

# The Covid-19 Pandemic: Impacts on the Hospital Environment and Spatial Design

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## ABSTRACT

Covid-19 is the most significant pandemic that happened at the end of 2019, where the first confirmed case was reported in Wuhan, China. Given the high population and economic activities in cities, there are always possibilities for Covid-19 to spread widely. Hence, the impacts in the urban area are much bigger affected by this pandemic. The fact that existing hospital design raises concerns and questions among people across the globe regarding the hospital capacity and lack of flexibility to accommodate sudden surges of patients due to the Covid-19 pandemic. Previous studies showed that hospital spatial design and organization are crucial and impact users' perceptions and experiences from multiple stakeholders. The scholars argue that the concept of restorative environment is rarely defined and some of the initiatives either focused on daily life in hospitals or broad terms about hospital architecture, layout, and interior design. The overview on the impact of Covid-19 towards hospital environment, hospital spatial design and its relationship through content analysis, and pilot survey as the groundwork are significant features to be discovered in this paper. This paper focuses on the existing hospital spatial design principles through the effectiveness and efficiency of current hospital planning design during the pandemic. The result indicates that the empirical principles contribute to hospital planning and design quality and call for further research.

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## 1. Introduction

Hospital activities are a very important sector in the healthcare system due to their function that protects the community health and engages the awareness to prevent diseases from spreading which indirectly will lead to a productive and healthy lifestyle (Khetrapal & Bhatia, 2020). As humans, we are very fortunate to have a good and organized healthcare system that normally we tend to take for granted until a pandemic occurs. At the end of

2019, there was a global pandemic disease named Covid-19 spreading (WHO, 2021). It is an infectious disease caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) (Rume & Islam, 2020). It affected the whole population around the world and until now the disease is still around and gives such huge impacts on daily activities especially in the medical, social, economic, and cultural sectors (Rice, 2020).

As the spread of COVID-19 accelerates, health systems have been preparing for major stressors on their delivery system and many are entering crisis mode planning (WSP, 2020). Because of this scenario, the whole hospital system has been exposed and overwhelmed by the Covid-19 disease (Khetrapal & Bhatia, 2020; Koh, 2020). The effects from the pandemic have not only shaken up the hospital operations but have also emptied outpatient departments and doctors' waiting rooms, and have virtualized many activities overnight along the way just to cater for Covid-19 patients (WSP, 2020). This situation became more complicated when it affected those patients suffering from acute and chronic illnesses who were in dire need of emergency treatment (Khetrapal & Bhatia, 2020). Hospital front liners are one of the affected groups hit by the pandemic considering that they are facing a high risk of infection and death due to excessive exposure to the disease (Toner & Waldhorn, 2006; Shaukat et al., 2020; Koh, 2020). The global responses towards Covid-19 have exposed inherent weaknesses in terms of preparation and responses from the hospital system (Khetrapal & Bhatia, 2020; Koh, 2020). There is an increasing concern that some of the old and obsolete hospital facilities with a focus on existing structural hospital design need to halt their planning and design.

