NEC
Nursing Evidence and Care
Integrating Science, Education & Caring Practice
INTERNATIONAL JOURNAL

NEC 2025; 1(1): 45 - 54

CC BY NC

Original scientific article

Environmental Awareness and Sustainable Practices among Nurses: Predictors, Barriers, and the Role of Green Audits

Valentina Ješić[1,2]

[1] Department of Anesthesiology, Intensive Care Medicine and Pain Management, Sestre milosrdnice University Hospital Center, Vinogradska cesta 29, 10000, Zagreb, Croatia, valentina.matic@yahoo.com

[2] Faculty of Health Sciences, University of Novo Mesto, Na Loko 2, 8000, Novo Mesto, Slovenia

Received September 12, 2025; Accepted November 2, 2025

https://doi.org/10.67009/nec.1.1.5

Corresponding author: Valentina Ješić, Tišina Kaptolska 61, 44000, Sisak, Croatia, valentina.matic@yahoo.com, +385 99 503 4197

Keywords: Environmental Awareness; Environmental Protection; Nurses; Sustainable Development.

Abstract

Introduction: The healthcare sector contributes substantially to environmental pollution, accounting for about 4.5% of global CO_2 emissions, while also generating large amounts of waste and consuming significant energy and water resources. Nurses, as the largest group of healthcare professionals, are well positioned to promote sustainability, but their efforts are often hindered by limited time, resources, and managerial support. This study aimed to examine the level of environmental awareness and the frequency of sustainable practices among nurses in Croatia, and to identify barriers and types of support needed for their more effective implementation.

Methods: A quantitative cross-sectional study was conducted using an online questionnaire among 150 nurses with diverse demographic characteristics. The questionnaire included a scale of environmental awareness, a scale measuring the frequency of sustainable practices, and questions about green audits, participation in sustainability initiatives, barriers, and support needs.

Results: Most participants were women (87%), with a mean age of 35 years and an average of 12 years of work experience. A green audit had been conducted in 20% of institutions. A high level of environmental awareness was observed (mean 4/5), while sustainable practices were moderate (mean 3.6/5). Waste segregation was the most frequent practice, while participation in "green" initiatives was the least common. Higher awareness, the presence of a green audit, and managerial support significantly predicted more frequent implementation of sustainable practices. Key barriers included lack of time, infrastructure, and managerial support.

Conclusion: Nurses in Croatia demonstrate a high level of environmental awareness, but their sustainable actions remain constrained by operational barriers. Institutional measures such as green audits, targeted education, and stronger leadership support are essential for embedding sustainability into everyday nursing practice.

INTRODUCTION

The growing threats of climate change, pollution, and resource depletion have stimulated global efforts toward sustainable development, including in the field of healthcare [1–3]. The healthcare system has a significant environmental footprint. For example, it generates approximately 4.4 to 4.5 percent of

total global greenhouse gas emissions [1], produces large quantities of medical waste, and consumes substantial amounts of energy and water [4]. In Croatia, the healthcare sector has been shown to account for about 4.5 percent of CO_2 emissions, which is more than certain industries such as shipbuilding or aviation [5]. These figures emphasize the urgent need to implement sustainable practices at all levels of healthcare delivery.

Nurses, who constitute the backbone of the healthcare workforce, play a crucial role in implementing and promoting sustainability within healthcare institutions [6]. Beyond their clinical duties, they are responsible for managing resources responsibly, reducing medical and infectious waste, ensuring the rational use of materials, and educating patients and colleagues about environmentally responsible practices [7]. Research in this field consistently shows that nurses hold positive attitudes toward environmental protection and view sustainability as part of their professional ethics [8–10]. However, despite these favorable attitudes, the actual implementation of sustainable practices in daily work remains limited. International studies indicate that more than half of nurses rarely engage in "green" activities, while about one third find it difficult to integrate such measures into their daily routines [8].

