The Value Proposition: What OEM Physicians Bring to Healthcare Sustainability

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Abstract: Occupational and environmental medicine (OEM) clinicians are distinctly qualified to lead efforts toward achieving sustainable healthcare systems. With training and experience in exposure prevention, hazard mitigation, and systems-based thinking, OEM physicians bring knowledge and skills in developing and executing sustainability initiatives in complex healthcare environments. This article explores how core OEM frameworks and tools can be used to reduce healthcare-related emissions, waste, and resource consumption while also developing strategies to address the effects of climate change on health. OEM specialists can link clinical care and operational strategy, liaising with multidisciplinary stakeholders, and driving culture change related to sustainability. As the healthcare sector faces mounting pressure to reduce its environmental footprint while improving quality and cost-effectiveness, OEM physicians offer expertise to support this evolution.

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This guidance paper was developed by ACOEM Work Group on OEM in Healthcare Sustainability under the auspices of the Council on OEM Science. It was approved by the ACOEM Executive Committee on December 18, 2025. ACOEM requires all substantive contributors to its documents to disclose any potential competing interests, which are carefully considered. ACOEM emphasizes that the judgments expressed herein represent the best available evidence at the time of publication and shall be considered the position of ACOEM and not the individual opinions of contributing authors.

Funding Sources: The authors received no external funding for the research, authorship, or publication of this article. ACOEM's Environmental Health section funded the work of the editor, Alyssa B. Schultz, PhD.

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DOI: 10.1097/JOM.0000000000003690

Keywords: sustainable health care, climate change, environmental responsibility, sustainability, occupational and environmental medicine, healthcare sustainability

Occupational and environmental medicine (OEM) is a preventive medical specialty focused on the diagnosis, management, and prevention of diseases and injuries arising from workplace and environmental exposures. As climate change, environmental degradation, and resource scarcity emerge as pressing global health threats, integrating sustainability into healthcare delivery has become increasingly urgent. In a healthcare context, sustainability refers to the development of systems and practices that are both cost-effective and environmentally responsible, supporting long-term resilience for organizations and the communities they serve.[1] Sustainability in healthcare requires balancing responsible resource use with high-quality patient care to meet present needs without compromising the ability to serve future patients and ecosystem demands.[2] The healthcare sector contributes nearly 5% of global greenhouse gas (GHG) emissions, driving the need for sustainable clinical operations that reduce environmental impact while preserving high-quality care.[3]

As climate-related health risks escalate, workforce health and environmental stewardship are increasingly important. The healthcare sector faces a range of environmental sustainability challenges, from excessive energy use and pharmaceutical waste to supply chain emissions and resource-intensive care practices. These issues are not only ecological concerns but also directly affect occupational health risks, especially for workers in high-exposure settings, such as those who work outdoors.

OEM bridges clinical medicine, toxicology, epidemiology, and health systems science.[4] Historically, the field has emphasized preventing and managing occupational injuries and illnesses, promoting safe work environments, and evaluating environmental exposures. Today, OEM is expanding its scope to include sustainability as a key domain, driven by growing recognition that the health of workers is inseparable from the health of the ecosystems in which they live and work.[5] Many OEM physicians already serve in key leadership roles within healthcare systems, such as medical directors, chief medical officers, and board members. Their oversight often involves workplace health, compliance, and operational priorities aligned with institutional priorities and regulatory frameworks, making sustainability a natural extension of their role.

This article explores 5 key domains where OEM physicians can advance sustainability in healthcare:

(1) Clinical practice
(2) Organizational leadership
(3) Education and training
(4) Research and innovation
(5) Policy and advocacy

Additionally, it outlines significant challenges and opportunities for OEM leaders across these domains, highlighting their vital role in transforming healthcare toward a more sustainable future.

OCCUPATIONAL AND ENVIRONMENTAL MEDICINE PHYSICIANS: LEVERAGING UNIQUE EXPERTISE FOR SUSTAINABLE HEALTHCARE

As specialists in preventing, diagnosing, and treating work-related injuries and illnesses and environmental exposures, OEM physicians' strengths range from the individual patient to organizations and the population level. In addition, OEM engagement can improve social sustainability related to the healthcare workforce.[6] This interdisciplinary scope makes

Conflict of Interest: The authors declare no conflicts of interest.

AI: Manijeh Berenji, MD, MPH, used AI for outline and content development (Perplexity AI); Tracy Tang, MOT, used ChatGPT for grammar and for stylistic choices for sentence organization.

Supplemental digital contents are available for this article. Direct URL citation appears in the printed text and is provided in the HTML and PDF versions of this article on the journal's Web site (www.joem.org).

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OEM physicians especially well-suited to address healthcare sustainability challenges in diverse settings. Key competencies include:

- **Clinical and preventive expertise** in minimizing harmful exposures and guiding mitigation strategies to individual patients and workers
- **Workplace hazard assessment** to reduce risks and promote workforce well-being
- **Interdisciplinary collaboration** between clinical teams, facilities management, operations, and executive leadership
- **Public health, epidemiology, and toxicology training** that informs regulatory compliance and safety standards
- **Policy development skills** to ensure sustainability initiatives to meet complex healthcare regulations at the local, state, and federal levels.

