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SPATIAL DESIGN EVALUATION OF ACCIDENT AND EMERGENCY DEPARTMENT OPTIMIZATION: A CASE OF CAPITAL HOSPITAL G-6, ISLAMABAD

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ABSTRACT

Sustainable usage and optimal performance of Accident and Emergency (A & E) department of any hospital is one of the most critical need of healthcare infrastructure in times of trauma, catastrophes and emergencies. Exploration with respect to A&E optimization is missing in the context of Pakistan. A study was undertaken with the focus on A&E Department at Capital hospital, Islamabad. Based on standards of A&E design optimization, a checklist based observational study was followed using the data obtained from the respondents from medical, paramedic, support and administrative staff along with patients and their attendants. It was concluded that the existing facility fails to fulfill the requirements for a standardized A&E Department for targeted number of beds and hence needs design interventions. The researchers with the help of A&E lead and chief medical officer devised a facility brief and later proposed a whole new design facility in the current context for sustainable usage in the future.

Keywords: Healthcare design, Environmental design, Accident and emergency, Architectural intervention, Sustainable usage

INTRODUCTION

Healthcare is considered one of the pivotal measure of any society towards achieving sustainability (Afzal and Yusuf, 2013). Within a hospital, Accident and Emergency (A&E) Department acts as the main frontline support mechanism for medication. Thus, an optimal functionality of A&E Department is of higher significance to the wellbeing of the society, especially, in times of emergency, trauma and uncertainty.

The A&E Department of public hospitals in Pakistan need to be optimized towards functionality and sustainable usage for current and future needs (Afzal and Yusuf, 2013). It is necessary to evaluate the existing facilities within A&E Department in relation to its optimum performance, issues and procedures and engaging end users towards developing solutions (Verbeek-Van Noord, et. al., 2014). This research paper presents the findings of an evaluation on the optimum performance of A&E Department of Capital Hospital in Sector G-6 in Islamabad.

A&E Department is an integral part of any hospital. It is commonly considered to be a microcosm of the hospital as a whole (Gupta, et. al., 2007). Being the front door of the hospital, it becomes the critical entry point with highest influx of critical patients around the clock. (Puvanachandra, Razzak and Hyder, 2015).

Historically A&E Departments have played a vital role in dealing with any epidemic spread through recording, highlighting, reporting and identification of new disease spread and patterns in population (Noreen et al., 2020). Here the role of information and analysis through data gathered from A&E Department becomes vital towards breaking down the epidemic, endemic or pandemic nature of the disease (Rose, Shufflebarger, and Walter, 2021). Pakistan has gone through recent epidemic history of cholera, malaria and dengue fever in the last decade (Siraj and Khan, 2020). Thus, the role of A&E Departments and their design and spatial configuration are of utmost importance in managing the disease through curbing it down to avoid any further spread and risk of contamination to others, including healthcare facility support personnel (Nasir, Rehman and Omair, 2021). Healthcare design integration of epidemic consideration acts as the lifeline for those who suffer from these large scale disease spread with higher RO (transfer rate from one patient to another) value towards spreading and causing panic and fear in public (Haroon, et. al., 2021).

The research was divided into five major phases with an introduction to the highlighted research gap followed by a review of relevant literature of the existing body of knowledge. That helped in defining the research methodology. An observational study, site documentation, development of data collection questionnaire and respondent's data collection was done. The comparison of data generated helped identify the major issues. This were later reported through findings and conclusions. To address the gaps, design interventions were proposed at the end of the research.

BACKGROUND

Healthcare facilities in Islamabad need to expand and upgrade with the rise in population and with the high influx rate of patients (Mehmood, Khan and Khursheed, 2012). Capital Hospital, Islamabad, was incorporated in the Capital Development Authority (CDA) as a small day care medical centre providing preventive and curative medical facilities to outpatients and residents of Islamabad.

The need for in-patient care necessitated the conversion of this day care centre into a hospital facility. In March 1981, a sixty bedded hospital was started comprising medical and pediatric wards, coronary care unit, X-ray department, pathology laboratory, dental clinic, dermatology department and mother and child health centre. In the second phase the surgical block was completed and started functioning in September 1992, with the department of general surgery, orthopedics, urology, gynae and obstetrics, neonatology, eye and ent, post-operative intensive care and A&E Department. Thus, the facility developed into a 250 bedded hospital equipped with the latest equipment and providing modern medical and surgical facilities to the patients in emergency, out-patients and patients in various wards. In 1999, a new block to house outpatients and a laboratory were also commissioned.

According to the literature review, following major issues have been observed with regard to hospital facilities in Islamabad in general (Mehmood, Khan and Khursheed, 2012)

1) Shortage of water for emergency department.
2) High influx of patients who are not CDA employees.
3) Shortage of medicines.
4) Shortage of paramedic staff.
5) Scale of A&E is generally small as compared to the patient influx.

Hence it was concluded that an exploration is necessary to find the current context towards better future prediction and optimum utilization for the benefit of the society and the public at large. Thus the following major objectives of the research were set forth using a case study methodology

- To evaluate A&E Department’s spatial functionality in the CDA Hospital

- To evaluate existing healthcare spatial design services, with the objective of achieving patient and service provider satisfaction and

- To design interventions to improve the spatial design and facility for A&E Department.

