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REVIEW ARTICLE

A MULTIDIMENSIONAL ANALYSIS OF GREEN HOSPITAL OUTCOMES: A SYSTEMATIC LITERATURE REVIEW

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ABSTRACT

AIM:

This systematic literature review aims to evaluate the multidimensional outcomes of green hospital practices, specifically focusing on environmental, patient-centered, and organizational dimensions to establish a comprehensive framework for healthcare sustainability.

BACKGROUND:

In recent years, green hospital initiatives have gained prominence as vital strategies for sustainable healthcare delivery. Despite the growing interest, there is a need for a holistic synthesis of how these initiatives impact various facets of hospital management and service quality.

METHOD:

A systematic search was performed across the Web of Science and PubMed databases using the keyword "green hospital" without any temporal restrictions. Following a rigorous screening process based on predefined inclusion criteria, 14 peer-reviewed studies were selected for qualitative synthesis.

FINDINGS:

The analysis indicates a significant surge in research within the last five years, reflecting a global trend. The findings demonstrate that green hospital practices are robustly associated with positive outcomes, including enhanced service quality, increased hospital attractiveness, improved patient satisfaction, optimized waste management, energy efficiency, substantial cost savings, and better environmental health indicators.

CONCLUSION:

Green hospital initiatives provide a synergistic benefit for both environmental sustainability and organizational performance. The study emphasizes that while policymakers must provide the necessary regulatory and financial framework to facilitate the green transition, healthcare managers must assume a proactive leadership role in driving this organizational transformation.

KEYWORDS

sustainability, green buildings, green hospitals

INTRODUCTION

Climate change, with its consequences such as extreme weather events and the rise in infectious and chronic diseases, is identified by the World Health Organization (WHO) as one of the most significant factors threatening global health. The WHO estimates that, as a result of the adverse effects of climate change, there will be 250,000 additional deaths each year between 2030 and 2050. These deaths are linked to various health issues, including heat-related illnesses, malnutrition, vector-borne infections, and water-related diseases. Furthermore, the climate crisis poses a significant threat not only to physical health but also to the systems that determine health, such as access to healthcare and social security [1]. Therefore, it is clear that the health sector, which has taken on an important mission in the preservation and promotion of health, must play a key role in mitigating the effects of the climate crisis. However, the fact that the health sector is currently responsible for 4.4% of global net carbon emissions, and the high level of this rate, creates a significant contradiction [2].

While performing critical functions such as protecting the health of individuals and the community, diagnosing and treating diseases, and providing rehabilitation, healthcare institutions consume significant amounts of energy and water, generate hazardous medical waste, and pose serious threats to the environment and human health. This situation necessitates healthcare institutions to be viewed not only in terms of healthcare service delivery but also as complex organizations that must be addressed within the context of their environmental impacts [3]. This impact of the health sector highlights the significant extent to which the sector contributes to the climate crisis. This situation necessitates a reevaluation of sustainable approaches in healthcare. Consequently, it is clear that the health sector must provide climate-resilient and sustainable healthcare services, reduce its carbon footprint, and adopt cleaner technologies [1]. This necessity has led to the emergence of the "green hospital" concept in the healthcare sector, incorporating many practices that have gained prominence as green buildings in other sectors. These structures have been described by Aini et al. [4] as an environmentally friendly design that enhances and highlights existing natural potential. Indeed, in green-building-certified hospitals, environmentally friendly facility design and service delivery are possible alongside practices such as hazardous material and waste management, as well as the efficient use of water and energy. This makes it possible to reduce service costs, improve quality, and ultimately ensure sustainability [5]. In that sense, green hospitals can be defined as facilities that incorporate environmentally sustainable building features, including the use of green technologies, efficient water and energy conservation practices, strategic locations that minimize transportation costs, the provision of healthy food options, the integration of alternative energy generation systems, and well-designed waste management infrastructure [6], [7].

