CURRENT PERSPECTIVES IN NURSING:
ENVIRONMENTAL SUSTAINABILITY AND CLINICAL PRACTICE

Editör:
Doç. Dr. Mehmet Salih YILDIRIM



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Current Perspectives in Nursing: Environmental Sustainability and Clinical Practice

Editor: Doç. Dr. Mehmet Salih YILDIRIM

ISBN: 978-625-5057-67-9

1st Edition
Page Layout By: Gözde YÜCEL
Publication Date: 2026-10-25
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Güzeltepe Mahallesi Abidin Daver Sokak Sefer Apartmanı No: 7/9 Çankaya / Ankara

PREFACE

Nursing brings together scientific knowledge, clinical judgment, ethical responsibility, and a commitment to human well-being. As healthcare needs evolve, nurses must consider both the quality of care delivered to individuals and the wider conditions that influence health. Environmental sustainability and evidence-based clinical practice are important dimensions of this responsibility, inviting reflection on how care is planned, delivered, and improved. Current Perspectives in Nursing: Environmental Sustainability and Clinical Practice brings these dimensions into a shared discussion. The book explores planetary health, sustainable healthcare, and green nursing alongside the evidence and practical considerations surrounding early mobilization in surgical patients. It aims to support nurses, educators, researchers, students, and other healthcare professionals in examining contemporary challenges from both environmental and clinical perspectives. The sections addressing planetary health and sustainable healthcare encourage readers to consider the relationships between human health, ecological systems, and healthcare delivery. Within this context, green nursing offers a framework for reflecting on environmental responsibility in everyday professional practice. Resource use, care processes, education, and organizational decisions provide opportunities to consider how sustainability can be incorporated into nursing while maintaining patient safety and care quality. The discussion of early mobilization in surgical patients turns attention to a specific area of clinical practice. By examining evidence, principles for safe

implementation, and the nurse's role, this section highlights the importance of informed assessment, individualized planning, and collaboration within the healthcare team. It also invites readers to consider how research findings can guide practical decisions in varied clinical settings. Together, these topics reflect the breadth of contemporary nursing responsibilities. Environmental awareness requires attention to the wider consequences of healthcare decisions, while effective clinical practice depends on careful judgment and responsiveness to individual needs. Bringing these perspectives into one volume creates an opportunity to examine how professional knowledge, education, and leadership can support thoughtful improvements in care. I extend my sincere thanks to all contributing authors for sharing their knowledge, experience, and scholarly work. I hope this book will encourage critical discussion, support learning, and help readers connect contemporary ideas with their own professional responsibilities. May it serve as a useful resource for those working toward environmentally responsible healthcare and safe, evidence-based nursing practice.

Assoc. Prof. Dr. Mehmet Salih YILDIRIM

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CHAPTER 1

PLANETARY HEALTH

FATMA BETÜL ÖZ DAMKALI[1]

Introduction

Human civilization has entered the Anthropocene an epoch in which it has established an unprecedented level of dominance over Earth's biophysical and geochemical systems. Industrialization, unchecked resource consumption, and population growth have disrupted the planet's atmospheric, hydrological, and biogeochemical balances, destabilizing the fundamental systems that support human life. While public health initiatives and biomedical advancements have historically succeeded in extending average life expectancy, these gains have come at the cost of the overexploitation and pollution of ecosystems. In response to this contradictory reality, the discipline of "Planetary Health" emerged formalized by the 2015 report from the Rockefeller Foundation and The Lancet Commission as a holistic field that examines the dynamic and systemic relationships between the health of human civilization and the sustainability of Earth's natural systems.

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The Anthropocene Epoch and the Medical Dimension of Ecosystemic Crises

Human civilization has entered the Anthropocene (the Age of Humans) a phase in which it has established an unprecedented level of dominance over Earth's biophysical and geochemical systems (Crutzen, 2002; Donohoe, 2027). Industrialization, population growth, the uncontrolled use of resources, and technological interventions have led to destructive disruptions in the planet's atmospheric, hydrological, and biogeochemical balances (Fialová, 2026; McNeill and Engelke, 2016). The "Planetary Boundaries" framework, developed by Rockström et al., identifies nine critical thresholds: biosphere integrity, climate change, land-system change, freshwater use, biogeochemical flows, ocean acidification, stratospheric ozone depletion, atmospheric aerosol loading, and the introduction of novel entities (synthetic chemicals and other human-made substances) (Rockström et al., 2009, 2024; Steffen et al., 2015; Richardson et al., 2023). Exceeding these boundaries causes the planet to move outside its "safe operating space" and leads to the destabilization of the fundamental ecological systems that support human life (Fialová, 2026).building sustainable healthcare systems (Razek et al., 2025; Attia et al., 2025).

Although the traditional approach to public health has achieved significant success over time in extending average life expectancy and controlling infectious diseases, these gains have come at the cost of the overexploitation and pollution of ecosystems (Rossa-Roccor et al., 2020). Historically, the public health practices of early modern nation-states lowered mortality rates, paving the way for population booms and the growth of industrial economies; however, this also accelerated ecological destruction (Brooke, 2014; Fialová, 2026). Conventional medical metrics such as disability-adjusted life years (DALYs) have tended to evaluate human health as a parameter

independent of the resilience of ecosystems (Rossa-Roccor et al., 2020). In contrast, the crises of the Anthropocene including air pollution, biodiversity loss, food insecurity, extreme weather events, and the spread of vector-borne diseases threaten human physiology and psychosocial health through both direct and indirect pathways (Ponte et al., 2026; Whitmee et al., 2015).

The Emergence and Definition of the Concept of Planetary Health

A new, interdisciplinary field has emerged to address the contradiction between ecological destruction and human health (Rossa-Roccor et al., 2020).The concept of "Planetary Health" was formalized in a landmark report published in 2015 by the Rockefeller Foundation and The Lancet Commission (Whitmee et al., 2015; Zyoud and Zyoud, 2025).

The Commission defines Planetary Health as follows: "Achieving the highest attainable standard of health, well-being, and equity worldwide, through the careful management of the human systems (political, economic, and social) that shape the future of human civilization, and the Earth's natural systems that define the safe environmental boundaries within which humanity can flourish." (Whitmee et al., 2015; Donohoe, 2027)

Planetary Health examines the dynamic and systemic relationships between global environmental changes, the degradation of natural systems, and the local, regional, and global impacts of these disruptions on human health and well-being (Pongsiri et al., 2019). This concept approaches human health not as the state of an individual organism, but as an outcome of a global network of systems intertwined with air, water, soil, and biodiversity (Fialová, 2026; Pongsiri et al., 2019). Furthermore, by being directly integrated with the United Nations Sustainable Development Goals (SDGs), it aims to foster cross-sectoral collaboration and policy

coherence, while highlighting both the co-benefits and the trade-offs associated with various decisions (Pongsiri et al., 2019).

Paradigm Shift: From Anthropocentrism to a Relational and Ecosystemic Approach

One of the most fundamental contributions offered by the discipline of Planetary Health is the questioning of the dominant anthropocentric (human-centered) and instrumentalist view of nature prevalent in medicine and the natural sciences (Fialová, 2026).