RESEARCH METHODOLOGY

Following were the major steps taken as part of the research methodology based on the qualitative aspects of research (Figure 1). Based on literature review and selected standards (American Disability Act Standards for Accessible Design, 2010; Standards for Emergency Department Design and Specification for Ireland, 2007; Guidelines for A&E department state of Haryana; Minimum Service Delivery Standards for Primary and Secondary Health Care in Punjab) existing functional and spatial planning aspects were analyzed. A checklist was prepared in the light of the standards studied and their modules and selected parameters were highlighted which helped the researchers to define aspects which needed to be analyzed for the efficient delivery of healthcare facilities within the A&E Departments. The A&E Department at Capital Hospital was visited, documented through photographs. Drawings were developed of the existing facility. The reason for selecting this case study was that since it initially targeted the CDA employees and

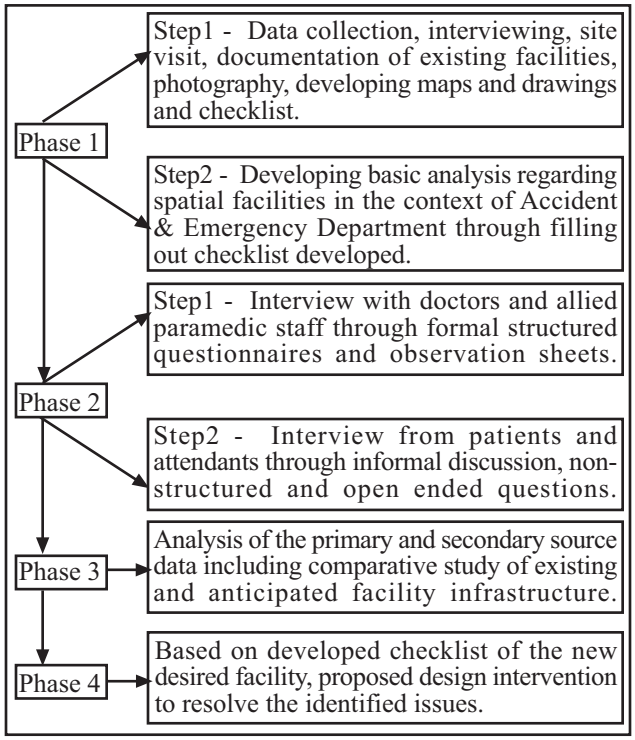

Figure-1: Flow Chart Diagram.

was later opened for general public use, thus the question of sustainable use arose. This was further reviewed with the lens of design evolution and adaptive measures. The recent changes in the department were documented to arrive at an understanding of the current scenario of the facility and how it serves the two major end users i.e. medical teams and the patients (Figure 1).The existing hospital map with major buildings and their areas was prepared (Figure 2). The location of A&E is shown in Figure 3 and the existing A&E Department plan is shown in Figure 4.

The primary data was gathered via a questionnaire from forty respondents and observational sheets. The collected data included recent reports and research articles and standards of A&E department. The objective was to develop a baseline parameter to evaluate and identify the current A&E facility. Data collection tools mainly included qualitative interviews, discussion with end users, documentation checklist for researcher, photographs and previously developed drawings from CDA. The gathered data was then analyzed in the context of initial analysis via comparison of existing facility with selected standards of A&E Department design to identify the current issues which the end users face while trying to either avail or use the A&E Department. A comparative analysis was later done, based on identified issues in the observation study and using primary data from all major respondent categories. This analysis is shown in Table 1. A visual documentation of some of the major issues observed is shown in Figure 5 to Figure 8.

LITERATURE REVIEW

Healthcare is considered the most critical of all primary rights of any human in a society (Akbari et al., 2009). A society which is unable to provide healthcare to its inhabitants has failed to survive and sustain itself in the history of mankind. Either in the days of peace or war, in times of natural calamity and disasters, epidemics, healthcare acts as a backbone towards enabling a society to survive and sustain core health of inhabitants (Bache, 2005). In order to achieve the targeted aim, hospitals and their core departments role becomes pivotal towards helping the society(Akbari et al., 2009). Amongst these departments, the emergency department acts as one of the most critical department which becomes the entrance door and welcome mat for people requiring immediate medical care and treatment. A&E department works round the clock, seven days a week and offers front face of any healthcare facility (Letvak & Rhew, 2015) and its smooth functioning enables people to get relief from pain and misery in critical health conditions.

