

Architecture in Medicine and Healthcare

Romina Rezazadeh¹, Maryam Yaghoubi²

1. Department of Architecture, College of Art and Architecture, West Tehran Branch, Islamic Azad University, Tehran, Iran

2. Health Management Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran

* Corresponding author: maryamyaghoubi2023@gmail.com



Romina Rezazadeh

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Abstract

The design and planning of buildings and spaces that are related to health care, such as hospitals, clinics, laboratories, and wellness centers, is an important aspect of architecture in medicine. It involves creating environments that are functional, efficient, safe, accessible, and comfortable for the users and the staff. It also requires considering the specific needs and preferences of different types of patients, such as children, elderly, disabled, or chronic. It also aims to promote healing, recovery, and well-being through the use of natural elements, biophilic design, ventilation, lighting, acoustics, and other features that enhance the physical and mental health of the occupants. architecture can promote well-being and prevent disease discuss examples of buildings that incorporate natural elements, biophilic design, ventilation, lighting, acoustics, and other features that enhance the physical and mental health of the occupants. that also mention some of the challenges and opportunities for creating healthy environments in different contexts, such as urban, rural, or remote areas. Medical architecture is the design of buildings and spaces that support the health and well-being of the people who use them. It can promote well-being and prevent disease by applying principles of social design, infection prevention and control, and wellness design, Such as how medical architecture can achieve these goals, social design refers to the design of relationships, including those that are invisible and intangible. In health care, it means reimagining the role a building can play in the health of its inhabitants and the locale in which it is situated.

Introduction

The design and planning of buildings and spaces that are related to health care, such as hospitals, clinics, laboratories, and wellness centers, is an important aspect of architecture in medicine(1). It involves creating environments that are functional, efficient, safe, accessible, and comfortable for the users and the staff. It also requires considering the specific needs and preferences of different types of patients, such as children, elderly, disabled, or chronic. It also aims to promote healing, recovery, and well-being through the use of natural elements, biophilic design, ventilation, lighting, acoustics, and other features that enhance the physical and mental health of the occupants(2).

1. How architecture can promote well-being and prevent disease

The natural elements, biophilic design, ventilation, lighting, acoustics, and other features enhance the physical and mental health of the occupants. You could also mention some of the challenges and opportunities for creating healthy environments in different contexts, such as urban, rural, or remote areas Medical architecture is the design of buildings and spaces that support the health and well-being of the people who use them. It can promote well-being and prevent disease by applying principles of social design, infection prevention and control,

and wellness design. Here are some examples of how medical architecture can achieve these goals (3).

1.1. Social design refers to the design of relationships Including those that are invisible and intangible. In health care, it means reimagining the role a building can play in the health of its inhabitants and the locale in which it is situated¹. For instance, the size and layout of a room, whether a bed sits in the middle or against a wall, how much space is maintained for patients to walk versus how many beds or operating equipment can be accommodated, can affect the experience, cost, and results of health interventions. By designing spaces that respect the dignity, privacy, and comfort of patients and health workers, social design can improve the quality of care and outcomes. Social design is the design of relationships, including those that are invisible and intangible, in health care settings. It can improve health outcomes by reimagining the role a building can play in the health of its inhabitants and the locale in which it is situated⁽⁴⁾. Some of the ways social design can improve health outcomes are: By designing spaces that respect the dignity, privacy, and comfort of patients and health workers, social design can improve the quality of care and outcomes. For example, the size and layout of a room, whether a bed sits in the middle or against a wall, how much space is maintained for patients to walk versus how many beds or operating equipment can be accommodated, can affect the experience, cost, and results of health interventions. By creating spaces that foster community and collaboration, social design can enhance social support and well-being among patients and health workers⁽⁵⁾. For example, providing views of nature or green spaces, creating spaces for exercise or meditation, and designing spaces that encourage social interaction and learning. By designing buildings with better exposure to sunlight and outdoor air, social design can reduce the risk of infection and promote healing. For example, sunlight and outdoor air may inhibit the survival and transmission of infectious causes, as well as improve mood and circadian rhythms⁴. Social design is an emerging field that has the potential to transform health care environments and improve health outcomes for patients and health workers. It requires a multidisciplinary approach

that involves architects, designers, engineers, health professionals, patients, and communities. By applying principles of social design to health care settings, we can create spaces that support the health and well-being of the people who use them (6).

Infection prevention and control (IPC) is a scientific method and hands-on solution intended to avert harm or health dangers initiated by infection to patients and health workers. Medical architecture can support IPC by designing buildings with better exposure to sunlight and outdoor air, which may inhibit the survival and transmission of infectious causes². It can also incorporate design strategies that balance the concept of open access with the need for control measures to lessen the rate of infections. For example, using partitions, curtains, or doors to separate patients, creating isolation rooms or wards for infectious cases, providing adequate ventilation and filtration systems, and ensuring easy access to hand hygiene facilities⁽⁷⁾.