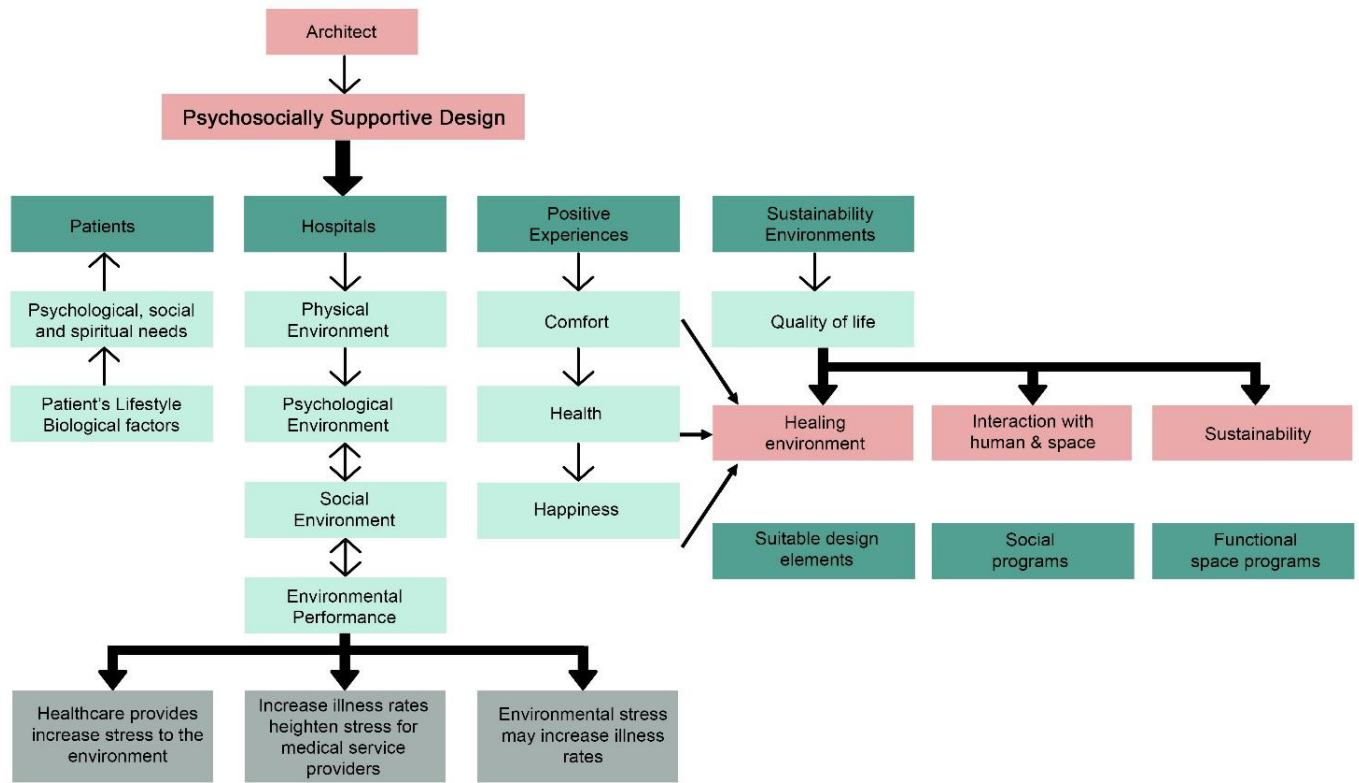
This issue has become crucial recently due to the Covid-19 pandemic crisis where hospital workers faced physical and mental exhaustion with the current Covid-19 workload and non-Covid-19 backlog procedures. A possible explanation for this might be that the global responses towards Covid-19 have exposed inherent weaknesses in terms of preparation and responses from the hospital system (Khetrapal & Bhatia, 2020; Koh, 2020). Hence, the hospital environment which also has been called therapeutic environments and healing space that integrate with landscape design provides prominent connections towards patients' recovery and healing process (Ulrich et al., 2004; Day et al., 2000; Wood et al., 2015; Suess & Mody, 2016; Cifter & Cifter, 2017). Thus, the hospital components related to architecture patient-centred and spatial design is a major criterion in a healthcare system base (Cifter & Cifter, 2017). This has been proven based on the number of growing literature and research studies found related to the future characteristics of hospitals and the current challenging scenario facing worldwide hospitals that patient-centred need to be part of the hospital spatial design. In conclusion, the Covid-19 pandemic situation shows a serious indicator towards the current and obsolete facilities of hospital design and major exhaustion issues facing by the medical workers.

### 1.1 Hospital Planning and Design

The current study found most healthcare designers accept the fact that designing a hospital is a complex task involving functional and psychological aspects (Shan & Verderber, 2016; WHO, 2021). Dickerman et al. (2008) and Carr (2017) mentioned that hospital design has detailed and strict guidelines to follow with many components involved. Some hospital components are emergency

departments, diagnostic, sub-intensive care, regular hospital rooms, and operating theatres designed typically separated along the pathway to ensure patients, visitors, and caregivers' safety. The strict design guidelines imposed relate to the function itself since the hospital is a place that supported all kinds of diseases, facilitated a wide range of diagnostic services, and incited appropriate treatment where possible, centrally or vice versa (Mohd Nawawi et al., 2013). The critical features that need to be looked into are the spatial planning and design that require different measurements, which will serve as an essential daily role, mainly to transport equipment and supplies for overall design (Shan & Verderber, 2016). Prior studies have noted that having proper spatial planning and design will indirectly resolve the current issue before hospitals with complex building planning and poor spatial wayfinding either internally or externally (Ulrich et al., 2004; Naccarella et al., 2018). In the studies done by Capolongo (2016), he stated the hospital design should include a specific requirement in the planning and design components that can accommodate the sense of isolation and disorientation to ease patients' concerns and help their recovery journey.