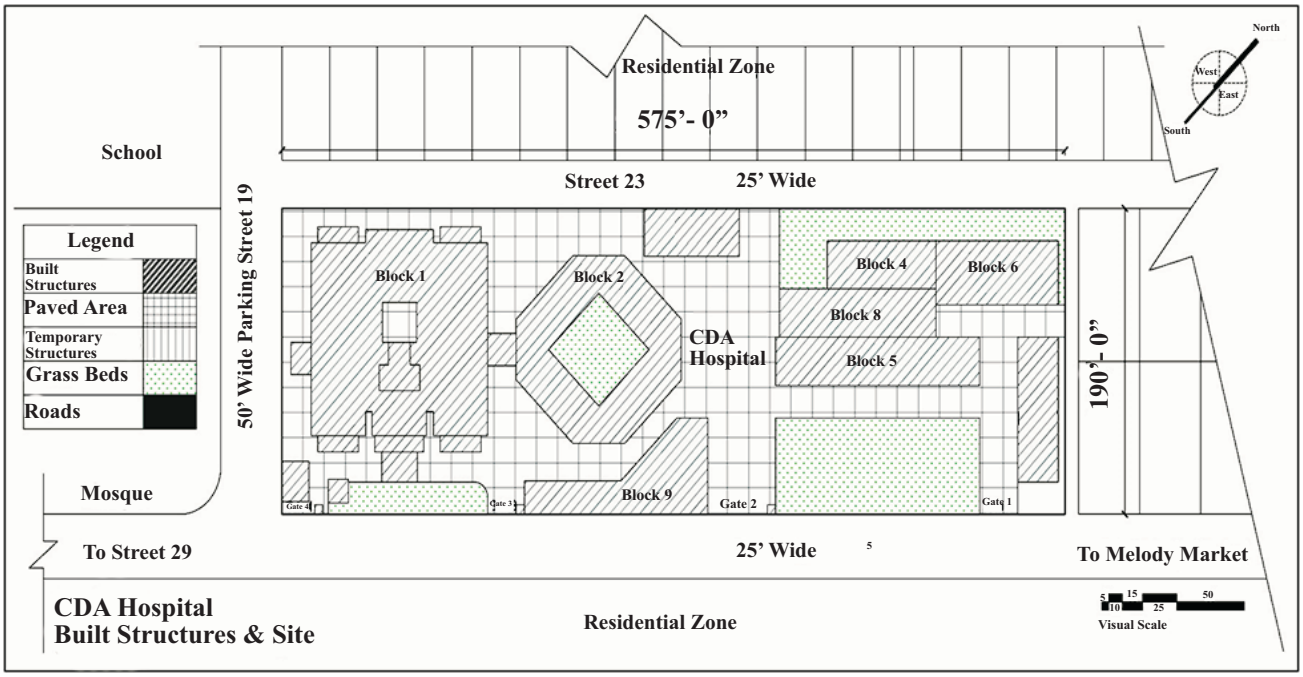

Figure-2: Plan of the Capital Hospital, Islamabad.

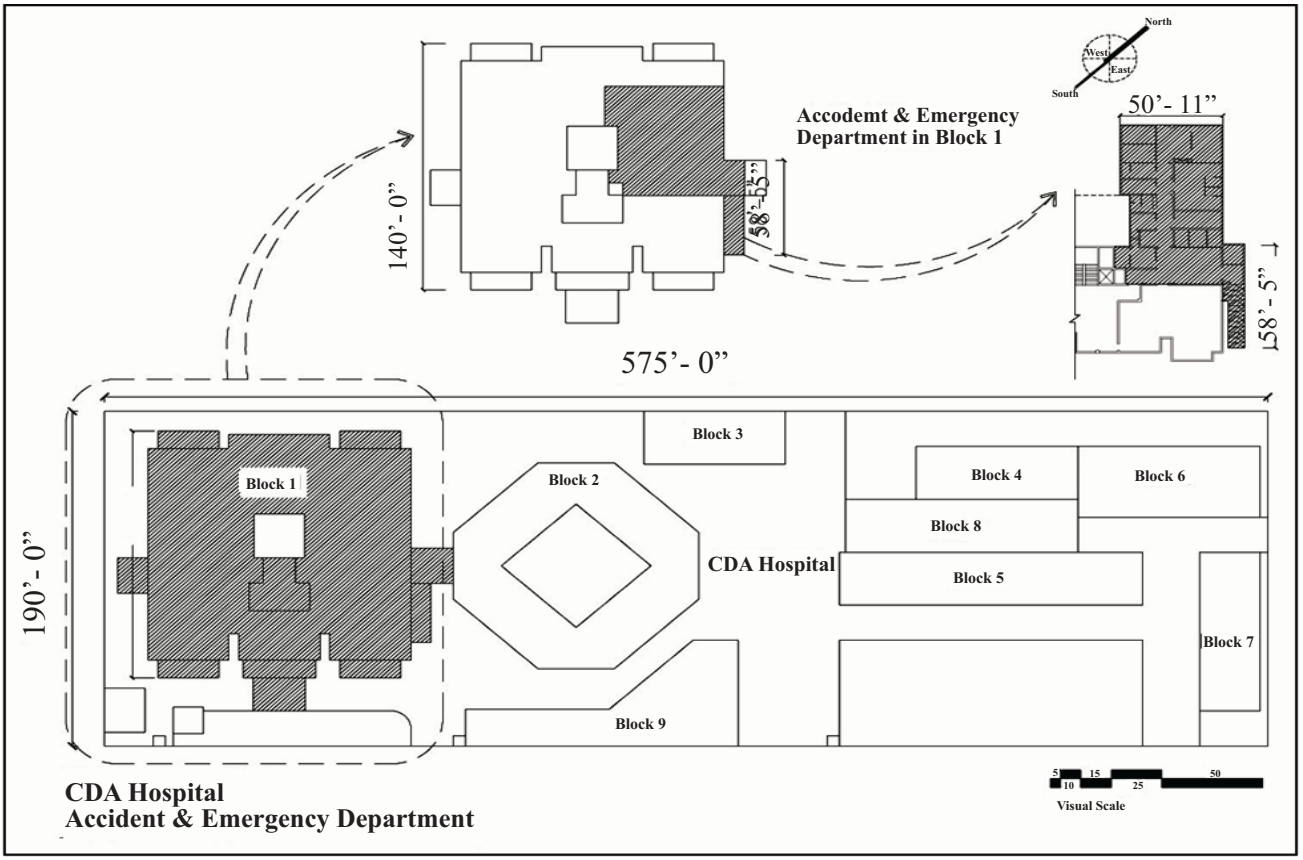

Figure-3: Location Map of A&E in Capital Hospital (commonly known as CDA Hospital).

The A&E Department is a comparatively modern department as compared to in-patient and out-patient departments, since it came into existence in mid-twentieth century when National Health Service (NHS) opted to reform the casualty departments in 1972. Sir Henry Osmond-Clarke in 1961, 1962 and 1970, Sir Harry Platt in 1962, Sir John Bruce in 1971, and Walpole Lewin in 1978 recommended that 'casualty' should be replaced by 'accident and emergency department'. Bruce's report of 1971 was particularly instrumental in recommending the introduction of the A&E department (Joint Consultants Committee, 1971).