OEM physicians bring a unique and strong skill set to sustainability within healthcare settings. Table 1 summarizes how their unique skills translate into sustainability practice.

Given OEM physicians' knowledge of not only individual patient care but also population health, environmental health, and organizational systems thinking, they are well-suited for the sustainability paradigm (shifting our perspective towards a more thoughtful and interconnected way of living, impacting both present and future well-being[7]) and its applications to the broader healthcare ecosystem. The benefits of sustainable healthcare, such as improved quality of care, reduced operational costs, and strengthened organizational resilience, align with the OEM mission of protecting both human, community, and environmental health.

Sustainability largely focuses on system-wide changes, therefore partnerships with key stakeholders are needed, ranging from the executive leadership to supply chain and procurement to sterile processing and waste management. To further understand the strategic advantage of OEM physicians in identifying and working with these partners, 2 commonly used business frameworks, Porter's concept of competitive strategy and the Value, Rarity, Inimitability, Organization (VRIO) framework, can help evaluate their potential contribution to healthcare sustainability. Occupational Safety and Health Administration's 2016 white paper emphasizes sustainability as a powerful framework to enhance occupational safety and health beyond traditional regulatory methods.[8] By aligning with broader sustainability movements, occupational safety and health administration has highlighted the potential to adopt common metrics, standardized reporting, and proactive practices that prioritize worker well-being as part of responsible, sustainable business operations.

Porter[9] defines competitive advantage as the pursuit of differentiation through a unique set of activities that create value. Regarding OEM physicians, they exist at the intersection of clinical care, environmental health, public health, and workplace safety. This differentiates OEM physicians by creating value that aligns with institutional priorities around sustainability. In the rapidly changing world of healthcare management, where many hospitals are operating on increasingly leaner margins, leaders must examine their internal workforce assets and harness existing talent to optimize operational capabilities and streamline workflows, thereby generating efficiencies while maintaining excellent patient care. The VRIO framework developed by Barney[10] helps evaluate how OEM physicians can best differentiate their strategic position in healthcare sustainability, collaborating with other key stakeholders to promote the health and well-being of patients and communities, as depicted in Table 2.

FIVE KEY DOMAINS FOR OCCUPATIONAL AND ENVIRONMENTAL MEDICINE PHYSICIANS IN SUSTAINABILITY

OEM physicians are capable of driving sustainability across multiple domains of healthcare. This section outlines 3 key areas, clinical practice, organizational operations, and education, where OEM leadership can produce measurable environmental, health, and financial benefits.

Clinical Practice

OEM physicians play a vital role in embedding sustainability within clinical care delivery and also caring for patients affected by climate change–related health problems. As healthcare professionals trained to identify and mitigate environmental and occupational health risks, they can recognize and treat illnesses exacerbated by climate change, such as heat-related illnesses, respiratory diseases worsened by air pollution and wildfire smoke, vector-borne diseases expanding into new regions, and water- and foodborne illnesses from extreme weather events. Incorporating climate exposure histories into patient assessments regarding topics including housing conditions, occupation, and air quality is an important component of clinical care.

Moreover, OEM physicians are well-positioned to educate patients and workforces on prevention strategies for heat exposure, air pollution, and extreme weather while promoting climate-resilient behaviors, like staying hydrated, using personal protective equipment in high-heat environments, and recognizing early signs of exposure-related illnesses. In particular, guiding patients with chronic conditions on how to adapt to changing environmental conditions (eg, adjusting inhaler use during high pollution days) is another component of clinical practice.

TABLE 1. OEM Physicians' Skills Related to Sustainability

OEM Core Competency	Key Skills	Applications
Clinical and preventive expertise	Diagnose, treat, and prevent work-related illness	Identify inefficiencies, reduce environmental and health-related costs, and implement sustainable care practices
Workplace hazard assessment	Evaluate workplace and environmental hazards	Guide interventions to reduce toxic exposures in clinical and operational environments
Interdisciplinary collaboration	Engage across healthcare teams, facilities management teams, sustainability groups, business leaders, and policymakers	Lead integrated initiatives to embed sustainability into healthcare operations, workforce well-being, and environmental strategy
Public health, epidemiology, and toxicology training	Biostatistics, epidemiological methods, and public health strategies	Promoting environmentally safer practices related to procurement, waste management, and energy efficiency
Policy development	Knowledge of strengths and weaknesses of existing regulations, such as OSHA and EPA standards	Inform policy, legal, and safety standards that advance sustainability

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TABLE 2. VRIO Framework Applied to OEM Physicians