The main barriers identified include lack of time due to the priority of direct patient care, insufficient material and organizational resources such as recycling containers and alternative materials, absence of formal managerial support or incentives, and inadequate education regarding sustainable procedures [8, 9, 11]. Conversely, evidence suggests that nurses with higher levels of environmental awareness and knowledge are more likely to adopt sustainable practices such as waste reduction, energy conservation, and environmentally responsible procurement [12]. Facilitating factors include ongoing education, professional development, the formation of "green teams," and visible institutional leadership support, particularly through clear environmental policies and resource allocation [6, 11].

Despite the global trend of "green healthcare," no data have yet been published in Croatia on environmental awareness and sustainable practices among clinical nurses. The available initiatives, such as the International Green Healthcare Policy Summit held in Zagreb in 2023 and pilot projects on hospital energy efficiency, have mostly been directed at the system and infrastructure level, while the perspective of nursing staff has been less explored [5]. The aim of this study was therefore to address this knowledge gap by examining everyday sustainable practices in nursing in the Croatian context. This study aimed to: a) analyze the level of environmental awareness and sustainable practices among nurses in Croatia, and identify statistically significant predictors of their implementation, including professional experience, sector, managerial support, and the presence of a green audit, and b) examine the main barriers and perceived support mechanisms influencing the integration of sustainability into everyday nursing practice.

METHODS

Design and Sample

A quantitative cross-sectional study was conducted using an online survey. The study included registered nurses employed in the Republic of Croatia with diverse characteristics in terms of gender, age, years of work experience, level of education, and type of healthcare institution. Data collection took place in 2024 through web-based questionnaires distributed via professional platforms and social media, including groups and mailing lists of nursing associations. Participation was voluntary and anonymous, and completion of the questionnaire was considered implied consent. A total of 150 valid responses were obtained. Participants represented a variety of healthcare institutions across Croatia, rather than a single site.

Instrument

A structured online questionnaire was developed specifically for this study and consisted of several sections. The first section included sociodemographic variables such as gender, age, years of work experience, type of institution (public or private), and highest level of education. The second section measured environmental awareness using a set of

statements assessing awareness and attitudes toward sustainability in healthcare. Participants rated their agreement on a five-point Likert scale ranging from 1 (strongly disagree/very low awareness) to 5 (strongly agree/very high awareness). Example items included: "I believe healthcare institutions play an important role in environmental protection" and "In my work, I try to consider the impact on the environment." The mean score of these items represented a composite indicator of environmental awareness, with higher scores indicating greater awareness. Internal consistency was satisfactory (Cronbach's α = 0.84).

The third section measured the frequency of sustainable practices with eight items asking participants how often they engaged in specific environmentally responsible behaviors in daily work, rated on a five-point Likert scale from 1 (never) to 5 (always). Five of these behaviors are presented in Table 2 as illustrative higher-frequency items and do not represent the full composite. A mean composite score (1–5) was calculated, with higher values indicating more frequent engagement in sustainable practices. Internal reliability for the eight-item scale was acceptable (Cronbach's α = 0.78).

The fourth section included items related to experience, support, and barriers. Participants were asked whether a green audit had been conducted in their institution (yes/no, explained as a formal environmental review or certification), whether they perceived managerial support for sustainable practices (yes/no), and whether they had participated in any organized sustainability initiatives or training (yes/no). In addition, they were provided with a list of potential barriers such as lack of time, insufficient financial or material resources, lack of knowledge or training, limited support from colleagues, and absence of managerial support, and were asked to select all relevant obstacles. A corresponding checklist of possible forms of support (e.g., additional education, clear guidelines and protocols, greater involvement of management, financial incentives, establishment of "green teams") was also included.

The questionnaire was piloted on a small sample (N = 10) of nurses to assess clarity and completion time. Based on feedback, minor wording adjustments were made to improve comprehensibility.