Furthermore, hospital spatial planning and design should be considered as a top priority guideline that can evolve substantial safety and treatment practices in the hospital settings (Lateef, 2009; Shan & Verderber, 2016). An & Lee (2010) and Asfour (2019) also mentioned in the literature review that users' fundamental understanding needs related to physical and psychosocial is connected with hospital design and planning. Figure 1 illustrates the psychosocial design is supported by the hospital's physical environment. According to Oxford English Dictionary (2021), the term of psychosocial design obtains the interrelation of social factors, behavioural and its relationship to the individual's behavior and mind. By drawing on the concept of positive experiences and a sustainable environment, Figure 1 has been able to show the good quality of hospital spatial planning is important in generating the healing environment. The healing environment in hospital design contributing to patients' psychological, social, and spiritual needs. Hospital in Korea is one piece of evidence that architects recommend the design of internal hospitals should integrate with nature elements, human figures, schemes, cultural events, symbolic landmarks as well as artworks that indirectly stimulate people's sensory and internal emotion (An & Lee, 2010; Asfour, 2019). These elements suggest enhancing the hospital environment as a healing and sustainable place by not just only catering to patient's recovery process but also healthcare workers' and visitor's needs as well.



**Figure 1** The Sustainability Environmental Qualities of Hospital Spatial Design  
 (Source: adopt and adapted from Roberts and Guenther, 2006; An and Lee, 2010)

A growing body of literature has shown that hospital design is not just part of spatial planning and design, but it is connected to the physical environment, including the indoor environment (Joseph & Rashid, 2007; Karanikola et al., 2020). Several studies suggested the elements of the physical environment, such as access to outside view, patients' privacy, lighting, and other appropriate factors in a newly built hospital have achieved a positive health recovery process (Aripin S., 2012). Some of the hospital environment design features that affect a patient's recovery process related to the physical environment are odour, sound, and light (Aripin S., 2007; Chong & Shanshan, 2020). The patients and healthcare workers had high anxiety around hospital environments when the Covid-19 pandemic happened (Peters & D'Penna, 2020). The author also mentioned an empirical research study related to the indoor spaces that are urgently needed to help boost patients' and workers' mental and physical state conditions. Iyendo (2014) and Podbelski (2017) revealed that many designers applied the concept of healing architecture as an important principle in designing hospitals that can significantly impact workers, visitors, and patients' recovery processes. Healing architecture is the popular concept of 21st-century hospital design that promotes satisfaction and comfort towards patients, visitors, and caregivers (Aripin S., 2012; Iyendo, 2014). The healing architecture environment concept for hospital facilities describes a physical setting that supports patients and families through the stresses that develop due to

illness, hospitalization, medical visits, the healing process, or bereavement (Stern, et al., 2003; Podbelski, 2017). Hence, the hospital environment must have a healing architecture concept applied in hospital design that can positively contribute to the hospital users (Gupta & Kant, 2004; Podbelski, 2017; Asfour, 2019).

Hospital design settings should have an objective to create a patient-focused and architecture centered by offering safety, secure, clean, and physical comfort atmosphere (Stern et al., 2003; Ulrich et al., 2004; Gupta & Kant, 2004; Aripin S., 2012; Podbelski, 2017). In the recent research, they suggested that hospital design needs to consider environmental stressors reduction such as the sense of control over physical-social surroundings, access to social support, connection to nature, and access to positive distractions to promote lifelong wellness (Ulrich et al., 2004; Iyendo, 2014). Furthermore, scientific evidence stated that patients experience a positive satisfaction in an environment that incorporates natural lighting and elements, suitable color matches, good sound, and pleasant views (Aripin S., 2012). In conclusion, the hospital environment should provide a cheerful and inviting ambiance and a caring healing environment to substantially affect patient health and safety (Gupta & Kant, 2004; Dickerman et al., 2008; Cifter & Cifter, 2017).

