Reshaping Patient Approach to health facilities throughout and beyond Pandemics: Redesigning entrances and waiting areas

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1. ABSTRACT

One of the questions that has emerged over the last few months is how to create safe healthcare environments that function for the community as much as they do for medicine. The current COVID-19 pandemic has revealed the fragility of health services and has also shed on how underprepared people have been to encounter any pandemics and revealed the malfunctions in the design of entrances and waiting areas in health facilities during a pandemic. Entrances and waiting areas in hospitals always witnesses overcrowding and considered as possible spot of infection for patients with other diseases. The aim of the paper is to identify how redesigning hospital entrances, reception and waiting areas can be made safer from an architectural design perspective and highlighting the architect's role in combating the pandemic. Hospitals simply have tried to impose restrictions on patients and emphasizes on social distancing, but their methods were not successful enough therefore, there must be an architectural interference. The objectives include to examine and evolution the medical architecture situation and the relation between infectious diseases and architectural space (such as entrance and waiting area) and suggest a design approach that enhances infection control using new technologies and latest innovations. Moreover, the proposed ideas can be implemented in existing health facilities which will increase their efficiency and their preparation for pandemics.

Keywords: Medical, Entrances, waiting areas, Covid-19, Architecture, Hospitals, New technologies, infection control

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1 THE RESEARCH PROBLEM DEFINITION

1.1 Introduction

Health facilities are rethinking how they operate considering the Covid-19 pandemic and preparing for a future where such crises may become a grim fact of life. The COVID-19 pandemic will serve as a milestone in human history, with everything being divided into three eras: Before COVID-19 (BC), During COVID-19 (DC) and After COVID-19 (AC) (EASTWOOD, 2020). With healthcare facilities as the battleground there is no doubt that healthcare facilities AC will be very different from BC. With the potential for resurgences of the coronavirus, and some scientists warning about outbreaks of other infectious diseases, hospitals do not want to be caught flat-footed again. So, more of them are turning to new protocols and new technology to overhaul standard operating procedure, from the time patients show up at the entrance through admission, sitting in waiting area and receiving treatment The reason of choosing waiting areas and facility reception is to find ways to triage and check in patients remotely, quarantine the infected in separate facilities and reduce physical contact with caregivers to prevent the spread of disease. And they are improving follow-up with formerly infected patients- and others- to look for red flags of disease (Landro, 2020).

1.2 Problem definition

Designing hospitals to be open, public spaces can make it difficult to control the spread of infectious diseases. Thus, there must be a precaution to take into consideration to encounter any future pandemics. With the challenges of new and emerging infectious diseases as well as higher public expectations and awareness of healthcare related issues, much consideration must be given to these in the planning phase of building hospitals (Cameron PA, 2006). For existing institutions and hospital buildings, renovation and upgrading plans must incorporate the necessary changes. Among the various methods for infection control two important environment factors are isolation and ventilation. Infected patients or those highly susceptible to infection need to be isolated in private rooms with proper ventilation systems in order to stop spread and reduce the possibility of developing a new infection (Burmahl, 2000).

1.3 Aim of the research

The research aims to fill in the gap between demands of operation and architectural design of physical built environment of receptions and waiting area layout as an approach to solve the problem of containing a pandemic. These changes promise to markedly reduce risk and disease spread and change the way people experience care even in times when there is no crisis.

1.4 Methodology

The research method is based on inducting results from a post-occupancy evaluation on a currently operated waiting area zones and entries in a number of hospitals in Alexandria city. Both qualitative and quantitative methods are undertaken in this research. Firstly, information provided in national design guidelines has been evaluated, and a quantitative survey is used to identify framework of evidence-based design methods and is fortified with field survey on local hospitals.

