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Review

GREEN HOSPITALS: A REMEDY FOR THE CLIMATE CHANGE BURDEN ON THE POLISH HEALTHCARE SYSTEM

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ABSTRACT

The global healthcare sector faces challenges, including an aging population and climate change concerns, contributing 4.4% to global greenhouse gas emissions. The Polish healthcare system, surpassing global averages in environmental impact, grapples with demographic challenges and disproportionate carbon emissions. This study explores the potential of green hospitals, integrating sustainable practices, to reduce the sector's environmental footprint. Recommendations for policymakers and healthcare stakeholders focus on energy, water management, and waste/recycling practices. The brief emphasizes water conservation in healthcare, citing successful case studies like the French Nephrocare network. Energy-efficient solutions, exemplified by the Philips BlueSeal MRI coupled with SmartSpeed acceleration engine, offer cost savings despite upfront expenses, aligning with Green Public Procurement (GPP) practices. Sustainable waste management practices - crucial for healthcare units - require training programs and recycling initiatives in green hospitals to minimize environmental impact. Despite challenges, green hospitals offer a promising avenue for the future of healthcare, contributing to improved patient outcomes, reduced costs, and a sustainable healthcare infrastructure. The brief emphasizes the need for immediate action, encouraging stakeholders to advocate for green hospital policies to minimize climate change's impact on public health.

KEYWORDS: climate change, green hospitals, environment, healthcare system, hospitals

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1. Introduction and problem background

Global healthcare sector grapples with a myriad of challenges, including uneven workforce distribution, an aging population, regional conflicts, and fluctuating population sizes (often disproportionately overloading different areas) [1]. While each national healthcare system contends with its unique demands, a universal concern affecting every corner of the globe is climate change. According to the report written by Health Care Without Harm and ARUP, the healthcare sector contributes to 4.4% of the global greenhouse gas emissions, ranking among the largest waste generators and top carbon emissions contributors worldwide [2]. If quantified as a separate

country, the global healthcare sector would emerge as the fifth-largest polluter. Furthermore, it produces substantial hazardous waste, posing risks to both human health and the environment.

Notably, the Polish healthcare system surpasses the global average in contributing to environmental degradation [2]. As a developed country with an aging population of 37.7 million citizens, projected to decline by 17.7% to 31.1 million by 2060 [3], Poland faces demographic challenges that extend beyond straining the national healthcare system [4]. These challenges encompass limited human resources, workforce migrations, and issues of underpayment in the public

sector. Additionally, Poland stands as a significant emitter of carbon dioxide (CO₂) in Europe, producing approximately 0.9% of the total global emissions in the past decade [5]. Considering that Poland constitutes around 0.5% of the global population and occupies only 0.6% of the Earth's surface, the disproportionate impact is alarming.

Atwoli et al. characterize climate change as the foremost threat to health in the twenty-first century, already manifesting through rising temperatures, recurrent droughts, and floods, impacting global and local health crises [6]. Immediate action is imperative to reduce the carbon footprint and mitigate the adverse effects of these events, aligning with sustainable goals [7].

Recognizing the paradox where healthcare systems, while providing medical aid, also significantly contribute to environmental harm, necessitates a strategic plan for action. This study aims to propose changes that may be introduced or scaled up in the health care sector nationwide across Poland and even worldwide.

2. Green hospitals - future of healthcare?

The emergence of green hospitals, alternatively known as sustainable or eco-friendly hospitals, offers a promising solution to the escalating environmental challenges facing the healthcare industry. This burgeoning trend sees an increasing number of hospitals undergoing design and transformation processes to embrace sustainable practices, aiming to mitigate their carbon footprint and enhance patient outcomes. Considering the presenting challenges confronting the healthcare sector, it becomes imperative for this industry to proactively address its environmental impact and promote sustainability. Green hospitals, by curbing energy consumption, minimizing waste generation, and advocating sustainable healthcare practices, stand poised to play a pivotal role in this transformative journey [2].

This policy brief seeks to delve into the concept of green hospitals, both within Poland and on a global scale, exploring their potential to significantly diminish the environmental footprint of the healthcare industry while concurrently elevating the quality of healthcare services. Central to its focus is the exploration of whether green hospitals represent the future of healthcare. Furthermore, the brief provides recommendations tailored for policymakers and healthcare, delineating strategies to foster the adoption of green hospital practices across three critical dimensions: energy utilization, water resource management, and waste/recycling practices. By offering insights into the implementation challenges associated with green hospitals, it endeavours to guide informed decision-making and facilitate the seamless interaction of sustainable healthcare practices into the future landscape of healthcare.