Thirty-two consultants in A&E medicine were appointed in 1972. The majority had a surgical rather than medical background. These pioneers were able to offer both clinical experience and leadership in the evolving specialty of A&E medicine. The experiment was judged a success and more consultant posts were introduced. In 1977, the first senior registrars in A&E medicine were appointed, with the development of formal training programs, and by the early 1980s posts at this level had been established throughout UK. Thus by the mid or late 1980s, most hospitals had an A&E department under the managerial control of one or two consultants in A&E medicine. Regional training schemes had been established so that senior registrars could supplement the consultant numbers (Bache, 2005).

During the 1980s and 1990s, journals were established, an examination structure was developed, academic posts were created in A&E medicine, and the number of consultant posts and senior registrar posts continued to increase. Another development during the 1990s was the introduction of emergency nurse practitioners. Thus, just as in the late 1980s various factors combined to necessitate an increased interest in the management of major trauma, and by late 1990s it was becoming apparent that many patients received a raw deal in the A&E department.

In order to create a baseline understanding of A&E department of a hospital, the book "Modern trends in Planning & Design of Hospitals: Principles & Practice" became a major single reference (Gupta, et. al., 2007). It has been extensively referred to throughout the literature review of this paper as well.

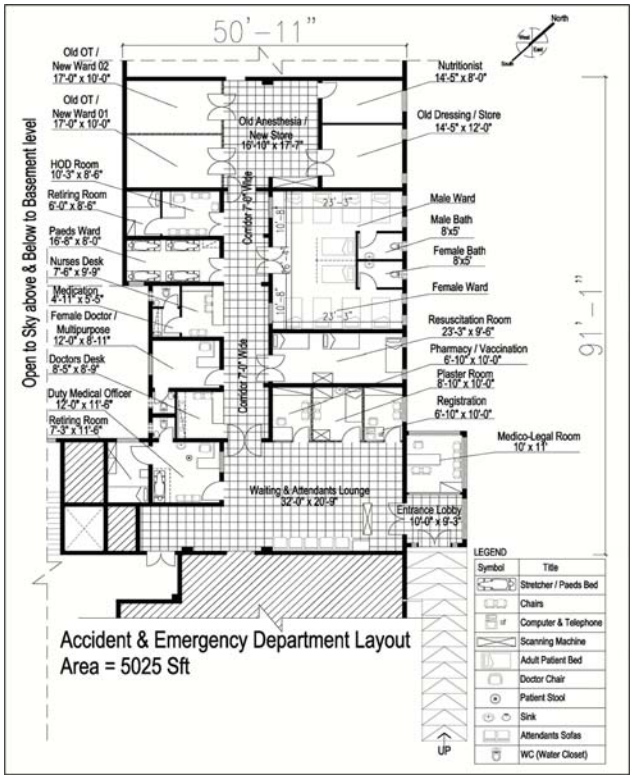

Figure-4: Plan of A&E Department, Capital Hispital.

Figure-5: Existing Condition of Beds Shortage Forced Administration to Display this Notice.

Figure-6: Poor Lighting and Cross Ventilation in Wards.

Figure-7: Lack of Signage on Main Access Road.

Figure-8: Lack of Shade and Poor Lighting on the Main Access of the A&E Department.

The A&E department is key facilitation factor towards stabilizing the poor or critical conditions of the people and patients brought in (Gonzalo et al., 2014). With increasing rate of uncertainty and accident within cities and urban centers, A&E departments face tremendous pressure to cater for the high influx of patients and to ensure treatment and diagnosis. Though however, it is also the least earning department of the hospital as compared to out patient department, diagnostics unit and in-patient departments etc(Kellermann & Weinick, 2012). This makes it a high end tough job for the administrators and managers at A&E department (Gupta et al., 2007).

DISCUSSION AND ANALYSIS

It was evidently visible that the issues identified by the researchers have been the source of major hurdles towards ability of the department to be a sustainable facility. The analysis showed that the existing facility of A&E department at CDA Hospital had short falls and was unable to provide basic emergency services to the patients including that of trauma, surgery and pediatric emergency. Influx of patients had increased tremendously over the last few years curtailing more burden on the department to provide quality services.

Some of the major issues included the limited numbers of doctors and paramedic staff as well as camped spaces designated for them. The numbers of beds available for patients was comparatively less as compared to patient influx. It is proposed that the existing facility should be used as private wards for the CDA employees while a new A&E Department building should be developed in the premises of the Hospital. The new proposed building needs to facilitate higher influx of patients. The building program of the new built structure needs to be in consensus with the doctors and staff recommendations to facilitate provision of optimum healthcare services through incorporating the spatial aspects missing in the existing design of the A&E Department. The objective behind these recommendation is to increase the number of beds to cater to higher influx of patients.

Furthermore, it was noticed that the signage of the existing facility was poorly planned and was not visible along the path leading to the Hospital. The location of the hospital was not appropriate either as it was not directly accessible by any public transport route. The patients and attendants were bound to use ambulances, private vehicles and personal transport to reach the Hospital. Incase of un-peaceful conditions in the city, the main access road was usually blocked by the city administration posing access burden on the medical team. The location of the A&E Department was also not planned as per the need of the hour. It had been placed in the building which is farthest from the main access road and thus poses issues of timely medical treatment. The absence of a shaded drop off point for emergency patients also caused issues during rain and hot season. Furthermore, lack of parking facilities for attendants forced them to park vehicles outside the Hospital, posing a risk of theft and inconvenience to patients and the genernal public. In addition, the internal spatial planning of the A&E Department was found to be poor and not inline with the national / international standards. This caused time delays in the safe access for patients to reach the doctor to initiate the process of medical treatment. It also caused lack of satisfaction and higher stress in the medical team, patients and their attendants. Lastly, the lack of surgical facility and post-trauma unit and lack of basic facilities of the A&E Department also led to further

Table-1: Data Verification of Documentation (Phase1) Against Data Collection from Primary Resources (Phase2).