2. JOURNEY OF PATIENT THROUGH MAIN ENTRANCE TO WAITING AREA

The entrance and concourse are the first major internal spaces that establish an impression on the patient or visitor, and as with other areas connected with the main entrance, the quality of the spaces will affect the patient's or visitor's perception of the quality of the service offered at the hospital. Waiting areas are required for patients, visitors and escorts arriving, and for those waiting to depart. Within a small hospital these will generally be combined into one, whereas in a large hospital there may be several distinct areas. Accommodation at the main entrance of a District General Hospital recommends a transport waiting area and a main waiting area (HBN, 2013)

2.1 Review of design guidelines of hospitals and health facilities in Egypt

2.1.1 Entrances

The entrance area immediately inside the lobby provides a space for re-orientation for the patient or visitor arriving, and a place for people to pause before departing. The information and enquiry desk will, in most cases, be the first destination for the arriving person. It should be clearly signed so that it is immediately apparent Therefore, patients must path through three types of streaming. Firstly, admission data concerning security reasons for the patient. Secondly, the patient must be screened for possible infection conditions. Lastly, the patient is

passed through triage room to be able to identify a primer medical diagnosis to be able to elect the most suitable specialist physician dedicated to treat the patient's case or discharge patient according to his condition urgency.
There are some recommendations for entrances according to EHFS (Design standards for hospitals and health facilities in Egypt) (EHFG, 2010) such as (figure1):

• There must be a ramp for disabled and the main entrance for pedestrian and car owners

• There must be a room attached to the emergency entrance with an area of 15 $m2$ to examine the coming potential patients in addition to a bathroom and a waiting area with place for 2 trollies

• Entrance area not less than 1.5 $m2$ for every person

• Availability of ticket booth outside the reception area to prevent overcrowding in large public hospitals.

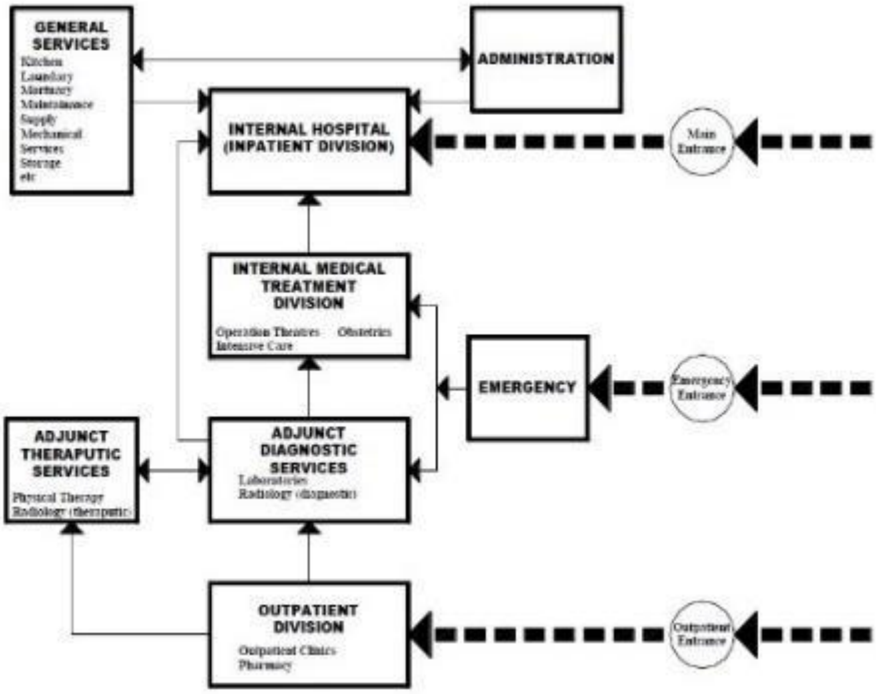


Figure 1: Diagram showing hospital facilities, their entrances and the directional flow (Rosenfield, 1969)

2.1.2 Waiting Areas

Waiting rooms are generally designed for utility and volume, devoid of comfort for the people who spend time there. And although staff members typically wish to help ease the stress of the unknown, the environment doesn't support easy information transfer. All too often, though, these spaces are unpleasant, and they leave people needing more information and privacy, needing more space, and needing access to power for their devices.
There are some recommendations for entrances according to EHFS (Design standards for hospitals and health facilities in Egypt) such as: (EHFG, 2010)

• It consists of Reserved area for patient waiting seats and preserve a distance of 1.5 meters between rows.