Epistemological Transformation: While the classical biomedical model tends to treat the human body as a machine isolated from its environment, Planetary Health defines the human being as an integral part of the biosphere's profound evolutionary and ecological processes (Fialová, 2026).

The Debate on the "Subject" of Health: Significant theoretical discussions exist within the literature surrounding the question, "Who is the subject of health?" (Fialová, 2026). It is questioned whether the primary focus should be on human civilization and societal health as in the approach of the Rockefeller-Lancet Commission or on the Earth system itself, which sustains the continuity of life as in the "Planetary Boundaries" framework. This ambiguity is noted as a factor that facilitates the convergence of diverse disciplines (Fialová, 2026).

Relationality: As emphasized by Sabine Gabrysch (2018, 2022), the distinction between humans and nature is a construct; "the environment is a part of us, and we are a part of the environment." The air we breathe is produced by microorganisms and plants, while the water within our bodies is in a constant state of circulation with the oceans and rivers (Fialová, 2026). Indigenous and Traditional Knowledge Systems: In contrast to the objectifying conception of nature found in Western medicine, Indigenous knowledge systems and ancient ecological traditions (Prescott and Logan, 2019; Redvers

et al., 2022) position humans not as masters of nature, but as ordinary members and guardians of the ecological community (Fialová, 2026; Rossa-Roccor et al., 2020).

Structural and Historical Dimension: As researchers such as Merrill Singer (2025) and Malcom Ferdinand (2022) have pointed out, the processes of capitalism, colonialism, and globalization lie at the root of ecological destruction and health inequalities; this gives rise to environmental injustices and historical burdens (Fialová, 2026; Benach et al., 2026).

Comparing Holistic Health Paradigms: One Health, EcoHealth, and Planetary Health

The increasing pressure of human activities on ecosystems has exposed the limitations of traditional, siloed approaches to medicine and public health, paving the way for the development of holistic paradigms that address human, animal, and environmental health in an integrated manner (Lerner and Berg, 2017; Rossa-Roccor et al., 2020; Zyoud and Zyoud, 2025). The most prominent among these paradigms are the One Health, EcoHealth, and Planetary Health approaches (Fialová, 2026; Lerner and Berg, 2017; Zyoud and Zyoud, 2025). While all three approaches acknowledge the inextricable link between human health and ecological systems, they differ significantly in terms of their historical origins, primary focus, temporal and spatial scales, and stakeholder structures (Lerner and Berg, 2017; Zyoud and Zyoud, 2025):

One Health: Rooted in veterinary medicine and the concept of "One Medicine," and having gained momentum following the 2003 SARS outbreak and the 2004 Manhattan Principles, this approach focuses on the intersections between humans, domestic and wild animals, and their immediate environments (Adisasmito et al., 2022; Zyoud and Zyoud, 2025). Operationalized by the FAO, UNEP, WHO, and WOAH (the "Quadripartite"), One Health. It primarily targets short-

to medium-term, concrete, and reactive/preventive interventions concerning zoonotic disease outbreaks, food safety, antimicrobial resistance (AMR), and vector-borne threats (Adisasmito et al., 2022; Ponnampalam et al., 2026; Zyoud & Zyoud, 2025). For instance, practices such as balanced animal nutrition and the repurposing of agro-industrial by-products serve as direct "One Health" interventions that support animal health at the farm level, enhance food safety, and contribute to the reduction of antimicrobial use (Ponnampalam et al., 2026).

EcoHealth: Centered on an ecosystem approach to health, this discipline focuses on the structure of ecosystems, biodiversity, community engagement, and the resilience of socio-ecological systems (Lerner & Berg, 2017; Zyoud & Zyoud, 2025). The involvement of local communities, interdisciplinarity, and socio-economic justice form the core of EcoHealth research (Benach et al., 2026; Lerner & Berg, 2017).

Planetary Health: Defined by the 2015 report from the Rockefeller Foundation and The Lancet Commission, this approach examines the global and systemic relationships between the health of human civilization and the sustainability of Earth's biogeochemical and climatic systems (Whitmee et al., 2015; Zyoud & Zyoud, 2025). Compared to the other two approaches, the time horizon is much longer (generations from 2100 onwards), and the focus is on global-scale environmental crises such as climate change, ocean acidification, biodiversity loss, and land-use change as well as their broad impacts on human well-being (Andreou et al., 2026; Fialová, 2026; Whitmee et al., 2015).

"One Health – One Planet – One Mind" Continuity

The traditional "One Health" architecture has largely framed the interaction between human, animal, and environmental health through the lens of biomedical, epidemiological, and

microbiological threats such as zoonoses, pathogen spillover, food hygiene, and chemical pollutants (Umar et al., 2026). However, the profound impacts of ecological crises on human psychology, cognitive processes, and social behaviors have extended beyond the boundaries of the classical One Health framework (Umar et al., 2026). Developed to address this conceptual gap, the "One Health-One Planet-One Mind" (OH–OP–OM) model examines planetary processes ("One Planet"), the physiological health of humans and animals ("One Health"), and psychosocial/mental processes ("One Mind") as an integrated continuum (Umar et al., 2026).

Within this continuum, the "One Mind" component represents how signals of ecological destruction and environmental change are perceived within the human mind and processed at both emotional and cognitive levels (Umar et al., 2026). Disruptions in planetary systems such as droughts, the loss of biodiversity, the drying up of rivers, and extreme weather events create not merely physical exposure for individuals and communities, but also an existential threat and chronic "anticipatory distress" (Albrecht et al., 2007; Umar et al., 2026). These psychosocial responses within the mental realm directly shape tangible human behaviors, including land use, livestock management, engagement with veterinary services, the conservation of natural resources, and disaster preparedness (Ponnampalam et al., 2026; Umar et al., 2026). Consequently, mental health ceases to be a passive "outcome" of ecological crises and instead emerges as an active "psychosocial determinant" that shapes the interactions between humans, animals, and the environment (Umar et al., 2026).

Eco-Anxiety and the Psychosocial Determinant Role of Mental Health

In the Anthropocene era, psychological responses arising from environmental degradation are defined in the literature through various concepts:

Eco-Anxiety: A state of chronic or anticipatory unease, apprehension, and worry stemming from perceived environmental destruction, the climate crisis, and uncertainties regarding the future of the planet (Boivin et al., 2025; Clayton & Karazsia, 2020; Kurth & Pihkala, 2022; Umar et al., 2026).

Solastalgia: A profound sense of desolation and existential distress experienced by an individual when their home the environment to which they feel a sense of belonging undergoes environmental destruction before their very eyes (Albrecht et al., 2007; Stanley et al., 2024).

Ecological Grief: A sense of mourning and loss arising from the disappearance of ecosystems, species, or natural habitats (Cunsolo & Ellis, 2018).

Unlike classic clinical anxiety disorders, eco-anxiety is a natural emotional response to a rational and real threat (Clayton & Karazsia, 2020; Hickman et al., 2021; Umar et al., 2026). However, the impact of eco-anxiety on social behaviors and systemic resilience is non-linear (Mathers-Jones & Todd, 2023; Ogunbode et al., 2022; Umar et al., 2026):

Adaptive (Protective) Response Cycle: Moderate levels of ecological anxiety; It increases individual awareness and triggers social solidarity as well as pro-environmental behaviors (Mathers-Jones and Todd, 2023; Umar et al., 2026). When individuals and communities feel empowered to take action possessing a sense of "perceived agency"and find social support, eco-anxiety can

transform into ecological agency and adaptation (Pihkala, 2020; Umar et al., 2026).