As the benefits of green buildings—which can be adopted in facilities across various sectors—have become increasingly recognized, green building rating and certification systems have also been developed. These systems subsequently established various criteria to evaluate "green hospitals" based on the green building concept [8]. In a comparative analysis of LEED, BREEAM, and WELL certifications conducted by Tsirovasilis et al. [9], it was noted that these systems go beyond environmental performance to address social sustainability, which also encompasses user well-being. The study found that while LEED and BREEAM are primarily focused on environmental and energy aspects, the WELL certification distinguishes itself by emphasizing human-centered health parameters. Therefore, green hospitals should be evaluated not only in terms of environmental impacts but also in terms of organizational and patient-centered impacts. Indeed, Nurfikri et al. [10] demonstrated in their studies that, alongside growing environmental awareness, patients' preference for green hospitals has become a significant driving force encouraging healthcare institutions to adopt sustainability policies. These findings reveal that the green hospital concept is the result of not only an institutional transformation but also a demand-driven change.

Reducing environmental pollution caused by healthcare services requires preventing the excessive or inefficient use of resources and systematically minimizing the environmental footprint of operational processes. Implementing such measures enhances the efficiency of healthcare services, supports the delivery of higher-value-added services, and

directly contributes to improving public health [11]. In addition to promoting energy and water conservation in hospitals, green initiatives also offer benefits such as providing patients with care in a higher-quality environment and ensuring better hygiene. When the environmental benefits are also taken into account, it is an undeniable fact that the green hospital concept can provide multifaceted benefits [7]. Given the critical importance of the sustainability of healthcare services for global health and social well-being, the multidimensional impacts of green hospital practices must be addressed from a holistic perspective. Accordingly, this study aims to examine the outcomes of green hospital practices from a multidimensional perspective. Studies in the literature generally focus on limited contexts, and no systematic review has been found in the literature that comprehensively examines the multidimensional impacts of green hospitals. This study systematically reviewed studies examining the effects of green hospitals on environmental, patient-centered, and organizational outcomes. In this regard, the study provides an evidence-based framework regarding the impacts of green hospital practices for researchers, healthcare managers, and policymakers, and has the potential to make a significant contribution to the literature.

MATERIAL AND METHOD

RESEARCH STRATEGY

This study is a systematic literature review. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines were followed in the design, conduct, and reporting of the study. The PRISMA statement, which serves as both a guide and a checklist, is primarily a reporting guideline used to ensure that systematic literature reviews and meta-analyses are conducted and reported within a standardized framework. It provides a standard framework that includes the selection of study titles, the establishment of the study background, the identification and selection of studies, the assessment of bias, and the reporting of results [12]. The Web of Science (WoS) and PubMed databases, whose credibility is internationally recognized, were selected for the literature review. The keyword "green hospital" was used in both databases to identify relevant studies. The search strategy was tailored for each database to ensure the retrieval of studies aligned with the research objectives. A search was conducted using the relevant keyword in all fields of the Web of Science (WoS) database and in the title and abstract fields of the PubMed database. No time restrictions were applied to the searches.

INCLUSION AND EXCLUSION CRITERIA

The eligibility criteria were determined prior to the literature search. Studies were included if they (i) were published in English or Turkish, (ii) were original research articles, and (iii) investigated the environmental, patient-centered, or organizational outcomes of green hospital practices. Publications that did not meet these criteria were excluded. Specifically, review articles, letters to the editor, conference proceedings, editorials, commentaries, and studies that were not directly related to the outcomes of green hospital practices were excluded from the review.

DATABASE SEARCH AND SELECTION OF THE STUDIES

Duplicate studies were excluded from the pool of studies identified through database searches. The titles and abstracts of the remaining studies were reviewed; after excluding studies identified during this initial screening, the full texts of the remaining studies were examined, and those meeting the study criteria were included. Finally, the selected studies underwent a quality assessment regarding reporting quality and risk of bias. Here, the quality of the studies was assessed within the framework of the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) statement, which is frequently used in the literature [12]. Since it was determined that all included studies met at least half of the criteria listed in the STROBE statement, no studies were excluded as a result of the quality assessment. The entire screening process was conducted independently by two researchers and subsequently reviewed jointly, and consensus was reached regarding the studies to be included.