• A room or a recording counter with minimum 9 m2
• a room for medical records.
• The number of seats is calculated allocated to clinics and according to the number of daily expected arrivals for detection about 25 m2 (Figure 2).
• The two architects have appreciated (Kostermans) and (Hopkinson) The designated waiting area with 20 seats for the one clinic, with an area 1.25 m2 so 25 m2 for one clinic. (Hopkinsons M., 1996)

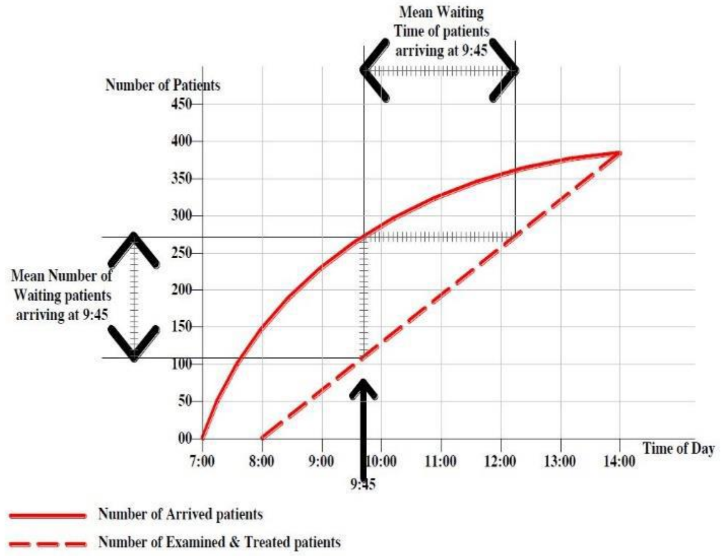


Figure 2: The number of new patients and patients who were completed Examine in the waiting area (Vogel, 1979)

2.2 Method of infectious transmission

The architecture of hospitals has been evolving from time to time to fit into the demands of the healing process. According to Guenther&Vittori (Guenther, 2008) and Cameron (Cameron, 2012), there exists a long-recognized relationship between health and architecture, they added that the relevance of suitable building in the healing process is well known to both medical and architectural professionals. To some extent, the experiences of the epidemics of the recent past (TB, SARS, And Coronavirus) have thought us some lessons regarding how architecture can be integrated into the fight against the spread of infectious diseases. Hence, we examine their major modes of transmission: air and surfaces.

2.2.1 Airborne and Droplet Transmission
Indoor spaces or environments such as homes, offices, schools, workplaces, hospitals, and terminals have possibly harmful pollutants (Guiseppina LR, 2013). Airborne transmission happens as soon as fine microbial particles comprising of pathogens stay up in the air for a long period, spread extensively by air flows and may cause infection when a vulnerable person inhales the infectious airflow. There is growing anxiety that the coronavirus is aerosolized. Viruses are small (20–400 nm), obligate intracellular parasites and they represent a common cause of infectious disease acquired indoors, as they are easily transmitted mainly in crowded, inadequately ventilated spaces or environments (Guiseppina LR, 2013) (Baker J, 2001). Droplet transmission takes place when viruses travel on comparatively large respiratory droplets (> 10 μm) that people sneeze, cough, or exhale when talking or breathing - primary aerosolization

(Guiseppina LR, 2013). Giuseppina et al. (Guiseppina LR, 2013) added that a single cough or sneeze in a corridor, lobby, or waiting area can discharge thousands of droplets, (up to 40,000) at speed of up to 80–320 kilometer per hour, each droplet comprising millions of viral particles. Droplet transmission is not the same as airborne transmission, droplets does not remain suspended in the air and aerosol droplets travel only small distances (1–2 m) before settling on surfaces (Doremalen NV, 2020).

2.2.2 Contact or Surface Transmission

Infectious diseases can be transmitted from person to person by 'direct or indirect contact'. Direct contact means 'person-to-person' spread of diseases through physical contact between an infected person or infectious agents including contaminated hands, gloves, or mucous membranes of the receiver. Indirect contact arises when a vulnerable person comes in contact with the infected object (Lateef, 2009). Some organisms can live on objects for a short time. For example, coronavirus (Covid-19) can live for 72 h on a plastic surface, 24 h on cardboard surface and the Copper surface for 4 h (Doremalen NV, 2020). The implication is touching an object such as handrails, door handles, shortly after an infected person, you might be open to infection. However, transmission takes place as you touch your mouth, nose, or eyes before washing your hands.