Maladaptive (Destructive) Response Cycle: High levels of unaddressed eco-anxiety lead to helplessness, hopelessness, emotional numbing, and fatalism (Lawrance et al., 2022; Ojala, 2012; Umar et al., 2026). This state causes individuals to avoid environmental issues and withdraw from animal welfare and conservation programs, ultimately leading to a deepening of ecological destruction (Umar et al., 2026).

Planetary Health Ethics: Indigenous Knowledge Systems and Relational Ethics

Traditional Western bioethics and public health ethics are largely predicated on the assumption of an autonomous, rational, and sovereign individual, while tending to treat nature as an instrumental resource available for human use (Fialová, 2026; Gardiner, 2022). However, the crises of the Anthropocene have exposed the inadequacy of this anthropocentric ethical framework a perspective that isolates humans from the biosphere, ecosystems, and evolutionary processes (Fialová, 2026). Planetary Health Ethics repositions the human not as a master over nature, but as a fragile and interdependent member of a complex web of relationships, shaped within the deep-time horizon of life itself (Benach et al., 2026; Fialová, 2026).

One of the most potent sources of inspiration for this ethical shift is found in Indigenous knowledge systems and traditional ecological wisdom (Fialová, 2026; Prescott and Logan, 2019; Redvers et al., 2022; Rossa-Roccor et al., 2020). In contrast to Western medical paradigms, Indigenous traditions reject the dichotomy between humans and nature:

Kincentric Ecology: As defined by Enrique Salmón (2000), Indigenous communities perceive all elements of an ecosystem soil,

water, plants, and animals as "kin." As a "keystone species" within the local ecology, humans have a responsibility to protect and care for this web of kinship (Salmón, 2000; Fialová, 2026).

An Ethic of Reciprocity and Gratitude: Robin Wall Kimmerer (2020) emphasizes that the resources provided by nature are "gifts" and that these gifts should not go unreciprocated; humans are obligated to respond to the ecosystem through acts of reverence, care, and protection (Fialová, 2026). Ailton Krenak (2024) encapsulates this existential relationality by describing the emotional bonds formed with rivers and mountains through the expression "we-river, we-earth" (Fialová, 2026).

Land Ethic and Deep Ecology: The "Land Ethic" developed by Aldo Leopold (2020) expands the boundaries of the moral community to include the land, waters, plants, and animals, defining health as the land's capacity for self-renewal (Fialová, 2026). Similarly, Arne Naess's (2016) theory of "Deep Ecology" posits that all living beings possess an intrinsic value, independent of their utility to humans (Fialová, 2026).

Epistemic Justice: Joan Benach and colleagues (2026) argue that when academic knowledge fails to engage with social and Indigenous experiences, "epistemic injustice" is perpetuated; It is stated that an ethic of Planetary Health can only be realized by dismantling hegemonic knowledge hierarchies and establishing a democratic partnership of knowledge (Benach et al., 2026).

Structural and Historical Burdens: Capitalism, Colonialism, and Environmental Injustices

Planetary health crises and global health inequalities are neither neutral nor accidental, nor do they stem merely from technical shortcomings (Benach et al., 2026; Fialová, 2026). These crises are a direct consequence of capitalism, colonialism, extractivism (the appropriation of materials/resources), and commercial determinants

all of which have been shaped through historical processes (Amrith, 2024; Benach et al., 2026; Fialová, 2026; Gilmore et al., 2023).

Decolonial Ecology and the Ecosyndemic Approach: In his work Decolonial Ecology, Malcom Ferdinand (2022) reveals the historical and colonial link between the comfort enjoyed by a consumer in the Global North and the plight of agricultural workers in the Global South for instance, those in Caribbean banana plantations who are poisoned by banned chemicals (Fialová, 2026). Meanwhile, through the concept of "ecosyndemics," Merrill Singer (2025) explains how social inequalities and environmental destruction converge with biological disease processes to inflict compounded harm upon vulnerable populations (Fialová, 2026).

Pollution as Colonialism: Max Liboiron (2021) and Michelle Murphy (2021) argue that the release of industrial chemicals and plastics into the environment constitutes a "non-consensual" intervention, wherein violence inflicted upon the land translates directly into violence against human bodies (Fialová, 2026). The "permits to pollute" granted to industrialized states and global corporations effectively legalize environmental injustice (Fialová, 2026; Landrigan et al., 2025).

Sacrifice Zones: Areas abandoned to environmental destruction, extractive mining, and toxic waste for the sake of global capital accumulation are defined as "sacrifice zones" (Andreucci and Zografos, 2022; Benach et al., 2026). This situation leads to a scenario where the peoples of the impoverished Global South who bear the least responsibility for ecological crises end up shouldering the heaviest, most devastating health burdens resulting from these crises (Benach et al., 2026; Fialová, 2026; Gardiner, 2011).

Conclusion

In conclusion, Planetary Health is a transformative approach that reveals the inextricable link between the health of human civilization

and the resilience of Earth's natural systems, necessitating a shift from theoretical definitions to decisive action. In the face of Anthropocene crises, the anthropocentric and reductionist limitations of conventional medicine must be transcended; mental processes including eco-anxiety linked to the climate crisis should be integrated into health systems within a "One Health,One Planet, One Mind" continuum, recognizing them as active psychosocial determinants that shape social cohesion and proactive environmental agency. Global health justice cannot be achieved without addressing the deep-seated structural root causes of environmental destruction and health inequalities, such as the legacy of colonialism, the dynamics of capitalist growth, and commercial determinants. Accordingly, health policies should adopt an intergenerational time horizon spanning at least 100 years (up to 2126 and beyond). Furthermore, a just and sustainable future must be built by securing the Rights of Nature and laws against ecocide within international legal frameworks, grounded in critical, transdisciplinary principles that bridge academic knowledge with societal and Indigenous wisdom.

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CHAPTER 2

EARLY MOBİLİZATİON İN SURGİCAL PATİENTS: EVİDENCE, PRİNCİPLES FOR SAFE IMPLEMENTATİON, AND THE NURSE'S ROLE

1. Hatice EĞİLMEZ[1]
2. Çiğdem AKSU[2]

Introduction

Although surgical procedures are an important treatment option for alleviating symptoms, improving survival, and enhancing quality of life, they may also result in various short- and long-term postoperative complications. In particular, prolonged postoperative bed rest can lead to reduced muscle strength and physical capacity, insulin resistance, venous stasis, an increased risk of thromboembolism, and pulmonary complications (Alsuwaylihi et al., 2026). Therefore, facilitating safe and early mobilization during the postoperative period is considered a key component of the recovery process (Tazreean et al., 2022; Alsuwaylihi et al., 2026).