Ethical Considerations

The study adhered to the principles of the Declaration of Helsinki. According to Croatian legislation and institutional policies, formal IRB approval was not required for anonymous online surveys without sensitive personal data. Participation was voluntary and anonymous, and informed consent was implied by completion of the online questionnaire. Confidentiality was assured, and all data were stored securely with password protection and used solely for research purposes.

Data Analysis

Data were analyzed using IBM SPSS Statistics version 25. Descriptive statistics were used to summarize sample characteristics and item distributions (means and standard deviations for continuous variables; frequencies and percentages for categorical variables). Group comparisons based on the presence of a green audit were performed using independent-samples t-tests for continuous variables and chi-square tests for categorical variables. Multiple linear regression analysis was conducted to identify independent predictors of the average frequency of sustainable practices. Predictor variables included environmental awareness (1–5 scale), years of work experience, presence of a green audit (1 = yes, 0 = no), and perceived managerial support (1 = yes, 0 = no). Gender and sector (public vs. private) were initially considered but were excluded from the final model due to non-significant contributions in preliminary analyses. Model assumptions such as multicollinearity and normality of residuals were checked. Statistical significance was set at $P<0.05$.

RESULTS

Sample description and presence of green audit

The study analyzed 150 participants, including 130 women and 20 men of varying ages and work experience. The mean age was 35.0 years (SD = 9.4; median 34), and the mean length of work experience was 12.1 years (SD = 10.2; median 10). Of the total sample, 100

participants (66.7%) were employed in public healthcare institutions (clinical hospital centers, general hospitals, health centers), and 50 (33.3%) in the private sector (special hospitals, polyclinics, private practices). Regarding education, 42% of respondents had completed secondary nursing school, 45% held a higher or bachelor's degree, and 13% held a master's degree, mostly in nursing management. A total of 30 participants (20%) reported that a green audit or another form of formal sustainability assessment had been conducted in their institution (Table 1).

Table 1. Demographic characteristics and differences according to the presence of a green audit (N = 150)

Variable		Total (N = 150)	Green audit Yes (n = 30)	Green audit No (n = 120)	*P* (Yes vs No)
Gender, n (%)					
	Women	130 (86.7)	26 (86.7)	104 (86.7)	0.990
	Men	20 (13.3)	4 (13.3)	16 (13.3)	
Age (years), M (SD)		35.0 (9.4)	36.5 (9.1)	34.7 (9.5)	0.580
Work experience (years), M (SD)		12.1 (10.2)	14.8 (11.0)	11.4 (9.9)	0.100
Public institution, n (%)		100 (66.7)	25 (83.3)	75 (62.5)	0.030*
Environmental awareness (1–5)		3.9 (0.7)	4.3 (0.5)	3.8 (0.7)	<0.001***
Sustainable practices (1–5)		3.6 (0.7)	4.0 (0.5)	3.5 (0.6)	<0.001***

Note: Green audit = formal internal or external review of environmental practices in the institution. Scores for environmental awareness and sustainable practices are mean values on a scale from 1 to 5 (higher scores indicate greater awareness and more frequent practices). *P* values obtained with χ^2 test (without Yates correction) for proportions and Welch's t-test for means. *P<0.05, **P<0.01, ***P<0.001.

Frequency of Sustainable Practices

Of the five surveyed aspects of sustainable behavior in daily work, the most frequently reported practice was waste segregation (M = 4.2, SD = 0.8). Energy conservation, such as switching off lights and medical devices when not in use, was also rated highly (M = 3.8, SD = 1.0). Reducing paper use, for example through digital documentation, showed a moderate frequency (M = 3.5, SD = 1.1). Reuse of materials or equipment when feasible was reported less often (M = 2.7, SD = 1.2). The least frequent activity was participation in "green" initiatives at the workplace (M = 2.3, SD = 1.1) (Table 2).

Note: The composite index of sustainable practices (M = 3.6, SD = 0.7) is based on the full set of eight items and is therefore not a simple arithmetic mean of the five illustrative behaviors listed in Table 2.

