

“ Exploration of patient’s perceived sustainable healthcare environmental design indicator.”

1st Author; Baby Jamzadi lalarukh¹, 2nd Dr.Sabeen Qureshi.

¹Achitecture & Mehran university of engineering and technology, Pakistan

**²Architecture & Mehran university of
engineering and technology, Pakistan**

¹lalarukhahmed93@gmail.com; ²sabeen.qureshi@muet.edu.pk

Abstract— *The aim of this paper is reduce the stress and confusion and the disturbance of patients, the connectivity of design have been frequently found in different studies. This article help us to control stress and reduce disturbance of patients and this will be achieved with the help of Quality Function Deployment (QFD) and Zero defect QFD is the tool that is used connectivity, parking, walkability, waiting area, barrier free way of finding, accessibility. In this regard only 02 case study analyses of hospital projects are special mention i.e. Jacobabad Institution of Medical science. Liaquat National Medical Center and Jacobabad Institute of Medical Science. In case studies a Design Determinant’s modeling on Quality Function Deployment (QFD) and House of Quality was carried out. The Areal Distribution options were analyzed on and Spatial Organization study was based on zero defect model which is Specifically designed for this research paper project Corridor and Connectivity simulate 84% improvement in circulation in Liqueur medical hospital. Grid allows enhancement by 44% in Barrier Free (Visibility), Orientation (Way finding) and Vicinity (Walkability). Survey suggested improved person on House of Quality Egress (Accessibility) and Feasibility (Waiting Area) Survey suggested improved person on House of Quality Egress (Accessibility) and Feasibility (Waiting Area)*

Keywords- *waiting area, parking, accessibility, barrier free way finding , connectivity*

I. INTRODUCTION

Hospital building occupies unique place in society, These studies provided a basis for understanding the path towards development of sustainable Healing Environment within hospitals.

This thesis to visualize and analyze the status of sustainable healing environment in hospital

buildings within Sindh and the ways and means to improve them. Various tools and techniques were also explored in this regard to evaluate the hospitals and case studies were conducted in Sindh to see the achievement of sustainable healing environment within hospitals from early stages of design to final product.

The beginning of this Master's thesis is based on one research papers written by author on hospital design that dealt with the design determinants, spatial organization and areal

distribution in hospital buildings. In these papers the author visualized and analyzed sun light design and its effects on environment within hospitals, the nurse walk path and reducing the horizontal travel time of staff in hospitals to achieve connectivity and direct barrier free accessibility and the process of efficient care giving to patients in the hospitals.

II. LITERATURE REVIEW

Sustainable Healing environment concept emerged in mid 19th century which indicates treatment of environment to be curative. (Nightingale, F. 1859) In next one century the concept expanded and it was discovered that in order to create sustain healing environment it needs the use of environmental qualities such as peaceful calmness, warmth and coziness, cleanliness, pure atmosphere and appropriate light levels which help a patient to recover. In 1960's, the concept of sustain healing environments got scientific underpinning through Evidence-based design. By mid 1980s Roger Ulrich made first evidence based research on sustain healing environment by identification of the effect of built environment on patients.

A. Definition of Hospital Buildings in Pakistan:

There is no single definition to describe the hospital buildings in Pakistan because the nature and scale of such structures varies to greater extent from one room poly clinic to large scale tertiary level hospitals. Therefore, this research describes about distinctiveness of healthcare innovation and apply concept of synergy of healing spaces in architecture of hospitals in Pakistan.

B. Concept of Hospital Buildings:

As most of these professionals identified the best hospital in Pakistan concerning healing environment as (LNMH) LIQUAT NATIONAL MEDICAL HOSPITAL and Healthcare Facilities in Karachi designed and developed by a foreign architect.

C. Definition of Design Determinants:

The concept of design determinants for healthcare facilities was first established by Kobus in the year (2008). Kobus defined the design determinants in terms of building typology prototype for healthcare facilities by an area mapping mechanism that describes the design

determinants in terms of preferred pattern for delivering care. Thus aim of design determinants evaluation is upgrading the level of community blending with the hospital facility raise community superiority. Design healing environment in hospital building by providing patient-centered care. House of Quality is the name of the matrix where roof-like triangular structure is at the top part. Hence the analogy is in form of a house which is divisible into room like spaces.

D. Spatial Organization:

Cummins et al [1] explains about understanding 'place' in health research from relational approach for measurement of potential spatial organization. These spatial ingredients may be localized and then applied to the current Pakistani healthcare setting. Khan and Ahmad [2]-[5] examined and analyzed the synergies from a barrier free perspective for spaces used by accessibility challenged users.

