



Applying The Benefits Of Spatial Organization To Cardiac Specialist Hospital Design In South Eastern Nigeria: The Case Of Spatial Organization Negligence In Cardiac Hospital Design.

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ABSTRACT

This article explores the application of spatial organization principles in the design of cardiac specialist hospitals in the south eastern Nigeria. As healthcare facilities become increasingly specialized, it becomes imperative to create environments that promote efficient workflows, patient comfort, and staff well-being. The benefits of effective spatial organization are manifold, ranging from enhanced operational efficiency to improved patient outcomes. By examining the unique requirements of cardiac specialist hospitals and the specific context of Anambra and Enugu State, this article aims to elucidate the key principles and strategies for designing healthcare spaces that optimize spatial organization. It delves into the significance of clear circulation paths, functional zoning, and strategic adjacencies in facilitating smooth patient flows and optimizing clinical operations. Furthermore, the article explores the role of evidence-based design and human-centered approaches in tailoring spatial organization to meet the needs of cardiac patients, their families, and healthcare professionals. Drawing from relevant case studies and best practices, it offers insights into the integration of technology, natural light, and calming environments to enhance the healing experience and reduce stress for patients. The article concludes by emphasizing the importance of collaborative design processes involving architects, healthcare professionals, and stakeholders to ensure the successful implementation of spatial organization principles in cardiac specialist hospital design in the south eastern Nigeria. By leveraging the benefits of thoughtful spatial organization, these hospitals can create healing environments that not only support medical excellence but also promote the overall well-being of patients and staff.

Keywords: south east, spatial organization, circulation, cardiac hospitals, architecture, patients' wellbeing, Nigeria.

INTRODUCTION

According to World Health origination fact sheet, cardiovascular disease remains the biggest cause of death globally. More people die annually from cardiovascular disease (CVD) than from any other cause. An estimated 17.5 million people died from CVDs in 2012 representing 31% of global deaths. Of these, deaths, estimated 7.4 million was due to coronary heart diseases and 6.7 million were due to stroke. Out of the 16 million deaths under the age of 70 due to non-communicable diseases, 82% are in low and middle class countries and 37% are caused by CVDs. Most cardiovascular disease can be prevented by addressing behavioral risk factor such as: tobacco use, healthy diet, lack of physical activity, excessive alcohol consumption and strengthening health care using population-wide strategies (Source: WHO-global status report on non-communicable disease 2014).

According to World Health Organization, cardiovascular diseases are the leading cause of death worldwide and also projected to take over HIV/AIDS as number one cause of death in Africa by 2025 .(source: WHO-causes of death 2008 summary tables).

Africa has not been spared in this global tide of CVD, Very few West African countries can boast of resources to provide optimum cardiac care to their population. Cardiac surgery requires relatively sophisticated diagnostic and surgical techniques and high level infrastructure operated by personnel with advanced training and expertise (Dalton and Hoelscher, 2007). The manpower and infrastructure required is largely unavailable on the African continent. The availability of cardiac surgeons per million of the population in North America and Europe is ten times more than the figure for Africa (Bernier and Stefanescu 2010). The treatment cost related to diagnosis and treatment of heart disease is way beyond the means of the largely indigent population in West Africa. In some part of the western Africa, only 20% of the parents of children below 15yrs old requiring surgery for congenital heart diseases are able to finance the operation with 12 months of diagnosis (Edwin and Serebeo 2010) while large number of patients in the area lack the resources to access whatever treatment is available locally. The few citizens who can afford cardiac surgery result to seeking treatment abroad. Apart from South Africa and Egypt with several active heart centres, the rest of the continent is still grappling with large populations with limited options for home-based cardiac surgery.

A cardiology specialist center is an establishment endowed for carrying out many operations on heart related diseases and also to make scientific researches on heart related diseases, in the early 18th century, Peter the Great established an educational-research institute to be built in his newly created imperial capital, St Petersburg. His plan combined provision for linguistic, philosophical and scientific instruction with a separate academy in which graduates could pursue further scientific research. It was the first institution of its kind in Europe to conduct scientific research within the structure of a university. The St Petersburg academy was established by decree on 28 January 1724.