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The Enhanced Recovery After Surgery (ERAS) approach aims to accelerate postoperative recovery by improving the quality of care for surgical patients and supporting recovery through the systematic implementation of evidence-based practices throughout the perioperative period (Grant & Engelman, 2025). Early mobilization is a key component of the ERAS approach and may contribute to functional recovery, restoration of mobility, and improvements in certain surgical outcomes (Tazreean et al., 2022). However, evidence regarding the effects of early mobilization on clinical outcomes, including morbidity and length of hospital stay, varies across surgical populations and according to the mobilization protocols used (Willner et al., 2023).

Early mobilization is an essential component of care that should be planned according to the surgical patient's clinical condition and individual needs. The timing and extent of mobilization may be influenced by various factors, including the type of surgery, the patient's current functional status, pain, hemodynamic and respiratory stability, the treatments being administered, the medical devices in use, and the presence of complications (Alsuwaylihi et al., 2026). This section examines the importance of early mobilization in surgical patients, the fundamental principles of safe mobilization, and the nurse's role in this process in light of the current literature.

The Importance of Early Mobilization in Surgical Patients

Early mobilization is recognized as an important component of postoperative care for surgical patients. Prolonged postoperative immobilization may contribute to functional decline, particularly in patients with limited muscle strength and physical capacity. Therefore, early mobilization aims to increase patients' physical activity as soon as clinically appropriate after surgery, with the goal of restoring functional mobility and facilitating a return to activities

of daily living. Furthermore, early mobilization forms part of a multimodal recovery strategy that integrates other care practices, including early oral feeding, multimodal analgesia, appropriate fluid management, and the early removal of unnecessary catheters (de Almeida et al., 2017; Gustafsson et al., 2019; Tazreean et al., 2022).

Patient-centered strategies to promote the implementation of early mobilization within ERAS programs are also important. In a randomized pilot study involving patients undergoing elective colorectal surgery, motivational interviewing increased the amount of time patients spent out of bed and the proportion of patients who achieved their daily ERAS mobilization targets. These findings suggest that providing patients with information and supporting their motivation may help them achieve early mobilization goals (Wiesenberger et al., 2024).

The literature indicates that early mobilization plays an important role in the postoperative recovery of surgical patients. Although benefits have been reported, particularly in terms of regaining functional capacity and improving certain physiological indicators of recovery, the available evidence does not establish that early mobilization alone definitively reduces morbidity or length of hospital stay. Given the differences in surgical procedures, patient characteristics, timing of mobilization initiation, duration of implementation, and mobilization protocols, early mobilization is best evaluated as part of a multimodal approach to care, such as ERAS (Tazreean et al., 2022; Willner et al., 2023).

The Evidence Base for Early Mobilization

Although evidence supports the benefits of early mobilization for functional recovery and certain physiological outcomes, its effects on clinical outcomes, such as morbidity and length of hospital stay, vary according to the type of surgery and the mobilization protocol used. Recent comprehensive reviews suggest

that early mobilization may be beneficial, particularly in terms of functional recovery and improvements in physical capacity. However, findings regarding morbidity, mortality, and length of hospital stay remain inconsistent across surgical populations (Alsuwaylihi et al., 2026).

The effects of early mobilization on functional recovery and postoperative gastrointestinal recovery have been investigated in patients undergoing abdominal surgery. In a randomized controlled trial involving patients who underwent major abdominal cancer surgery, a structured early mobilization program was reported to improve functional capacity and facilitate earlier independent ambulation (de Almeida et al., 2017). A meta-analysis of patients undergoing gastrointestinal surgery found that early mobilization accelerated gastrointestinal recovery; however, the randomized controlled trials included in the analysis showed no significant differences in postoperative morbidity or length of hospital stay. The authors also reported substantial heterogeneity across studies in terms of surgical procedures, mobilization protocols, and outcome measures (Willner et al., 2023). These findings suggest that early mobilization may support functional and gastrointestinal recovery after abdominal surgery, but should not be regarded as an intervention that independently improves all clinical outcomes.

The feasibility and outcomes of early mobilization within ERAS programs have also been investigated in patients undergoing colorectal surgery. In a randomized controlled trial, the addition of structured mobilization support provided by healthcare professionals to the ERAS program was reported to improve patients' adherence to mobilization targets and increase out-of-bed activity during the postoperative period. However, no significant between-group differences were observed in functional walking capacity or other clinical outcomes at the four-week follow-up (Fiore et al., 2017). These findings suggest that structured mobilization support may

increase activity levels during the early postoperative period, although these short-term improvements may not necessarily translate into better functional outcomes over the longer term.

Positive effects on functional outcomes have been reported following early mobilization after cardiac surgery. A systematic review and meta-analysis of patients undergoing cardiac surgery evaluated the effects of early mobilization on physical function at hospital discharge and reported a mean improvement of 54 meters in the six-minute walk test. In the included studies, early mobilization was generally initiated on the first or second postoperative day and implemented during the first five postoperative days (Kanejima et al., 2020). These findings suggest that early mobilization may contribute to the recovery of physical capacity and walking ability, particularly after coronary artery bypass grafting. However, because some studies combined early mobilization with other interventions, such as respiratory exercises and psychoeducation, caution is warranted when attributing the observed improvements solely to mobilization.

In orthopedic surgery, the association between early mobilization and clinical outcomes has been examined, particularly in patients undergoing hip fracture surgery. A systematic review and meta-analysis reported lower 30-day mortality and complication rates among patients who underwent early mobilization than among those whose mobilization was delayed. However, no significant difference was found in length of hospital stay (Agarwal et al., 2024). The authors emphasized that, because most of the included studies were observational, the association between early mobilization and better outcomes should not be interpreted as evidence of a direct causal relationship. These findings suggest that early mobilization may be associated with favorable outcomes in patients undergoing orthopedic surgery, including both the recovery of mobility and short-term clinical outcomes.

In thoracic surgery, early mobilization is a key component of Enhanced Recovery After Thoracic Surgery (ERATS) protocols, particularly in patients undergoing lung resection. A systematic review and meta-analysis evaluating ERATS programs in thoracic surgery reported that these multimodal interventions, which include early mobilization, reduce hospital length of stay and postoperative complications. However, these outcomes cannot be attributed solely to early mobilization, as other ERATS components, such as early nutrition, multimodal analgesia, and the early removal of chest tubes and urinary catheters, also contribute to these outcomes (Khoury et al., 2021).

The safety of early mobilization and rehabilitation in neurosurgery, as well as their role in reducing postoperative complications, has increasingly become a focus of research. A recent systematic review and meta-analysis of adult patients who underwent craniocerebral surgery reported that early rehabilitation programs, which include mobilization practices such as elevating the head of the bed, sitting up, standing, and walking, were associated with a lower risk of postoperative complications (Li et al., 2026). As early mobilization is incorporated into broader rehabilitation programs in some studies, caution is warranted when attributing the reported benefits solely to mobilization. These findings suggest that early, structured mobilization may be a safe and beneficial approach to supporting recovery after brain surgery in appropriately selected patients.