A large number of growing literature reviews investigate the characteristics of future hospitals and the challenges faced by hospitals worldwide and most of them agreed that the future hospital should be designed to be patient centric. Consequently, the design of the hospital should incorporate the evolution of technology application and advancement of healthcare services and spaces design to improve its ambiance. Addressing the effects of the physical environment on the healing and restorative process and well-being has become increasingly important in hospital design. Some of the recent design trends in hospital planning and design that can be adapted during the pandemic crisis are by having flexible and open spaces such as moveable partitions or walls, good filtration systems, and also multi-bed in the hospital rooms (Waite & Pitcher, 2020). Emergency and disaster planning preparation is an important key issue, especially during this pandemic time. A recent study found that most hospitals failed to maintain their normal working routine due to a shortage of mitigation and planning preparation (Vick et al., 2018; Cao, et al., 2020). Astron Hospital and Health Care Consultants (2021) listed ten recommendations of innovative strategies in creating safer hospital planning specifically for pandemic situations. The recommendations such as improving infection prevention, increasing isolation room capacity, limiting shared staff spaces, patients must be triaged by paramedics before they enter Emergency Department, re-imagining waiting rooms and public spaces, planning for inpatient surge capacity, finding surge capacity in an outpatient centre, inventories for greater supply chain control, telemedicine's impact on facility sizes, isolation operating rooms and laboratory can be applied to create safer hospital environment.

## 2. Methodology

In order to obtain reliable and comparable data, this paper employed a combination of both qualitative and quantitative methods. The PubMed, Web of Science, Science Direct, Elsevier Novel Coronavirus Information Centre, and other open access publications such as Google Scholar citation database were used to identify the literature on the impact of hospital design during Covid-19 from 2019 to 2021. The database searching includes the article, conference paper, book, book chapter, editorial notes, and web pages. This systematic data searching is to identify and investigate further the current scenario of Covid-19 that encompasses the physical and spatial planning in the hospital environment. The search terms used were "hospital design Covid-19", "temporary Covid-19 hospital", "hospital spatial design", "Covid-19 hospital," "and "healthcare design Covid-19". The terms of Covid-19 were interchangeably used with "pandemic-19" or "pandemic". Hence, from The PubMed, it shows 268 references of "temporary Covid-19 hospital" and 2,691 references of healthcare design Covid-19". As for the Web of Science, it generated 66 references and the Elsevier Novel Coronavirus Information Centre showed 21,462 references which were either from web pages, books, and journals. On the other hand, Goggle Scholars yielded 61K references for "hospital design environment", 15.7K on "temporary hospital design Covid-19", and 65.9K for "temporary Covid-19 hospital". A pilot study was

conducted by distributing self-administer questionnaires to collect respondent's responses towards hospital design in Malaysia. This random sample perception survey was designed to test the feasibility of people's perception towards the hospital's spatial organization and its' restorative environment by patients, visitors, and staff. The survey also aims to further strengthen the evaluation on the impact of covid-19 and the reaction of Malaysian towards existing hospital design. Through this qualitative and quantitative paradigm, the objectives of these investigations will be established. They are mainly to (1) evaluate the impact of Covid-19 on hospital design; (2) investigate the evolution of hospital spatial design and its current needs; and (3) investigate people's perception towards hospital design. This is important to address how covid-19 impact the existing hospital spatial design and its operational consideration during the time of the pandemic.

## 3. Result and Discussion

The webpages, journals, and news were accessed for data validation on recent building development involving temporary hospitals across worldwide countries. For example, in Argentina, the architect adopted a collaborative design strategy by differentiating passages within internal environments for patients who presented symptoms of Covid-19 by using coloured signage and special demarcations on floors to reduce infection risks. In the United States, some hospitals removed floor carpet as one of the prevention methods and replaced it with more durable floorings to prevent the Covid-19 virus from spreading. Much of the current literature listed some hospitals that have been built only to treat Covid-19 disease. The examples of temporary hospitals during the pandemic are Fira Barcelona Montjuic (Spain), Jacob K. Javits Center (New York), Pacaembu Stadium (Brazil), Century Link Event Center (Washington), McCormick Place (Chicago), Excel Centre (London), Triage Tent (Lombardy Italy), East Meadow Central Park (New York), Temporary Hospital Indio (California), Medical Tents Buenos Aires (Argentina), Parking lot Mary Washington Hospital, Ifema exhibition complex Madrid (Spain), a temporary hospital in Rafah (Gaza), military medical tents Mulhouse (France) and others. In Malaysia itself, the government has established 60 quarantine and low-risk treatment centres. The government also took an initiative by opening more treatment centres to provide medical needs for Covid-19 patients by transforming an exhibition hall and stadium as a temporary shelter. The National Management Agency reported that in June 2021, Malaysia had reached 60% utilization of quarantine and low-risk treatment centres.