VRIO Criteria	Fulfills VRIO?	Rationale
Valuable: Does the resource enable the firm to improve its effectiveness?	Yes	OEM physicians bring deep knowledge of workplace health, environmental exposure, and regulatory frameworks. They can help reduce waste and health-related environmental impact while improving efficiency and guiding sustainable clinical practices, contributing to long-term effectiveness and cost savings.
Rare: Is control of the resource in the hands of a relative few?	Yes	The intersection of clinical, occupational, and environmental expertise is uncommon and highly specialized. OEM physicians have received extensive training in these disciplines throughout medical school, residency, and post doc settings. While many clinicians value sustainability, few are trained in both occupational health and environmental sustainability.
Inimitability: Is it difficult to imitate, and will there be a significant cost to a firm to try to duplicate the resource?	Yes	Combining clinical experience, occupational health knowledge, regulatory requirements, and sustainability strategy takes years of medical education, residency, and niche training. It is difficult to replicate this expertise without significant investment.
Organized: Is the firm organized in such a way that it is ready to exploit the resource?	Yes	Healthcare organizations can utilize OEM physicians to lead sustainability initiatives, optimize workplace health programs, and design climate-resilient healthcare operations.

Case Study: Transitioning from MDIs to DPIs

A clear example of sustainable clinical intervention involves the transition from metered-dose inhalers (MDIs) to dry powder inhalers (DPIs) for respiratory conditions such as asthma and chronic obstructive pulmonary disease. MDIs use a GHG hydrofluoroalkane propellant, which pressurizes the medication out of the inhaler device into the lungs.[11] In total, MDIs are responsible for an estimated 0.03% of annual GHG emissions, a seemingly small but significant figure in healthcare emissions.[9] In contrast, the carbon footprint of a DPI is around 20–30 times lower than that of an MDI.[12] Substituting DPI for MDI for adult patients where clinically indicated, and utilizing information technology-informed clinical decision support tools and formulary directives as set by the insurance carrier, can significantly reduce GHG emissions. This is just one small example of how OEM physicians can champion a scalable solution that reduces emissions while maintaining high standards of care.

To help doctors consider environmental effects in their clinical decisions, the Royal College of Physicians in the United Kingdom introduced a "Green Physician Toolkit." The toolkit offers advice on reducing unnecessary prescriptions and tests, participating in sustainability projects, and discussing the health consequences of climate change with patients. This initiative aims to incorporate environmental awareness into everyday clinical practice and medical training.[13] Another example is found at the University of California, San Francisco (UCSF) Medical Center. As with the national health service (NHS) above, UCSF stopped using desflurane, an anesthetic with a very high global-warming potential, during surgeries.[14] This change in professional practice has cut emissions and saved money, showing that sustainable practices can also be economically beneficial to healthcare organizations.

Organizational Level—Within Healthcare Organizations

Beyond the clinical setting, OEM physicians are well-suited to lead organizational-level sustainable strategies within healthcare systems, with the overarching goals of promoting human health while safeguarding the environment. For example, the healthcare supply chain contributes heavily to the sector's environmental footprint due to its dependence on global logistics, just-in-time inventory, high volume of disposable goods, lack of transparency, and strict regulatory and clinical requirements. To drive evidence-based, data-informed strategies that advance sustainability, OEM physicians can leverage new technologies to systematically collect this information, synthesize the inputs, analyze the outputs, and set milestones to achieve these new targets.[15,16]

Supply Chain Transformation and Procurement Innovation

Research estimates that 80% of healthcare GHG emissions are embedded in the supply chain.[17] OEM experts are key partners in designing programs and undertaking the sustainability accounting to assess and demonstrate the financial, human capital, and environmental benefits of sustainability initiatives. OEM physicians can work together with hospital leadership to evaluate and improve evidence-based procurement protocols with environmental transparency and information about product life cycle impact. These can include:

- Requiring suppliers and vendors to provide carbon disclosure data;
- Prioritizing products and services based on durability, reprocessability, recyclability, and repurposability[18];
- Incorporating life cycle assessment data in purchasing decisions[13]; and
- Embedding value-based environmental criteria into local and regional contracting choices.[19]

OEM physicians, already engaged in compliance and safety oversight, can contribute their expertise to supply chain and procurement teams. Their dual focus on worker safety and environmental health enables them to frame sustainable procurement as part of the organization's broader risk management and population health strategy.

Comprehensive Emissions Reduction

A critical area where OEM input is increasingly relevant is hospital energy use and emissions reduction. Healthcare facilities rank among the most energy-intensive buildings due to their continuous operations, complex heating, ventilation, and air conditioning (HVAC) systems, and reliance on high-powered equipment. For example, US healthcare facilities account for 4.8% of the total square footage of the commercial sector but are responsible for 10.3% of total energy consumption in that sector.[20] As hospitals seek to limit their operational carbon footprint and meet climate targets, OEM physicians can provide strategic guidance at both the technical and systems levels.

