that someone else will save it” (Robert Swan, Author). Healthcare leaders can make changes in their organizations to support hospital sustainability - we encourage you to start today!

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