DATA EXTRACTION

To compare the results of database searches and exclude duplicate studies, the search results were exported in Excel format. Subsequently, to extract the findings of the studies selected for inclusion, the researchers used an Excel table

containing the authors and years of the studies, their objectives, design, sample characteristics, measurement tools, and main findings. This table was created separately by each researcher and then consolidated.

RESULTS

An initial search of the WoS database yielded 112 studies; after selecting the "article" option, the number of studies was narrowed down to 71. All studies were screened based on their titles and abstracts. Of the studies whose titles and abstracts were reviewed, 18 were selected for full-text review, and the full text of 1 study was unavailable. Following the full-text review, 4 studies were excluded, and 13 studies were ultimately included. A search of the PubMed database yielded 51 results. It was determined that 17 of these studies were duplicates of those obtained from the WoS database, while 34 studies were subjected to a title and abstract review. The remaining 2 studies were included for full-text review. Access to the full text of 1 study could not be obtained. 1 study was included. Ultimately, a total of 14 studies were included from both databases (Figure 1). The findings from the included studies are summarized in Table 1.

FIGURE 1. PRISMA FLOWCHART

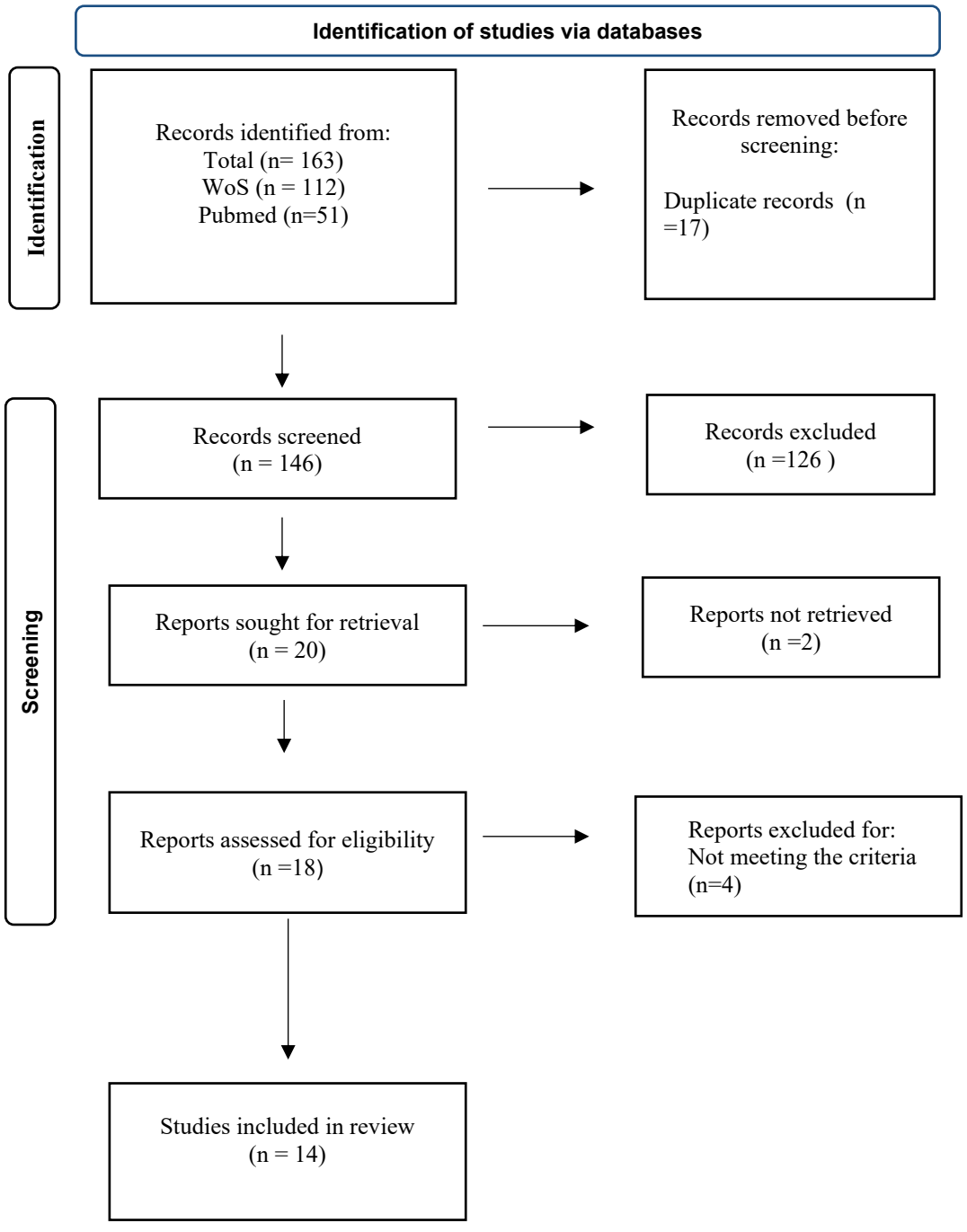


TABLE 1. CHARACTERISTICS AND FINDINGS OF THE INCLUDED STUDIES

Studies	Language	Aims	Design	Sample	Measurement	Main Findings
Nurfikri et al., 2024	English	To analyze the impact of public awareness, attitudes, behaviors, and social norms on shaping the corporate image of green hospitals	Quantitative	400 outpatients receiving care at green hospitals in Indonesia and Taiwan	Survey Form	Green hospital initiatives have been identified as a key factor in increasing patients' choice of hospital and their trust in healthcare facilities.
