

## Using AI to cut down on waste and save energy at Green Hospital Management

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### KEYWORDS

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### ABSTRACT

Modern hospitals are always operational and require many resources. To ensure continued delivery of medical services, they need a lot of water, electricity, medical supplies, and other resources. Hospitals also produce lots of waste, whether dangerous or not, increasing the costs of operation and pollution. In today's world, hospitals must find a way to offer quality medical services while at the same time being environmentally friendly as there are concerns about global warming and rising healthcare costs. AI is one of the major players in the quest for environmental sustainability within hospitals. It helps in making decisions through analysis of data, automation, and improvement of operations. The current research aims to explore the role of AI in decreasing waste production and energy efficiency in healthcare facilities. As indicated by the research findings, AI systems can significantly lower energy use by 10%–30%, enhance supply chain operations, cut down disposal costs, and boost waste management. Nonetheless, AI systems are computationally intensive, and unless this issue is carefully handled, AI may end up negatively affecting the environment. It is recommended that a sustainable AI system be developed, taking into account both economic gains and environmental considerations.

## 1. INTRODUCTION

The hospital is not just another business, but a complicated organization, and it does not have any downtime, unlike the usual businesses. For important places such as intensive care unit, operating theatre, medical instruments, and artificial life support systems to work, electricity is a necessity. Hospitals consume a considerable amount of power as a consequence.

There is also significant waste generation in hospitals, ranging from plastics, expired drugs, chemicals, contagious medical waste, and electronic waste. Disposal of such trash is an important challenge that adds to the hospital's overheads.

Carbon dioxide emissions of the health sector contribute approximately 4 to 5% of the world's carbon emissions. The growth of the population, development of new cities, and technological advancements in the healthcare sector are expected to exacerbate environmental impacts in the future.

In an effort to mitigate such problems, green hospital management aims at creating greener hospitals. These include efforts of saving energy, using renewable energy, generating less waste, and utilizing resources efficiently.

The adoption of AI makes hospitals smarter and more productive. Information is applied to detect problems, enhance operations, and minimize wastage. AI supports hospitals in moving away from outdated systems towards new and automated systems. The current study highlights how AI can help hospitals deal with any problems related to its application and become eco-friendly.



## 2. LITERATURE REVIEW

Author(s) and Year	Area of Focus	Main Contributions / Results	Importance to Current Research
Health Care Without Harm (2019)	Healthcare that lasts	stresses the importance of being environmentally friendly and the impact of healthcare on the environment.	serves as the basis for a green hospital's management.
World Health Organization (2019)	Taking care of healthcare waste	stresses how important proper disposal of waste is to ensure safety of people and the environment	confirms the need to minimize waste production.
International Energy Agency (2022)	Using Energy	points out that hospitals are high energy-consuming institutions.	confirms the need for energy efficiency.
Topol (2019)	Artificial Intelligence in Healthcare	explores ways that AI can help optimize hospitals' functioning and decision making	decides on the significance of utilizing artificial intelligence.
McKinsey & Company (2020)	AI and Productivity	shows how using AI saves money and enhances efficiency of operations.	confirms the financial gains from AI.
Rajkomar et al. (2018)	Machine Learning in Health Care	reveals how AI helps process big data for improved results.	helps people make decisions based on data.
Deloitte (2021)	Change in the Digital World	shows how essential AI is in creating smart hospitals.	promotes the increased utilization of AI in management.
OECD (2021)	Long-term growth	emphasizes the significance of green technology in public sector organizations.	facilitates sustainable practices.

Gupta and Kumar (2020)	Problems with Implementation	with reveals some problems, for instance, high costs and insufficient experience.	points out the challenges related to
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From the recent study, it is evident that offering quality services is only one of the ways in which sustainability can be achieved in a hospital. The other way is minimizing the impact on the environment. As indicated by Health Care Without Harm (2019) and the World Health Organization (2019), hospitals are sources of much waste and energy consumption, which negatively impacts the environment. This clearly illustrates the need for healthcare to be green.

It has been noted that hospitals are some of the buildings with high energy use. Therefore, enhancing energy efficiency in hospitals is critical, as highlighted by the International Energy Agency (2022). AI can help make hospitals more efficient through smart systems, fast processing, and optimization, as pointed out by Topol (2019) and McKinsey (2020).

AI can be utilized in creating intelligent hospitals and making informed decisions through the application of data analytics, according to Rajkomar et al. (2018) and Deloitte (2021). In addition, the importance of employing eco-friendly technologies to attain sustainability is mentioned by the OECD (2021) and many other international bodies.

Nevertheless, recent researches highlight additional challenges. In particular, Gupta and Kumar (2020) identify potential difficulties which might hinder the adoption of AI in hospitals, including high costs of implementation, insufficient infrastructure, and deficiency in skilled labor.

In conclusion, it should be noted that although sustainability and artificial intelligence are equally important for contemporary healthcare practices, further improvements in planning, implementation processes, and collaboration among different stakeholders remain necessary for their integration.

### 3. RESEARCH GAP

There have been many studies done about environmental sustainability in relation to AI for health care; however, there are not enough studies that make an effective connection between these two factors.

Most of the available studies are on one of the following subjects: the ways that AI can help the hospital in functioning (through diagnosis, scheduling, etc.) or making the hospital environmentally sustainable by reducing energy use and waste. Yet, there are very few studies done about the environmental sustainability of AI in relation to the financial stability of hospitals.

The third gap lies in empirical information about the long-term consequences of artificial intelligence application to energy efficiency and waste management within healthcare institutions. Estimating the efficiency of AI in real-life situations is problematic because much of the information provided is either theoretical or based on small-scale studies.

The fourth gap is that little attention has been paid to the environmental impact of the implementation of AI. On the one hand, AI promotes energy efficiency in hospitals; on the other hand, it entails using computers with a high demand for electricity.

Currently, there are no adequate frameworks/models available for ensuring sustainable use of AI. Most existing studies fail to offer guidelines for sustainable use of AI by hospitals.

In conclusion, concerns regarding high costs, unavailability of capable workforce, opposition to change, and insufficient infrastructures, among others, are some of the recurring themes. However, few studies have explored possible ways of dealing with these concerns.

### 4. OBJECTIVE

To determine the extent to which artificial intelligence minimizes energy consumption within hospitals.

To analyze the possibilities of AI implementation for the efficient management of waste in the healthcare sector.

To examine the economic advantages that could be gained by using artificial intelligence.

To outline a guide for the incorporation of AI in sustainable hospital administration methods.

### 5. METHODOLOGY FOR RESEARCH

In terms of employing qualitative and quantitative techniques, the current research study centers around the influence of AI as a way of enhancing the sustainability of hospitals through waste reduction and energy efficiency.

The use of this approach allows for the investigation of complex matters, such as the problem of hospital energy usage, issues of waste disposal, and the influence of AI as a means of improving efficiency. This is because it involves more than just numbers; it involves concepts as well.

Data analysis for this paper is carried out using thematic analysis and percentage analysis techniques. Awareness of AI technology, financial gains, energy efficiency, waste reduction, environmental concerns, and difficulties associated with applying these concepts have been selected as the major themes for discussion. Through the comparison of answers provided by the respondents and their conclusions, similarities and differences in their viewpoints have been found.

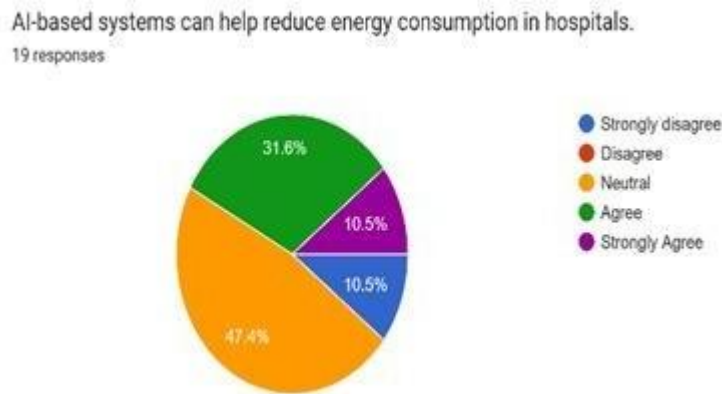
Primary and secondary data are both subjected to systematic analysis in order to ensure that results obtained through their analysis correspond to contemporary medical practices and technological advances.

With such a method of data collection, the study is impartial and all-encompassing since it comes from a number of different sources and people. With this strategy, the study will be able to evaluate a number of viewpoints and come up with useful ways of applying AI in creating sustainable hospitals.

This strategy normally helps in the analysis of how AI can be applied effectively in managing green hospitals.

### Interpretation

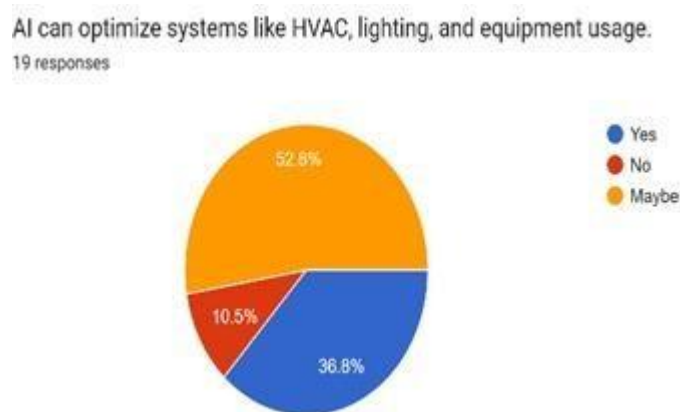
Figure 1:



From the answers provided, it becomes evident that the majority of the participants hold the view that AI technology could help cut down energy use in hospitals. Most of the people are in agreement with this opinion, whereas a few of them are very much in agreement with it. But quite a number of people have an indifferent stance towards this statement.

The results show that although most people think that AI could help conserve energy, yet there is a requirement for more knowledge regarding AI technology.

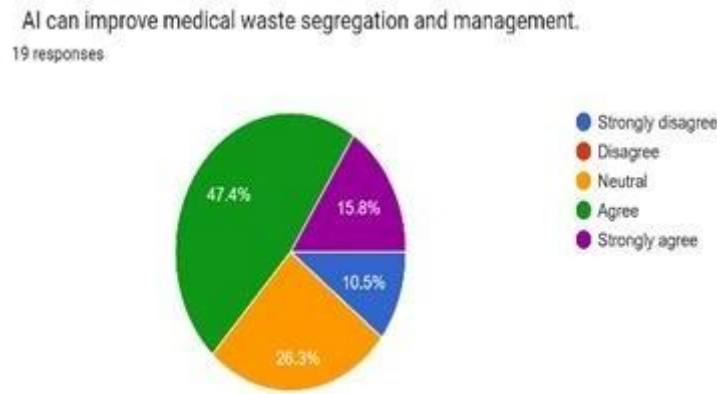
Figure 2:



In response to the survey, over 50 percent of those who responded were undecided on whether AI can improve such systems as lighting, HVAC, and equipment usage. Very few individuals disagreed with the idea that AI can help optimize such systems presented by the other small group.

The results have shown that many of those who responded were very skeptical regarding this technology, despite acknowledging its benefits. The conclusion here is that there is a need for more understanding of AI and its applications within hospitals.

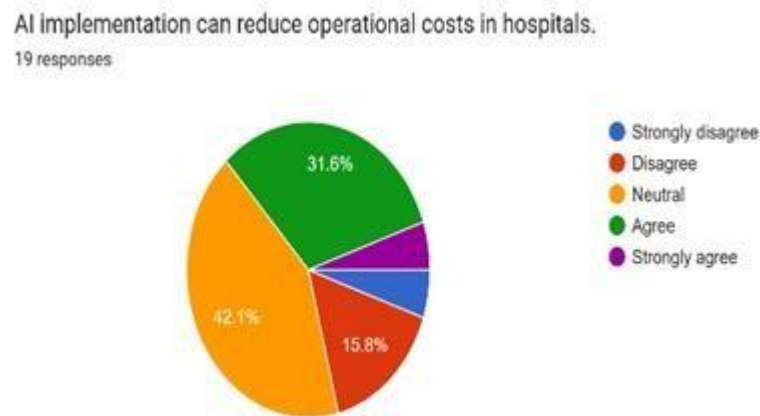
Figure 3:



This demonstrates that there is consensus amongst most of the respondents that artificial intelligence will be able to help manage and sort out medical waste. Most people, including those who strongly agree with the statement, have similar sentiments. Few people disagreed, whereas others were neutral as they were uncertain.

On the whole, it has been established that although there is uncertainty among some individuals, most believe that AI can assist in waste management.

Figure 4:



From the results obtained, a considerable number of people feel ambivalent about the issue of whether AI can help lower hospital operational costs. Most people agreed with the statement, but a smaller number disagreed and strongly disagreed with the given question. A small group feels strongly positive about the issue of AI being used.

From the above analysis, we learn that there are diverse viewpoints, and many people are skeptical about whether AI lowers costs. Although there are optimistic views about whether AI saves money, the high level of ambiguity shown by participants about the cost-saving nature of AI clearly shows that they lack knowledge about how AI affects the hospital financially.

## 6. RESULTS AND DISCUSSION

Based on the research findings, even though AI has become increasingly important for the operation of hospitals, there have been deficiencies in the field. Although most of the respondents who answered the question had heard about AI before, the understanding level of most was mediocre at best. Therefore, they will still need to be trained further on this matter.

Most respondents agree that AI could lower energy usage and help hospitals manage their waste better. It is clear that most people believe that AI would contribute to the reduction of energy use, better sorting of medical wastes, as well as make HVAC and other machines run more efficiently. AI is expected to help reduce wastage of medicines and supplies through better inventory management as well.

This means that like in many other areas, being aware of something does not mean one can have absolute faith in its capabilities. In relation to the ability of AI to lower operational expenses and impact on the environment, many people surveyed had a neutral view.

The report also identifies some of the major challenges in the implementation of the strategy. The first challenge is the shortage of expertise. High cost, inadequate infrastructure, and change management are also some of the challenges. It is difficult for hospitals to incorporate AI due to these reasons.

In general, from the analysis above, one can conclude that the implementation of AI could bring huge benefits to the management of green hospitals, but for that, it is necessary to increase cooperation and enhance skills and systems. This discrepancy can be bridged through practical experience and skills training as well as legislation.

## 7. CONCLUSION

It is evident from this research that the implementation of AI could greatly contribute to the development of sustainable practices at the hospital level, especially regarding waste management and energy savings. Unfortunately, not many individuals have the opportunity to use it since there is not enough experience and knowledge on its benefits.

Among the limitations of AI implementation in hospitals, the following can be mentioned: costly nature, a lack of knowledgeable personnel, and insufficient infrastructure. The government initiatives aimed at promoting sustainable practices and the digital economy are valuable, yet they should be properly implemented to bring about any tangible results. In conclusion, the application of AI technologies can bring about sustainable improvements at hospitals, yet for this purpose, it would take time and effort.

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