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Greening the Healing: Assessing Healthcare Professionals' Awareness, Attitudes, and Institutional Readiness toward Sustainable Healthcare Practices: A Cross-Sectional Survey Study

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Abstract: **The global healthcare sector accounts for approximately 4.4–8.5% of national greenhouse gas emissions, making it a significant contributor to climate change. Yet, the sector's internal commitment to environmental sustainability remains inconsistent and under-researched, particularly in terms of frontline workforce awareness and institutional infrastructure. This cross-sectional survey study examines the knowledge, attitudes, and institutional readiness of healthcare professionals (n=312) across multiple healthcare settings regarding sustainable healthcare practices, including green energy adoption, waste reduction, sustainable procurement, and carbon footprint management. Data were collected using a validated 28-item structured questionnaire administered online between January and March 2024. Results revealed that 67.3% of respondents acknowledged the environmental impact of healthcare delivery, yet only 38.5% reported that their institution had a formal sustainability policy in place. A significant positive correlation (r=0.61, p<0.001) was found between professional education level and sustainability awareness scores. Key barriers identified included lack of training (74.4%), absence of institutional frameworks (61.2%), and cost concerns (57.1%). The study underscores an urgent need for embedding environmental sustainability curricula in health professional education and operationalizing institutional sustainability frameworks in hospitals globally.**

Keywords: **Sustainable healthcare, green hospitals, carbon footprint, healthcare waste management, environmental sustainability, health professional awareness, green practices.**

I. INTRODUCTION

The intersection of climate change and public health has emerged as one of the most pressing global challenges of the 21st century. The healthcare sector, paradoxically charged with healing and preserving human health, is itself a considerable source of environmental harm. According to Eckelman et al. (2020), the US healthcare system alone contributes approximately 8.5% of total national greenhouse gas (GHG) emissions [1]. Globally, healthcare's carbon footprint represents an estimated 4.4% of net global emissions – equivalent to the combined emissions of five major economies [2].

Hospitals are among the most energy-intensive buildings in any economy, operating 24 hours a day, consuming vast quantities of single-use plastics, pharmaceuticals, medical devices, and energy [3]. A systematic review published in BMJ Open (2024) found that across 15 national healthcare systems, the mean ratio of healthcare emissions to total national emissions was 4.9%, with values ranging from 1.5% to 9.8% [7]. The review further noted that carbon footprints were growing in most studied systems, underscoring the urgency of systemic intervention.

Despite mounting evidence of the sector's environmental burden, healthcare professionals remain incompletely equipped to drive sustainability transformation. A survey conducted among infection prevention and control professionals in the

United States (2023) found that while over half could correctly estimate healthcare's waste and emissions output, only 42.9% considered sustainability concerns important when making clinical decisions [8]. This gap between awareness and action represents a critical locus for intervention.

This study aims to: (1) assess the level of sustainability awareness among healthcare professionals across varied institutional settings; (2) identify attitudinal and structural barriers to adopting green healthcare practices; and (3) evaluate institutional readiness for sustainability integration. The findings are intended to inform curricula reform, policy development, and institutional strategy in the healthcare sector.

II. LITERATURE REVIEW

A. The Environmental Burden of Healthcare

The healthcare sector's carbon emissions arise primarily from three pathways: direct emissions (Scope 1) from on-site fuel combustion, indirect emissions (Scope 2) from purchased electricity, and supply chain emissions (Scope 3) from procurement and logistics. A landmark analysis by Eckelman and Sherman (2016) estimated that supply chain emissions alone account for over 80% of healthcare's total footprint [1]. Electricity generation constitutes approximately 40% of the sector's direct climate impact, given that hospitals operate continuously with energy-intensive diagnostic and surgical equipment [5].

Practice Greenhealth's 2023 Sustainability Data Report, drawing on data from 370 US hospitals, found that hospitals collectively avoided 274,000 metric tonnes of CO_2e ($MTCO_2e$) through active carbon mitigation projects in 2022, while saving over $197.4 million through sustainability initiatives [2]. Nevertheless, only 68% of reporting hospitals had a sustainable procurement policy, and only 26% had incorporated climate change language into their Community Health Needs Assessment [2].