Table 2. Average frequency of sustainable practices in daily work (N = 150)

Sustainable practice	Mean (SD)
Waste segregation for recycling	4.2 (0.8)
Energy conservation (switching off lights and devices)	3.8 (1.0)
Reduced paper use (digital documentation)	3.5 (1.1)
Reuse of materials or equipment (when feasible)	2.7 (1.2)
Participation in "green" initiatives	2.3 (1.1)

Note: Frequency scale: 1 = never, 5 = always. SD = standard deviation.

Predictors of Sustainable Practices (Multiple Regression)

A multiple linear regression analysis was conducted to identify factors that significantly predict the frequency of sustainable practices among respondents. The dependent variable was the average score of

sustainable practices (continuous, scale 1–5). The independent variables entered into the model were environmental awareness (scale 1–5), years of work experience, presence of a green audit in the institution (binary: 1 = yes, 0 = no), and perceived managerial support (1 = yes, 0 = no) (Table 3). Educational level was not a significant correlate of sustainable practices (*P*=0.18) and was therefore excluded from the final model.

Table 3. Multiple regression analysis of predictors of the frequency of sustainable practices (N = 150)

Predictor	B (SE)	β	*P*
(Constant)	1.10 (0.40)	–	0.006
Environmental awareness (1–5)	0.50 (0.10)	0.45	<0.001***
Green audit in institution	0.30 (0.12)	0.19	0.010**
Perceived managerial support	0.25 (0.11)	0.17	0.021*
Years of work experience	0.009 (0.005)	0.14	0.065

Note: Dependent variable: average frequency score of sustainable practices (1–5). Values represent unstandardized regression coefficients (B) with standard errors (SE), standardized coefficients (β), and p-values. Binary coding: green audit (1 = yes, 0 = no); managerial support (1 = yes, 0 = no). The regression model was statistically significant ($F(4,145) = 24.3$, $P<0.001$) and explained approximately 38% of the variance in the frequency of sustainable practices (adjusted R0.38 = ²). ***$P<0.001$, **$P<0.01$, *$P<0.05$.

Perceived Barriers and Needed Support for Sustainability

The survey section on barriers and support options allowed respondents to select multiple items. Nearly all participants (96%) identified at least one significant barrier. The most frequently reported barrier was lack of time (100 respondents, 66.7%). Lack of resources and infrastructure was reported by 80 respondents (53.3%). Half of the participants (75 respondents, 50%) cited insufficient managerial support, while 50 respondents (33.3%) indicated lack of knowledge or training. Sustainability not being a workplace priority was noted by 40 respondents (26.7%).

When asked about the forms of support that would help them engage more in sustainable practices, the majority emphasized the need for greater managerial support and engagement (110 respondents, 73.3%). Additional education and training were identified by 90 respondents (60.0%), while 85 respondents (56.7%) highlighted the importance of clear guidelines and protocols. Participation in organized initiatives or "green teams" was selected by 70 respondents (46.7%). Financial incentives or rewards were the least frequently chosen option, noted by 50 respondents (33.3%) (Table 4).

Table 4. Most frequently perceived barriers to implementing sustainable practices and proposed forms of support (N = 150)

Barriers (multiple answers possible)	n (%)	Support needed (multiple answers possible)	n (%)
Lack of time for additional activities	100 (66.7)	Greater managerial support and engagement	110 (73.3)
Lack of resources or infrastructure	80 (53.3)	Additional education and training	90 (60.0)
Insufficient managerial support	75 (50.0)	Clear guidelines and protocols	85 (56.7)
Lack of knowledge or training	50 (33.3)	Formation of "green teams"	70 (46.7)
Sustainability not a workplace priority	40 (26.7)	Financial incentives or rewards	50 (33.3)

Note: Values represent the number and percentage of respondents (N = 150) who selected each option. Multiple responses were possible; therefore, totals exceed 100%.