Major Issues Identified as per Phase 1		Verification of Identified Issues Through Phase 2				
S. #	**Issues**	**Doctors**	**Paramedic Staff**	**Support Staff**	**Patients**	**Attendants**
1	Non availability of local transport	-	Yes	Yes	Yes	Yes
2	Location of hospital	-	-	-	Yes	Yes
3	Poor signage towards location of hospital	-	-	-	Yes	Yes
4	Poor transport system / access	Yes	Yes	Yes	Yes	Yes
5	Lack of parking	Yes	Yes	-	Yes	Yes
6	Lack of shaded patient drop point	-	Yes	-	Yes	Yes
7	Lack of shaded passage to A&E Department	Yes	Yes	Yes	Yes	-
8	Poor signage of department entrance / access	-	-	-	Yes	Yes
9	Distant and small registration desk	-	-	-	Yes	Yes
10	Insufficcent waiting facility	Yes	Yes	Yes	Yes	Yes
11	Lack of triage facility	Yes	Yes	-	-	Yes
12	Lack of toilets for attendants	-	-	-	Yes	Yes
13	Lack of tuck-shop/pharmacy inside department	Yes	Yes	Yes	Yes	Yes
14	Poor facilities and less beds in resuscitation room	Yes	Yes	-	Yes	Yes
15	Less number of beds in wards	Yes	Yes	Yes	Yes	Yes
16	Too small pediatric unit	Yes	Yes	-	Yes	Yes
17	Non availability of surgical facilities	Yes	Yes	Yes	Yes	Yes
18	Lack of isolation rooms	Yes	Yes	-	Yes	-
19	Lack of post resuscitation unit for high dependency patients	Yes	Yes	-	Yes	Yes
20	Inappropriate location of nurse's station in wards corridor	Yes	Yes	Yes	-	Yes
21	Lack of beds in plaster room	-	Yes	Yes	Yes	Yes
22	Fresh air, cross ventilation and natural light aspects in different spaces of A&E Department	Yes	Yes	-	Yes	Yes
23	Lack of in-house lab based diagnostics facility	Yes	Yes	-	Yes	Yes
24	Lack of CT Scan facility in close vicinity	Yes	Yes	Yes	-	Yes
25	Overall poor planning of the facility	Yes	Yes	-	Yes	Yes

difficulties. This posed serious threats to critical care patients. In addition to this, the non availability of lab based tests within A&E Department was another hurdle for the patients and the attendants. In addition the attendants had to carry the sample themselves or request the paramedic staff for the missing facility. With only three to four beds available for the pediatric patients, the high influx of these patients had to be referred to other hospitals. Apart from their major issues, other problems faced by the A&E Department were poor lighting, poor indoor air quality and lack of trained staff. There was also lack of privacy for female patients and there was lack of coordination between A&E Department

Table-2: Spatial Requirements for New A&E Department and Old Department Comparison.

S. #	Spaces Required	Existing	Proposed	Defference
1	Separate gates for entrance of walking and vehicular based patients	No	Yes	
2	Guard room	Yes	Yes	
3	Ambulance drop point covered	No	Yes	+1
4	Ambulance shed with staff area and allied facilities	No	Yes	
5	Stretcher / wheel chair bay / store	Yes	Yes	
6	Reception / Registration counter	Yes	Yes	
7	Triage with CMO (Causality Medical Officer) room	No	Yes	+1
8	Medico-Legal room	Yes	Yes	
9	Duty doctor room	Yes	Yes	
10	Waiting lounge with toilets	No	Yes	
11	Public drinking water facility	No	Yes	
12	Examination room with multiple couches	No	Yes	
13	Observation wards	1	6	
14	ECG room	Yes	Yes	
15	Nursing station/s	Yes (1)	Yes (4)	
16	Minor surgical room	No	Yes	
17	Plaster / dressing room	Yes	Yes	
18	Resuscitation room	Yes	Yes	
19	Clean linen store	Yes (1)	Yes (2)	
20	Dirty utility / store	Yes (1)	Yes (2)	
21	Internal Pharmacy	Yes	Yes	
22	Multiple storage spaces	No	Yes	
23	Diagnostics of X-ray and Ultrasound	Yes	Yes	
24	Internal ramp and lift facility	No	Yes (Lift)	
25	Separate toilets for staff, paramedics, doctors (M/F)	Yes	Yes	
26	Changing room facility separate	Yes	Yes	
27	Decontamination room	No	Yes (2)	
28	Isolation room	No	Yes	
29	Lockers facility	No	Yes	
30	Announcement system room	No	Yes	
31	Cardiac observation room	No	Yes	
32	Pediatric Observation room	No	Yes (5)	
33	Gynecological observation room	No	Yes	
34	Critical ER room	No	Yes	
35	Conference / meeting room	No	Yes	