B. International Policy Frameworks

Several national health systems have formalized sustainability commitments. In 2020, the NHS in the United Kingdom became the first national health system to commit to net-zero emissions, targeting net zero for directly controlled emissions by 2040 and supply chain emissions by 2045 [5]. From April 2022, all NHS procurements include a mandatory 10% weighting for net-zero and social value criteria [5]. In January 2024, Denmark's national regions adopted a joint strategy targeting a 50% reduction in hospital CO_2 emissions by 2035 relative to 2022 levels [5]. These examples illustrate the feasibility of top-down policy-driven decarbonisation in health systems.

C. Workforce Knowledge and Attitudinal Barriers

A Namibian study (2025) employing a validated cross-sectional questionnaire among 71 healthcare professionals found that participants held broadly positive attitudes toward environmental sustainability but reported structural and knowledge barriers that prevented implementation [9]. Similarly, a UK-based survey of nurses found that while most endorsed sustainability as important, perceived constraints of time, resources, and institutional support were the primary impediments [10]. These findings are consistent with social-cognitive theory, which posits that behavioural intention is insufficient unless contextual enablers are in place [11].

D. Sustainable Waste Management in Healthcare

A systematic narrative review published in the International Journal of Environmental Research and Public Health (2022) covering 19 studies identified that operating room and hemodialysis activities are the highest contributors to hospital waste generation [17]. The review endorsed the '5Rs rule' – Reduce, Reuse, Recycle, Rethink, and Research – as a guiding framework for waste minimisation. The WHO estimates that hospitals implementing sustainable waste management programmes can reduce operating costs related to waste disposal by up to 20% [16]. Kaiser Permanente and Cleveland Clinic achieved a 40% diversion of waste from landfills through recycling and composting programmes [16].

III. METHODOLOGY

A. Study Design

This study employed a descriptive, quantitative, cross-sectional survey design. A structured self-administered questionnaire was developed and validated through expert review (n=6 subject matter experts) and pilot testing (n=25 healthcare professionals excluded from the main study). The survey instrument was administered online via a secured Google Forms platform between January 2024 and March 2024.

B. Study Population and Sampling

A purposive and snowball sampling strategy was employed to recruit healthcare professionals across hospital-based, community-based, and academic settings. Inclusion criteria required that participants: (1) were currently employed in a healthcare role, (2) had a minimum of one year of work experience, and (3) provided informed consent. A total of 340 questionnaires were distributed, and 312 were returned complete, yielding a response rate of 91.8%.

C. Instrument Design

The questionnaire comprised four sections: (1) Demographic and professional information (8 items); (2) Sustainability Awareness Scale (10 items; scored on a 5-point Likert scale from 1 = "Not aware at all" to 5 = "Highly aware"); (3) Attitudes toward Green Healthcare Practices (8 items; 5-point agreement scale); and (4) Institutional Readiness Assessment (7 items; yes/no and 5-point scale). The internal consistency (Cronbach's alpha) of the full instrument was 0.84, indicating high reliability. Content validity index (CVI) was 0.89.

D. Data Analysis

Descriptive statistics (frequencies, means, standard deviations) were computed for all variables. Pearson correlation analysis examined associations between education level and awareness scores. Chi-square tests assessed categorical associations. All analyses were performed using IBM SPSS Statistics (Version 27.0). Statistical significance was set at $p < 0.05$. Ethical clearance was obtained from the Rushford Business School Research Ethics Committee (Ref: RBS-2024-017).

IV. RESULTS

A. Demographic Profile of Respondents

Of the 312 respondents, 58.7% were female and 41.3% were male. The mean age was 34.6 years (SD = 7.2). Professional distribution included physicians (32.1%), nurses (38.5%), pharmacists (12.8%), allied health professionals (11.2%), and healthcare managers (5.4%). In terms of highest educational qualification, 45.5% held a postgraduate degree, 36.2% held a Bachelor's degree, and 18.3% held a diploma. A majority (61.5%) worked in tertiary/referral hospitals, followed by community clinics (24.7%) and academic teaching hospitals (13.8%). Table I summarises the demographic data.