3 THE WORLD HEALTH ORGANIZATION (WHO) ROLE IN FACING COVID-19 SPREAD

With the challenges of new and emerging infectious diseases as well as higher public expectations and awareness of healthcare issues, much consideration must be given to these in the planning phase of building hospitals. For existing institutions and hospital buildings, renovation and upgrading plans must incorporate the necessary changes. Among the various methods for infection control two important environment factors are isolation and ventilation. Infected patients or those highly susceptible to infection need to be isolated in private rooms with proper ventilation systems in order to stop spread and reduce the possibility of developing a new infection (ECDC, 2020).

3.1 (WHO) checklist for hospitals preparing for the reception and care of coronavirus

Hospitals need to consider their readiness to cope with the influx of patients and increased need for medical services in times of crisis. They should prioritize and implement actions specified in their emergency preparedness plans for biological threats, specifically threats that may cause severe acute respiratory illness, in order to identify suspected cases, limit transmission within the facility and provide specialized medical care. This includes activating protocols and procedures in safe physical spaces emphasizing isolation measures

Here are some measures: (WHO, Hospital readiness checklist for COVID-19, 2020)

- Calculate maximum case admission capacity and estimate increase in demand for hospital services during a COVID-19 outbreak.
- Identify areas that can be used to increase patient care capacity (surge capacity) (e.g., use of hospital corridors, lobby and other non-essential spaces and parking areas and open spaces as a last), bearing in mind the necessary physical space, staff, supplies and processes.
- Establish a triage space with optimal conditions for the prevention and control of triage patients with acute respiratory symptoms (isolation area for suspected patie availability of PPEs, disposal of contaminated supplies and linens, etc.).

- Train health workers to identify suspected cases rapidly and accurately in accordance with standardized case definitions, to enable timely reporting to the corresponding level in any area of the hospital.
- Identify, sign, and equip areas for the medical care of suspected and confirmed cases in secure and isolated conditions.

3.1.1 Important architectural design points

Recognizing the need to develop optimal design strategies for these nuanced practices, it was conducted research and interviews with surgeons, physicians, specialists, nurses, therapists, social workers, administrators, and scientists.
Input gathered—during November and December 2020—was used to inform a variety of considerations, including:

- Spatial modifications for entering by applying barriers or special paths, testing, triaging, flexing spaces, setting up isolation areas and creating COVID-19 care rooms (Critical room).
- Air handling for spaces where procedures produce aerosols or increase risk of transmission.
- Spaces for staff respite and recovery during the extreme duress of COVID care; and Strategies for unique environmental and infection control challenges.
- Using ventilation and filtration systems to control and prevent the spread of infections.
- Using surfaces that can be easily decontaminated.
- facilitating hand washing with the availability of sinks and alcohol hand rubs
- increasing corridor and waiting area spaces to more than 2 meter in every direction.

3.2 Swiss Hospitals example to encounter covid-19

Switzerland currently has one of the highest incidences of COVID-19 (SalathéM, 2020) worldwide among affected countries, but also one of the lowest mortalities, with a case fatality ratio of approximately 0.054 (Switzerland, 2020) (number of fatalities per reported cases). On 23 April 2020, the John Hopkins University coronavirus resource centre reported 28,268 confirmed COVID- 19 cases and 1509 deaths (Switzerland, 2020) in Switzerland, which has a population of 8,603,900 residents. Swiss government introduced drastic new social-distancing measures to prevent further dissemination of the virus and to protect the health and safety of the public. Hospital infrastructures across Switzerland were re-organized to cope with the anticipated influx of critically ill COVID-19 patients, including a significant upscale of the intensive care unit and mechanical ventilation (Zurich, 2020).

3.2.1 Design approach

Critical control of COVID-19 relies on its prompt early identification, appropriate risk evaluation, isolation of possible cases and prevention measures for the spread of the virus. A vital strategy in minimizing the risk of infection begins with an effective triage system. triage unit was strategically constructed outside the main hospital building to help prevent the spread of COVID-19 through early screening, before potentially affected individuals even enter the hospital premise. Patients who are identified as meeting COVID-19 criteria or who have tested positive for the disease are categorized as suspected or confirmed cases, respectively, and are immediately re-directed into designated isolation zones (Georgios Peros, 2020).