Aini et al., 2023	English	To develop and analyze a sustainable "eco-friendly hospital" model that integrates the components of green building, green innovation, and green human resource management	Quantitative	A total of 241 participants from a public hospital in Indonesia: 84 staff members, 100 visitors, and 57 residents living in the vicinity of the hospital	Survey Form	Green building, green innovation, and green HR practices each have a meaningful and positive impact on the hospital's environmental performance and organizational sustainability. Green initiatives—such as solar energy, waste sorting, and online systems—reduce costs while creating a cleaner, more comfortable, and safer healthcare environment for patients and the local community.
Wood et al., 2016	English	To identify the needs of patients, visitors, and staff in green hospital design and to develop a "House of Quality" model that translates these needs into technical design requirements	Quantitative	A total of 149 end users from public and private hospitals in Malaysia	Survey Form	It has been determined that the most important green design factors for end-users are "safety in emergencies," "natural ventilation," "use of natural light," and "use of non-toxic materials." Satisfaction with green design among private hospital users was found to be significantly higher than among public hospital users.
Ngatindriatun et al., 2024	English	To analyze the relationship between green hospital initiatives and patient flow issues and service quality, as well as their impact on patient satisfaction in specialized medical departments	Quantitative	572 patients receiving care at five different hospitals in Indonesia that have received the national "Green Hospital" award	Survey Form	Green initiatives have a significant and positive impact on patients' satisfaction with the indoor and outdoor environments, operational procedures, and care services. Green service quality has been identified as a key factor in mitigating the negative impact of disruptions in hospital processes on patient satisfaction.