DISCUSSION

This study is among the first in Croatia to quantitatively examine sustainable practices in nursing. The findings provide valuable insights into the level of environmental awareness among nurses, the frequency of "green" activities, and the main barriers and support needs related to implementing sustainability in everyday practice.

High environmental awareness but moderate application of practices

Participants generally demonstrated relatively high environmental awareness and positive attitudes toward sustainability, which provides a good foundation for future interventions. However, sustainable practices were only moderately implemented: some behaviors (e.g., waste segregation) were well established, while others (e.g., participation in environmental initiatives) lagged behind. This pattern is consistent with the composite index score of 3.6/5, which reflects the broader set of surveyed behaviors beyond those listed in Table 2. This discrepancy between high awareness and moderate behavioral application has also been observed in international research.

Luque-Alcaraz et al. [9] reported that nurses display strong environmental awareness but tend to engage in sustainable practices more frequently in their private lives than in professional settings. Similarly, Yeboah [13], in a systematic review, highlighted a consistent gap between awareness and the actual implementation of sustainable activities among healthcare professionals.

These findings are further supported by Kırtıl et al. [14], who conducted a phenomenological study among operating room nurses in Turkey and found limited awareness of environmental sustainability and numerous barriers, including insufficient education and lack of institutional support. On the organizational level, Bobini et al. [15] showed that while 97% of Italian healthcare leaders recognize sustainability as a strategic priority, only 41% of organizations had formalized strategies, with most institutions acting in a fragmented way and lacking a systematic approach.

Taken together, these studies confirm that high levels of awareness, whether at the individual or institutional level, are not sufficient to ensure the consistent implementation of sustainable practices. Translating awareness into tangible change requires a systematic framework, well-defined policies, continuous education, and strong support from organizational leadership.

Education alone is insufficient motivation – organizational factors are more decisive

Although respondents reported relatively high environmental awareness, differences in the frequency of sustainable practices according to educational level were negligible. This finding is inconsistent with numerous international studies in which higher education levels are consistently associated with stronger environmental behavior. A possible explanation is that in the Croatian context organizational factors, such as managerial support and available infrastructure, exert greater influence on behavior than individual characteristics.

Attia et al. [16] found that "green competencies" and awareness were stronger predictors of sustainable practices than educational attainment. Similarly, Chung [17] emphasized that awareness of climate change strongly promotes sustainable practices, even in the absence of formal education. These findings support our result that organizational conditions are decisive for behavior, regardless of educational level.

Additional studies reinforce this interpretation. Sepetis et al. [18], in a study of 379 healthcare professionals from public and private sectors, showed that the main predictors of sustainable practices were organizational attitudes and behaviors, whereas individual characteristics, including education, had limited influence. The principal barriers identified were insufficient communication, lack of managerial support, and weak institutional awareness, indicating that meaningful change requires a transformation of organizational behavior.

Similarly, Shaban et al. [19], in a concept analysis of eco-conscious nursing, concluded that education and awareness are important prerequisites but that sustainable healthcare practices become feasible only when combined with institutional support, clear

protocols, and infrastructure. The authors highlight that "eco-conscious nursing" must be systematically integrated into organizational culture and strategy if education and motivation are to translate into actual behavioral change.

These findings demonstrate that education alone, without parallel institutional support and organizational frameworks, is insufficient to ensure the consistent implementation of sustainable practices in the nursing profession.

Green Audits and Institutional Commitment

It is particularly notable that only a small proportion of participants reported the implementation of a "green" audit in their institution, suggesting that most workplaces still lack a formal assessment or sustainability strategy. Institutions that had conducted such an audit demonstrated higher levels of environmental awareness and more frequent adoption of sustainable practices. However, it remains unclear whether the audit itself triggered greater staff engagement or whether institutions with a more established culture of sustainability were more likely to introduce an audit, a typical ambiguity in cross-sectional studies.