3.2.2 Procedures applied

The pre-triage areas or checkpoints are located in front of each of the two main entrances to the hospital as shown in figures (3A,4B).

Individuals without COVID-19 symptoms who have an outpatient clinic appointment are allowed to enter the main hospital building only after presenting their clinic appointment letter. Patients admitted to the Emergency Department (ED), but who are otherwise clinically stable, enter the ED via the pre-triaging process. Unstable critically ill patients enter the ED. In these cases, family members and visitors are generally not allowed to enter the hospital, except in special circumstances (Georgios Peros, 2020).

Figure3: Pre-Triage check point operated by Military staff (Georgios Peros, 2020)

Figure 4: Patient reception (Georgios Peros, 2020)

I. Patient Registration

When a patient is directed from a Pre-triage checkpoint to the triage unit, the first step is patient registration. At the patient reception area, the administration staff are located inside the pavilion while the patients' queue outside, and a large glass visor is placed in between to avoid direct contact. At this stage, patients' data, including their mobile phone number and email address, are verified, and recorded.

II. Waiting Area

The second step is directing the patients to the large outdoor tent labelled as the waiting area. Because the weather in Switzerland, even in the springtime, can be a little cold several heating lamps were installed. The current data suggests that the average waiting time for each patient prior to clinical assessment was less than 10 min.

III. Screening: History Taking & Assessment

The third step is collecting the patients from the waiting area and accompanying them into the main pavilion for clinical assessment by a physician. No patient is allowed to enter the building without wearing a surgical mask. For those individuals, especially small children, where the application of a face mask is not well tolerated, the assessment is performed outside. Again, no physical contact is allowed and a minimum distance of 1.5 meters (≈3.18 feet) is maintained. Once inside the assessment room, the patient is asked a series of specific questions to identify if they display symptoms indicative of COVID-19, fulfil the criteria for a nasopharyngeal test, or require further investigations in Triage plus (Georgios Peros, 2020) as shown in figure 5 (C,D,E) and Figure (6).

Figure5: (C)Triageplus tent, (D) *Waiting area,* (F) *Clinical assessment room, (Georgios Peros, 2020).*

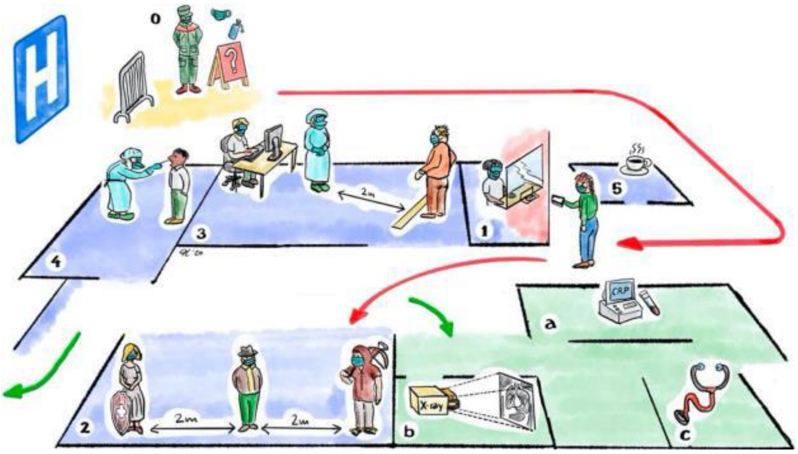


Figure 6: Sketch for triage procedures (Georgios Peros, 2020)

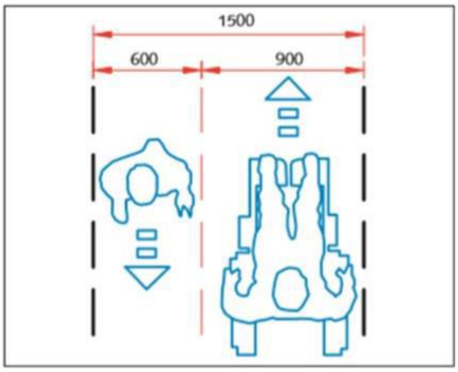
APPROPIATE DESIGN STRATGIES FOR WAITING AREAS AND RECEPTION

When architectural spaces are conceptualized and designed with a clear goal, such space can promote or aid the inhibition of infectious diseases. This was first experimented with by Florence Nightingale, when she launched the hospital ward model, stated that natural daylight and cross ventilation are significant components to disinfect and lessen the infection occurrence in hospitals (Young P, 2011). Below are some design strategies to employ in adapting our hospital spaces specially waiting areas and receptions for infection prevention and control.