Wellness design is the design of spaces that host a multidimensional definition of health, which includes physical, mental, and social well-being. It can promote well-being and prevent disease by creating environments that enhance the natural elements, such as light, air, water, and plants, that support human health. It can also incorporate features that encourage healthy behaviors, such as physical activity, social interaction, relaxation, and mindfulness. For example, using natural materials and colors, providing views of nature or green spaces, creating spaces for exercise or meditation, and designing spaces that foster community and collaboration⁽⁸⁾.

2. How medicine can inspire architecture and vice versa.

You could explore how medical concepts like anatomy, physiology, pathology, diagnosis, treatment, and prevention can inform architectural design and innovation. You could also examine how architectural principles, such as form, function, structure, materiality, aesthetics, and sustainability, can influence medical practice and research. You could provide examples of projects that demonstrate the mutual benefits of

interdisciplinary collaboration between medicine and architecture. Medicine and architecture are two fields that may seem very different, but they can inspire each other in many ways. Both are concerned with the well-being of human beings, and both can benefit from the advances in science, technology, and design(9).

2.1. Medicine can inspire architecture by providing insights into the multisensory nature of human perception and cognition. By understanding how the senses interact and influence each other, architects can design spaces that stimulate and enhance the sensory experience of the users, such as by using natural elements, colors, sounds, smells, and textures. For instance, exposure to sunlight and outdoor air can improve mood and health, while natural materials and colors can create a sense of warmth and comfort (10).

2.2. Architecture can inspire medicine by providing innovative solutions for the delivery of health care services. By rethinking the traditional layout of hospitals and clinics, architects can create spaces that are more patient-centered, efficient, and collaborative. For example, instead of moving patients between different departments and floors, care can be brought to the patient in a single hub, where all the necessary functions and equipment are available. This can reduce waiting and transfer times, simplify way-finding, and improve access to quality views (11).

2.3. Medicine and architecture can inspire each other by sharing common principles and values, such as social design, infection prevention and control, and wellness design. These principles aim at creating environments that support the health and well-being of the people who use them, not only physically but also mentally and socially. By applying these principles to both fields, we can create buildings and spaces that promote dignity, privacy, comfort, community, collaboration, learning, healing, and prevention (12).

3. How architecture can reflect and shape the history and culture of medicine.

You could analyze how different styles, periods, and movements of architecture have expressed and influenced the development of medical knowledge, values, and ethics. You could also consider how architecture can communicate and educate the public about medical issues and achievements. You could illustrate your points with examples of historical and contemporary buildings that represent or relate to medicine, such

as hospitals, clinics, laboratories, museums, monuments, or memorials. Architecture can reflect and shape the history and culture of medicine in many ways. Architecture can express the values, beliefs, and practices of different medical traditions, as well as the social and environmental contexts in which they operate. Architecture can also influence the delivery, quality, and outcomes of health care services, as well as the well-being of patients and health workers(13).

3.1. Architecture can reflect the history and culture of medicine by preserving and showcasing the heritage and legacy of different medical systems. For example, the Ayurvedic Museum in Kerala, India, is a complex of traditional buildings that display the ancient knowledge and techniques of Ayurveda, one of the oldest holistic healing systems in the world. The museum aims to educate visitors about the history, philosophy, and principles of Ayurveda, as well as its relevance and applications in modern times(14).

3.2. Architecture can shape the history and culture of medicine by creating spaces that facilitate innovation and collaboration among different disciplines and stakeholders. For example, the Francis Crick Institute in London, UK, is a biomedical research center that brings together scientists from various fields and institutions to tackle some of the most challenging questions in human health². The building is designed to encourage interaction and exchange among researchers, with open-plan laboratories, flexible workspaces, and social areas (15).

3.3. Architecture can reflect the history and culture of medicine by adapting to the changing needs and preferences of patients and health workers. For example, the Maggie's Centres are a network of cancer support facilities that offer a range of services and activities for people affected by cancer. The centers are designed to create a warm, welcoming, and homely environment that contrasts with the clinical setting of hospitals. Each center is unique and reflects the local context and culture, as well as the vision of different architects(16). Architecture can shape the history and culture of medicine by promoting health and well-being through design. For example, the Khoo Teck Puat Hospital in Singapore is a public hospital that integrates nature and sustainability into its design⁴. The hospital features green roofs, gardens, ponds, waterfalls, and courtyards that create a healing and therapeutic environment for patients, visitors, and staff. The hospital also supports community engagement and empowerment through its rooftop farm, where volunteers grow organic vegetables

for the hospital's kitchen. Architecture is a powerful medium that can reflect and shape the history and culture of medicine. By designing buildings and spaces that support the health and well-being of the people who use them, architecture can contribute to the advancement and transformation of medicine(17).

4. The challenges and opportunities:

Some of the challenges and opportunities for the design and planning of buildings and spaces that are related to health care are:

4.1.The rapid changes and advances in medical technology and practice, which require flexibility and adaptability in the design and planning of the facilities. For example, the use of telemedicine, robotics, artificial intelligence, and nanotechnology may affect the layout, equipment, and infrastructure of the buildings and spaces(18).