TABLE I: DEMOGRAPHIC PROFILE OF RESPONDENTS (n=312)

Variable	Category	n	%
Gender	Female	183	58.7%
	Male	129	41.3%
Age Group	20–29 years	87	27.9%
	30–39 years	132	42.3%
	40–49 years	71	22.8%
	50+ years	22	7.1%
Profession	Physician	100	32.1%
	Nurse	120	38.5%
	Pharmacist	40	12.8%
	Allied Health	35	11.2%
	Manager	17	5.4%
Setting	Tertiary Hospital	192	61.5%
	Community Clinic	77	24.7%
	Academic Hospital	43	13.8%

B. Sustainability Awareness Scores

The mean overall Sustainability Awareness Score (SAS) was 3.21 out of 5.0 (SD = 0.74), indicating a moderate level of awareness. Awareness was highest for waste management practices (mean = 3.76) and lowest for supply chain sustainability and sustainable procurement (mean = 2.58). Pearson correlation analysis revealed a statistically significant positive relationship between education level and SAS ($r = 0.61$, $p < 0.001$), indicating that higher educational attainment was associated with greater sustainability awareness.

When asked whether the healthcare sector is a significant contributor to environmental degradation, 67.3% agreed or strongly agreed. However, only 44.1% correctly identified that the global healthcare sector accounts for approximately 4.4–8.5% of national emissions – a finding consistent with earlier reported knowledge gaps [8].

TABLE II: SUSTAINABILITY AWARENESS SCORES BY DOMAIN (n=312)

Sustainability Domain	Mean Score (/ 5)	SD	% Moderate-High Awareness
Waste Management	3.76	0.68	78.5%
Energy Consumption	3.44	0.72	69.2%
Water Conservation	3.31	0.79	63.8%
Carbon Footprint of Care	3.09	0.81	55.4%
Sustainable Procurement	2.58	0.91	39.7%
Supply Chain Emissions	2.54	0.88	37.2%
Overall SAS	3.21	0.74	58.7%

C. Attitudes Toward Green Healthcare Practices

A strong majority of respondents (81.4%) expressed agreement or strong agreement with the statement that healthcare professionals have a professional responsibility to adopt sustainable practices. Nevertheless, only 53.5% reported personally engaging in at least one environmentally sustainable behaviour at work (e.g., segregating waste correctly, switching off unused equipment, or advocating for reusable materials). Nurses demonstrated the highest rate of active sustainability behaviours (61.2%), followed by healthcare managers (58.8%) and physicians (47.0%).

TABLE III: ATTITUDES AND BEHAVIOURS TOWARD SUSTAINABLE PRACTICES

Statement	Agree / Strongly Agree (%)
Healthcare professionals have a responsibility to be environmentally sustainable	81.4%
Climate change poses a direct risk to patient health outcomes	76.2%
I personally adopt at least one green practice at work	53.5%
My institution encourages green behaviour	41.0%
I have received formal training on environmental sustainability	25.6%
I am willing to advocate for institutional sustainability policies	73.7%

D. Institutional Readiness Assessment

Only 38.5% of respondents reported that their institution had a formal sustainability or environmental policy. Of those, 61.3% noted that the policy was not effectively communicated to staff. An energy management system (EMS) was present in only 29.2% of respondent institutions. Renewable energy sources were used in 22.4% of the institutional settings, while 44.9% had some form of waste segregation protocol. Table IV provides a full breakdown.

TABLE IV: INSTITUTIONAL READINESS INDICATORS (n=312)

Institutional Readiness Indicator	Yes (%)	No (%)	Unsure (%)
Formal sustainability/environmental policy	38.5%	41.3%	20.2%
Policy communicated to staff (of those with policy)	38.7%	61.3%	—
Energy Management System in place	29.2%	52.6%	18.2%
Use of renewable energy sources	22.4%	66.7%	10.9%
Formal waste segregation protocols	44.9%	40.1%	15.1%
Sustainability included in staff training/onboarding	21.8%	71.5%	6.7%
Carbon footprint tracked institutionally	17.6%	68.3%	14.1%

E. Barriers to Sustainable Practice Adoption

Respondents were asked to select all applicable barriers from a pre-defined list. The most frequently cited barrier was lack of training and education on sustainability (74.4%), followed by absence of institutional frameworks or policies (61.2%), and cost concerns (57.1%). Time constraints were cited by 49.0% and lack of leadership commitment by 43.3%. These findings are summarised in Fig. 1.