The first step in any emissions reduction plan is a baseline assessment, which should include measurement of direct emissions from on-site fuel combustion, indirect emissions from purchased energy, and supply chain emissions across procurement, transportation, and waste. Conducting this

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comprehensive inventory through an OEM lens or adding an OEM lens for healthcare systems with this already in place will enhance science-based reduction targets aligned with international standards such as the Science Based Targets initiative (SBTi).[14] After establishing baseline data, an organizational approach to energy optimization can focus on boosting energy efficiencies in HVAC systems, IT equipment power sourcing, lighting technologies, and equipment upgrades.[13] Focusing on renewable energy sources (including solar, wind, and geothermal, among others) and diverting from fossil fuels can further accelerate the organization's energy independence.

These measures not only reduce environmental harm but can also incur lower operational costs and contribute to healthier indoor environments for patients and staff. Table 3 summarizes carbon emission reduction initiatives from 2 hospitals.

OEM physicians can help transform healthcare infrastructure into living laboratories that showcase the feasibility and benefits of sustainable care delivery. By applying occupational health principles to building operations and environmental systems, they promote both ecological health and worker safety, reinforcing the inseparability of human and environmental well-being.

Waste Minimization

As healthcare systems strive for long-term sustainability, an important area of concern is waste minimization. One estimate suggests that global healthcare waste comprises 1%–2% of total produced urban waste, with 85% of this being nonhazardous.[23] Over time, the industry should aim to transition from linear resource use to circular utilization models that minimize waste and emphasize repurposing.[24] One component of this strategy is substituting single-use products with reusable alternatives as deemed clinically appropriate. A systematic approach to evaluating existing practices can facilitate new opportunities in sustainable operations. OEM physicians, in collaboration with infection prevention and control teams, can assess where reusable tools and textiles (eg, surgical gowns and instrument trays) may be safely reintroduced without compromising patient or worker safety.

Infrastructure Resiliency

As climate change accelerates, healthcare systems must prepare for the increasing frequency and intensity of extreme weather events, including wildfires, floods, hurricanes, and heatwaves. Ensuring infrastructure resiliency is essential not only for continuity of care but also for protecting the health and safety of patients, workers, and communities during crises. The OEM clinician, with expertise in emergency preparedness and disaster response, can perform a localized climate risk assessment to identify current infrastructure gaps to specific scenarios such as heat stress, wildfire, flooding, and electricity disruption, which can inform infrastructure conditioning and operational contingencies.[25] Moreover, OEM professionals can serve as liaisons between healthcare systems, public health agencies, emergency services, and local governments to coordinate responses and support vulnerable populations during climate-related disasters.[19]

Education and Training

To prepare OEM physicians, as well as physicians in general, to lead in sustainability, medical education at all levels, undergraduate, graduate, and continuing professional development, must include training in environmental health and climate-related issues. This involves both "the WHY" of sustainability, which is the health impacts of climate change and land use, as well as "the HOW," which is implementing sustainability practices in healthcare, such as sustainable packaging, energy efficiency, and clinical decision-making.

At the undergraduate level, sustainability curricula should be broad and adaptable across specialties. Core concepts often include definitions of sustainability, environmental justice, and the role of healthcare in ecological challenges.[26] Schools like UCSF[27] teach about ecosystem impacts on health, aligning specific topics—for example, legal or ethical issues—with stages of training.

Global efforts are already underway. The International Federation of Medical Students' Associations (IFMSA)[28] has called for sustainability education in all medical curricula, citing gaps and the need for interdisciplinary, equity-focused training.[29] The Royal College of Physicians and Surgeons of Canada's CanMEDS 2015 framework[30] touches on relevant competencies with sustainability themes under consideration for the 2025 update.[31] Similarly, the Association for Medical Education in Europe emphasizes environmental stewardship and systems thinking.[26] In the United States, the Liaison Committee on Medical Education[32] mandates attention to social influences, including climate change, supported by Association of American Medical Colleges resources[33] like the Climate Change and Medical Education bundle. Despite these initiatives, sustainability education remains limited. IFMSA surveys[23] from 2019 to 2020 found that fewer than 30% of medical schools included consistent sustainability instruction. The Planetary Health Report Card (PHRC), developed by UCSF students, evaluates schools on sustainability curricula and practices, with 151 schools in 18 countries participating as of 2024.[34]

In graduate medical education, sustainability becomes more specialty-specific and hands-on. OEM physicians treat populations exposed to hazardous environments, making sustainability integral. The American College of Occupational and Environmental Medicine (ACOEM) outlines the following environmental health competencies, recently updated to strengthen sustainability integration[35]:

- Recognize environmental hazards—chemical, physical, and biological threats to health.
- Take thorough exposure histories, incorporating both environmental and occupational sources.
- Identify and assess risk—characterize environmental hazards, understand dose–response relationships, and interpret environmental and biomonitoring data.
- Be aware of local threats—common environmental agents and diseases relevant to the physician's geographic area.