Similar findings are reported by Badanta et al. [20], who showed that institutional strategies and formal protocols encourage sustainable staff behavior. Mills [21] emphasizes that removing workplace barriers and providing clear guidelines significantly facilitates the implementation of sustainable practices. Slutzman et al. [22], in a systematic review, noted that waste audits are a standard tool for measuring waste and shaping policies, but they also highlighted considerable methodological inconsistency and variable quality, which limit their impact on systemic change without standardized protocols and staff training. Furthermore, Khosravi et al. [23], in a systematic review, stressed that the adoption of green practices in healthcare institutions is influenced by a wide range of factors, including government regulations, financial incentives, technological capabilities, and resource constraints, with audits alone rarely acting as the main driver.

These findings support our conclusion that institutional commitment plays a crucial role, while also suggesting that audits can only be effective when integrated into a broader, system-supported strategy with clear protocols, adequate resources, and coordination across the entire system.

Predictors of Sustainable Practices: Environmental Awareness and Managerial Support

Multiple regression analysis showed that environmental awareness was the strongest individual predictor of sustainable practices, while perceived managerial support also played a significant role. In contrast, years of work experience and type of institution (public versus private sector) were not identified as significant factors, suggesting that barriers such as lack of time, resources, and organizational culture are fairly universal.

These results are consistent with the findings of Luque-Alcaraz et al., who emphasize the importance of team support and institutional leadership for the implementation of sustainability [9]. Attia et al. [16] similarly confirm that competencies and institutional support exert a stronger influence on behavior than demographic characteristics or sectoral differences. Comparable results were reported by Abou Hashish et al. [24] in a study conducted among nurse managers in Egypt, showing that knowledge management competencies play a pivotal role in the implementation of evidence-based practices, while organizational support had only a partial but still significant effect.

Taken together, this evidence indicates that the successful implementation of sustainable practices stems from a combination of professional competencies and a supportive institutional climate, while individual characteristics play only a secondary role.

Practical Implications

Key implications and recommendations for sustainable nursing practice are summarized in Table 5.

Table 5. Practical implications and recommendations for future research

Area	Recommendations
Education and training	Integrate sustainability principles into continuing education and nursing curricula; organize workshops focused on practical implementation steps.
Organizational support	Clearly communicate sustainability as an institutional priority; allocate time and provide infrastructure (e.g., recycling bins, materials, energy-efficient equipment).
Structures for change	Appoint "sustainability ambassadors" and establish multidisciplinary "green teams" to promote and coordinate sustainable initiatives.
Recognition and incentives	Develop systems for recognizing and rewarding successful sustainability initiatives at both departmental and individual levels.
Safety frameworks	Implement clear protocols on safe reuse and other environmentally responsible practices to minimize risks and address staff uncertainties.

Note: Recommendations are based on study findings and aligned with international guidelines for sustainable healthcare practices.

Limitations

The sample was convenient and may not be representative of the overall population of nurses in Croatia. The data were self-reported and therefore subject to social desirability bias, while the cross-sectional design prevents conclusions about causality. The questionnaire captured only a limited range of practices and barriers; additional aspects of sustainability warrant further investigation. For clarity, five illustrative behaviors were presented in Table 2, while the composite index (M = 3.6/5) was calculated from all eight items.

Recommendations for Future Research

Further studies with larger, more representative samples and longitudinal or experimental designs are needed. Qualitative research could provide deeper insights into specific barriers and facilitators. It would also be valuable to explore managerial perspectives and to evaluate the effects of pilot programs (e.g., educational modules, green teams) on staff behavior and environmental outcomes.