4.1 Designs for social distancing

Provide adequate spacing in waiting areas, corridors, hallways, and entrance lobby to support social distancing of at least 1500 mm apart. This will not only reduce contact transmission but will create safe distancing since current research reveals that aerosol droplets travel only short distances of 1000 mm to 2000 mm before settling on surfaces (Baker J, 2001)

It has become obvious that Waiting areas and Reception design considerations need to be reviewed to accommodate not only wheelchairs, crouches, trolleys, and beds but also safe distancing as required by CDC. As seen in Figure. 7, a corridor width of 1500mm recommended by the UK Department of Health (UKDH, 2013) is inadequate regarding safe distancing within hospital space. Hence, this study suggests a minimum of 2800 mm width for corridors and entrances as analysed in Figure (8). This is to allow for 1000 mm minimum interval in social distancing and 300 mm as bilateral freeboards since human movement is not exactly in a straight line (Figure 9, 10).



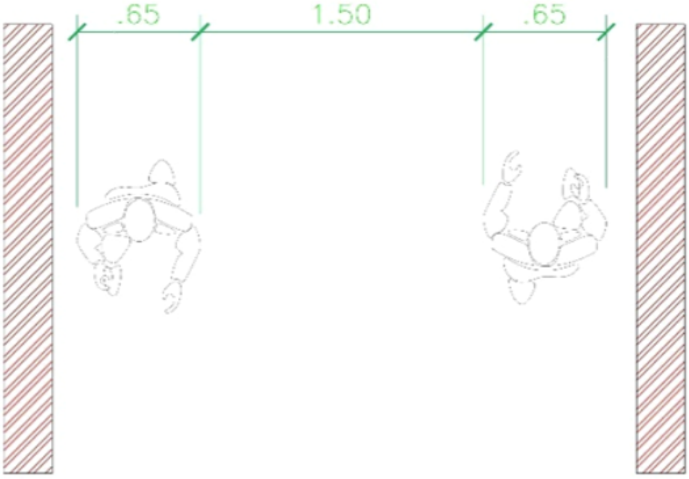


Figure 7: Corridor width as recommended

Figure 8: minimum corridors width suggested by (author,2021)

4.2 Designs for entrances

pre-screen all patients before they arrive at facilities during a pandemic. Even with pre-screening, in-place providers will confirm and screen people entering a facility. Wheelchair staging areas are opportunities to safely position staff and monitor entry points. Temperature screening can also take place in this sheltered space before patients approach non-clinical staff and other patients in the registration area (Figure 11).

Figure 9: private Hospital entrance in Alexandria by (author, December2020)

Figure 10: public hospital entrance in Alexandria by (author, january2021)

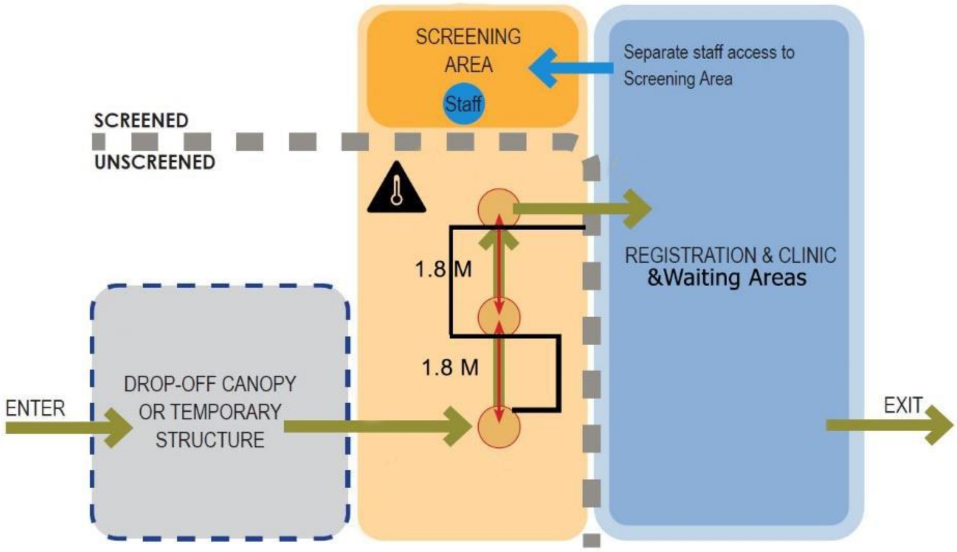


Figure 11: hospital entrance proposal by (author, 2021)