E. Definition of Areal Distribution:

Areal distribution is defined as schematic design or roughly bounded part of the space on a region e.g. bubble diagram. Holst (2015) while his study to optimize the efficiency of Hospital Layout where the bipartite significant determinants for areal distribution planning specifically for the provision of health care facilities are the criterion concerning patients for selection of hospital emergency departments and catchment areas information

III. CASE ANALYSIS

A. Case # 01: Case study of Jacobabad Institute of Medical Sciences:

The case study of Jacobabad Institute of Medical Sciences which follows the bubble diagram as shown blow in figure at micro level and the following design on macro level. The following design determinants are followed in the hospital of Jacobabad.



FIGURE 01

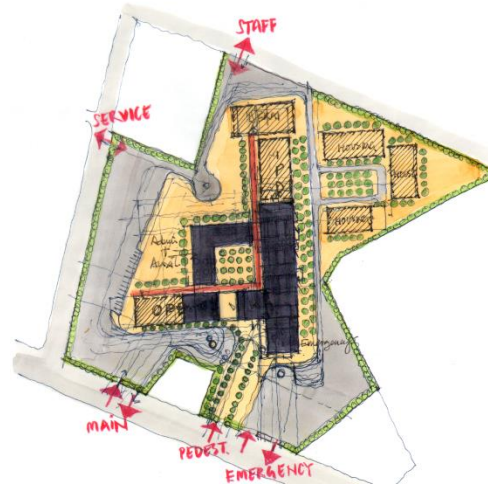


FIGURE 02

1. Ability to grow and change in repose to future needs as shown in figure 01 . The aim in planning should be to reduce to a minimum, the physical inhibition for future unforeseen growth. Which is the major criterion of design for the Jacobabad Institute of Medical Center.
2. Development of circulation and utility arteries. The main circulation and utility distribution system in a hospital should be conceived in three dimensions as shown in figure 03. Generally, maintaining a rectilinear pattern provides the greatest amount of flexibility, from connectivity perspective. As shown in figure 04. and the plan is consolidated on a grid design which is orthogonal thus the plan provides the greatest amount of free usable space. The circulation zone is visible in yellow colour, which connects the primary zone to the road for vehicular circulation as shown in figure.



FIGURE 03



FIGURE 04

3. Separation of various kinds of traffic, pedestrian from vehicular and patient, staff, visitor service from each other.
4. Here room standard for eight patient is used for prototype module, and toilet size act as a repetitive component thus development of modular spaces, to provide maximum flexibility. Room sizes are seldom so critical that a variation of 10 % to 20 % will not make any difference in their usefulness if a module can be developed that is acceptable for a larger variety of occupancies.
5. Careful consideration to orientation is studied and applied Here sun control and building material according to the local context of Jacobabad is used. The development of air conditioning and artificial illumination have a significant effect on hospital design.

B. Case # 02: Liaquat National Medical Center

Liaquat National Medical Center covers a huge population. Even people from far off regions seek here, for the quality treatment and all the facilities are available. It is completely functional, approx 1000 bed hospital, serving thousands of patients per month round the clock, managing the work in three shifts, (8–2pm, 2-8pm and 8-8pm) and all of modern equipment is available and operational along with the presences of the staff.



FIGURE 05

As shown in figure.1 The principal benefits of the horizontal scheme manifest in the planning. As main function of every hospital is to serve the human being. Building is human habitat and hospital is habitat for suffering people. The way we design, contract, and operate the hospital buildings has a profound impact on our health and the health of our environment.

01. The evolution of the plan of LNMC

As the site plans shows that the circulation of this hospital was problematic due to inefficient connections and inappropriate paths thus a humongous revision took place to redesign the entire building while uplifting of facade was also incorporated. As it is highly evident that designing a new hospital is rather much easier than revising a functional public center hospital located in the heart of the city.

02. Tool of Analysis:

This chapter of analysis for Liaquat National Medical Center is designed in two distinctive scope: one is macro level analysis of site planning and second is micro level planning of ICU. Therefore the research posed two fundamental questions:

01. What specific innovations of efficient circulation could be made to improve care delivery-
and at what cost?
02. Translated into efficiency (Kaizen) Continuous improvement: how much more productive, and how much less dangerous to patients, would healthcare delivery be?