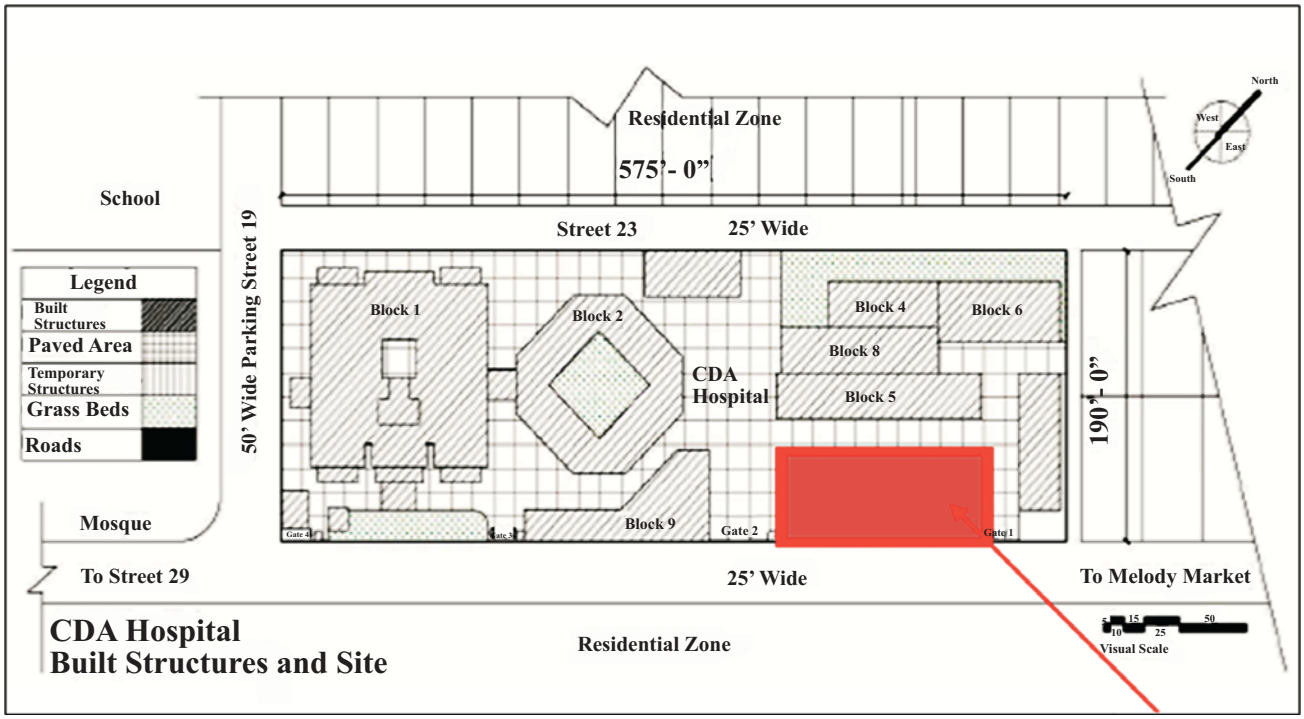

Figure-9: Proposed Location for New A&E Block.

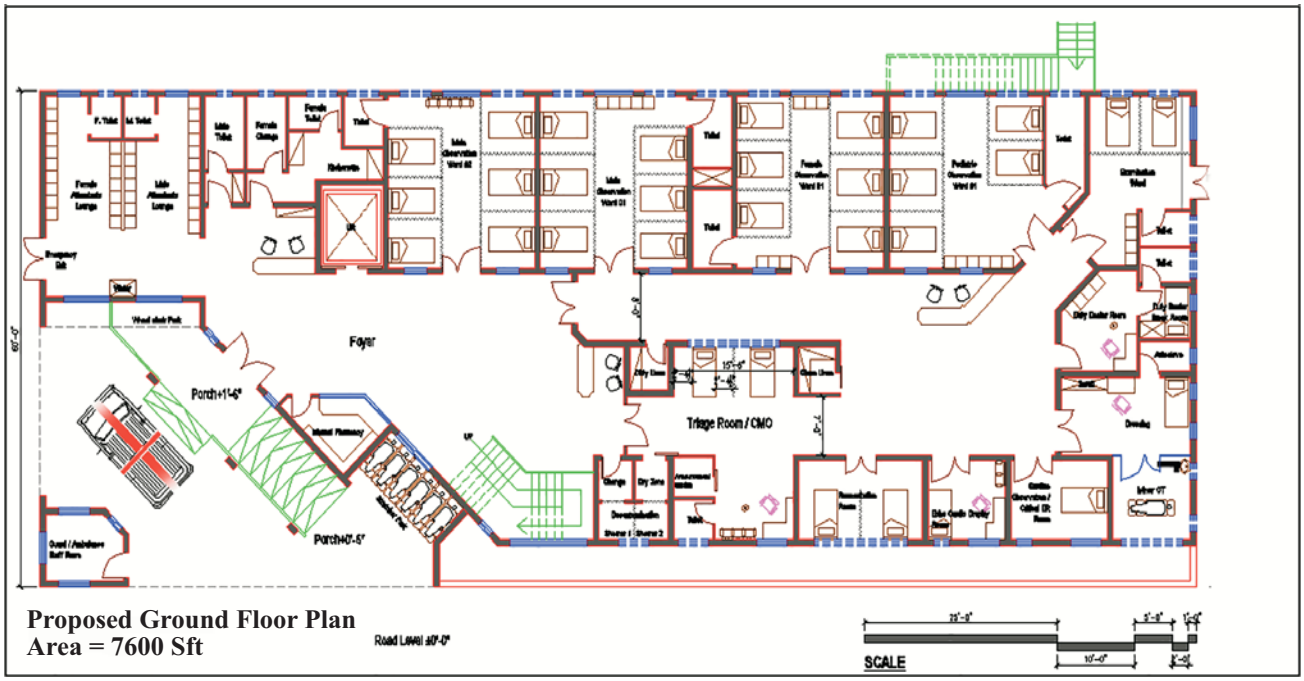

Figure-10: Proposed Ground Floor Plan.

