Securing Crowd Management Over Patients' Behavior in Chinese Public Hospitals

Yajie Luo[1], Rahinah Ibrahim[2*]
{gs59297@student.upm.edu.my[1], rahinah@upm.edu.my[2]}

Faculty of Design and Architecture, Universiti Putra Malaysia, 43400, Serdang, Selangor, Malaysia[1,2]

Abstract. The COVID19 pandemic has made many medical professionals realized the need for managing local patients' behavior in order to avoid unwarranted series of accidents caused by crowding. This study is part of a larger case study research methodology for developing an efficient guideline in managing patients' behavior in Chinese public hospitals. Combining with the behavioral factors and interior material and crowd management of Chinese public hospitals to avoid risk during COVID19. The previous research was more concerned the recovery of a patient under normal conditions. In this paper, the authors report an early selective literature review to evaluate factors about patients' behavior which can be used in Chinese public hospitals. Then, it conducts further analysis on how to apply those results to Chinese public hospital. The results are expected to lead towards recommending key aspects in developing a guideline for the patient management. This study contributes in documenting patients' behavioral analysis and is expected to support the design of Chinese hospitals that cares for the well-being of their resident patients.

Keywords: human ethology, crowd management, health and well-being, hospital planning, Chinese public hospital.

1 Introduction

Based on the study of infectious diseases, it has previously been observed that China has a relatively complete set of management measures to prevent the spread of epidemic diseases. Zhang et al. (2020) [48] highlighted on the incorporation on the Internet of psychological intervention platforms for patients, family and healthcare professionals by physicians, psychiatrists, psychologists and social workers. Kenanidis et al., (2020) [17] highlighted on the management of orthopedic medical and nursing staff, changes in ward, operating room and outpatient work flow for orthopedic patients from admission to discharge. Holmes N, Virani S, Relwani J. (2021) [11] state that despite isolation measures, the rate of orthopedic hospitalization virus transmission was 12.5% among orthopedic patients, possibly due to asymptomatic health care workers or inpatients waiting for swab results.

There is a need to effectively control the spread of the disease from the source. However, once it is infected inside the hospital, it will take a huge data trail to identify the source and cut it off. Chang et al. (2020) [4] states that the strategies adopted by Daegu (Korea) University Hospital to prevent COVID-19 transmission within our institution were reviewed. Gan, Lim & Koh (2020) [9] states that the prevention of the spread of infectious diseases in hospitals is therefore a priority. Zhou et al., (2020) [50] states that measures to address the diagnosis,

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prevention, and treatment of infections taken by West China Sichuan University Hospital. Cai et al., (2020) [3] states that virus contamination of common objects, virus aerosolization in a confined space, or transmission by asymptomatic infected persons.

Currently, there will be no alternative except to keep people from moving around that is bound to cause a series of abnormal behavior in hospitalized patients and harm their physical and mental health. Before the pandemic, the inpatient's daily life is not only in the sickroom, but they are free go to canteen, or the hospital garden for a walk. Whereas their movements are restricted to their floor after the outbreak of COVID 19.

This study is part of a larger case study research methodology for developing an efficient guideline in managing patients' behavior in Chinese public hospitals. The purpose of this paper is to discuss whether the behavior of inpatients can be guided by way of human flow management to avoid causing a larger scale of infection.

2 Research methodology

The literature review study presented in this paper follows the unique "Literature Review Synthesis Process" (Ibrahim and Mustafa Kamal, 2018) [14] in Masiran, et al. (2020) [15]. This process is a stand-alone literature review typology (Rousseau, Manning and Denyer, 2008 [32]; Yu and Watson, 2019 [47]; Templier and Paré, 2015 [37]) known to make sense of a selected body of existing literature leading to decisions regarding the background theoretical context in an early research ideation phase. Topics were identified using Ibrahim's (2011 & 2020) [13][23] research question's (RQ) construct categorization technique for identifying three different RQ Constructs — "WHO", WHAT" and "HOW" — in formulating a main research question. "WHO" is defined as the element being impacted by the study, "WHAT" is the information or body of knowledge required to solve the problem, and "HOW" is the targeted impact by the study. In one PhD study, there are four required RQ constructs.

This study selected the RQ construct Chinese public hospital for reporting. The literature articles were identified using Scopus, Google Scholar and Elsevier using the keywords related to the selected RQ construct such as the inpatient's behavior, crowd management, hospital interior planning, and current situation in Chinese public hospital. After title search and filtering out full research papers from year 2000 to recent, a total of thirty-nine journal articles were identified. The abstracts were reviewed and assigned to small topics: the management of Chinese public hospital, the behavior of patients during the hospital, and the material and space used in Chinese public hospital. The abstract was reviewed in term of their major findings by prior scholars, how their works could support future studies, and what aspects need to be enhanced. The articles cited in this study are believed to have strong potential to solve the main study's problem and were selected for the synthesis review process. The distribution into the smaller topics was based on their existential importance as any new emerging topic may not have sufficient literature articles.