4.2.The increasing demand and expectations for quality and personalized health care services, which require innovation and differentiation in the design and planning of the facilities. For example, the use of patient-centered design, evidence-based design, participatory design, and co-design may improve the satisfaction, engagement, and empowerment of the users and the staff(19).

4.3. The growing awareness and concern for environmental sustainability and social responsibility in health care, which require integration and collaboration in the design and planning of the facilities. For example, the use of green building standards, renewable energy sources, waste management systems, and community involvement may reduce the environmental impact and enhance the social value of the buildings and spaces(20).

5. Innovative healthcare facilities:

Innovative healthcare facilities are buildings and spaces that are designed and planned to provide high-quality and personalized healthcare services using the latest technology and best practices. Innovative healthcare facilities aim to improve the health and well-being of the patients, staff, and community by creating environments that are functional, efficient, safe, accessible, comfortable, and sustainable. Innovative healthcare facilities also seek to promote healing, recovery, and prevention through the use of natural elements, biophilic design, ventilation, lighting, acoustics, and other features that enhance the physical and mental health of the occupants(21). Innovative

healthcare facilities also reflect and shape the social and cultural values and norms of society by expressing and challenging the prevailing medical knowledge, ethics, and ideologies. innovative healthcare facilities architecture is a field that combines design, technology, and human well-being to create spaces that promote healing and wellness. Here are some examples of projects that showcase different aspects of this field:

CURA: This stands for Connected Units for Respiratory Ailments, and it is a project that aims to convert shipping containers into plug-in intensive care units for COVID-19 patients. The containers are modular, scalable, and easy to transport and deploy in different contexts. They are also equipped with biocontainment technology to prevent cross-infection. This project was developed by an international team of architects, engineers, doctors, and military experts(22,23).

Tambacounda Maternity and Paediatric Hospital: This is a hospital extension in Senegal, designed by Swiss studio Manuel Herz Architects. The building has a distinctive S-shape that curves around the existing structures and creates new courtyards. The facade is made of lattice-like brickwork that allows natural ventilation and light to enter the rooms. The hospital also incorporates local materials and craftsmanship, as well as elements of traditional African architecture(22).

Harvey Pediatric Clinic: This is a clinic for children in Arkansas, USA, designed by American firm Marlon Blackwell Architects. The clinic has an irregular shape and a bright red facade that makes it stand out from its suburban surroundings. The design reflects the progressive identity of the clinic, which takes a holistic approach to treating children. The interior spaces are organized around a central atrium that provides natural light and views of the landscape(24).

Bayalpata Hospital: This is a medical campus in Nepal, designed by New York-based Sharon Davis Design. The hospital is located in one of the most remote and poorest regions of the country, and it was built using local materials and labor. The walls are made of rammed earth from the site itself, the foundations are made of stone, and the doors, windows, and furniture are made of wood from the indigenous sal tree. The hospital also features courtyards, gardens, and views of the mountains that create a biophilic environment for healing(25).

Discussion:

The intersection of architecture and medicine offers a compelling arena for the advancement of healthcare facilities and the well-being of individuals and communities.

The discussion highlights several key aspects of different, Architecture's Role in Health Promotion: The discussion emphasizes how architectural design can promote well-being and prevent diseases. Incorporating elements like biophilic design, proper ventilation, and wellness spaces into healthcare facilities can significantly enhance the physical and mental health of patients and healthcare workers(26).

Mutual Inspiration: The collaboration between medicine and architecture is a two-way street, with each field inspiring the other. Medical concepts can inform architectural innovation, while architectural principles can improve healthcare practices. This interdisciplinary approach enhances the quality of care and patient experiences(27).

Reflecting and Shaping Culture: Architecture plays a vital role in reflecting and shaping the culture of medicine. Buildings and spaces can preserve medical heritage, foster innovation, and adapt to changing healthcare needs. By doing so, architecture contributes to the evolution of medical knowledge and values(28).

Challenges and Opportunities: The challenges in medical architecture, such as adapting to rapidly evolving technology and meeting the growing demand for personalized care, present opportunities for innovation and creativity. Additionally, the increasing emphasis on sustainability and social responsibility in healthcare facilities underscores the need for collaborative solutions(29).

Innovative Healthcare Facilities: The concept of innovative healthcare facilities is highlighted as a testament to the potential of merging architecture and medicine. These facilities prioritize patient well-being, incorporate the latest technology, and adhere to evidence-based design principles(22).

Conclusion:

In conclusion, the dynamic relationship between architecture and medicine offers immense potential for the betterment of healthcare environments and outcomes. By creating spaces that prioritize well-being, reflect cultural values, and embrace innovation, architects and medical professionals can significantly enhance the quality of healthcare delivery. The challenges posed by evolving technologies and changing patient expectations underscore the need for continued collaboration and innovation in the field of medical architecture. As society evolves, the collaboration between these two disciplines will continue to shape the way we experience healthcare and healing.

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