The pilot survey was conducted in March 2021, a total of 34 respondents answered the survey. The questionnaire data were analysed to reflect reports about the patient's experience and how Covid-19 affects their perception of the existing hospital spatial design in Malaysia. The previous studies informed that hospital spatial design and organization are crucial and impact users' perceptions and experiences from multiple stakeholders. The question that is related to the quality of hospital design received 50% of responses that think Malaysia has proper and good quality of hospital design in terms of form, space

functionality, and arrangement, as well as building orientation. However, 50% agreed that the existing hospital design needed improvement for better health outcomes. Some of them suggested that spatial planning and design of hospitals related to the restorative environment should be considered as a priority when designing the hospital. Half of the respondents weren't satisfied with the conditions of the hospital's physical environment. The answer reflected the actual condition of the hospital in Malaysia itself which does not have a substantial buffer to control noise level, poor air quality, and thermal comfort control that affects patients, staff, and visitor's health. Up until now, the majority of research studies discovered that the research of hospital designs in Malaysia tended to concentrate more on the improvement of physical features rather than tackling the crucial issue such as the spatial organization and its physical, healing, and restorative environment of hospitals. 44% neutrally agreed that hospital design in Malaysia has included an adequate number of passive design elements such as natural lighting, ventilation, good view, and proper orientation. Generally, hospitals have been built based on standard recommendation guidelines given by health associations, World Health Organization, and only caters for current care services. With regards to the current situation with the Covid-19 pandemic, none of the respondents respond to the disagreement of the survey question and agreed that the global pandemic Covid-19 will change the method, planning, and design of the hospital in the future. The respondents were asked to suggest an improvement for current hospital design and most of the respondents surveyed indicated that the spatial arrangement especially on communal spaces needs to be redesigned, separation of the entrances with expected contagious diseases, bigger spaces for waiting area, designing for infection control with new protective. They also highlighted the flow of services should be considered based on the human movements and interactions especially with those elderly and sick people.

Until today (May 2021), the Covid-19 pandemic is sweeping through the USA (33,950,633 confirmed cases and 605,307 people died). India (27,359,751 confirmed cases and 315,000 peoples died), Brazil (16,195,981 confirmed cases with 252,224 deaths) and France (5,621,696 confirmed cases with 109,023 deaths) ([www.worldometers.info](http://www.worldometers.info)). The affected countries are currently facing huge numbers of Covid-19 cases; flares-up at local areas indirectly affected the enormous lack of clinical assets at the beginning phase of the Covid-19 epidemic in Wuhan. The data shows that numerous hospitals do not have the ability to caters to a huge number of Covid-19 patients due to a shortage of medical services and supplies. In the early period of the Covid-19 outbreak in Wuhan, many hospitals were not prepared for the tremendous treatment needed by patients (Wang, et al., 2020). Emergency hospitals have been running at a maximum pace to treat Covid-19 patients with extreme manifestations. Architects have distinguished a new design framework for medical planning services to make sure hospital activities run smoother and more effectively. The intention is to oversee the wellbeing and administer given medical services near patients' houses within the local context. The healthcare providers and associations have decided to make some changes

to the surrounding area due to Covid-19. Spatial and authoritative transformations have been carried out to ensure the emergency department could cater and treat Covid-19 patients. The transformation planning includes rearranging inward 'foot traffic flow' courses and streams to separate the Covid-19 contaminated area and the other non-affected area.