4.3 Design for waiting areas

Waiting rooms will see a great deal of redesign from an operational and physical standpoint. After years of moving toward a hospitality model with soft seating in small clusters we may see a trend toward hard surfaces that are easier to clean. Always specify furniture with non-porous surfaces and fabrics that are easy to clean/wipe. HVAC technology must be used in waiting areas to filtrate air and renew it. Considerations for separating infected patients, providing separate entrances, ventilation (including providing a negative pressure relationship in the infectious side of the unit), and repurposing lower-acuity patient care spaces for increased patient beds. (figure12). There must be a nurse station in the waiting area in case any patient or visitor feels thick.

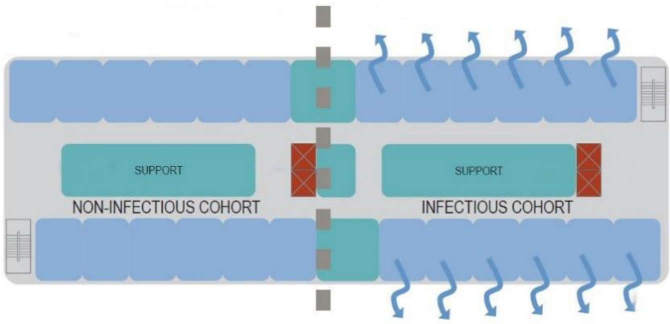


Figure 12: Suggested idea of separation in waiting areas by (author,2021)

a study is made in a waiting area for a hospital in Alexandria (figure 14,15) by using the method of section seating zones (figure 15) for various patient groups. Provide zones for 1-2 chairs and spaces for wheelchairs. Research proved the effectiveness of this strategy but may provide comfort that physical distancing is being maintained. It is important to always keep a distance of 1.8 meter or more in seating.

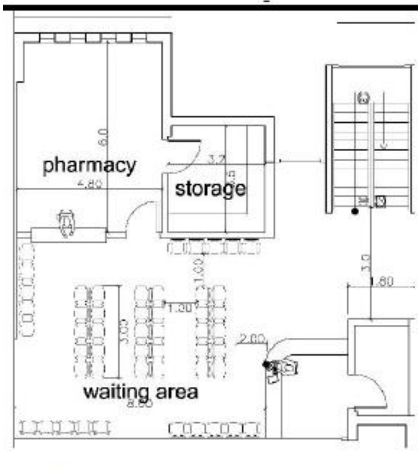


Figure 13: waiting area plan of study case by (author, December2019)

Figure 14: waiting area of study case by (author, December2019)

Figure 15: waiting area of study case by (author, December2019)

Figure 16: suggested solution plan by (author, 2021)

Figure 17: suggested solution 3D by (author, 2021)

Figure 18: example for the suggested waiting zone (Steel Case, 2020)

Figure 19: Clear upper panel, frosted lower panel (EUA, 2020)

Proposed solution

5. CONCLUSIONS

Design strategies can play a significant role in infection prevention. With the present effort to contend with the coronavirus (Covid-19) outbreak, it has become necessary that a multidisciplinary approach be adopted. It also proposes that architects and engineers directly involved in designing or constructing health-care facilities should be given a form of training in public health. Architects must rise to play their role in curbing the spread of coronavirus. This can be achieved at the early stage of design, specification writing, and construction. The emergence of the novel coronavirus, increase in microbial resistance and lack of a vaccine for the present pandemic have made it imperative to appraise the preventive strategies employed during this period. It is even more urgent as bioterrorism now poses an additional possible threat to public health indoors. Moreover, the modern architectural practice of designing healthcare buildings or hospitals for comfort and aesthetics favours pathogen persistence. Also, the proposed solution is affordable and can be easily obtained and applied in the health facilities and hospitals.