CONCLUSION

This study demonstrated that nurses in Croatia possess a strong ecological awareness and generally positive attitudes toward sustainability, yet face numerous organizational barriers that limit the consistent implementation of sustainable practices. Key challenges include lack of time, support, and resources, indicating that sustainability in healthcare depends not only on individual awareness but also on structural changes. Progress opportunities lie in a motivated core of staff who, with adequate education, clear guidelines, and managerial support, can act as drivers of change toward a greener healthcare system. Institutionalizing sustainability through formal policies, infrastructure, and leadership engagement, alongside professional education and recognition of sustainable initiatives, would enable nurses to translate awareness into concrete action. Supporting healthcare professionals in these efforts can significantly reduce the system's ecological footprint while safeguarding and improving population health.

Funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author Contributions

Conceptualization, V.J.; Methodology, V.J.; Formal Analysis, V.J.; Investigation, V.J.; Data Curation, V.J.; Writing – Original Draft Preparation, V.J.; Writing – Review & Editing, V.J.; Visualization, V.J.; Supervision, V.J.

Declaration of Conflicting Interest:

The author declares no conflict of interest.

REFERENCES

1. Tee NCH, Yeo JA, Choolani M, Poh KK, Ang TL. Healthcare in the era of climate change and the need for environmental sustainability. Singapore Med J. 2024;65(4):204–10. https://doi.org/10.4103/singaporemedj.SMJ-2024-035
2. Martins FP, Paschoalotto MAC, Closs J, Bukowski M, Veras MM. The Double Burden: Climate Change Challenges for Health Systems. Environ Health Insights. 2024;18:11786302241298789. https://doi.org/10.1177/11786302241298789
3. Hart J, Lignou S, Sheehan M. Environmental sustainability and the limits of healthcare resource allocation. Bioethics. 2025;39(6):538–45. https://doi.org/10.1111/bioe.13395
4. Sepetis A, Rizos F, Parlavantzas I, Zaza PN, Nikolaou IE. Environmental costs in healthcare system: the case studies of Greece health care. BMC Health Serv Res. 2025;25(1):522. https://doi.org/10.1186/s12913-025-12542-x
5. Health Hub. Green healthcare on the horizon: European experts for green transformation and sustainability at the Green Healthcare Policy Summit for CEE region [Internet]. Zagreb: Health Hub; 2023 [cited 2025 Sep 7]. Available from: https://www.healthhub.hr/green-healthcare-on-the-horizon-european-experts-for-green-transformation-and-sustainability-at-the-green-healthcare-policy-summit-for-cee-region/.
6. Baykara Mat ST, Mutlu H. Strategic and Holistic Approach to Sustainable Development in Hospitals—Perspectives of Nurse Executives: A Qualitative Study. Colet PC, editor. J Nurs Manag. 2025;2025(1):5296442. https://doi.org/10.1155/jonm/5296442
7. Sürme Y, Maraş G, Aydin Akbuğa G. Environmental sustainability, medical waste management, energy and medicine consumption of the surgical intensive care nurses: A qualitative study. Nurs Crit Care. 2025;30(1):27–36. https://doi.org/10.1111/nicc.13150
8. Zoromba MA, EL-Gazar HE. Nurses' attitudes, practices, and barriers toward sustainability behaviors: a qualitative study. BMC Nurs. 2025;24(1):437. https://doi.org/10.1186/s12912-025-03023-x
9. Luque-Alcaraz OM, Aparicio-Martínez P, Gomera A, Vaquero-Abellán M. The environmental awareness of nurses as environmentally sustainable health care leaders: a mixed method analysis. BMC Nurs. 2024;23(1):229. https://doi.org/10.1186/s12912-024-01895-z