### 3.1 Impact of Covid-19: Environment and Spatial Design

The impact of the hospital current scenario from the first wave of Covid-19 was to isolate patients, isolate the source of infection, prevent family transmission infections cause by home isolation as well as prevent contamination of the environment caused by repeated hospital trips (Yuan et al., 2020; Wang et al., 2020). The recent literature and worldwide news reported the idea of converting a public place into a temporary or emergency hospital during the Covid-19 pandemic had been widely used (Zhou et al., 2020; Chen et al., 2020; (Sacchetto et al., 2020). China, which is the most affected country hit by Covid-19 disease, has taken immediate action by converting the existing gymnasium, International Convention and Exhibition Centre, and other indoor centres, schools, and stadiums to build multi-shed emergency hospital shelters. These temporary shelters were divided into four spatial functions, which are medical, nursing, laboratory testing, and ward areas (Zhou et al., 2020; Chen et al., 2020; Sacchetto et al., 2020). Due to time and cost constraints, these temporary shelters also act as an immediate response from the government to mitigate the stress coming from the insufficient number of hospital beds. These temporary shelters only provide medical services and treat mild and moderate conditions of Covid-19 patients.

As reported by worldwide media, the government of China has taken immoderate action by building a Covid-19 emergency hospital within five days. Temporary Ark Hospitals, located in Wuhan, has a significant and positive impact from the community area-based plan. The design was based on clinical outcomes, epidemic control situations, and public health impact (Zhu et al., 2020; Yuan et al., 2020). These hospitals were modelled after a case study of Xiaotangshan Hospital in Beijing that treated the SARs epidemic in 2003. The original concept is from the battlefields that were adopted during natural disasters and disease outbreaks (Shu et al., 2020). The hospital was separated into three different zones: Clean Zone, Dirty Zone, and Contaminated Zone. The architects involved adopted the modular design concept and BIM application approach to construct the hospital design and development by dividing the whole block into individual prefabricated units (Blackwell and Bosse, 2007; Cheng et al., 2015; Luo et al., 2020). Both hospitals have become reference studies by other countries based on the design, construction, and commissioning projects. The spatial organization of these two hospitals involved designated pathways with gradual reduction of Covid-19 related accesses considering the consequences of the virus could spread through droplets and existing building conditions which have poor ventilation (Luo et al., 2020). The areas have been divided into different sections, which are: (a) three areas of the polluted area, semi-polluted area, and clean area; (b) two channels of a

polluted and clean channel and (c) contaminated area where infected patients are treated (wards, treatment rooms, dirty rooms, places of activity, and patient admission and discharge rooms) (Shu et al., 2020). In conclusion, these are examples of emergency temporary hospitals in China that have rapid construction, a massive scale of building size, and low-cost construction projects. The whole world has seen rapid development of Covid-19 emergency shelters since 2019 that act as isolation, triage, primary medical care, frequent monitoring, and rapid referral, essential living as well as massive social engagement (Chen et al., 2020; Fang et al., 2020; Wang et al., 2020; Shen et al., 2020).