Kara et al., 2024	English	To analyze the effects of the LEED certification system and hospital expansions on healthcare quality, pandemic management, and environmental performance using mathematical modeling	Quantitative	Two hospitals in Northern Cyprus: Near East University Hospital (Private/LEED Gold Certified) and Dr. Burhan Nalbantoğlu Hospital (Public)	LEED evaluation criteria, LEED Healthcare criteria, and	It has been found that a private hospital with LEED Gold certification significantly outperforms a non-certified public hospital in terms of patient and staff satisfaction and service quality. It has been mathematically proven that hospital expansions facilitate the management of pandemics such as COVID-19 by improving criteria such as water efficiency, indoor environmental quality, and sustainable land use.
Ryan-Fogarty et al., 2016	English	To evaluate the implementation and effectiveness of a systematic environmental management framework that integrates technical infrastructure with staff training, and to improve the hospital's environmental performance in areas such as energy and waste management	Mixed	Cork University Hospital - Ireland	Environmental Review, Sustainability Key Performance Indicators (KPIs), Employee	As a result of systematic green management practices, despite an increase in hospital activity, energy consumption per patient bed was reduced by 14%, and the amount of waste sent to the landfill was reduced by 35%.
Golbazi & Aktas, 2020	English	To determine the priority that green hospitals place on LEED credits that directly impact patient well-being and to compare patient satisfaction levels at these facilities with the national average	Quantitative	140 healthcare facilities certified in the U.S. for LEED scorecard analyses, and 52 green hospitals among these facilities for which patient satisfaction data is available	USGBC LEED Scorecards, Patient-Consumer-Healthcare Provider	Green hospitals were found to have a "General Hospital Score" 3.6% higher than the national average, and a "Recommendation Rate" 5.6% higher. No statistically significant difference was found between green and traditional hospitals in terms of perceptions of cleanliness and quietness.
Dion & Evans, 2024	English	To develop "green hospital" management strategies that integrate energy efficiency and corporate governance in healthcare institutions	Qualitative	10 hospitals—both public and private—operating in the Middle East and North Africa (MENA) region; 29 senior executives included in the data collection process	Interviews and Site Observations	Energy management projects have yielded tangible results, including a 23% reduction in energy consumption at the facility level and an annual cost savings of $85,700.

Bagherian & Mukherjee2025	English	To develop a systematic framework for implementing the "Quality 5.0" approach—which balances technological, patient-centered, and ethical objectives in the healthcare sector—and to analyze the strategic prioritization of patient-centered innovations	Qualitative	43 experts (doctors, nurses, administrators, and clinical pharmacists) with experience in the digital transformation of healthcare; a medium-sized public hospital in southern Germany with 300 beds and approximately 500 employees	Hybrid practice	Green hospital initiatives and sustainable practices have been identified as key strategic approaches for reducing operational and environmental costs.
Fannah et al., 2023	English	To measure the environmental impacts of clinical anesthesia and surgical procedures in healthcare delivery and to develop a data-driven "green hospital" approach for healthcare planning.	Quantitative	A tertiary care hospital in Oman (Royal Hospital)	Secondary data	It has been concluded that environmental sustainability must be managed as part of the quality dimensions of healthcare.
AlShareef et al., 2022	English	To investigate whether designating a "green hospital" during the pandemic ensured the safe and uninterrupted resumption of surgical services	Quantitative	Hospitals designated as "green hospitals" in five cities in the northern regions of Saudi Arabia (experimental group); A large tertiary care hospital in Riyadh that is not designated as a green hospital (control group)	Secondary data	The green hospital model reduced surgical backlogs by 81% in the Al Jawf region, 78% in the Northern Borders, and 74% in Alqurayat. In the control group (non-green hospitals), the backlog reduction rate was found to be only 8%.
Sadatsafavi vd. 2014	English	To compare the financial performance of LEED-certified hospitals with the average performance of non-green facilities	Quantitative	14 LEED-certified hospitals in the U.S. (experimental group) and 3,522 hospitals listed in the Medicare/Medicaid (CMS) database (control group)	Secondary data	Operating costs for green hospitals were found to be approximately 84% higher than those of an average non-green hospital. Green hospitals generated 82% more inpatient revenue, but this increase in revenue was not sufficient to offset the higher operating costs. It was found that a higher LEED certification level (such as Gold or Platinum) does not guarantee better financial performance.