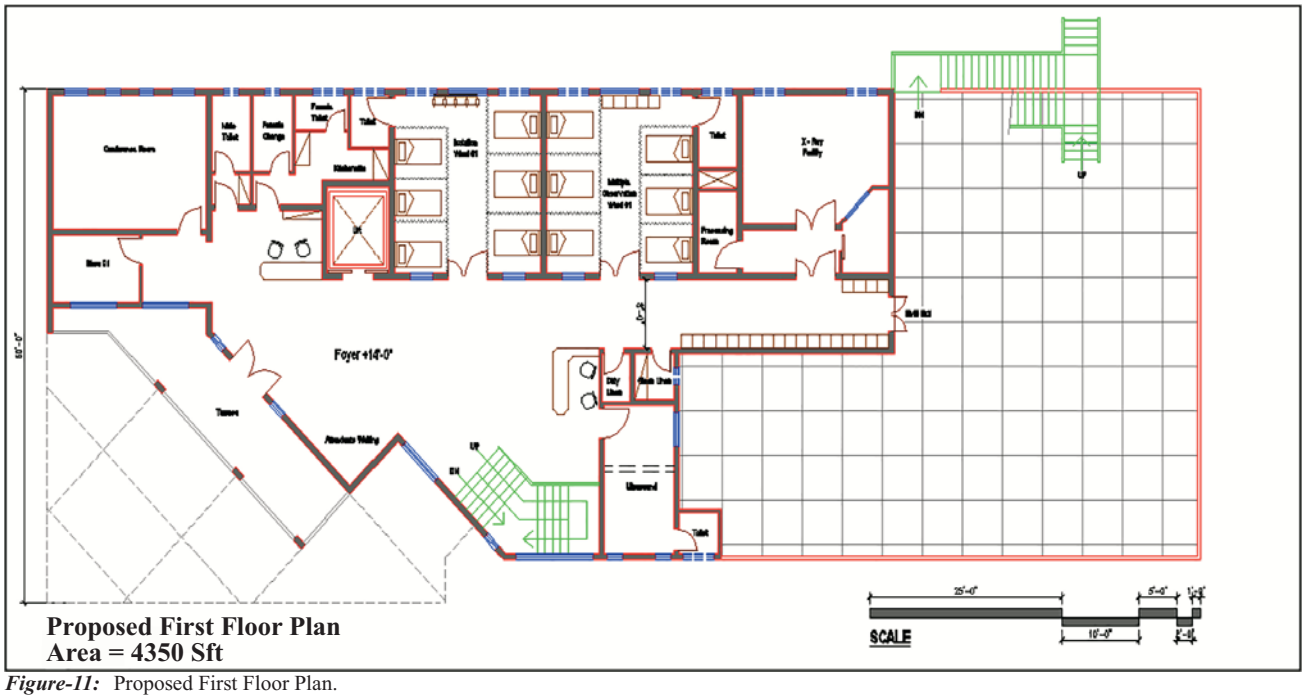

Figure-11: Proposed First Floor Plan.

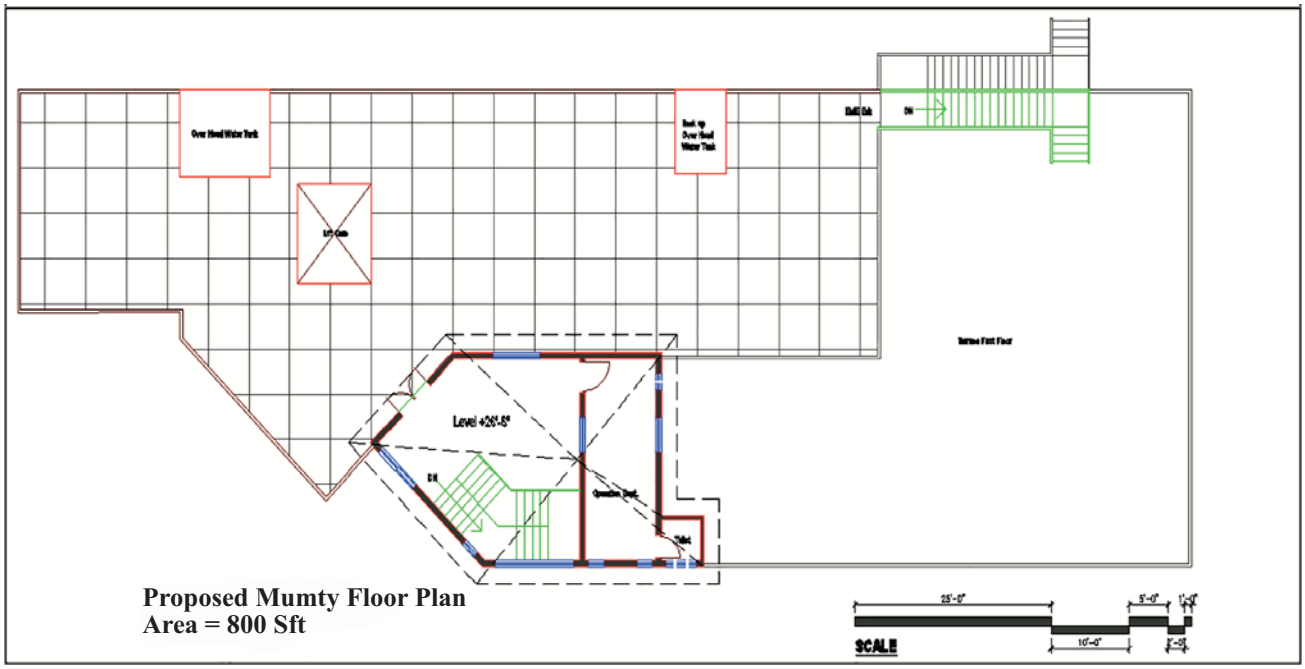

Figure-12: Proposed Mumty Floor Plan.

and other departments creating critical issues for the patients. Furthermore, the seating space for the attendants was insufficient forcing the attendants to wait in uncomfortable areas.

Conclusively, along with the existing built structure and planning, a triage would not be feasible as the current facility is a very small area and further congestion would result in additional complexity of the space. This would not be helpful for patients and the medical team. It was also evident that extensive spill out spaces were occupied by attendants and other allied end users could not be adjusted in the existing facility. Thus, the A&E Department either needs to be expanded within the existing premises, or should be relocated to a new area. Another preferred choice was to design a new unit of A&E Department in the open area available in the CDA Hospital, basing it on the future and current needs.