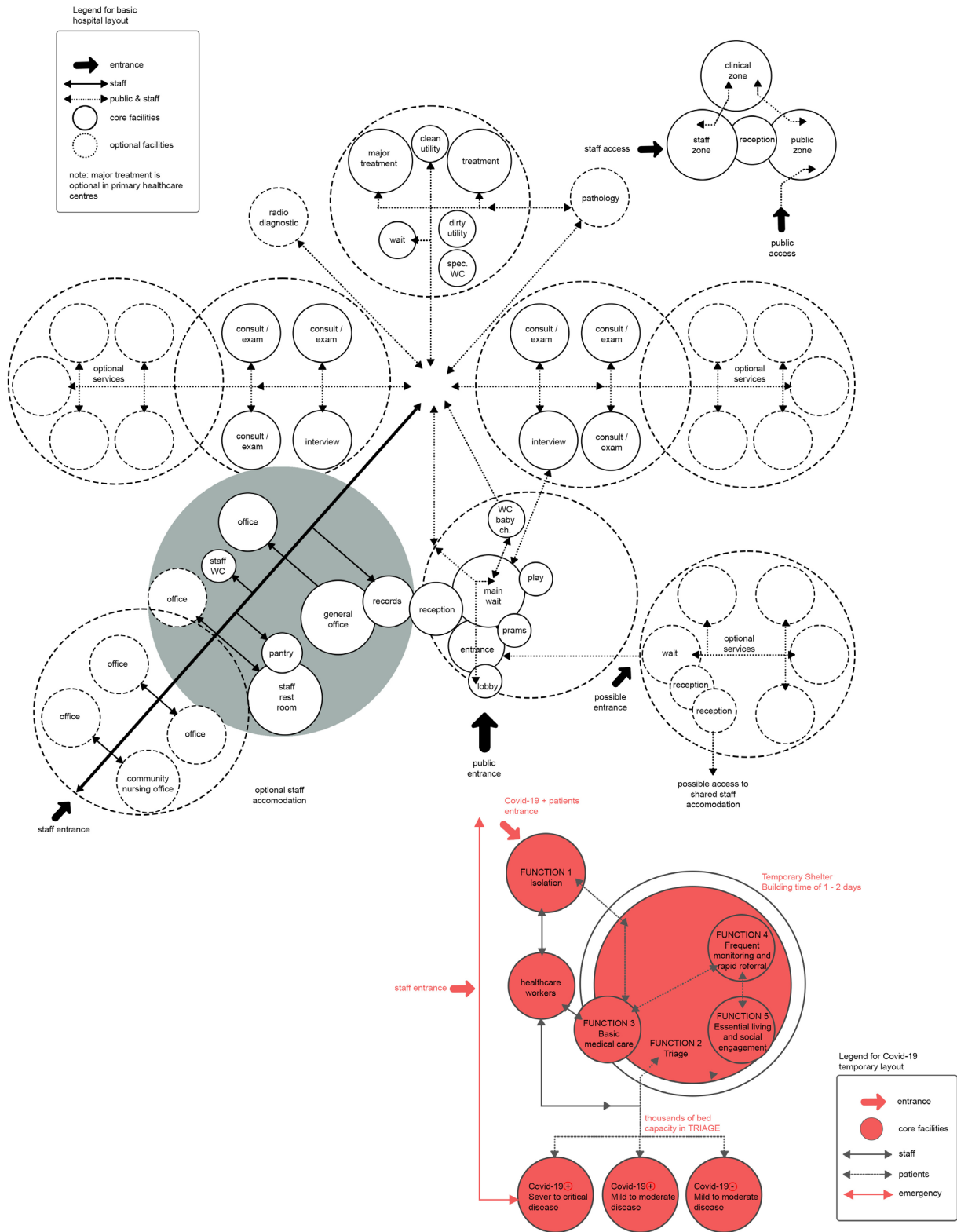
Another example is in Northern Italy, where they built a temporary rapid-assembly emergency hospital only to cater for those patients who developed mild and moderate Covid-19 symptoms. In Turin, where an existing concert hall has been transformed by applying different ideas and concepts based on taking temporary shelter in China as a precedent study. The architect had also implemented a “semi-open” layout space and did not separate the existing admitted patients from Covid-19 patients. This temporary hospital is equipped with high-standard clinical devices, the latest technology, recent furniture design, and structural details to observe and treat patients (Sacchetto et al., 2020). According to Tosoni et al. (2020), he reported that temporary hospitals in Rome however did separate Covid-19 patients at the contaminated wards to lessen the risk and prevent the disease from spreading. Chen et al. (2020) recommends a temporary hospital or shelter for Covid-19 patients should be located separately from the main hospital block. Based on the evidence in Chengdu, China, the implementation of a one-way “foot passage traffic” design only avoids mixing patients at the admission area.

Figure 2 shows a spatial diagram of an emergency shelter that only provides basic facilities and within an enclosed area to minimize the patient's movements. The evidence finding emphasizes the planning difference in terms of spatial planning, size, facilities with a massive buffer between healthcare workers and patients compared to how people are usually treated in the main hospital building. It concludes that the insights studies about hospital planning and design can be seen as an empirical topic to prepare for unpredicted events such as the Covid-19 epidemic. Some of the recent design trends in hospital planning and design that can be adapted during the pandemic crisis are by having flexible and open spaces such as moveable partitions or walls, good filtration systems, and also multi-bed in the hospital rooms (Waite, 2020). Emergency and disaster planning preparation is an important key issue, especially during this pandemic time. A recent study found that most hospitals failed to maintain their normal working routine due to a shortage of mitigation and planning preparation (Vick et al., 2018; Cao et al., 2020). Astron Hospital and Health Care Consultants (2021) listed ten recommendations of innovative strategies in creating safer hospital planning specifically for pandemic situations. The recommendations such as improving infection prevention, increasing isolation room capacity, limiting shared staff spaces,