Jannah vd.2023	English	To determine the impact of "Green Brand Image" and "Green Satisfaction" on "Green Brand Value" through "Green Trust" for outpatients	Quantitative	100 outpatients receiving care at the East Java Hospital in Indonesia	Survey Form	The impact of green brand image and green satisfaction on green brand value is mediated by green trust.
Ghersin vd. 2020	English	To examine the entrenched culture of waste and the generation of medical waste in the healthcare sector from an ethical perspective, and to conduct a quantitative analysis of the volume and cost of medical supplies that were opened but never used and subsequently discarded in a pediatric intensive care unit	Quantitative	A 14-bed pediatric intensive care unit at Massachusetts Children's Hospital in the U.S.	Secondary data	During the study, 76 kg of unused medical waste was collected; it was determined that the majority of the waste originated from isolation rooms and unopened packages. While endotracheal tubes, baby diapers, and suction catheters were the most commonly wasted materials, it was emphasized that even high-cost equipment was being discarded without being returned to the system, and that this situation conflicted with principles of environmental sustainability and bioethics.

A total of 14 studies that met the inclusion criteria were analyzed as a result of the systematic review. All studies were published in English, and the vast majority employed a quantitative design. The studies were concentrated within the last 5 years and were conducted in various regions around the world. Additionally, it was determined that the studies were predominantly conducted in the Southeast Asian countries of Indonesia and Malaysia. Studies conducted in the Middle East were found to have been carried out in Saudi Arabia and Oman, while those in European countries were conducted in Ireland and Germany. The findings of the studies focus on three main themes: end-user-focused outcomes, environmental outcomes, and organizational outcomes.

It has been determined that green hospital initiatives are associated with numerous positive outcomes for patients and end-users. Providing clean, comfortable, and safe service areas for patients [4], delivering higher-quality healthcare services [14], and increasing patient satisfaction [15], [16], [17], [14] stand out as the most significant outcomes of green hospitals from the patients' perspective.

Green hospital initiatives are associated with a range of benefits, not only for patients but also for healthcare institutions. In addition to improving patient experience and satisfaction, these initiatives increase the institution's desirability [10], and likelihood of being recommended [16], enhance employee satisfaction [14], and contribute to brand value [18], as well as reducing costs associated with energy consumption and waste volume [19], [4], [20], [21], are among the institutional benefits of green hospitals. Furthermore, being designated as a "green hospital" during crisis periods such as the pandemic ensured the uninterrupted continuation of elective surgeries and significantly reduced surgical backlogs (by up to 81% in some regions) [22]. On the other hand, Sadatsafavai et al. [23], argue that facility operating costs may increase under green hospital practices and that green hospitals do not guarantee cost reductions or better financial performance.

As the third theme, the environmental impacts of green hospital practices are addressed. Energy efficiency and conservation are evaluated as organizational outcomes. In this theme, findings have been obtained that contribute to environmental health and sustainability, such as a cleaner environment [10], reduced waste volumes [24], and lower greenhouse gas emissions [25].

DISCUSSION AND CONCLUSION

The aim of this study was to conduct a multidimensional analysis of the outcomes of green hospital initiatives. To this end, a systematic review was conducted of studies examining the effects of green hospitals on environmental, patient-centered, and organizational outcomes. Within this framework, 14 studies were included. The studies were primarily conducted over the past five years and took place in various regions around the world. Considering the countries where the studies were conducted, it is evident that green hospital practices are being researched more intensively, particularly in developing countries and those undergoing an energy transition. This indicates that green hospital practices remain current in many countries and that the outcomes of such practices in these countries require scientific validation. Research findings indicate that green hospital initiatives are associated with numerous positive outcomes. Across the three themes examined, it was found that these initiatives improve the patient/end-user experience and satisfaction, while often reducing institutional costs and enhancing the hospital's reputation. Furthermore, the contributions of green hospitals to environmental sustainability have been clearly demonstrated in the research. This highlights the importance of integrating sustainability principles into the strategic management processes of healthcare organizations.