It was concluded that a new building program needs to be devised for the A&E Department based on the feedback provided by the major stakeholders of the department and its lead team. The new building program should focus on the sustainable future usage of the facility through a new proposed facility for the extensive and optimum service delivery. The new proposed program is shown in Table 2. It was proposed that the preferred location of the new unit should be nearer the entrance to the hospital. The existing open space next to first entrance gate of the hospital seemed the most appropriate location, as discussed with the end users from the Department (Figure 9). The proposed facility design was based on the given brief and focused on the missing gaps from the existing facility. The proposed ground floor plan (Figure 10), proposed first floor plan (Figure 11) and proposed mumty floor plan (Figure 12) are shown.

CONCLUSION

Recent COVID-19 pandemic highlighted some of the major gaps in the existing design and integration of the A&E Department design with respect to epidemic considerations at all major health care facilities across the nation (Bhatti and Ghufran, 2020). It was evident that such high influx jolted the national level healthcare infrastructure and hence highlighted some critical issues to be considered as part of the futuristic A&E Department design with provisions to manage such epidemic influx of patients (Khalid and Ali, 2020). Some of the aspects included flexible design to incorporate provision for bifurcation and isolation towards managing the patients either in the quarantine or in isolation, through enabling spaces for purposeful segregation. The need for the spaces to be in coordination with the central communication, healthcare safety, central diagnostics, monitoring and reporting was also highlighted. Furthermore the overall administrative management of the patient influx, specially in the case of epidemics through space segregation, designation and implementation of protocols for isolation and quarantine, was also needed.

REFERENCES

Afzal, U. and Yusuf, A., 2013, "The State of Health in Pakistan: An Overview", *The Lahore Journal of Economics*, 18 (special edition), 233-244.

Akbari, A. H., Rankaduwa, W., and Kiani, A. K., 2009, “Demand for Public Health Care in Pakistan,” *The Pakistan Development Review*, 48(2):141-153.

Bache, J., 2005, “Emergency Medicine: Past, Present and Future. Journal of the Royal Society of Medicine,” 98(6): 255-258.

Bhatti, O. S., and Ghufran, A., 2020, “Pakistan Healthcare Infrastructure and Covid-19?: A Case For Isolation and Quarantine Facilities Optimization In The Context Of Pakistan", *Journal of Research in Architecture and Planning*, 29, 36–45.

Gonzalo, J. D., Yang, J. J., Stuckey, H. L., Fischer, C. M., Sanchez, L. D. and Herzig, S. J., 2014, “Patient Care Transitions from the Emergency Department to the Medicine Ward: Evaluation of a Standardized Electronic Signout Tool,” *International Journal of quality in Health Care*, 26: 23-39.

Gupta, K., Gupta, S. K., Kant, S., Chandrashekhar, R. and Satpathy, S., 2007, *Modern Trends in Planning and Designing of Hospitals: Principles and Practice*, New Delhi, Jaypee Brothers Publishers.

Haroon, N., Owais, S. S., Khan, A. S. and Amin, J., 2021, “Prevalence, Risk Factors and Sources of Anxiety among Emergency Department Healthcare workers in Pakistan during COVID-19 Pandemic: A Single Center Survey”, *Experimental Results*, 2: 1–13.

Joint Consultants Committee (Chairman: Sir John Bruce), 1971, “Report of a Joint Working Party,” London: BMA.

Kellermann, A. L.. and Weinick, R. M, 2012, “Emergency Departments, Medicaid Costs and Access to Primary Care: Understanding the Link,” *New England Journal of Medicine*, 366(23): 2141-2143.

Khalid, A. and Ali, S., 2020, "COVID-19 and its Challenges for the Healthcare System in Pakistan", *Asian Bioethics Review*, 12(4): 551–564.

Letvak, S. and Rhew, D., 2015, “Assuring Quality Health Care in the Emergency Department,” *Healthcare (Basel),* 3(3):726-32.

Mehmood, A., Khan, B. A. and Khursheed, M., 2012, "Overcrowded Emergency Departments: A problem looking for solution", *Journal of Pakistan Medical Association*, 62(6): 529-530.

Nasir, N., Rehman, F. and Omair, S. F., 2021, "Risk Factors for Bacterial Infections in Patients with Moderate to Severe COVID-19: A Case-Control Study", *Journal of Medical Virology*, 93(7): 4564–4569.

Noreen, N., Dil, S., Niazi, S. U. K., Naveed, I., Khan, N. U., Khan, F. K. and Kumar, D., 2020, COVID-19 Pandemic and Pakistan; Limitations and Gaps, 1(4).

Puvanachandra, P., Razzak, J. A. and Hyder, A. A., 2015, "Establishing a National Emergency Department Surveillance: An Innovative Study from Pakistan", *BMC Emergency Medicine*, 15(Suppl 2), I1, DOI: https://doi.org/10.1186/1471-227X-15-S2-11.

Rose, A. L., Shuffle Parger, E. and Walter, L. A., 2021, “Ïmpact of the COVID-19 Pandemic an Emergency Department Boarding" *Academic Emergency Medicine*, 28 (Suppl-I)

Siraj, A. and Khan, M. W., 2020, "Uncertainty in the Air: In the Emergency Room with COVID-19 in Pakistan", *International Journal of Medical Students*, 8(1): 54–55.

Verbeek-Van Noord, I., Wagner, C., Van Dyck, C., Twisk, J. W., and De Bruijne, M. C., 2014, "Is Culture Associated with Patient safety in the Emergency Department? A Study of Staff Perspectives", *International Journal for Quality in Health Care*, 26(1): 64-70.