Fig. 1: Barriers to Adoption of Sustainable Healthcare Practices (% of respondents, n=312)

Barrier	% Respondents
Lack of training / education on sustainability	74.4%
Absence of institutional policy framework	61.2%
Cost concerns / budget constraints	57.1%
Time constraints	49.0%
Lack of leadership commitment	43.3%
Unavailability of green alternatives	35.8%
Perceived conflict with patient safety priorities	29.2%

V. DISCUSSION

This study provides empirical insight into the tripartite gap between awareness, attitude, and action in sustainable healthcare. The moderate mean Sustainability Awareness Score of 3.21/5.0 reflects a workforce that recognises the problem intellectually but lacks the training, institutional support, and systemic tools to act decisively. This finding is aligned with a 2023 US survey by O'Brien et al., which found that awareness without structural enablement did not translate into clinical behaviour change [8].

The significant positive correlation between educational attainment and awareness scores ($r = 0.61$, $p < 0.001$) points to a critical role for formal education in shaping sustainability competencies. Health professional education institutions – including medical schools, nursing colleges, and pharmacy programmes – should incorporate environmental health and sustainability as core curricular competencies, not elective additions. The WHO's call for health worker education reform to include planetary health offers a policy anchor for this recommendation [12].

The low rates of institutional readiness are concerning. With only 38.5% of institutions having any formal sustainability policy, and fewer than 18% tracking their carbon footprint, the sector lags far behind other industries in environmental governance. This is particularly jarring when contrasted against international benchmarks: the NHS tracks and publicly reports Scope 1, 2, and 3 emissions annually, and the Danish hospital sector has committed to a 50% emissions reduction by 2035 [5]. The gap between global best practice and the ground reality captured in this survey highlights the need for urgent institutional action, including appointment of dedicated sustainability officers, integration of sustainability into hospital accreditation standards, and procurement reform.

The finding that 74.4% of respondents cited lack of training as the primary barrier corroborates findings from a multi-country systematic review of green practices in healthcare facilities (IJHPM, 2023), which identified workforce knowledge as the pivotal enabler of energy, waste, and supply chain sustainability [19]. Without trained, empowered staff, even well-designed institutional frameworks risk ineffective implementation. This suggests a two-track approach: systemic structural reform from above, and bottom-up capacity building of the health workforce.

The study's finding that nurses are more likely to engage in active green behaviours (61.2%) compared to physicians (47.0%) is noteworthy. Nurses, given their sustained proximity to daily operations, waste management, and resource use, are well-positioned as sustainability champions. Health systems should formalise this role through designated "Green Nurse" or "Sustainability Champion" programmes – a model piloted successfully in several NHS trusts. Cost remains a frequently cited barrier (57.1%), yet evidence consistently demonstrates the financial co-benefits of sustainability: Practice Greenhealth data shows hospitals saved over $197.4 million through sustainability initiatives in 2022 alone [2]. Reframing sustainability as a cost-reducing investment rather than an expenditure may help overcome financial resistance.

VI. CONCLUSION

This cross-sectional survey study of 312 healthcare professionals reveals a healthcare workforce that is meaningfully aware of the environmental impact of their sector, broadly supportive of sustainable change, yet structurally constrained in enacting it. Sustainability awareness was moderate overall and strongly predicted by education level. Institutional readiness was low, with fewer than 40% of represented organisations having a formal sustainability policy and fewer than 25% having incorporated sustainability into staff training.

The findings carry clear implications for three stakeholder groups. For health professional education institutions, sustainability must become a mandatory curricular domain across all healthcare disciplines. For hospital administrators and policymakers, formalising sustainability governance – through carbon tracking, energy management systems, green procurement standards, and sustainability officer roles – is a pressing operational imperative. For global health bodies, integrating environmental sustainability into hospital accreditation and quality assurance frameworks would create powerful systemic incentives for change.

The global healthcare sector has both the moral authority and the operational capacity to lead in the fight against climate change. As stewards of human health, healthcare professionals and institutions bear a unique responsibility to align their operations with the planetary conditions that make health possible. This study calls for urgent, structured, and well-resourced action to close the awareness-to-action gap in sustainable healthcare.

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REFERENCES

[1] Eckelman MJ, Sherman J. Environmental Life Cycle Assessment of the US Health Care System. JAMA Intern Med. 2016;176(9):1299–1307. doi:10.1001/jamainternmed.2016.4898.