TABLE 3. Examples of Sustainability in Healthcare Infrastructure

Hospital	Sustainability Initiative	Potential OEM Support
Queen's Medical Centre in Nottingham, United Kingdom[21]	15-year energy efficiency partnership with E.ON, a European multinational electric utility company, to achieve net zero by 2030 through geothermal heating/cooling, energy-saving windows, and advanced building controls	Contributing insights to improve indoor environmental conditions to support patient recovery and staff well-being while aligning building improvements with occupational health standards
Kiowa Country Memorial Hospital in Kansas, USA[22]	Rebuilt after a 2007 tornado as the first LEED Platinum Certified Critical Access Hospital in the United States, with features including energy-efficient design, recycled materials for 30% of interior finishes, and healing gardens	Ensuring occupational safety and environmental compliance. Translating sustainability into clinical practice improvements by articulating downstream health benefits from reduced pollutants, enhanced thermal comfort, and access to natural environments

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- Recognize and manage environmental illness, including exposure-related conditions.
- Effectively communicate risk, including strategies to reduce environmental exposures.
- Advise on mitigation strategies.

Graduate medical education should aim to embed sustainability into clinical workflows and decision-making, using rotations, quality improvement projects, and didactics to instill lasting principles.

Sustainability and the health effects of climate change may be discussed in OEM residencies currently, although the literature on this topic is lacking.[36] A scoping review[37] has outlined suggestions and potential roadblocks to including climate change health education in medical training, while another has focused on sustainability in surgery.[38] OEM training includes multiple settings in which sustainability could be seamlessly integrated. Clinical rotations take place in varied settings, including corporate sites that balance health and resource use. Public health coursework and quality improvement initiatives offer platforms to address topics like energy use, waste reduction, and sustainable procurement. Assessment is ongoing and based on clinical competency, making real-world sustainability applications especially impactful.

Pedagogical strategies vary, including lectures, case studies, online modules, and problem-based learning.[26] Field-based introductions that link rural community health to conservation and environmental health conditions, as well as primary care rotations in communities facing environmental health and sustainability challenges, have been implemented to provide valuable experience for students as they contextualize lessons from sustainability in real-world medical practice settings.[39,40] Institutions often adapt existing tools or use resources from the Association of American Medical Colleges. At Bristol Medical School, for instance, students participate in interactive workshops[41] using the SusQI toolkit,[42] helping reframe their approach to sustainability in quality improvement. Assessment methods are less defined but can include exams, presentations, reflective writing, and performance evaluations.[36] Barriers to implementation include administrative resistance, overloaded curricula, and faculty expertise gaps.[36]

In continuing professional education, sustainability is addressed less frequently but remains essential. Topics may involve optimizing clinic operations, addressing new technologies, and responding to regulatory changes. OEM board certification and maintenance processes can integrate sustainability themes, and cross-disciplinary training is encouraged. Moving forward, OEM physicians should help expand sustainability education where it is lacking, promote resident-led quality improvement projects with environmental impact assessments, and ensure sustainability is a standard consideration in clinical decision-making. Ongoing education and personal initiative among practicing physicians are crucial to advancing sustainability in OEM practice.

Integrating sustainability into healthcare leadership development is essential. Business management training programs, such as those advocated by the Harvard Business Review, emphasize strategic leadership, systems thinking, and interdisciplinary collaboration to promote sustainability thinking, guiding carbon-aware decision-making and organizational change.[43] Evidence-based management principles incorporating sustainability strengthen resource utilization, enhance cost-effectiveness insights, and improve strategic planning in healthcare settings.[44] Such training equips leaders to align clinical priorities with environmental and economic goals, fostering a culture of innovation and resilience.

Scientific Investigation and Innovation

As climate-related events intensify and environmental challenges grow, hospitals must address multiple interconnected issues: extreme weather impacts, toxic environmental exposures, and the relationship between workforce health and public safety in a culture of sustainability. The National Academy of Medicine's Climate Grand Challenge continues to accelerate research at the nexus of climate and health, with regional research and innovation hubs developing action-oriented solutions for vulnerable populations.[45] The field has embraced translational research methodologies that ensure sustainability studies generate actionable interventions capable of implementation across healthcare systems.[46]

OEM physicians are well-versed in evidence-based medicine and can apply their skill sets to contribute to such studies to optimize hospital operations and improve patient care. Unlike management consultants, who may lack clinical and public health expertise, OEM physicians understand the interaction between environmental exposures, worker safety, and system performance. This makes them essential members of research and quality improvement teams seeking to develop practical, scalable, and cost-effective sustainability solutions that improve health outcomes while reducing environmental impact.[39] The emphasis on systems-level interventions recognizes that sustainability challenges require comprehensive approaches that address multiple organizational and system factors simultaneously.