When findings from different surgical specialties are considered together, the most consistent benefits of early mobilization appear to be improvements in physical function and walking capacity, as well as the recovery of functional independence. In contrast, evidence regarding outcomes such as morbidity, mortality, and length of hospital stay varies according to the surgical population and the mobilization protocol used. As some of the

favorable outcomes reported in thoracic and neurosurgery arise from multimodal rehabilitation or ERAS programs that incorporate early mobilization, these outcomes should not be attributed to mobilization alone (Khoury et al., 2021; Li et al., 2026). Therefore, early mobilization should be individualized according to the patient's clinical condition, the characteristics of the surgical procedure, and functional capacity, and implemented as part of a multimodal approach to care in appropriately selected patients (Alsuwaylihi et al., 2026).

Safe Early Mobilization

The primary goal of early mobilization in surgical patients is to resume physical activity after surgery and gradually increase it to a safe and tolerable level. Initial mobilization may begin with low-intensity activities, particularly in patients who have experienced prolonged bed rest, have reduced muscle strength, or have limited physical capacity following surgery. Changing position in bed, sitting at the edge of the bed, transferring to a chair, and then walking short distances are sequential steps in mobilization that can be advanced according to the patient's tolerance. At each stage, the patient's clinical response and ability to tolerate the activity should be assessed before progressing to the next level of mobilization (Tazreean et al., 2022; Alsuwaylihi et al., 2026).

The timing of early mobilization should be determined through a comprehensive assessment of the patient's clinical condition, the type and extent of surgery performed, preoperative functional capacity, pain level, hemodynamic and respiratory status, level of consciousness, and any medical devices in use. Although current evidence identifies early mobilization as an important component of surgical recovery, substantial variations have been reported across studies in how mobilization is defined and in its timing, duration, and intensity (Alsuwaylihi et al., 2026).

Before mobilization, the patient's hemodynamic and respiratory status should be assessed alongside their overall clinical condition and symptoms, including blood pressure, heart rate, respiratory rate, and oxygen saturation. Orthostatic intolerance, which may occur particularly during the patient's first attempt to stand, can manifest as dizziness, nausea, weakness, visual disturbances, or a feeling of impending fainting, thereby increasing the risk of falls. Therefore, mobilization out of bed should proceed gradually according to the patient's clinical condition, beginning with movement in bed and progressing to sitting up, sitting at the edge of the bed, standing, and walking. (Tazreean et al., 2022; Willner et al., 2023; Alsuwaylihi et al., 2026).

Pain management is also an integral component of safe mobilization. Inadequately controlled pain can restrict patients' movement, leading to delays in mobilization or limiting their ability to participate fully. Conversely, adverse effects of analgesics, particularly opioids, such as sedation, dizziness, and nausea, may also compromise safety during mobilization. Therefore, mobilization planning should consider not only the presence and severity of pain but also the balance between analgesic effectiveness and the patient's level of alertness and ability to move safely. A multimodal analgesia approach can help reduce opioid requirements while maintaining adequate pain control, thereby supporting patients' early participation in physical activity (Alsuwaylihi et al., 2026).

Before mobilization, the patient's drains, urinary catheter, intravenous lines, epidural catheter, nasogastric tube, and other medical devices should be assessed. The presence of these devices should not, in itself, be considered a contraindication to early mobilization when appropriate precautions are taken. However, all lines and drains should be securely fastened before mobilization, with sufficient length and flexibility to allow movement without the

risk of pulling, disconnection, breakage, or displacement. This approach helps maintain the safety of medical devices without unnecessarily restricting the patient's mobility (Gustafsson et al., 2019). It also highlights that early mobilization should not be considered in isolation from other aspects of surgical care but rather integrated with practices such as analgesia, nutrition, fluid management, timely catheter removal, and support for patient independence (Gustafsson et al., 2019; Grant & Engelman, 2025).

The patient's clinical response should be closely monitored throughout mobilization. If dizziness, pronounced weakness, nausea, shortness of breath, chest pain, a feeling of impending fainting, altered consciousness, or pain that the patient cannot tolerate occurs, mobilization should be stopped, the patient should be placed in a safe position, and their clinical condition should be reassessed. The risk of falls should be considered, particularly during initial mobilization attempts. Assistive devices or additional healthcare personnel should be used as needed, and the patient's tolerance of activity should be closely monitored. After mobilization, the patient's symptoms and clinical status should be reassessed, and the intensity and duration of subsequent mobilization should be adjusted according to the patient's tolerance. Accordingly, safe early mobilization should be regarded as an individualized and dynamic care process involving the assessment of the patient's readiness, the establishment of appropriate conditions, the gradual initiation of activity, monitoring of the clinical response, and adjustment of the mobilization plan based on the findings (Tazreean et al., 2022).

The Role of the Nurse

The effective and sustainable implementation of early mobilization in surgical patients requires more than simply assisting patients to move; it involves assessing, planning, implementing, and

monitoring the mobilization process according to each patient's individual needs. In this process, nurses play a key role in assessing patients' readiness for mobilization, setting individualized mobilization goals, facilitating implementation, encouraging active patient participation, and ensuring continuity of care in collaboration with the healthcare team.

Patient motivation and active participation in the care process play an important role in sustaining early mobilization. During the postoperative period, patients' willingness to mobilize and adherence to established activity goals can influence the extent to which mobilization is achieved. Therefore, nurses should assess patients' needs and concerns regarding mobilization, explain its purpose and importance in the recovery process, and support patients in setting realistic and achievable goals. Motivational interviewing, a patient-centered approach that encourages active patient participation, has been shown to increase postoperative mobilization in patients undergoing elective colorectal surgery (Wiesenberger et al., 2024).

The nurse's role in early mobilization extends beyond implementing the intervention; evaluating the patient's response and ensuring continuity of the process are also essential components of nursing care. The patient's tolerance of mobilization, pain level, fatigue, and any other symptoms that may arise should be monitored, and mobilization goals and activity levels should be reassessed accordingly. Early recognition of changes in the patient's condition and communication of these changes to the healthcare team, when necessary, help ensure that mobilization remains consistent with the patient's clinical condition and functional status. Structured mobilization protocols and systematic monitoring of the patient's activity level can support the consistent integration of early mobilization into routine care and help sustain its implementation (Tazreean et al., 2022).

The role of early mobilization in postoperative recovery highlights the importance of integrating this practice with other components of care rather than considering it in isolation. Within the ERAS approach, early mobilization is part of a multimodal strategy that includes care practices such as early oral feeding, multimodal analgesia, appropriate fluid management, and the timely removal of unnecessary catheters (Gustafsson et al., 2019). Coordinating these care components helps create conditions that facilitate patient mobilization. In this context, nurses monitor patients' activity levels, identify factors that may limit mobilization, and communicate their observations to the healthcare team. Sustaining early mobilization within the ERAS pathway requires nurses to collaborate with other healthcare professionals and integrate mobilization into the patient's overall recovery goals (Gustafsson et al., 2019).

In conclusion, the nurse's role in early mobilization encompasses a comprehensive care process that includes assessing and preparing the patient, implementing mobilization, supporting the patient's motivation and active participation, monitoring the patient's response, and coordinating care with the multidisciplinary team. This approach reinforces the view that early mobilization should be regarded not merely as an early postoperative activity but as a planned, individualized, and sustainable component of care that supports functional recovery in surgical patients.