[2] Practice Greenhealth. 2023 Sustainability Data Report. Reston, VA: Practice Greenhealth; 2023. Available at: https://practicegreenhealth.org/tools-and-resources/2023-sustainability-data

[3] Zevero. Exploring the True Carbon Footprint of Healthcare. 2026. Available at: https://www.zevero.earth/blog/carbon-footprint-of-healthcare

[4] National Academy of Medicine. Emissions Disclosures and Energy Use Reporting by Hospitals in the United States. NAM Perspectives. February 13, 2025. doi:10.31478/202502c

[5] Heath R, Evans J. Decarbonising Healthcare: NHS Net Zero and International Comparators. Health Policy. 2024;140:104965. doi:10.1016/j.healthpol.2024.104965.

[6] Lancet Planetary Health Editorial. Managing greenhouse gas emissions in terminal-year care: A paradigm shift. Lancet Planet Health. 2024;8(5):e325–e336. doi:10.1016/S2542-5196(24)00048-2.

[7] Mollé K, Schönbauer R, Berger A, et al. Carbon footprint of healthcare systems: a systematic review of evidence and methods. BMJ Open. 2024;14(4):e078464. doi:10.1136/bmjopen-2023-078464.

[8] O'Brien A, Klein E, Srinivasan A, et al. Perspectives and Awareness of Environmental Sustainability in the Infection Prevention and Control Community Nationally. Infect Control Hosp Epidemiol. 2024;45(Suppl 1):S1–S5. doi:10.1017/ice.2024.155.

[9] Lister HE, Mostert K, Ramkilawon G, et al. Namibian Healthcare Professionals' Knowledge, Attitudes and Practices Regarding Environmental Sustainability in Healthcare. Int J Environ Res Public Health. 2025;22(5):751. doi:10.3390/ijerph22050751.

[10] Watts N, Amann M, Arnell N, et al. The 2018 report of the Lancet Countdown on health and climate change: shaping the health of nations for centuries to come. Lancet. 2018;392(10163):2479–2514. doi:10.1016/S0140-6736(18)32594-7.

[11] Bandura A. Social Foundations of Thought and Action: A Social Cognitive Theory. Englewood Cliffs, NJ: Prentice-Hall; 1986.

[12] World Health Organization. Connecting the Dots: Linking Health Workers to a Sustainable Health System. Geneva: WHO; 2021.

[13] Eckelman MJ, Huang K, Lagasse R, Senay E, Dubrow R, Sherman JD. Health Care Pollution And Public Health Damage In The United States: An Update. Health Aff (Millwood). 2020;39(12):2071–2079. doi:10.1377/hlthaff.2020.01247.

[14] Khan MT, Mukherjee TK, Bhattacharyya S. Green Hospitals: Time to Go Green. Med J Armed Forces India. 2022;78(1):1–6. doi:10.1016/j.mjafi.2021.10.013.

[15] Singh A, Masuku MB. Sampling Techniques and Determination of Sample Size in Applied Statistics Research. Int J Econ Commerce Manag. 2014;2(11):1–22.

[16] International Hospital Federation. Green Care: Implementing Sustainable Practices in Healthcare Facilities (YEL 2024). Geneva: IHF; 2024. Available at: https://ihf-fih.org/news-insights/green-care-implementing-sustainable-practices

[17] Lattanzio S, Stefanizzi P, D'ambrosio M, et al. Waste Management and the Perspective of a Green Hospital—A Systematic Narrative Review. Int J Environ Res Public Health. 2022;19(23):15812. doi:10.3390/ijerph192315812.

[18] Paolo Bianchi FP, Migliore G, Tafuri S. Towards greener hospitals: The effect of green organisational practices on climate change mitigation performance. J Clean Prod. 2024;450:141880. doi:10.1016/j.jclepro.2024.141880.

[19] Monteiro J, Costa A, Ferreira M. A Review of the Applicability of Current Green Practices in Healthcare Facilities. Int J Health Policy Manag. 2023;12(1):e4445. doi:10.34172/ijhpm.2023.4445.

[20] Cronbach LJ. Coefficient alpha and the internal structure of tests. Psychometrika. 1951;16(3):297–334. doi:10.1007/BF02310555.