Sustainability research priorities include the development of climate-resilient healthcare infrastructure and the implementation of adaptation strategies that include structural changes, training programs, surveillance systems, and operational plans.[47] With the advent of artificial intelligence (AI), these technologies are being utilized to enhance environmental monitoring and resource allocation. AI applications are expanding beyond traditional clinical uses to include energy consumption optimization, supply chain management, and waste reduction strategies.[48]

Research has identified the need for composite measures that capture multiple dimensions of healthcare environmental impact, including GHG, air pollution, chemical pollution, and resource depletion, which could be used at both the organization and population levels. Data capture and verification, along with transparency, are the basis of all sustainability efforts. Developing comprehensive metrics for sustainable healthcare demands a holistic framework that integrates environmental and economic dimensions, linking healthcare environmental sustainability reporting with quality and performance reporting. These metrics are designed to be standardized, reliable, meaningful, integrated with data management systems, fair, and aligned with the core mission of healthcare.[49] For example, the NHS achieved an 18.5% reduction in carbon emissions between 2007 and 2017 and a 21% decrease in water use from 2010 to 2017 by institutionalizing consistent measurement protocols and leveraging annual performance reporting.[50,51]

Case Study: What Healthcare Organizations Can Learn from Coca-Cola's Sustainability Reporting[52]

The Coca-Cola Company has a comprehensive approach to sustainability reporting and management, which systematically measures, manages, mitigates, and publicly discloses verified data on the negative environmental and societal consequences of its operations. Key learnings for the healthcare sector include: adopting standardized reporting frameworks, comprehensive disclosure about GHG emissions and waste metrics, progress towards global goals, third-party verification, and integration of sustainability into core operations strategies. Healthcare organizations can learn to move beyond fragmented, voluntary efforts to a unified, sector-wide mandate for transparent, verified sustainability accounting and disclosure.

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Workforce development programs rooted in Green Human Resource Management practices significantly enhance organizational sustainability performance by embedding eco-friendly policies in recruitment, training, and reward systems.[53,54] Institutions implementing such programs report improved employee engagement, lower turnover, and stronger sustainability outcomes. Given pervasive staffing shortages in the healthcare industry, novel staff retention strategies are critical: advocacy for and implementation of targeted workforce development initiatives to reduce costs associated with disability, injury, and staffing gaps while bolstering organizational resilience.[55]

Evaluating sustainability interventions requires robust, multidimensional methodologies. The RE-AIM framework—encompassing Reach, Effectiveness, Adoption, Implementation, and Maintenance—provides a comprehensive structure for assessing both short-term impacts and long-term sustainability of healthcare initiatives, with iterative measurement across multiple time points.[56] Effective evaluation designs incorporate mixed methods, longitudinal follow-up, and attention to both implementation determinants and outcome metrics.[46]

Case Study: Return on Sustainability Investment (ROSI™) Application

The Return on Sustainability Investment (ROSI™) methodology developed by the NYU Stern Center for Sustainable Business has generated compelling real-world case studies demonstrating significant financial returns from sustainability initiatives across multiple industries.[57] In healthcare delivery systems, the Advocate Health case study exemplifies ROSI™'s practical application, where switching from single-use to reprocessed medical devices generated a $20.3 million 10-year Net Present Value with average annual benefits of $3.5 million (approximately 3% of Advocate Health's annual operating income), while reducing emissions by 1.5 kg CO_2e per reprocessed device.[47]

Policymaking

OEM physicians can play a significant role in shaping sustainability policy discussions due to their expertise in medicine and public health. Their training enables them to navigate the challenges of balancing individual patient care with the broader health of communities, making them ideal advocates for environmentally responsible healthcare reform. In both domestic and international settings, there are several examples of physician-led sustainability and policy changes that have led to sustainability improvements in healthcare operations.

One prominent example of a sustainability policy is the United Kingdom's NHS commitment to achieving net-zero carbon emissions. The NHS aims to eliminate its direct emissions by 2040 and reduce emissions from its supply chain by 2045.[58] These initiatives were initially led by the NHS's first Chief Sustainability Officer, Dr Nick Watts, a physician with training in public health and policy. Examples of specific NHS efforts to improve sustainability include removing anesthetics with high global-warming potential,[59,60] implementing energy-saving projects like the retrofit at Nottingham Queen's Medical Centre,[61] and requiring major suppliers to submit Carbon Reduction Plans.[62] These NHS strategies provide a replicable roadmap for OEM physicians worldwide to advocate for similar reforms at different levels of government, even in countries such as the United States (U.S.) that may not have a formal NHS. Analogous initiatives can be implemented as part of policy at the state or local level, as well.

A U.S.-based example is found in Massachusetts, where MassHealth released Acute Inpatient Hospital Bulletin 198, which makes emissions reporting mandatory for all acute care facilities in the state that receive Medicaid funding.[63] The levers of policy operate at all layers of government, and OEM physicians can drive local change even when national-level initiatives face headwinds. Further areas for potentially actionable policy change include integrating sustainability into healthcare accreditation and payment models and supporting policies that mandate environmental impact assessments for the construction and renovation of new healthcare facilities.