2.1. Water consumption

Water management emerges as a critical focal point for healthcare institutions, given their extensive use of water for patient care, sanitation, and operational activities. Striking a balance between ensuring effective patient care and responsible resource management poses a central challenge for healthcare providers as they navigate the path toward a more sustainable and ethically sound future.

The considerable volume of water required by healthcare facilities, exemplified by needs of dialysis services, are part of the sustainability concerns within the sector. Dialysis stations, integral to patient care, rely heavily on substantial water volumes not only for the dialysis procedure itself but also for equipment sterilization, reverse osmosis systems, and routine facility operations [8]. The purification process demands high-quality water to prevent contamination and uphold patient safety. The heightened consumption raises environmental, economic, and ethical considerations, compelling the exploration of greener alternatives. Within this context, noteworthy advancements can be observed in the French Nephrocare network, where the adoption of eco-reporting, progressive replacement of dialysis machinery, and the integration of devices with enhanced water purification systems, led to a commendable reduction in water consumption by up to 50% [9].

To instill sustainable water practices, green hospitals can deploy a range of strategies, encompassing leak detection and repair, installation of more efficient fixtures like low-flow toilets and faucets (capable of reducing water consumption by up to 30%), implementation of water recycling systems such as greywater systems (capturing and treating water from sinks and showers for instance for irrigation or toilet flushing), and rainwater harvesting for non-potable applications, diminishing reliance on municipal water supplies [10]. Hospitals are tasked with educating both staff and patients about the significance of water conservation, promoting simple practices like turning off faucets when not in use, and reporting leaks.

Addressing the multifaceted challenge of water consumption by healthcare providers necessitates a comprehensive approach involving investments in water-efficient technologies, the establishment of recycling and reuse systems, and the cultivation of awareness among healthcare professionals and patients regarding the environmental implications of practiced procedures. By improving education on sustainability and implementing water-saving measures, hospitals not only reduce their consumption and embrace sustainable practices but also achieve cost savings. Furthermore, these initiatives contribute to improved patient outcomes by fostering a healthier and hygienic environment for both patients and healthcare staff.

2.2. Energy

Hospitals, being among the largest consumers of energy, face significant expenses related to their energy consumption [11]. In the pursuit of sustainable practices, they can benefit from adopting energy-efficient solutions in various aspects of operations. While onsite renewable energy sources like solar panels and wind turbines, as well as energy-efficient lighting systems, are crucial components of a sustainable approach, integrating energy-efficient medical equipment is equally important. Plenty institutions have already installed LED lighting which lasts five times longer than a compact fluorescent lamp (CFL, also called energy-saving light), thus reducing energy consumption even up to approximately 60% [12].

Product's energy efficiency is a critical aspect of sustainable practices, regardless of sector concerned. In this context, it becomes imperative for healthcare

facilities to consider the energy cost and requirements of each product they invest in. An example of energy-friendly medical equipment is the Philips BlueSeal MRI coupled with SmartSpeed acceleration engine, which reduces power consumption by up to 53% per patient scan [13].

Recognizing the higher upfront costs associated with energy-efficient technologies, it is important to note that they often lead to substantial savings over their lifecycle [14]. Contrary to the misconception that sustainable products are more expensive, Green Public Procurement (GPP) practices can result in long-term cost savings [15]. This holds true for the healthcare sector, where energy-efficient technologies not only contribute to environmental sustainability but also offer financial benefits in the form of reduced energy expenses.

In the context of hospitals, where energy consumption is a significant concern, the adoption of energy-efficient heating, ventilation, and air conditioning (HVAC) systems can lead to a considerable reduction in energy usage, up to 30% [16]. Furthermore, hospitals are encouraged to replace outdated and inefficient equipment with newer, more energy-optimal models, such as refrigerators, freezers, and medical equipment.

Implementing energy management systems further enhances hospitals' ability to monitor and control energy use. These systems facilitate the identification of areas where energy can be saved, allowing for the implementation of tailored operational solutions based on the specific needs of individual units within the hospital. In this way, a comprehensive approach to energy efficiency, encompassing both infrastructure and medical equipment, contributes not only to cost savings but also to the overall sustainability of healthcare facilities.