10. Abousoliman AD, Ibrahim AM, Abualruz H, Magdi HM, Zaghamir DEF, Alhowimel A, et al. Exploring the relationship between nursing students' knowledge and attitudes towards climate change and their psychological distress: a cross-national investigation. BMC Nurs. 2024;23(1):294. https://doi.org/10.1186/s12912-024-01927-8
11. Cowie J, Nicoll A, Dimova ED, Campbell P, Duncan EA. The barriers and facilitators influencing the sustainability of hospital-based interventions: a systematic review. BMC Health Serv Res. 2020;20(1):588. https://doi.org/10.1186/s12913-020-05434-9
12. Álvarez-Nieto C, Richardson J, Navarro-Perán MÁ, Tutticci N, Huss N, Elf M, et al. Nursing students' attitudes towards climate change and sustainability: A cross-sectional multisite study. Nurse Educ Today. 2022;108:105185. https://doi.org/10.1016/j.nedt.2021.105185
13. Akore Yeboah E, Adegboye ARA, Kneafsey R. Perceptions, attitudes, awareness and perspectives towards sustainability practices and climate change among nurses: a systematic review protocol. BMJ Open. 2023;13(10):e071965. https://doi.org/10.1136/bmjopen-2023-071965
14. Kırtıl İ, Çağan Kişin Ş, Akyüz N. Nurses' Perceptions and Experiences Regarding Environmental Sustainability in the Operating Room: A Phenomenological Study. Nurs Health Sci. 2025;27(3):e70207. https://doi.org/10.1111/nhs.70207
15. Bobini M, Cicchetti A. Chasing environmental sustainability in healthcare organizations: insights from the Italian experience. BMC Health Serv Res. 2025;25(1):978. https://doi.org/10.1186/s12913-025-13158-x
16. Attia NM, Hamed AEM, Elbakry MAAE, Barakat AM, Mohamed HS. Navigating sustainable practice: environmental awareness and climate change as mediators of green competence of nurses. BMC Nurs. 2025;24(1):658. https://doi.org/10.1186/s12912-025-03313-4
17. Chung SJ, Lee H, Jang SJ. Factors affecting environmental sustainability attitudes among nurses – Focusing on climate change cognition and behaviours: A cross-sectional study. J Adv Nurs. 2024;16205. https://doi.org/10.1111/jan.16205
18. Sepetis A, Parlavatzas I, Zaza PN, Platis C, Fotios R, Nikolaou IE. The Role of Organizational Behavior to Sustainable Health Care: The Case of Greece. Environ Health Insights. 2024;18:11786302241298788. https://doi.org/10.1177/11786302241298788
19. Shaban MM, Alanazi MA, Mohammed HH, Mohamed Amer FG, Elsayed HH, Zaky ME, et al. Advancing sustainable healthcare: a concept analysis of eco-conscious nursing practices. BMC Nurs. 2024;23(1):660. https://doi.org/10.1186/s12912-024-02197-0
20. Badanta B, Porcar Sierra A, Fernández ST, Rodríguez Muñoz FJ, Pérez-Jiménez JM, Gonzalez-Cano-Caballero M, et al. Advancing Environmental Sustainability in Healthcare: Review on Perspectives from Health Institutions. Environments. 2025;12(1):9. https://doi.org/10.3390/environments12010009
21. Mills A. Developing a green nursing workforce to mitigate healthcare emissions and improve human health. Evid Based Nurs. 2024;ebnurs-2024-104104. https://doi.org/10.1136/ebnurs-2024-104104

22. Slutzman JE, Bockius H, Gordon IO, Greene HC, Hsu S, Huang Y, et al. Waste audits in healthcare: A systematic review and description of best practices. Waste Manag Res. 2023;41(1):3–17. https://doi.org/10.1177/0734242X221101

23. Khosravi M, Mojtabaeian SM, Marzaleh MA, Izadi R. A systematic review of factors influencing the adoption of green practices within healthcare centers to mitigate climate change. Environ Health Insights. 2025;19:11786302251332058. https://doi.org/10.1177/11786302251332058

24. Abou Hashish EA, Khattab SMAK, Mohammad HF, Elliethey NS. Exploring the Impact of Leadership, Organizational Support, and Knowledge Management in Evidence-Based Practice Implementation Among Nurse Managers Through SEM. Worldviews Evid Based Nurs. 2025;22(3):e70051. https://doi.org/10.1111/wvn.70051