OSF Saint Anthony's Health Center in Illinois serves as an excellent example of sustainability change at the organizational level. Known as a "Sustainability Champion," the center works with Medtronic's Remanufacturing Program to recycle used pulse oximetry sensors, significantly reducing waste and saving costs. Their open reporting of these results has brought them national recognition and shows how OEM physicians can promote similar initiatives.[64] Another example is the Wentworth-Douglass Hospital in Dover, New Hampshire, which optimized its energy use as part of a sustainability initiative. The hospital saved about $150,000 with a modernized energy management system, and the installation of low-flow fixtures contributed to an additional $200,000 in annual savings.[65]

Both of these efforts were guided by the "Sustainability Roadmap for Hospitals," developed by the American Society for Healthcare Engineering, the Association for the Healthcare Environment, and the Association for Healthcare Resource & Materials Management.[1] This roadmap assisted the hospital in identifying and implementing cost-effective sustainability projects without substantial financial investments. The successes at OSF Saint Anthony's Health Center and Wentworth-Douglass Hospital demonstrate how environmental sustainability measures can be implemented at the institutional level, independent from national-level policy constraints, and lead to both improved sustainability and sometimes operational cost reductions that further empower the organization in continuing to serve its core mission in the community. OEM physicians in health systems everywhere are well-positioned to drive similar institutional changes, given their training in public and environmental health.

OEM physicians can expand these practices in their own organizations by helping establish and innovate climate and health committees among their physician colleagues of diverse specialties, and by including environmental factors as part of institutional clinical guidelines and performance measures.

ACTION STEPS FOR OCCUPATIONAL AND ENVIRONMENTAL MEDICINE PHYSICIANS TO ENHANCE SUSTAINABILITY EFFORTS

Healthcare industry leaders would be wise to seek input from other industries, which have embraced sustainability more quickly than the healthcare sector. Table 4 outlines practical actions OEM physicians can take to support sustainability in healthcare. These examples are not exhaustive; clinicians are encouraged to choose steps based on their role, setting, and capacity, as well as based on the individual needs of the communities and healthcare systems that they serve.

CHALLENGES AND OPPORTUNITIES

Implementing sustainable practices in healthcare presents several challenges, but also significant opportunities, for OEM physicians. To effectively lead sustainability initiatives, OEM physicians must recognize these barriers, identify the opportunities, leverage their unique skill set, and actively pursue strategic systems-level solutions. One prominent challenge is the current structure and

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TABLE 4. Sustainability Action Steps for OEM Physicians

Area	Potential Action Steps	Resources Needed
Clinical practice	• Avoid unnecessary labs or imaging when not clinically indicated • Use digital patient education and discharge notes when possible • Switch from MDIs to DPIs with proper indication	• Clinical decision support tools integrated into EMRs • Digital platforms for patient education and discharge documentation • Training and formulary alignment for DPI prescribing
Organizational leadership	• Collaborate with facilities teams, sustainability officers, supply chain managers, and clinical leaders to influence sustainable operations • Recommend switching to reusable items (eg, gowns or instruments) in department • Participate in hospital sustainability or green team committees • Work with Group Purchasing Organizations (GPOs) to increase availability of green/sustainability products	• Access to multidisciplinary green teams or governance bodies • Procurement and supply chain data for cost and lifecycle comparisons • Funding or pilot resources to trial reusable solutions
Education and training	• Share one sustainability-related article or case study with colleagues each month • Organize informal lunch and learn sessions on healthcare sustainability strategies • Integrate sustainability topics into resident or staff education sessions • Offer to teach medical students or residents about sustainability in a didactic session • Integrate sustainability conversations into existing rotations for medical students and residents	• Access to curated resources like Energy to Care Toolkit or GGHH guidance • Time and institutional support for educational programming • Platforms for content sharing and tracking engagement
Research and innovation	• Join or support a small QI project on clinic waste, emissions, or resource use • Propose adding environmental metrics to dashboards or audits • Collaborate with research teams studying occupational or environmental health impacts	• Data collection tools for emissions, waste, and resource usage • Support for quality improvement frameworks • Access to researchers, sustainability experts, and funding
Policy and advocacy	• Cosign professional society position statements on sustainability • Encourage leadership to include sustainability metrics in quality and safety goals • Advocate and vote for policies at local, state, or federal levels that support sustainable healthcare • Participate in hospital policy review processes related to environment or energy	• Networking with professional bodies or committees • Templates and coordination for joint statements • Data and business cases for institutional policy adjustments • Time and platforms for engagement in policymaking and leadership forums

emphasis of core competencies outlined by organizations such as the ACOEM.[66] These competencies traditionally focus on occupational hazards and workplace safety but have yet to fully embrace the emerging risks posed by climate change and environmentally unsustainable business practices. As a result, current OEM training curricula do not comprehensively equip physicians with tools to address climate risks or sustainable healthcare delivery.[67] Expanding ACOEM's competencies to clearly incorporate climate hazards, sustainable healthcare management strategies, and environmentally responsible business practices would better prepare future OEM physicians to tackle these urgent issues.

Table 5 outlines key challenges, identifies related gaps, and provides strategic solutions that OEM physicians and health systems can implement to advance sustainable healthcare.