A cardiology specialist center is a health institution that deals with the disorders of the heart as well as some part of the circulatory system. The field includes medical diagnosis, and treatment of congenital heart defects, coronary artery disease, heart failure, valvular heart disease, and electrophysiology.

Architecture plays a pivotal role in the design of healthcare facilities, especially when it comes to specialized institutions such as cardiac specialist hospitals. The spatial organization within these healthcare environments can significantly impact patient outcomes, staff efficiency, and overall quality of care (Choi et al, 2008). In the context of south east, Nigeria, where the demand for high-quality cardiac care is rising, there is a pressing need to explore how the benefits of spatial organization can be effectively applied to the design of cardiac specialist hospitals. This article aims to examine the importance of spatial organization in healthcare settings, specifically focusing on its application to cardiac specialist hospital design, and how it can enhance patient care and medical staff performance.

Spatial organization in healthcare refers to the deliberate arrangement of physical spaces, circulation paths, and functional zones within a hospital facility to optimize the delivery of healthcare services (Ulrich et al, 2010). It takes into account factors such as patient flow, infection control, access to medical equipment, and the creation of supportive environments that aid in the healing process. By applying thoughtful spatial organization principles, architects and designers can create environments that promote efficiency, safety, and positive patient experiences. In the context of cardiac specialist hospitals, spatial organization assumes even greater significance due to the complex nature of cardiovascular care. The treatment of cardiac patients often involves a range of specialized departments and requires seamless coordination between different medical disciplines, including cardiology, cardiovascular surgery, diagnostic imaging, and rehabilitation. Therefore, the design of these hospitals must facilitate efficient collaboration and communication among medical professionals, ultimately improving patient outcomes. To understand the benefits of spatial organization in cardiac specialist hospital design, it is essential to consider several key aspects. First and foremost, patient-centered care should be prioritized, ensuring that the physical layout supports a healing and comforting environment. Research has shown that well-designed spaces can reduce stress levels, enhance patient satisfaction, and contribute to better clinical

outcomes (Ulrich et al., 2008). By incorporating natural light, views of nature and access to outdoor spaces, architects can create environments that positively impact patient well-being.

Secondly, efficient patient flow is critical in ensuring timely and effective delivery of care. Effective spatial organization can streamline the movement of patients, minimizing congestion, reducing wait times, and facilitating smooth transitions between different areas of the hospital (Zimring C. et al, 2020). This can be achieved through the strategic placement of key departments, such as emergency services, diagnostic imaging, operating theaters, and inpatient units, allowing for a logical and efficient flow of patients throughout the hospital.

Furthermore, spatial organization plays a vital role in optimizing the workflow of healthcare professionals. By carefully designing workspaces, circulation routes, and supportive facilities, architects can enhance staff productivity and satisfaction. For instance, locating cardiac catheterization laboratories adjacent to operating rooms and intensive care units can foster efficient collaboration and reduce transfer times for critically ill patients.

In the realm of healthcare design, the significance of spatial organization cannot be overstated. The arrangement and layout of spaces within a cardiac facility have a profound impact on the overall functionality, efficiency, and user experience (Knorr, 2009). This holds particularly true for specialized healthcare institutions like cardiac specialist hospitals, where precision, accessibility, and patient well-being are of paramount importance.

Studies have consistently shown that the physical environment has a profound effect on patient well-being, satisfaction, and even clinical outcomes. For instance, a systematic review by Ulrich et al. (2008) demonstrated that access to natural light, views of nature, and pleasant surroundings have a positive impact on patient recovery rates and pain management.

Spatial organization in healthcare facilities can significantly contribute to streamlined workflows, improved staff efficiency, and reduced patient wait times. Studies by Chaudhury et al. (2006) and Sadatsafavi et al. (2016) highlight the importance of well-designed circulation patterns, clear wayfinding systems, and appropriately located clinical support spaces in enhancing staff productivity and minimizing patient stress. Efficient spatial organization can facilitate the smooth flow of medical personnel, equipment, and patients, leading to enhanced patient care delivery (Ulrich et al, 2008).