A review of the literature indicates that the adoption of environmentally friendly policies, in particular, significantly enhances patients' trust in the institution and boosts brand value [18], [10]. The fact that patients prioritize green design factors such as natural ventilation, natural light, and the use of non-toxic materials when selecting a healthcare facility is a critical finding for healthcare managers [15]. Furthermore, unlike traditional approaches that measure the quality of healthcare solely through clinical outcomes, research findings indicate that a hospital's physical environment and green image are also among the key factors contributing to patient satisfaction. Indeed, the fact that the recommendation rates for green hospitals exceed the average confirms this situation [16].

One of the most significant barriers hospital managers face in the transition to green hospitals is the initial investment cost. Indeed, Sadatsafavai et al. [23] (2014) found that facility operating costs increase in green hospitals. However, the same study reported that while green hospitals may not fully offset these operating costs, they also experience a corresponding increase in inpatient revenue. According to studies reporting energy savings, reduced waste, and lower costs [19], [4], [20], [21], [24], [25], it appears that the initial investment costs can be recouped and significant long-term savings achieved [20]. Furthermore, considering the contributions green hospitals make to environmental sustainability in addition to cost savings, it can be noted that the return on the increased costs is quite high.

This study represents the first systematic literature review to examine green hospital practices from a multidimensional perspective, considering the perspectives of service users, healthcare institutions, and the environment. It is anticipated that the synthesis and reporting of findings from studies included in the literature and indexed in major databases will serve as a key reference point for policymakers, healthcare managers, and researchers regarding the outcomes of green hospital practices. Policy makers can accelerate the green transformation of healthcare institutions by developing financial support mechanisms and sustainability policies that encourage green hospital practices. It is also important for healthcare administrators to consider green hospital practices not only as an environmental responsibility but also as a strategic management approach that increases patient satisfaction, institutional efficiency, and sustainability. In future research, prioritizing comparative studies across different countries and research evaluating long-term impacts will contribute to strengthening the existing evidence base. On the other hand, this study has certain limitations. First, the literature review utilized highly recognized indexes. Consequently, studies not indexed in these databases may have been excluded from the review. Furthermore, only journal articles were included, while theses, books, and conference papers were excluded.

In conclusion, studies in the literature indicate that green hospital practices can provide significant benefits across all three themes. The proliferation of such studies will be important for more frequently comparing the potential benefits of the green hospital concept with actual implementations and for identifying its long-term effects. Additionally, healthcare managers need to consider the potential benefits of green transformation in healthcare institutions and take a leadership

role in institutional transformation processes. It is also important for policymakers to develop policies that encourage this transformation and play a facilitating role in the transformation processes by removing barriers to implementation.