The outcome of this exercise produces a synthesized summary for each topic which went further cross-analysis, integration of possibilities, and prioritization of the synthesized summary towards high probable solutions for how to develop an interior spatial system for controlling

dangerous infections from resident patients in Chinese public hospitals. The resulting key summaries are presented in the “Point of Departure (POD) Tree Diagram” adapted from Ibrahim and Mustafa Kamal (2018) [14] shown in Figure 1. This study used the EAGLE Navigator online system to document the literature review synthesis process.

3 Background problem

3.1 Current situation of Chinese public hospital

After a lengthy period of growth, China has created a medical and health care system that include hospitals, community-level medical and health institutions, and specialized public health institutions in both urban and rural regions. By the end of 2013, China had 974,400 medical and health institutions, including 24,700 hospitals, 915,400 community-level medical and health institutions and 31,200 specialized public health institutions. 9.79 million health workers, including 7.21 million health technicians; there are 6.18 million beds, 4.55 million beds in medical and health institutions, 2.06 practicing (assistant) physicians and 2.05 registered nurses for every 1,000 permanent residents. From 2004 to 2013, the total number of visits to medical and health institutions nationwide increased from 3.991 billion to 7.314 billion annually, an annual growth rate of 6.96%, and the number of inpatients increased from 66.57 million to 191 million annually, with average growth of inpatients has been 12.42% a year [49].

However, the space of most medical institutions can no longer respond to the needs of the increasing number of patients. Once people are crowded, it is very easy for people to find no direction, leading to behavior separation. Especially in today's epidemic of infectious diseases, the infection of large-scale population leads to the increase of segregation and psychological needs in hospitals. Take into account this, firstly, it is particularly important for China's public hospitals to change their management strategies. From the long-term development of medical institutions, although we can build the compartment hospital in the current epidemic infectious diseases, there are still many patients with other diseases who need a relatively humanized medical guide management to relieve their psychological pressure and perfect protection to reduce infection. Ulrich (1991) [40] opined the healthcare’s interior design focus primarily on function and tends to create an environment that negates the psychological needs of patients, visitors and staff. As a result, he believes these facilities are psychologically "difficult" and can be stressful for users. Hospitals, as well as many other public facilities, can become a disconnected and confusing spatial labyrinth due to the complexity of their functions and procedures [31]. Therefore, there is a requirement to analyze the management of Chines public hospital and inpatient’s behavior in order to reduce the spread of epidemics among hospitalized patients.

3.2 The management of Chinese public hospital

Ma et al. (2020) [24] convey that all members work together; To closely monitor the development of the epidemic nationwide, in hospitals and in hospital districts; Report the pandemic condition to the appropriate agencies in a timely and accurate manner; We also organize regular meetings to discuss, formulate and revise the prevention and control plans and measures, and take charge of the overall implementation of the plans and the organization and coordination of resources. Selamat, Khamis & Ghani (2020) [34] state that can be used not only

to understand the behavior of a crowd in different environments, but also in risk assessment of spaces and in designing spaces that are safer for crowds, especially during emergency evacuations. Yu et al. (2020) [46] found that these unconventional measures, on the one hand, controlled the spread of the epidemic in China, and on the other hand, exposed some of China's short-comings in biosafety, food safety, public health input.

In summary, the study found that they are focusing more on the safety aspects of crowding during emergency evacuations for crowd management, besides focusing on surveillance of the outbreak and control actions to reduce infection. Thus, this study will integrate both safety and surveillance factors in order to propose more suitable management for Chinese public hospital.

3.3 The behavior of patients during the hospital

Human ethology is defined as the biology of human behavior [8]. Thus, we will use this theory to analyze the inpatient's behavior start from the essence. Human ethology can give useful insights about human behavior pathology in a range of medical fields. By incorporating ethology, a crucial duty of medical forecasting may be made more dependable [19]. It is important to understand the why inpatient does this action and the reason behind.

Samah, Ibrahim, Othman & Wahab (2012) [33] explain that they wish to evaluate the design of health facilities in a way that understands their expectations, preferences and experience from the perspective of the patient and their family (user). Based on Samah's study, the impact of interior space will be evaluated from multiple angles in this study, such as medical workers, patients and their family. According to Lenfestey et al. (2013) [21], there is a need to assess expert knowledge, perceptions, and experience on the role of the built environment in the acquisition and transmission of healthcare-associated infections (HAIs), facility design decision-making considerations, and interventions strategies through facility design and technologies. Based on Lenfestey's study, not only need to collect material from different angles, but also required to consider those experts' comments that they have more experience in fighting infectious diseases. In addition, the scholar emphasized that good design must consider human behavior. If they don't follow usage specifications, the best design will be located in vain. Li et al. (2015) [22] suggests improvements to criteria for measuring therapeutic and patient satisfaction in Chinese hospitals. Based on Li's study, China still has many problems need to solve, for example, medical resources are limited, patient satisfaction need to be improved.

Nevertheless, most important is that how to provide the best possible medical care to those who need to live in the hospital. Sengke, Mustikawati & Triandriani (2019) [35] state that the visual mechanisms of seeing and their significance in experiencing an interior space. Based on Sengke's study, though the interior design as an essentially spatial structure, the study really cannot afford to underestimate the importance of the visual experience. It also can serve to guide the flow of inpatient easily. Karanikola, