

Mini Review

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Sustainable Healthcare: Exploring Renewable Energy Integration and Technological Innovations in Sustainable Healthcare Aligned with Islamic Principles and UAE Initiatives

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Abstract

In this day and age, Earth's fragile beauty stands at its most venerable peak of extinction, driven by the unquenchable greed for economic prosperity with boundless demands for industrial growth. As a result, the topic of sustainability lies in the common interest of every industry, which is to optimize their resources to generate minimal waste and to invest in efficient technologies. The primary objective of this article is to investigate the current percepts of sustainability within the healthcare industry concerning innovations in eco-friendly energy while simultaneously focusing on the emerging technological innovations highlighting the sustainable aspect of the healthcare sector while incorporating the Islamic viewpoint of sustainability and initiatives taken in the United Arab Emirates (UAE). This paper provides a comprehensive overview of each of these factors.

Keywords: Sustainability, Renewable Energy, Technological Innovations, Healthcare Industry, Integration, Islamic Values, United Arab Emirates (UAE).

Introduction

The healthcare and medical sectors play a critical role as the reservoirs of society. As the world progresses, threats from challenges such as climate change and global warming are rapidly evolving and becoming a serious issue of concern worldwide. To tackle this, every industry is coming up with exclusive approaches to scale down the impact caused by these challenges. In recent years, to adhere to this crisis, every industry has aimed toward sustainability as their main goal, including the healthcare industry. Moreover, the medical and healthcare sectors across the world have been striving to brainstorm solutions to utilize clean energy sources and innovative technologies in their production of goods and services to hit their sustainability targets.

This paper delves into the topic of sustainability, giving reasons for its importance while extending its reach in healthcare sectors by acknowledging the complex interconnectedness of the components present. Furthermore, this paper investigates

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the relationship between the most common clean energy sources that have previously been studied and adopted in medical institutions, highlighting the benefits and potential risks of relying on renewable energy sources. Moreover, it sheds light on technological innovations in the medical sector and their significance, along with navigating the component of artificial intelligence (AI) in the medical field. The last element of this writing paper demonstrates Islamic views on sustainability, considering the Quran and Hadith, and how the UAE bases Islamic principles across various industries and initiatives taken by the UAE concerning the health sector.

Discussion of Sustainable Healthcare

In general, the term sustainability refers to utilizing resources in a way that there is enough for future generations to use; the main aspect of sustainability is “for the future.” According to this definition, sustainability in association with healthcare refers to satisfying the needs of individuals seeking healthcare without endangering the essential healthcare amenities for future patient treatments. In this era, it is unquestionably vital to incorporate sustainability into healthcare services to ensure the safeguarding of human health by fostering a healthy environment for communities to flourish. Moreover, the significance extends to preserving ecosystems and the earth’s natural resources by minimizing the environmental impact caused by toxic clinical practices, which further assists in mitigating the effects of climate change.

This brings us to the fact that the sustainable ideology in healthcare must have a holistic approach, bearing in mind that “health” itself is influenced by multiple interconnected factors and is not just limited to traditional physical health but also to factors that include mental health, as well as social determinants of health such as employment, education, and housing conditions, which play an important role. We must acknowledge these factors and understand the complex interconnected relations between them. Taking a holistic approach to sustainable healthcare not only enhances individual health effects but also facilitates the development of healthier communities and a sustainable future for everyone.

Exploration of Renewable Energy Integration in Healthcare

Fusing renewable energy sources and the concept of sustainability enables an efficient way to achieve an environmentally healthy future. As industries grow in fascination with integrating sustainability into organizations, the demand for environmentally friendly energy sources has risen, causing healthcare organizations to achieve their sustainable objectives. Provided below are some real-life scenarios for adopting renewable energy in healthcare organizations: Solar energy is adequate for powering hospitals and medical centers. According to the Practice Green Health organization, the use of “solar thermal technology” has already begun in many healthcare systems for heating water.

Furthermore, a study done by T. Toutsos et al. In 2010, at a Greek hospital, the installation of an absorption cooling system was concluded to be successful in reducing costs for healthcare facilities and in the depletion of ozone by replacing ACs with a

cooling system. This cooling mechanism captures and holds moisture, which aids in cooling. Through this, we come to know that renewable energy offers countless opportunities for the health sector, and the advantages of installation are substantial. However, it is also vital to take note of personal risks such as those involving huge dependence on weather, initial investment costs, and future maintenance costs before reducing the risk of potential obstacles.

Sustainability in Healthcare Statistical Data Analysis

The healthcare industry is one of the major contributors to overall greenhouse gas emissions, producing an estimated 4.4% of greenhouse gases responsible for global warming and being a major consumer of natural resources. It has been noted that England, the United States, Australia, and Canada combined annually produce around 748 metric tons of carbon dioxide. Countries like India and China, along with the Organization for Economic Co-operation and Development (OECD) countries, account for 78% of global production. Within these countries, there is a twenty-five times difference in healthcare emissions per capita between the highest (the United States) and lowest (India).

According to “Practice Green Health’s Sustainability Organization,” each year the organization collects and reviews data through Environmental Excellence Awards to generate a benchmark report that consists of comprehensive sustainability performance data for the United States healthcare sector.

Below are some of the statistically analysed data for the U.S. healthcare sector in 2023 for sustainability.

Examination of Technological Innovations in the Medical Sector

Over the last decade, innovation in technological aspects concerning healthcare and medicine has rapidly accelerated, transforming the healthcare domain. It offers unlimited opportunities to enhance healthcare provisions, improve patient outcomes, develop energy-efficient medicinal devices, and advocate for sustainability. Innovations such as telemedicine, digitalizing health records, and patient monitoring hold the power to reshape how health care is accessed, delivered, and experienced.

Furthermore, innovation in the context of artificial intelligence (AI) seeks to imitate human cognitive capabilities by using AI algorithms to manipulate and simplify vast amounts of data and to interpret complex patterns without the need for additional medical professionals. Moreover, AI’s innovation extends its branches into various health-related realms, comprising tasks like diagnosing skin cancer as effectively as, or comparatively more effectively than, other dermatologists [1, 2], crafting intelligent prosthetic devices [3, 4], and predicting mortality rate after cardiac surgery [5].

The United Nations Sustainable Development Goals (SDGs) consist of 17 life-changing goals outlined by the United Nations and adopted by United Nations Member States in 2015, whose aim is to change the world for the better by addressing various social and economic challenges such as poverty, gender equality, and giving people better healthcare. Each goal has specified

targets and procedures to measure progress. As per United Nations Sustainable Development Goal Number 3, it is important to promote well-being and ensure healthy lives for all ages. One way to accomplish this objective is by continuously monitoring health, which can be done through smart wearable healthcare (SWH) devices. Using such monitoring devices captures real-time data via sensors, RFIDs, and biometrics, which links the sensing technology to enhance the quality of human health.

These smart devices can remotely track vital signs and various health metrics, which analyze and generate various patterns that further provide individuals with an insight into their health and encourage users to adopt a sustainable lifestyle by promoting physical activities and healthier eating habits while promoting overall well-being that benefits their health and the environment, which can contribute significantly to achieving the United Nations Sustainable Development Goals.

Alignment of sustainability with Islamic Principles and UAE initiatives

In the heart of Islamic teachings lies a profound regard for the environment, including a directive towards stewardship. This concept is nestled within Quranic verses and the Hadiths of Prophet Mohammed. This section uncovers the connection between Islamic teachings, sustainable practices, and environmental stewardesses and highlights their significance in shaping a more sustainable future. Islam accentuates the importance of the earth's stewardship and its resources. This is embedded in the concept of "Khalifah," which is derived from the Arabic word "khalifa," which means successor.

"Then We made you heirs in the land after them, to see how ye would behave!" Quran (10:14) The notion of Khilafah (stewardship) in Islam underlines the duty of humanity to safeguard the earth and its resources and to make humans understand that they have a responsibility to manage the earth's resources as successors. Another Quranic verse states "O children of Adam! wear your beautiful apparel at every time and place of prayer: eat and drink: but waste not by excess for Allah loveth not the wasters." (Quran 7:31). This verse prompts Muslims to wisely utilize the blessings bestowed by Allah (SWT) while abstaining from excess and ensuring sustainable utilization. Additionally, the Hadith contains many references to sustainability and environmental protection, supplementing the Quran.

The prophet Mohammed (Peace be upon Him) said, "There is none amongst the Muslims who plants a tree or sows seeds, and then a bird, or a person or an animal eats from it, but is regarded as a charitable gift for him." ('Sahih al-Bukhari) This Hadith from 'Sahih al-Bukhari' underscores Islamic emphasis on environment preservation, the binding connection between humanity and nature, and depicting environmental care as honorable actions with spiritual benefits. The United Arab Emirates constitutes its governance, culture, and society based on Islamic principles. It plays a key role in shaping the policies, laws, and regulations of the country to ensure that they are within the framework of the Quran and Hadith in every government facet, including the medical and healthcare sectors.

In the UAE's healthcare sector, healthcare professionals are trained to deliver services based on Islamic beliefs and principles,

which fosters a rapport between patients and professionals. As previously stated, sustainability is one of the crucial aspects of Islam, and the UAE incorporates such sustainable procedures into its healthcare industry. One of the recent sustainable healthcare initiatives the UAE has incorporated is the integration of renewable energy technologies in hospitals and medical institutions. Moreover, initiatives such as Dubai Health Strategy 2021, in which Dubai aims to dominate by raising the standard of healthcare delivery by implementing innovative, cutting-edge technology [6-8].

Conclusion

In conclusion, by deeply examining the subject of sustainability concerning the medical and healthcare sectors, the significance of combining these elements is evident, and healthcare facilities need to strive for sustainability by crafting creative solutions to make use of clean energy instead of traditional carbon-emitting fossil fuels, which increase the ecological impact and can enhance health organization profits by investing in cleaner and more cost-effective energy sources. In addition to that, technological innovation within health care, which is done by incorporating AI, can substantially elevate the delivery of healthcare to patients. Furthermore, we come to comprehend Islamic values about sustainability profoundly, alongside how the UAE honors Islamic principles and integrates them into the healthcare sector to promote sustainability.

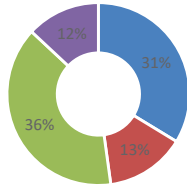
***Summary Cv Dr. Ahmed Sebihi:** Dr. Ahmed Sebihi stands as a luminary figure in the realm of global education, blending academic expertise with practical teaching and international training in education and counseling. He was honored with an honorary doctorate in "Innovation and Artificial Intelligence" from the Board of Directors of the Academy of Geniuses for Education, Training, and Consultation in Egypt. With extensive experience in major universities across Thailand, Tunisia, Saudi Arabia, and the UAE for over 29 years, he has excelled in teaching, research, and supervising students at the undergraduate, master's, and doctoral levels.

As an international educator, he has overseen curriculum development for schools and private institutes in Thailand under the supervision of the Ministry of Education, as well as conducted numerous social training courses for married couples and those preparing for marriage at the Sharjah Ladies Club. He serves as the media center director and journalist at the Higher Committee for Muslims in Bosnia and Herzegovina and Somalia in Saudi Arabia and holds leadership positions such as leading research and studies in the Emirates Association for Senior Citizens and as the president and vice president of several associations, including the Parent-Teacher Association and the Arab Thai Cultural and Development Association. Through his contributions to research, television appearances, and scholarly publications, Dr. Ahmed Sebihi strives to enhance the educational sector and address family issues, establishing himself as a distinguished and influential figure on a global scale.

****Biography:** Areebah Fatimah is a determined student at Skyline University, Sharjah. She is currently pursuing her undergraduate degree in Human Resources Management and is engaged in her Islamic studies in the field of Islamic psychology. In her high school A-level studies, she chose psychology, economics, and math. Her passion for studying is accompanied by her natural

leadership and teamwork skills, and she finds joy in motivating others to excel. Moreover, she is dedicated to the pursuit of knowledge with an unquenchable inquisitiveness and is eager to take on new challenges. She has been consistent in her academics and managed to retain a 4.0 CGPA.

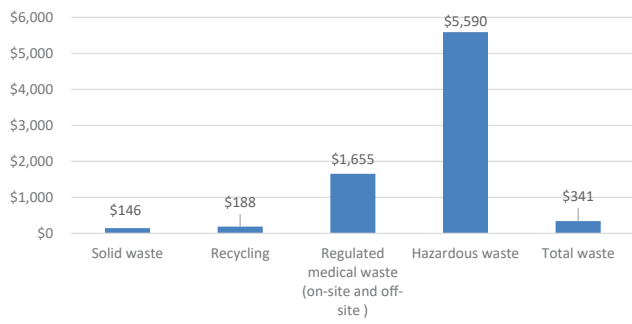
Average cost of waste generation by type in U.S healthcare sector (%)



■ Solid waste ■ Recycling ■ Regulated medical waste ■ Hazardous waste

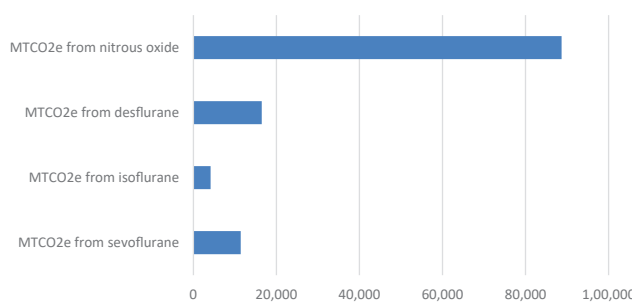
The average cost of waste generation by type in the U.S. healthcare sector (%). Cost per ton of different waste types (\$).

Cost per ton of different waste types (\$)



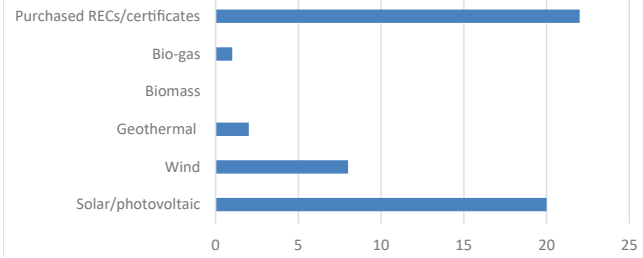
Note: Total waste is the sum of solid waste, recycling, regulated medical waste, and hazardous waste. Pharmaceutical and food waste are counted as subsets of those four waste streams. Cost for recycling includes only those facilities that had a net cost (not a profit) for their recycling program.

Total GHG emissions from inhaled anesthetics in metric tons of carbon dioxide equivalent (MTCO₂e)



Total greenhouse gas (GHG) emissions from inhaled anesthetics in metric tons of carbon dioxide equivalent (MTCO₂e).

NUMBER OF REPORTING FACILITIES WITH RENEWABLE ENERGY WHERE RECS ARE OWNED



Type of renewable energy and number of reporting facilities with renewable energy where RECs are owned.

*REC: Renewable Energy Certificate.

For more information, search "Renewable Energy Certificates" at <https://www.epa.gov/repowertoolbox>

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