patients must be triaged by paramedics before they enter Emergency Department, re-imagining waiting rooms and public spaces, planning for inpatient surge capacity, finding surge capacity in an outpatient centre, inventories for greater supply chain control, telemedicine's impact on facility sizes, isolation operating rooms and laboratory can be applied to create safer hospital environment. In conclusion, the improvement of Covid-19 response capacity is by building and providing field hospitals, temporary shelters, and emergent hospitals according to recommended WHO guidelines. Hence, the existing medical facilities in the future are flexible to be renovated, repurposed, and reopened at any suitable time, especially to respond to pandemic situations (Luo et.al, 2021). The referral pathways for Covid-19 treatment are categorized by WHO (2021) into two: (1) screening, isolation, and triage; (2) hub and spoke models (community transmission) such as a hospital (with triage and Covid-19 dedicated ward) and primary health centre (with triage and temporary isolation rooms). This pandemic mode hospital design should consider:

- a. Convertible spaces and movement flow of human and machinery for quarantine and treatment in which should integrate isolation for infected group and social distancing (isolate, contain, and separate);
- b. Maintaining physical distancing by choreographing the routes and movement of people;
- c. Flexible design – easy convertible space, changing the spaces to be more flexible to accommodate more people, spatial modification during the surge;
- d. Fostering virtual connectivity - need to modify the existing facilities and adoption of technology and digital innovation in the healthcare system with rapid action during emergencies;
- e. Maximizing air quality - clean air and surfaces to mitigate routes of airborne transmission, prevention from contaminated air from spreading;
- f. Support well-beings – hospital as sanatorium with aesthetic therapeutic design for treating patients and protecting healthcare staffs;
- g. Transforming an individual critical treatment room to a unit care treatment to accommodate more patients.

The evidence from this study suggests that spatial design transformation into temporary Covid-19 mode hospitals was quickly adopted worldwide. Whilst, the hospitals were not designed for this pandemic but the adaptation of infection control measures and protocols are adequate for the pandemic crisis. Numerous examples have demonstrated that Covid-19 has a measurable and desirable impact on the hospital spatial design.



#### 4. Conclusion

The Covid-19 pandemic exposed an unprecedented crisis worldwide, especially to the healthcare system and its infrastructure. Although this study is based on a small sample of participants and content analysis, the findings suggest that the hospital need to adapt to the new realities. The architects or designers should understand the routes of any viruses that caused the pandemic to restructure the hospital design. The collaboration with the policymakers, healthcare providers, engineers, technologists, and other related fields will change the contemporary hospital design towards community lifesaving. Scholars suggested that the new technology will impact the hospital's design and need to encompass the new techniques for the maximum benefit of well-being, especially during a crucial time of the pandemic. The lesson learned from this pandemic, hospital circulations and arrangements should be integrated with exterior and interior buildings spaces from the psychological and functional aspects of the hospital. There is a need to choreograph the movement pattern of the people to reduce virus transmission. The hospital became a war zone during this pandemic, the highest stress level for the front liners depicted the need for healing spaces as a psychological and psychosocial relief. These healing spaces will become integral elements as the hospital providing 24/7 functional support and services during a pandemic or normal routine. Notwithstanding, a hospital is a place where healthcare services are delivered to patients who may stay in long-term recovery, the place must be patient-centered, healing, and life-affirming to its visitors but a few designs consideration need to be established. Hence, Covid-19 acknowledges that the intrinsic pace of reconstruction and rehabilitation of existing hospital spatial design is not able to keep up with the escalating mass production and consumption demands, driven by this dangerous novel virus. There are meaningful improvements in the current course of hospitals' environment into pandemic resilient healthcare design to create and maintain the operational facilities during this tough time. There should be a significant change in planning, designing, developing, and operating hospital spatial organizations and its distribution of pandemic mode hospital design. This combination of findings provides some support for the conceptualization of contagious infection control with new protective elements in the hospital's spatial design.

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