03. The design innovations and their costs were organized into four categories

1. Efficiency and Effective Circulation (Macro Level)
2. Indoor environmental quality (IEQ) Micro Level
3. Operational efficiency
4. Infection Control



FIGURE 06



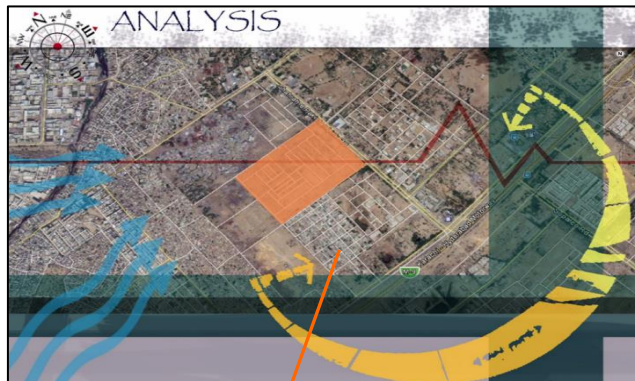
FIGURE 07

IV. ARCHITECTURAL DESIGN RECOMMENDATION

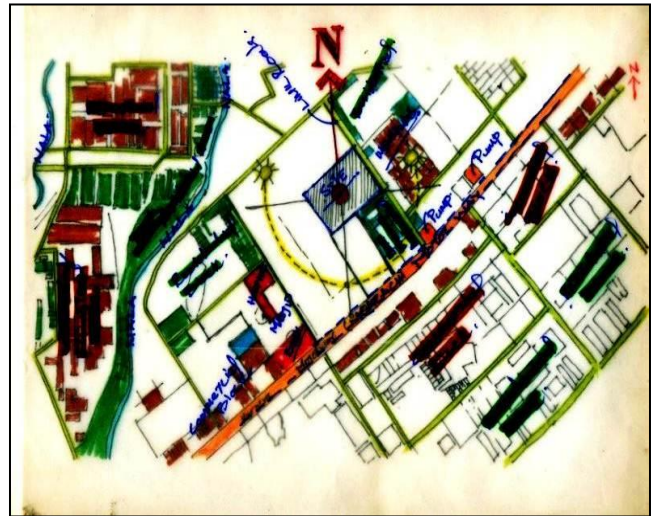
This is the live project initiated to apply the lessons learned from this entire research on improving of healing environment in healthcare facilities with an appropriate spatial organization, design determinants, and aerial distribution.

The process of the proposed hospital project began by identifying the needs of the community that developed in the suburban areas of Karachi. As currently new developments are going on in the periphery of Karachi.

There occurred many low income and high income settlements and they needed the hospital as the main hospitals of the city are in city center and are quite away on around one hour drive. Therefore a site is identified on the main super highway leading from Karachi city to Hyderabad which is another city 150 km away.



SITE ANALYSIS



LOCATION OF SITE ANALYSIS

01.SITE LOCATION

The proposed site for hospital is located around 30 km away from the city center of Karachi in the north side. The community land reserved for the amenity facilities was chosen to make the hospital. In this regard applied for foreign funding to develop the hospital and this land is acquired in the suburbs of Karachi.

V.CONCLUSION

The comprehensive analysis of healthcare facilities in Pakistan in relation to sustainable healing environment improvement of spatial Organization, Area Distribution and Design Determinants with the aim to improvements based on research objectives. If we want to remove all sorts of wastage of space in hospital and variation of space. The aim of the research was to “improving healthcare facilities in Sindh by adding healing environment based on design determinants, spatial organization, and areal distribution”. Total quality tool helped this research to simulate all three aspects which studied. Fish bone analysis short listed the design determinants.

A 75 % improvement was simulated when the design of Liaquat was redesigned applying all the listed determinents for design, whereas a 54% improvement was measured.

VI. REFERENCES

- [1] Berwick, D. M., Godfrey, B. A., & Roessner, J. (1991). Curing Health Care: New Strategies for Quality Improvement. *Journal for Healthcare Quality*, 13(5), 65-66.
- [2] Carpman, J. R., Grant, M. A., & Simmons, D. A. (1985). Hospital Design and Way finding A Video Simulation Study. *Environment and Behavior*, 17(3), 296-314.
- [3] Dileo, C., & Bradt, J. (2009). On creating the discipline, profession, and evidence in the field of arts and healthcare. *Arts & Health*, 1(2), 168-182.
- [4] Hutton, J. D., & Richardson, L. D. (1995). Health capes: the role of the facility and physical environment on consumer attitudes, satisfaction, quality assessments, and behaviors. *Health Care Management Review*, 20(2), 48-61.
- [5] Haq, S., 2003. Investigating the syntax line: configurationally properties and cognitive correlates. *Environment and Planning B: Planning and Design*, 30(6), pp.841-863.
- [6] Ingram, D. R., Clarke, D. R., & Murdie, R. A. (1978). Distance and the decision to visit an emergency department. *Social Science & Medicine. Part D: Medical Geography*, 12(1), 55-62.
- [7] Kobus, R. L. (2008). *Building type basics for healthcare facilities* (Vol. 13). John Wiley & Sons.
- [8] Sadatsafavi, H., Walewski, J., & Shepley, M. M. (2015). Factors influencing evaluation of patient areas, work spaces, and staff areas by healthcare professionals. *Indoor and Built Environment*, 24(4), 439-456.