Spatial organization in healthcare facilities encompasses the arrangement and utilization of physical space, including the layout, circulation, zoning, and integration of various functional areas within the hospital (Dandridge et al, 2001). It aims to enhance patient experience, facilitate efficient workflows, and promote collaboration among healthcare providers, ultimately contributing to improved healthcare delivery.

Anambra State, located in southeastern Nigeria, is a region that has witnessed rapid development in recent years. As healthcare needs evolve and the demand for specialized medical services increases, it becomes imperative to examine the application of effective spatial organization principles in the design of cardiac specialist hospitals. By incorporating thoughtful spatial strategies and design elements tailored to the unique requirements of cardiac care, Anambra State can strive to create healthcare environments that optimize patient outcomes, streamline workflows, and enhance the overall healing environment.

Patient-centered design is an approach that places the individual at the core of the design process, ensuring that their needs, preferences, and comfort are prioritized (Jain, Saint et al, 2014). This approach fosters an environment that empowers patients and promotes active participation in their own healthcare journey. Studies by Jain et al. (2015) and McCullough et al. (2017) emphasize the importance of patient engagement, flexibility in room layouts, and the provision of personal control over the environment as key elements in patient-centered design. By applying these principles to the spatial organization of cardiac specialist hospitals, architects can contribute to improved patient satisfaction and a sense of empowerment.

The benefits of applying spatial organization principles to cardiac specialist hospital design are far-reaching. Efficient spatial planning can significantly improve operational workflows, reducing the time and effort required for healthcare professionals to navigate the facility and access critical resources

(Lawson B et al, 2011). This, in turn, enhances the efficiency of medical procedures, allowing for faster diagnoses, interventions, and patient management.

Additionally, well-designed spatial arrangements can contribute to the creation of a patient-centered environment. Cardiac patients often undergo long and challenging treatment processes, requiring comprehensive care and emotional support. By carefully organizing spaces to promote comfort, privacy, and positive distractions, cardiac specialist hospitals can foster a healing atmosphere that aids in the recovery and well-being of patients.

Carmona (2002) connotes that circulation is the most vital aspect of planning and designing of any public building, pointing out that the identification and analysis of a traffic pattern in a cardiac center is very necessary. Not to be overlooked, it is the role that good architectural and interior design can play in enhancing efficiency within the centre. Human circulation within the interior and exterior of a public building if not properly organized tend not only to create a disorder state but also endanger human lives, especially when there is conflict with vehicular circulation (Tylor & Spicer, 2007). He further opined that the circulation of vehicles within a public building is a major concern as a failure to achieve proper resolution of the movement of vehicles will hamper efficiency.

Moreover, the utilization of effective spatial organization strategies can help optimize resource allocation. This includes efficient utilization of space, equipment, and staff, resulting in cost savings and increased operational effectiveness. By optimizing the allocation and proximity of spaces such as examination rooms, operating theaters, cardiac catheterization laboratories, and patient recovery areas, healthcare providers can streamline patient care pathways and reduce unnecessary movement, ultimately leading to improved outcomes.

Devies et al, (2008) stated that spatial planning in architectural design is the creation of functional layouts or sequences of rooms or spaces as required by the brief. A good hospital design integrates functional requirements with the human needs of its varied users: patients, visitors, support staffs, volunteers, and suppliers. The design of a facility/structure with its fixed and moveable components can have a significant impact on human performance, especially on the health and safety of employees, patients, and families (AIA, 2001).

Most importantly, good way finding design promotes healing because being able to understand their environment provides visitors with a sense of control and empowerment, key factors in reducing stress, anxiety, and fear feelings that undermine the body's ability to heal (Passini and Arthur 1992).

To achieve these benefits, architects and healthcare professionals need to collaborate closely during the design process, ensuring that the spatial organization aligns with the specific needs of cardiac care. Factors such as circulation patterns, sightlines, zoning, and functional adjacencies must be carefully considered to create an environment that promotes efficiency, safety, and patient satisfaction.