Conclusion and Recommendations

Early mobilization is a key component of postoperative recovery in surgical patients and may help preserve functional capacity and facilitate a return to activities of daily living. However, its effects should be evaluated in the context of the patient's clinical and functional status, the type of surgery performed, and other perioperative care practices.

Nurses play a crucial role in assessing patients' readiness for mobilization, setting individualized goals, implementing mobilization gradually, encouraging active patient participation, and monitoring patients' responses. Collaboration within the multidisciplinary team helps integrate early mobilization into the patient's overall recovery plan. Accordingly, early mobilization in surgical patients should be planned according to their clinical and functional characteristics, implemented progressively, and integrated with pain management, nutrition, and other components of the ERAS approach.

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CHAPTER 3

SUSTAINABLE HEALTHCARE AND GREEN NURSING

FATMA BETÜL ÖZ DAMKALI[1]

Introduction

Despite their fundamental mission to protect and improve public health, global healthcare systems impose a significant burden on the environment by consuming vast quantities of energy, water, pharmaceuticals, and single-use materials during the provision of diagnostic, treatment, and care services (Badawy et al., 2025; Ojha & Bajwan, 2026; Shaban et al., 2024). The fact that the healthcare sector is responsible for approximately 4.4% of net global greenhouse gas emissions creates a paradox: while aiming to improve human health, the sector indirectly threatens public health through environmental pollution and climate change (Berniak-Woźny & Rataj, 2023; Ojha & Bajwan, 2026; Shaban et al., 2024). Nurses, who constitute the largest segment of the healthcare workforce, are in a pivotal position to help overcome this ecological crisis through their continuous presence in patient care, as well as

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their roles in waste management, resource conservation, patient education, and institutional "green" leadership (Badawy et al., 2025; Ojha & Bajwan, 2026; Shaban et al., 2024). Accordingly, equipping nurses with climate literacy, enhancing their "green" competencies, and supporting them through green leadership thereby fostering eco-friendly, innovative practices ("green creativity") in clinical settings is vital both for preserving ecological balance and for building sustainable healthcare systems (Razek et al., 2025; Attia et al., 2025).

The Environmental Footprint of the Healthcare Sector and the "Healthcare Paradox"

Healthcare systems, which aim to protect and improve human health on a global scale, consume significant amounts of energy, water, pharmaceuticals, and single-use medical supplies while providing intensive care and treatment services (Ojha & Bajwan, 2026; Shaban et al., 2024). This high level of resource consumption and the associated operational processes have made the healthcare sector a major contributor to global environmental degradation in terms of greenhouse gas emissions, biomedical waste, and the depletion of natural resources (Badawy et al., 2025; Ojha & Bajwan, 2026).According to international assessments, the healthcare sector is responsible for approximately 4.4% of net global greenhouse gas emissions (Berniak-Woźny & Rataj, 2023; Eckelman et al., 2020; Ojha & Bajwan, 2026). Hospitals and healthcare institutions exert significant pressure on the environment due to energy-intensive infrastructure such as heating, ventilation, and air conditioning (HVAC) and lighting systems as well as logistics processes, the heavy use of pharmaceuticals and chemicals, and the generation of large quantities of hazardous or biomedical waste (Berniak-Woźny & Rataj, 2023; Ojha & Bajwan, 2026).

In academic literature, this phenomenon is described as a "paradox of healthcare": a sector whose primary objective is to protect and improve human health ends up indirectly threatening public health

through the environmental pollution and carbon emissions it generates (Berniak-Woźny & Rataj, 2023; Ojha & Bajwan, 2026; Shaban et al., 2024). The rise in respiratory diseases, heat-related illnesses, and outbreaks of vector-borne infections, in particular, clearly demonstrates the adverse effects of environmental degradation and climate change on human health (Ojha & Bajwan, 2026; Shaban et al., 2024).

Sustainable Healthcare Services and the "Green Hospital" Approach

In order to address the adverse effects of the environmental crisis on health, the concepts of "sustainable healthcare" and "green healthcare" have gained significance (Berniak-Woźny & Rataj, 2023; Shaban et al., 2024). Sustainable healthcare refers to an approach that is balanced in terms of environmental, economic, and social dimensions, grounding the improvement, management, and optimization of human health upon an ecological foundation (Attia et al., 2025; Berniak-Woźny & Rataj, 2023).

In this context, the "green hospital" concept aims to mitigate harmful impacts on human health and the environment across all operational processes from the design and operation of buildings and campuses to energy and water efficiency and waste management (Howard, 2003; Berniak-Woźny & Rataj, 2023). The core components of green healthcare systems include the following (Berniak-Woźny & Rataj, 2023; Fadda, 2020; Ojha & Bajwan, 2026; Shaban et al., 2024).Leadership and Management: Integrating environmental priorities into institutional policies and fostering internal awareness through training (Berniak-Woźny & Rataj, 2023; Ojha & Bajwan, 2026).

Waste Management: The safe segregation, reduction, and recycling of biomedical and hazardous waste (Berniak-Woźny & Rataj, 2023; Ojha & Bajwan, 2026; Shaban et al., 2024).

Energy and Water Efficiency: Transitioning to renewable energy sources, achieving energy savings in climate control and lighting systems, and optimizing water consumption (Ojha & Bajwan, 2026; Shaban et al., 2024).

Green Procurement: Prioritizing biodegradable and eco-friendly medical supplies, as well as products from sustainable sources (Ojha & Bajwan, 2026; Shaban et al., 2024).

Substitution of Harmful Chemicals and Prevention of Pharmaceutical Pollution: Replacing chemicals that are hazardous to health and the environment with safe alternatives, and designing green buildings (Berniak-Woźny & Rataj, 2023; Shaban et al., 2024).

Digital Transformation: Implementing digital documentation, telehealth, and remote care practices to reduce paper usage (Berniak-Woźny & Rataj, 2023; Ojha & Bajwan, 2026).

Planetary Health and the UN Sustainable Development Goals

The "Planetary Health" approach, which emphasizes the inextricable link between human health and the health of global ecosystems, argues that healthcare cannot be limited to individual care alone; rather, preserving the ecological balance of the planet is a fundamental prerequisite for public health (Badawy et al., 2025; Shaban et al., 2024). Green healthcare practices align directly with the United Nations' 2030 Sustainable Development Goals (SDGs) (Badawy et al., 2025; Berniak-Woźny & Rataj, 2023; Shaban et al., 2024; United Nations, 2015).

SDG 3 (Good Health and Well-being): Reducing environmental harm in the delivery of healthcare services and protecting public health (Berniak-Woźny & Rataj, 2023; Shaban et al., 2024).

SDG 6 (Clean Water and Sanitation): Preventing medical waste from contaminating water sources and ensuring water efficiency (Berniak-Woźny & Rataj, 2023; Shaban et al., 2024).

SDG 7 (Affordable and Clean Energy): Energy efficiency and the integration of clean energy in healthcare facilities (Berniak-Woźny & Rataj, 2023; Shaban et al., 2024).

SDG 12 (Responsible Consumption and Production): Sustainable procurement and waste management in the use of medical supplies (Badawy et al., 2025; Shaban et al., 2024).