References

1. World Health Organization. Health. Climate Change 2023. Available online: https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health (accessed on 24 November 2023).
2. Pichler, P. P., Jaccard, I. S., Weisz, U., & Weisz, H. (2019). International comparison of health care carbon footprints. Environmental research letters, 14(6), 064004.
3. Terekli, G., Özkan, O., & Bayın, G. (2013). Çevre dostu hastaneler: Hastaneden yeşil hastaneye. Ankara Sağlık Hizmetleri Dergisi, 12(2), 37-54.
4. Aini, F., Irianto, A., & Amar, S. (2023). Sustainable development model toward environmentally friendly hospital. Global Journal of Environmental Science and Management, 9, 61-76.
5. Baytaş, V. & Çetin Aydın, G. (2022). Sağlık kurumlarında çevreye duyarlı politikalar: Yeşil hastane örnekleri. Ekonomi Maliye İşletme Dergisi, 5(2), 336-356.
6. Dhillon, V. S. & Kaur, D. (2015). Green hospital and climate change: Their interrelationship and the way forward. Journal of Clinical and Diagnostic Research: JCDR, Cilt 9(12), LE01.
7. Tarkar, P. (2022). Role of green hospitals in sustainable construction: Benefits, rating systems and constraints. Materials Today: Proceedings, Cilt 60, 247-252.
8. Kılıç, C. H. & Güdük, Ö. (2018). Yeşil hastane kavramı ve Türkiye'deki son kullanıcıların beklentileri üzerine bir hastane örneği. Gümüşhane Üniversitesi Sağlık Bilimleri Dergisi, 7(1), 164-174.
9. Tsirovasilis, E., Katafygiotou, M., & Psathiti, C. (2025). Comparative Assessment of LEED, BREEAM, and WELL: Advancing Sustainable Built Environments. Energies, 18(16), 4322.
10. Nurfikri, A., Kesa, D. D., Wu, M., Roselina, E., & Hidayat, A. (2024). Public awareness, attitudes, behavior and norms building green hospitals' power. Heliyon, 10(20).
11. Sherman, J. D., MacNeill, A., & Thiel, C. (2019). Reducing pollution from the health care industry. Jama, 322(11), 1043-1044.
12. Page, M.J., McKenzie, J.E., Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D., ... Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ, 372:n71. doi: 10.1136/bmj.n71
13. Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP; STROBE Initiative. (2007). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: Guidelines for reporting observational studies. Lancet. 2007 Oct 20; 370(9596):1453-7. PMID: 18064739
14. Kara, B., Kaymakamzade, B., Tulbentci, T., Savasan, A., Amilo, D., & Hosseini, K. (2025). A fractional-order model for the effects of expansions in hospitals on the applicability of performance certificate programme. Applied Mathematics in Science and Engineering, 33(1), 2438769.
15. Wood, L. C., Wang, C., Abdul-Rahman, H., & Abdul-Nasir, N. S. J. (2016). Green hospital design: integrating quality function deployment and end-user demands. Journal of Cleaner Production, 112, 903-913.
16. Golbazi, M. ve Aktas, C. B. (2020). Leed certification and patient wellbeing in green healthcare facilities. Journal of Green Building, 15(4), 3-18.
17. Ngatindriatun, N., Alfarizi, M., & Arifian, R. (2024). Green hospital practices on patient's satisfaction in Indonesian hospital: medical specialist department case investigation. Journal of Modelling in Management, 19(3), 899-924.
18. Jannah, N., Bahri, M. I., Kismawadi, E. R. ve Handriana, T. (2023). The effect of green brand image and green satisfaction on green brand equity mediated green trust outpatients. Quality-Access to Success, 25(198).
19. Ryan-Fogarty, Y., O'Regan, B., & Moles, R. (2016). Greening healthcare: systematic implementation of environmental programmes in a university teaching hospital. Journal of Cleaner Production, 126, 248-259.
20. Dion, H. ve Evans, M. (2024). Strategic frameworks for sustainability and corporate governance in healthcare facilities; approaches to energy-efficient hospital management. Benchmarking: An International Journal, 31(2), 353-390.
21. Bagherian, A., & Mukherjee, S. (2025). Advancing healthcare innovation with Quality 5.0: a hybrid fuzzy AHP–TOPSIS model for strategic prioritization. International Journal of Health Care Quality Assurance, 38(4), 268-291.

22. AlShareef, Y., AlShammary, S. A., Abuzied, Y., AlAsseri, Y., & AlQumaizi, K. I. (2022). Assigning green hospitals during the COVID-19 pandemic assure continuous and safe resumption of surgical services. Annals of Medicine and Surgery, 73, 103207.
23. Sadatsafavai, H., Walewski, J. ve Taborn II, M. (2014). Comparison of a sample of green hospitals with non-green hospitals with respect to operating expenses and patient revenue. Journal of Green Building, 10(1), 169-185.
24. Ghersin, Z. J., Flaherty, M. R., Yager, P., & Cummings, B. M. (2020). Going green: decreasing medical waste in a paediatric intensive care unit in the United States. The new bioethics, 26(2), 98-110.
25. Al Fannah, J., Al Sabahi, S., Al Harthi, H., Al Bahrani, M., & Al Salmi, Q. (2023). Towards a green hospital approach in Oman: A case study of quantifying an environmental impact. The International Journal of Health Planning and Management, 38(5), 1583-1589.