Designing a cardiac specialist hospital requires careful attention to the unique needs of cardiac patients, medical staff, and support services. Factors such as patient acuity, infection control, emergency response, and technological integration should guide the spatial organization process. By incorporating evidence-based design principles, hospitals can optimize efficiency, reduce medical errors, and create a healing environment conducive to cardiovascular health.

Aim of study

This article aims to explore the application of spatial organization principles in the design of cardiac specialist hospitals in south east, Nigeria, aiming to create an environment that promotes healing, efficiency, and improved patient care. By examining international best practices, local context, and the unique requirements of cardiac care.

RESEARCH METHOD

A mixed-methods approach was employed for this research, combining a literature review, case studies, and expert interviews. The literature review focused on relevant publications, research papers, and industry guidelines related to healthcare design, spatial organization, and cardiac care facilities. Case studies of successful cardiac specialist hospitals were examined to extract best practices. Expert

interviews were conducted with healthcare architects and clinicians experienced in cardiac care to gain insights and practical recommendations.

This research investigated the inadequate spatial planning of spaces, activities, general patients and staff work floor in cardiac hospitals in the southeast region, Nigeria and the architectural solutions and policies to improve the patients' health and maximizing wellbeing through spatial organization in the region.

FINDINGS

Enugu State, located at the south east, Nigeria, has a cardiac center situated inside the university of Nigeria teaching hospital, located along enugu-portharcourt express road, ituku/ozalla and built in 1970's by the federal government. It was the first hospital built by the government which serves the old eastern region (plate 1).



Plate 1: showing the poor circulation area of the hospital which leads to traffic and confusion at the lobby.

Source: Akametalu, (Retrieved may 20th, 2023)

In Anambra State, located at the south east, Nigeria, the Federal Cardiac Center situated inside the Chukwuemeka Odumuegwu Ojukwu University Teaching Hospital, Amaku, was built in the city of Awka in year 2000 and located at Aroma, along Enugu-Onitsha express road (plate 2).



Plate 2: Showing poor circulation of spaces at the wards; this leads to congestion and discomfort to both patients and staff.

Source: Akametalu, (Retrieved may 20th, 2023)

During the visitations and interviews conducted in the hospitals aforementioned for the sake of this paper, none of the cardiologist were met on site because they share same facility with other specializations in the unit, the medical nurse the researchers met, explained bitterly that the facilities are not purposely built, and she lamented that a lot of spaces need be incorporated for effective spatial organization and circulation. This mayhem has caused uncontrolled traffic and confusion within the shared facility.

However, upon further investigation, the researchers noticed that the major equipment needed in a cardiac specialist center was conspicuously missing. According to the Importance of cardiac center (2017), safety against cardiac diseases and its awareness is highly important. Every year, large numbers of people die due to cardiovascular diseases (CVDs). Good heart condition, general public awareness and sensitization can easily be ensured by having cardiac surgery equipment in purposely built cardiac disease specialist hospitals.

While proposing a cardiac specialist hospital, it is worthy to note the importance of spatial organization planning for effective circulation and patients' well-being.

In further investigations and literature/journal reviews by the researchers, the following papers opined the essential need for spatial planning of spaces in cardiac hospitals/ health centers

The publication by Ulrich RS et al. explores the relationship between healthcare-associated infections (HAIs) and hospital design. It emphasizes the importance of spatial organization in reducing HAIs through effective zoning, hand hygiene stations, appropriate room layouts, and airflow control mechanisms (Ulrich et al., 2010).

The study conducted by Zimring CM et al. examines the impact of evidence-based design on patient outcomes. It highlights the significance of spatial organization in minimizing patient stress, optimizing staff performance, and improving safety through the integration of decentralized nursing stations, clear wayfinding, and efficient patient room layouts (Zimring et al., 2013).

The article by Carayon P et al. investigates the influence of spatial organization on safety in critical care units. It underscores the need for careful consideration of patient visibility, accessibility, and staff proximity in cardiac care settings to support rapid response, minimize errors, and enhance overall patient safety (Carayon et al., 2011).