SDG 13 (Climate Action): Reducing the carbon footprint of the healthcare sector and combating climate change (Badawy et al., 2025; Berniak-Woźny & Rataj, 2023; Shaban et al., 2024).

Nurses, who constitute the largest group among healthcare professionals, play a pivotal role in the transition toward sustainable healthcare services, owing to their direct involvement in patient care processes and their participation in clinical decision-making (Badawy et al., 2025; Ojha & Bajwan, 2026; Shaban et al., 2024).

Environmentally Conscious Nursing (Green Nursing) and the Metaparadigm

An examination of the historical development of the nursing profession reveals that the relationship between the environment and human health has been central to the field since its earliest theoretical foundations. In the 19th century, Florence Nightingale recognized as the founder of modern nursing articulated principles aimed at improving the quality of patient care, in which she highlighted the decisive role of environmental factors such as fresh air, clean water, effective sanitation/hygiene, light, and quiet in the recovery process (Karimi & Masoudi Alavi, 2015; Shaban et al., 2024). This approach is rooted in the premise that enhancing environmental conditions activates a patient's inherent potential for self-healing (Karimi & Masoudi Alavi, 2015; Shaban et al., 2024).

Today, the nursing profession has expanded upon the physical care environment originally emphasized by Nightingale, now

incorporating issues such as ecological sustainability, climate change, and global environmental health into the core of care delivery (Ojha & Bajwan, 2026; Shaban et al., 2024). Contemporary nurses are viewed as agents of change, responsible not only for maintaining hygiene within clinical settings but also for reducing the ecological burden that healthcare delivery places on planetary ecosystems (Badawy et al., 2025; Shaban et al., 2024).

Environmentally Conscious Nursing

Environmentally conscious nursing ("green nursing") is a professional ethical and practical approach that harmonizes nursing care with the principles of environmental stewardship, aiming to minimize the ecological footprint within clinical practice (Ojha & Bajwan, 2026; Shaban et al., 2024). Conceptually, there is a distinct difference between "sustainability" and "eco-consciousness" (Badawy et al., 2025; Shaban et al., 2024).

Sustainability: Refers to a set of institutional and systemic practices at the level of healthcare systems geared toward resource conservation, waste reduction, and the maintenance of long-term ecological balance (Badawy et al., 2025).

Eco-consciousness (Environmental Consciousness): Refers to a state of individual awareness, mindset, and intentionality that enables nurses to incorporate environmental principles into their daily clinical decisions and actions (Badawy et al., 2025; Shaban et al., 2024).

Key Attributes According to Rodgers's Evolutionary Concept Analysis Method

According to Rodgers' evolutionary concept analysis method, there are five key attributes of environmentally conscious nursing that emerge from the literature (Rodgers & Knafl, 2000; Shaban et al., 2024):

Sustainability Integration: The conscious incorporation of eco-friendly principles such as waste reduction, energy conservation, and the use of sustainable materials into clinical routines across all stages of nursing care (Shaban et al., 2024).

Environmental Advocacy: The role of nurses in raising awareness about environmental health determinants and advocating for "green" policies, both within the hospital setting and at the community level (Shaban et al., 2024).

Holistic Patient Care: An approach to care planning that considers not only the patient's physical, psychological, and social needs but also the impact of their environment and ecological factors on their health (Shaban et al., 2024).

Professional Development and Education: The responsibility to engage in continuous learning regarding climate change and environmental health, and to share this "green" knowledge with colleagues and patients (Shaban et al., 2024).

Collaboration and Leadership: Taking a leadership role in cooperation with environmental experts, hospital administration, and other healthcare disciplines on projects aimed at reducing the carbon footprint at an institutional level (Shaban et al., 2024).

Antecedents and Consequences

For environmentally conscious nursing practices to emerge within a clinical setting, certain prerequisites must be met (Shaban et al., 2024).

Environmental Awareness and Climate Literacy: Nurses must possess fundamental knowledge regarding the environmental harm caused by healthcare operations and the impact of the climate crisis on health (Attia et al., 2025; Shaban et al., 2024).

Institutional Policies and Management Support: Healthcare organizations must support green management strategies and

provide the necessary infrastructure for recycling and energy conservation (Razek et al., 2025; Shaban et al., 2024).

Integration into Educational Curricula: Environmental health topics must be incorporated into nursing education at both the undergraduate and postgraduate levels (Badawy et al., 2025; Shaban et al., 2024).When these prerequisites are met, the following outcomes are achieved (Shaban et al., 2024).

Improved Environmental Health Outcomes: A reduction in medical waste, the conservation of resources, and the prevention of ecological pollution (Shaban et al., 2024).

Enhanced Well-being for Patients and Staff: The creation of safer hospital environments through the reduced use of toxic chemicals, leading to faster patient recovery processes (Shaban et al., 2024).

Economic Efficiency: Cost savings for the institution through energy and water conservation, as well as the prevention of material waste (Ojha & Bajwan, 2026; Shaban et al., 2024).

Empirical Indicators

The measurable and observable indicators (empirical indicators) of environmentally conscious nursing in a clinical setting are as follows (Shaban et al., 2024):

1. Sustainable waste segregation and recycling rates (Shaban et al., 2024).
2. Adherence to the use of energy-efficient equipment in clinical areas (Shaban et al., 2024).
3. Implementation of techniques to reduce water consumption (Shaban et al., 2024).

4. Selection of medical supplies in accordance with green procurement policies (Shaban et al., 2024).
5. Number of eco-friendly improvement projects led by nurses (Shaban et al., 2024).

Green Nursing from the Perspective of the Nursing Metaparadigm

The four fundamental concepts that form the core structure of the nursing discipline Person, Environment, Health, and Nursing are being reinterpreted through the lens of "green nursing" (Fawcett, 2022; Fawcett, 2024; Shaban et al., 2024):

Person (Human): Viewed not merely as a biopsychosocial being, but as an integral part of the ecosystem (Attia et al., 2025; Shaban et al., 2024). Human health is directly linked to the quality of the ecological environment in which one lives (Ojha & Bajwan, 2026; Shaban et al., 2024).

Environment: Extends beyond the confines of a physical care setting such as a hospital room or corridor to encompass air, water, soil, climate systems, and the planetary ecosystem (Fawcett, 2022; Kalogirou et al., 2020). The environment is recognized as a primary determinant that influences health in both positive and negative ways (Attia et al., 2025; Ojha & Bajwan, 2026).

Health: Transcends individual well-being and has become integrated with the concept of "Planetary Health" (Badawy et al., 2025; Shaban et al., 2024). It emphasizes the reality that individual and public health cannot be sustained if the balance of the Earth’s ecosystems is disrupted (Badawy et al., 2025; Ojha & Bajwan, 2026).

Nursing: Defined as a professional role that, in addition to providing direct patient care, works to preserve the planet’s ecological balance, incorporates sustainability into clinical decision-making to reduce the ecological burden on healthcare systems, and engages in

environmental advocacy (Badawy et al., 2025; Ojha & Bajwan, 2026; Shaban et al., 2024).