Existing business models in healthcare often prioritize short-term operational and financial objectives over long-term sustainability goals. Nonetheless, progressive healthcare systems are now integrating environmental performance metrics directly into organizational priorities. A notable example in the U.S. is Mass General Brigham, which established a clinician-led sustainability initiative that aligns clinical decision-making with net-zero emissions targets. Under physician and nursing leadership, Mass General Brigham strategically addresses critical environmental impact areas, including clinical practices, supply chain management, and anesthetic gas usage—successfully reducing anesthetic-related emissions by approximately 50%.[62]

Moreover, deficits in the public healthcare workforce represent another barrier. Many public healthcare systems face limitations in staffing, resources, and specialized expertise, hampering their capacity to adopt and maintain sustainable practices. By bridging public and private healthcare, OEM physicians can bring vital expertise in operational efficiency, regulatory compliance, and strategic planning to resource-constrained settings. These public–private collaborations offer a promising model for extending sustainability efforts across the healthcare industry. While prevailing healthcare business models typically emphasize short-term financial returns over long-term sustainability, many organizations have recognized that environmental performance is integral to operational success.

Sustainability in healthcare is no longer optional. Rather, it is foundational to organizational resilience, patient safety, and public health. By advocating for updated training, forming strategic partnerships, and reframing sustainability as an essential business function, OEM physicians can lead the healthcare industry toward a more sustainable, equitable future.

CONCLUSION

OEM physicians possess a unique blend of expertise that positions them as essential leaders in healthcare sustainability. In an era where hospital performance on key quality indicators increasingly determines quality metrics, such as Medicare star ratings, reimbursement levels, and accreditation status, identifying efficiencies in how these healthcare systems operate can have significant implications for organizational survival in the face of ongoing economic pressures.

OEM specialists have long been experts in healthcare sustainability,

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TABLE 5. Challenges and Opportunities in Sustainable Healthcare

Challenge	Identified Gaps	Proposed Solution	Example
Limited scope of ACOEM competencies	Current ACOEM competencies do not fully address climate risks or sustainability-oriented business practices[61]	Revise and expand ACOEM competencies to integrate climate resilience, sustainability skills, and strategic action planning within clinical and organizational domains	Updating ACOEM milestones to address climate resilience in OEM training
Business models and organizational priorities	Healthcare business models often prioritize short-term economic goals, lacking alignment with long-term sustainability objectives	OEM physicians can reframe sustainability initiatives as essential business strategies that enhance operational efficiency, reduce costs, and improve healthcare delivery outcomes	Mass General Brigham created clinician-led sustainability leadership roles, cutting anesthetic gas emissions by ~50%, directly linking clinical decision-making with net-zero emission targets[68]
Public healthcare workforce deficits	Public health systems face shortages in specialized expertise and insufficient resources for effectively managing climate-related health risks	Foster public–private partnerships, drawing on OEM specialists' business management expertise and risk management skills to implement sustainable solutions	Integration of private OEM physicians into public sector sustainability planning

although this expertise has not been traditionally framed in such terms. Their training in anticipating, mitigating, and preventing harmful exposures enables healthcare organizations to implement proven methodologies for addressing environmental challenges while maintaining clinical excellence. The hierarchy of controls framework that OEM physicians routinely apply to eliminate or mitigate workplace hazards translates seamlessly to healthcare sustainability initiatives, where emissions, waste, and resource consumption can be approached as environmental hazards requiring systematic reduction or elimination.

Within healthcare organizations, OEM physicians naturally bridge patient care and operations, thereby enabling them to drive sustainability initiatives that span both domains. They routinely convene diverse stakeholders—from C-suite executives and supply chain managers to procurement teams, environmental services, and clinical administrators—around shared objectives. Their established credibility with frontline staff, built through decades of experience in occupational health and safety, enables them to foster a culture where sustainability is embraced as an extension of patient and worker safety rather than an external mandate imposed by regulatory bodies.

The crisis management expertise that OEM physicians have developed through their responses to occupational outbreaks and environmental disasters directly transfers to sustainability leadership. They can champion targeted measures such as environmental impact assessments for new facilities, the integration of emissions metrics into hospital operation trackers, and the linkage of energy-efficiency upgrades to direct cost savings for the institution. These interventions create "living laboratories" within healthcare systems that demonstrate how low-carbon operations enhance organizational resilience, reduce operational costs, and improve healthcare worker morale while maintaining high standards of patient care.

In this context, OEM physicians represent mission-critical expertise for healthcare organizations seeking to align environmental stewardship with clinical excellence. Their unique combination of regulatory knowledge, stakeholder engagement skills, risk management expertise, and credibility with both clinical and operational staff makes them indispensable partners in advancing sustainable healthcare delivery. As the healthcare industry increasingly recognizes that planetary health and human health are inextricably linked, OEM physicians stand ready to lead health system transformation toward low-carbon, high-quality care that serves both current patients and future generations.

An Appendix containing resource lists of organizations, reports, publications, courses, and networking can be found at https://links.lww.com/JOM/C422.

ACKNOWLEDGMENTS

The authors are grateful for the contributions of Dr. Emily Senay, who provided a helpful review and pointed out multiple improvements to the paper.

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