Health Facility Guidelines and Cardiac Service guidelines issued by the Facility Guidelines Institute (FGI), offer evidence-based recommendations for the design and planning of healthcare facilities, including cardiac care centers. They address key considerations such as patient flow, efficient use of space, zoning of specialized cardiac units, and proximity of treatment areas to support optimal patient outcomes (FGI, 2009).

By drawing upon the guidance and research findings from these authoritative sources, architects and designers can create cardiac specialist hospitals in Anambra State that integrate evidence-based spatial organization principles.

Designing for the patient experience is crucial in cardiac specialist hospitals. Clustering related functions, such as diagnostic and treatment areas, near patient rooms reduces travel distances and enhances patient comfort. Clear wayfinding, natural lighting, and access to outdoor spaces were also identified as critical factors. Spatial organization should be based on careful zoning and adjacencies. Critical areas such as emergency departments, operating rooms, intensive care units, and rehabilitation spaces should be strategically located for optimized workflow and ease of access. Collaboration between departments and interdisciplinary communication should also be prioritized. Efficiency in cardiac specialist hospitals relies on well-designed workspaces. Centralized supply areas, adequate storage, and optimized circulation paths were found to enhance staff productivity. Additionally, integrating technology solutions, such as telemedicine and electronic medical records, can streamline processes. Considering the evolving nature of healthcare, flexible and adaptable spaces are crucial. Design features like modular layouts, flexible room sizes, and standardized equipment placement can support future expansion and changes in technology.

This approach will not only enhance patient experience and outcomes but also optimize workflow efficiencies for healthcare professionals, ultimately contributing to the success of cardiac care provision in the region.

CONCLUSION

The need for the application of spatial organization to cardiac specialist hospital design in Anambra State holds immense potential for improving healthcare outcomes and enhancing the overall patient experience. Through careful planning, thoughtful design, and consideration of key principles, such as efficiency, patient-centeredness, and adaptability, architects and designers can create spaces that not only support the specialized needs of cardiac patients but also contribute to their healing and well-being. By employing effective spatial organization, cardiac specialist hospitals can optimize workflow, minimize unnecessary movements, and enhance staff efficiency. This can lead to streamlined processes, reduced wait times, and improved patient outcomes. For instance, strategically locating diagnostic and treatment areas in close proximity can facilitate swift and seamless transitions for patients, allowing for prompt interventions and timely access to critical care.

Moreover, the concept of patient-centered design should be at the forefront of the spatial organization of cardiac specialist hospitals. Creating spaces that are welcoming, comforting, and aesthetically pleasing can have a positive impact on patients' psychological well-being, reducing anxiety and stress levels. Thoughtful consideration should be given to factors such as natural lighting, soothing color palettes, and the integration of nature and green spaces, all of which can contribute to a healing environment.

In summary, applying the benefits of spatial organization to cardiac specialist hospital design in south eastern Nigeria presents a compelling opportunity to elevate healthcare standards and enhance the well-being of cardiac patients. This integration of spatial organization principles with healthcare design can contribute significantly to improving cardiac care and shaping a healthier future for the south east.

RECOMMENDATIONS

Adopting a patient-centric approach to spatial organization will place patients at the center of design decisions. This involves creating clear wayfinding systems, minimizing travel distances, and enhancing accessibility for patients with limited mobility. The integration of private rooms, family zones, and relaxation spaces can promote patient comfort and contribute to their overall well-being. More so, efficient staff workflow is crucial in delivering high-quality cardiac care. Through careful spatial planning, hospitals can establish logical adjacencies between clinical areas, procedure rooms, and support services. This enables healthcare professionals to navigate the facility with ease, fostering collaboration and effective communication among multidisciplinary teams.

I also strongly recommend the integration of advanced technology and medical equipment as it is integral to cardiac specialist hospital design. Spatial organization should consider the placement of diagnostic imaging suites, catheterization laboratories, and operating rooms, optimizing their proximity to relevant support areas. Furthermore, accommodating future technological advancements in the design process ensures flexibility and adaptability in the long run.

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