6 REFERENCES

1-Baker J, S. D. (2001). Spread and Prevention of Some Common Viral Infections in Community Facilities and Domestic., (pp. 7-21).

2-Burmahl, B. (2000). *Facilities of the future: New design puts patients first. Health Facilities Management. ;13:30–4.*

-Cameron PA, S. M. (2006). . *The impending influenza pandemic. Lessons from SARS for hospital practice. Med J Australia (eMJA);185:189–90.*

3-Cameron, L. (2012, 12 2). International travels as medical research:architecture and the Mordern hospital. . *Health Hist.*, pp. 116-33.

4-Christine, L. (2007). Waterborne Transmission of Infectious Agent. . *Washington:press ASM*, 222-48.

Doremalen NV, T. B. (2020). Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. (p. 382). New England : J Med.

5-EASTWOOD, T. (2020). Pandemic preparedness: How hospitals can adapt buildings to address worst-case scenarios. Stantec. doi. *Stantec. doi*.

6-ECDC, E. C. (2020). Outbreak of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2): increased transmission beyond China. stockholm: ECDC.

7-EHFG. (ا, القومى .(2010 10 / المعايير التصميمية للمستشفيات والمنشآت الصحية ج 1) مكونات عامة- مركزية - خاصة ومتطلباته .

8-EUA. (2020). Pandemic Considerations in Health Facility Design |. 1-9.

9-Georgios Peros, F. G. (2020). Organizing a COVID-19 triage unit: a Swiss perspective, Emerging Microbes & Infections. *Emerging Microbes & Infections*.

10-Gleick, p. (2002). *Dirty water: Estimatined death from water related diseases 2000–2020.* Environment and Security: Pacific Institute for Studies in Development.

11-Guenther, R. V. (2008). *Sustainable healthcare architecture.* . New Jersey: : John Wiley and Sons.

12-Guiseppina LR, M. F. (2013). Viral Infections acquired Indoors through Airborne, Droplet or Contact Transmission. *Annali dell'Istituto superiore di sanita* , pp. 124-32.

HBN, 1. (2013). *Accident and emergency departments. Planning and design guidance, National Healthcare States, United Kingdom.*

13-Hopkinsons M., K. K. (1996). Building for Health Care : a Guide for Planners and Architects of First and second level facilites . *World Bank*, 36.

14-Landro, L. (2020, june 8). *Rethinking the Hospital for the Next Pandemic.* Retrieved from The wall street journal: www.wsj.com/articles/rethinking-the-hospital-for-the-next-pandemic-11591652504.

Lateef, F. (2009). Hospital Design for Infection Control. *Trauma shock*, 175-9.

Macy TI, Q. R. (2010). *Macy TI, Quick R. E. Transmission and Prevention of Water- Related diseases. Uk: Eolss Pub.Ltd.; 2010.* Eolss Pub.Ltd.

15-Michelle Ossmann, M. (2016, june 9). *Healthcare Waiting Room Design.* Retrieved from Facility executive: https://facilityexecutive.com/2016/06/healthcare-waiting-room-design/

16-Rosenfield, I. (1969). *Hospital Architecture and Beyond p 51-55, Nostrand Reinhold, New York,* .

-SalathéM, A. N. (2020, March 15). *COVID-19 epidemic in Switzerland: on the importance of testing,*.

17-Steel Case, l. (2020). *Exam+Waiting Experiences Reimagined.*

18-Switzerland, C.-1. I. (2020, april 20). Retrieved from https://www.corona-data.ch/

19-UKDH. (2013). *Health Building note.* London.

20-Vogel, L. (1979). Inpatient Department, Approaches to Planning and Design of Health Care Facilities in developing areas. *WHO*, 47.

21-WHO. (1992). *District Hospitals: Guidelines for Development", p.53, World Health Organization, Geneva,.*

22-WHO. (2020). Hospital readiness checklist for COVID-19.

23-Young P, D. S. (2011). flourence Nightingale (1820-1910), 101 years after her deth. 807-13. Zurich, D. o. (2020, April 16). *Coronavirus*. Retrieved from https://gd.zh.ch/internet/gesundheitsdirektion/en/themen/coronavirus.