Green Transition in Clinical Nursing Practices

Healthcare facilities generate large quantities of biomedical and hazardous waste during the complex diagnostic and treatment services they provide (Badawy et al., 2025; Ojha & Bajwan, 2026). Failure to properly manage waste generated in clinical settings poses a risk of infection and threatens public health by contributing to soil, water, and air pollution (Ojha & Bajwan, 2026; Shaban et al., 2024). Nurses are at the heart of waste management, as they are the professionals who directly oversee the use of materials throughout a patient's journey from admission to discharge (Badawy et al., 2025; Ojha & Bajwan, 2026). Key practices for sustainable waste management include the following (Badawy et al., 2025; Ojha & Bajwan, 2026; Shaban et al., 2024).

Proper Waste Segregation at the Source: Disposing of biomedical waste and municipal solid waste into correctly color-coded bins significantly reduces the volume of hazardous waste requiring disposal, as well as the associated costs and carbon emissions (Ojha & Bajwan, 2026; Shaban et al., 2024).

Reduction of Single-Use Plastics: Limiting the consumption of unnecessary single-use plastic items in clinical practice and opting for washable/reusable equipment whenever it is safe to do so (Badawy et al., 2025; Ojha & Bajwan, 2026).

Recycling Programs: Directing non-medical packaging, paper, and other waste materials into recycling streams (Ojha & Bajwan, 2026; Shaban et al., 2024).

Resource Use, Energy Efficiency, and Water Conservation

Hospitals are facilities that operate 24 hours a day and are highly energy-intensive due to their heating, ventilation, and air

conditioning (HVAC) systems, lighting, and high-tech medical equipment (Berniak Woźny & Rataj, 2023; Ojha & Bajwan, 2026). Small steps taken within clinical nursing routines can lead to significant savings at an institutional level (Badawy et al., 2025; Ojha & Bajwan, 2026).Nursing initiatives aimed at resource conservation in clinical settings include the following (Badawy et al., 2025; Ojha & Bajwan, 2026; Shaban et al., 2024):

Energy Conservation: Turning off lights and equipment or placing them in standby mode in unoccupied patient rooms, utility rooms, and other areas when not in use (Badawy et al., 2025; Ojha &Bajwan,2026).

Efficient Use of Water Resources: Preventing unnecessary water consumption during hand hygiene and clinical procedures, and promoting the use of water-saving fixtures (Ojha & Bajwan, 2026; Shaban et al., 2024).

Economic and Ecological Balance: Reducing resource consumption lowers operational costs, demonstrating that ecological sustainability and economic efficiency are complementary goals (Ojha & Bajwan, 2026; Shaban et al., 2024).

Green Procurement and the Selection of Environmentally Friendly Products

A significant portion of the healthcare sector's environmental impact stems from its supply chain and material production processes (Badawy et al., 2025; Berniak-Woźny & Rataj, 2023). Nurses play an influential role in the selection of materials and procurement decisions within clinical units, ensuring that eco-friendly criteria are taken into account (Badawy et al., 2025; Ojha & Bajwan, 2026). Within the framework of a "green" supply approach (Badawy et al., 2025; Ojha & Bajwan, 2026; Shaban et al., 2024), the objectives include:

1. Prioritizing medical supplies manufactured from biodegradable or recycled raw materials (Badawy et al., 2025; Ojha & Bajwan, 2026),
2. Utilizing safe alternatives to chemicals that are harmful to human health and the environment such as toxic disinfectants or equipment containing PVC/phthalates (Berniak-Woźny & Rataj, 2023; Shaban et al., 2024),
3. Reducing logistics-related emissions by collaborating with local, eco-friendly suppliers (Badawy et al., 2025; Berniak-Woźny & Rataj, 2023).

Digital Transformation and Paperless Clinical Practices

The integration of digital health technologies and electronic health records (EHRs) into clinical processes serves as one of the most effective catalysts for a "green transition" (Berniak-Woźny & Rataj, 2023; Ojha & Bajwan, 2026). Transitioning nursing care documentation, patient monitoring forms, and prescription or order processes to a digital environment reduces paper consumption and the felling of trees, while simultaneously enhancing data security and the quality of care (Berniak-Woźny & Rataj, 2023; Ojha & Bajwan, 2026). Furthermore, telehealth and remote care practices significantly curb carbon emissions resulting from the travel of both patients and healthcare professionals (Berniak-Woźny & Rataj, 2023).

Development of Clinical Protocols and Interdisciplinary Collaboration

Ensuring that sustainable clinical practices become permanent requires moving beyond individual efforts and transforming them into institutional standards and clinical protocols (Badawy et al., 2025; Shaban et al., 2024). Nurses who volunteer as "sustainability champions" within clinical units are taking the lead in developing

guidelines for eco-friendly care (Badawy et al., 2025). Furthermore, interdisciplinary collaboration such as working with the pharmacy department to reduce pharmaceutical waste, and with cleaning and waste management teams to optimize waste segregation is a key factor in the success of the green transition in clinical settings (Badawy et al., 2025; Shaban et al., 2024).

Conclusion

While the global healthcare sector fulfills its mission of protecting public health, it simultaneously creates a paradoxical ecological burden, accounting for approximately 4.4% of global greenhouse gas emissions and generating significant amounts of waste (Berniak-Woźny & Rataj, 2023; Ojha & Bajwan, 2026; Shaban et al., 2024). In addressing this environmental crisis, approaches such as sustainable healthcare and "green hospitals" aim to optimize resource use ranging from energy and water efficiency to green procurement and to safeguard planetary health in alignment with the United Nations Sustainable Development Goals (SDGs) (Berniak-Woźny & Rataj, 2023; Ojha & Bajwan, 2026; Shaban et al., 2024).

The nursing profession draws upon a historical tradition dating back to Florence Nightingale that emphasizes the direct link between the environment and the quality of care (Karimi & Masoudi Alavi, 2015; Shaban et al., 2024). Environmentally conscious nursing (or "green nursing"), as defined through Rodgers' method of concept analysis, redefines the profession's metaparadigm (Person, Environment, Health, Nursing) through an ecological lens; its core attributes include the integration of sustainability, environmental advocacy, holistic patient care, professional development, and interdisciplinary leadership (Fawcett, 2022; Kalogirou et al., 2020; Shaban et al., 2024). When prerequisites such as environmental awareness, education, and institutional policies are in place, patient recovery processes are accelerated, and the ecological and economic

efficiency of healthcare facilities is enhanced (Badawy et al., 2025; Ojha & Bajwan, 2026; Shaban et al., 2024).

The "green transition" within clinical practice represents the application of these theoretical principles in real-world settings (Badawy et al., 2025; Ojha & Bajwan, 2026). Concrete nursing initiatives such as the proper segregation of medical waste at the source, the limitation of unnecessary single-use materials, the adoption of routines that conserve energy and water, the support of green procurement processes, and the transition to digital documentation significantly reduce the carbon footprint of healthcare institutions (Badawy et al., 2025; Ojha & Bajwan, 2026; Shaban et al., 2024).

Ultimately, nurses, through their decision-making authority and leadership roles in clinical settings, serve as indispensable agents of change in the construction of sustainable healthcare systems (Badawy et al., 2025; Ojha & Bajwan, 2026; Shaban et al., 2024).

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