2.3. Waste management

Sustainable waste management practices constitute a critical aspect of responsible healthcare operations, especially for medical units aspiring to adopt environmentally conscious practices. In the last report of the Supreme Audit Office (*Naczelna Izba Kontroli, NIK*), the functioning of the management of infectious medical waste in the years 2019-2022 was assessed negatively. NIK has identified numerous irregularities in the storage, collection, and disposal of these, as well as a lack of effective supervision by public administration authorities. Additionally, many procedures and records were found to be non-compliant with regulations, making it difficult to accurately report waste data. This information underscores the urgent need for action in the waste management, including medical and hazardous waste, in Poland [17]. The World Health Organization (WHO) underscores that up to 15% of hospital-generated waste comprises hazardous, toxic, or radioactive materials [18, 19].

Singh et al. shed light on a substantial challenge: inadequate knowledge and awareness regarding proper waste management among medical staff [20]. Moreover, their study reveals a disconcerting correlation, indicating that countries with longer life expectancy, higher human development indices, and increased healthcare expenditures tend to produce more waste. Paradoxically, while wealthier nations generate greater pollutants, their adeptness in managing this burden suggests a more efficient and sustainable approach. However, the detrimental impact of

waste on natural resources coupled with a surge in waste production, poses a serious threat to human health. Biomedical waste, laden with heavy metals like zinc, copper, and chromium, exerts profound repercussions on soil, water, and air quality. The subsequent alterations in soil biology and chemistry in the vicinity of hospitals and waste disposal sites inevitably disrupt local ecosystems.

Recognizing the imperative for change, the implementation of training programs for workers on proper waste management emerges as an initial but crucial step [21]. Żebrowski et al. underscore the transformative potential of seemingly modest changes, affirming that such initiatives can yield substantial environmental benefits without compromising patient welfare [22, 23]. Consequently, the incorporation of robust waste management and recycling strategies becomes paramount for green hospitals aiming to mitigate their environmental footprint. Initiatives encompassing recycling programs, composting, hazardous waste management, waste reduction efforts, and comprehensive education and outreach initiatives collectively constitute a multiplicate approach to fostering much needed sustainable waste management practices.

3. Challenges to implementation of green hospital practices

Admittedly, green hospital practices encounter numerous challenges in implementation, including the significant upfront costs associated with green building design, the necessity for specialized expertise in sustainable healthcare practices, and resistance to change from stakeholders accustomed to traditional methods. The financial barriers posed by the initial expenses in adopting green building materials, energy-efficient systems, and eco-friendly technologies can impede widespread adoption.

Bridging the knowledge gap among healthcare professionals and facility management staff through comprehensive training programs and the recruitment of sustainability experts is essential for successful integration. Moreover, stakeholders, such as hospital staff and patients, may exhibit reluctance to depart from established routines, necessitating strategic communication and education to highlight the long-term benefits of reduced operational costs and environmental impact. Despite these challenges, the potential advantages position green hospitals as a promising avenue for the future of healthcare, contributing significantly to both patient well-being and the broader health of the planet. In an evolving healthcare landscape, the incorporation of sustainable practices becomes not only a necessity but a strategic imperative for building a resilient and environmentally conscious healthcare infrastructure.

4. Conclusions

The concept of "green hospitals" represents a critical step in aligning healthcare facilities with environmentally conscious policies and quality strategies. The changes, emphasizing efficient water usage, energy conservation, and prudent management of medical and non-medical

waste, can be implemented with relative ease and low costs, culminating in substantial savings. The widespread adoption of green hospitals across the nation necessitates active efforts, as these upgrades will not materialize autonomously. The essential role of policymakers and stakeholders in driving these changes cannot be overstated. To counteract the adverse health effects of climate change, immediate action is imperative.

However, the policy proposed in this brief has its inherent limitations. Firstly, it operates at a general level, lacking specificity for individual facilities. Secondly, each hospital must assume responsibility by devising a tailored modernization program that considers its unique strengths and weaknesses. Despite these constraints, it is crucial to acknowledge that every journey begins with the first step. Hence, we strongly encourage all stakeholders to engage in the process and advocate for the adoption of green hospital policies, aiming to minimize the impact of climate change on public health.

The anticipated benefits of embracing green hospital practices are manifold, including improved patient health outcomes, reduced healthcare costs, a diminished environmental footprint, and the mitigation of negative impacts associated with climate change, such as heightened rates of respiratory illnesses and infectious diseases. As hospitals strive to strike a balance between cost-effective care and sustainable practices, dedicating more time and effort to these initiatives becomes crucial.

Ultimately, the research objective of this policy brief has been to provide a comprehensive overview of green hospitals and their potential to lead the healthcare industry towards a more sustainable and environmentally friendly future. By embracing green public procurement strategies, incorporating environmental criteria into purchasing decisions, and disseminating knowledge on the environmental impact of the healthcare system, a collective effort can propel the healthcare sector into a greener and more sustainable era.

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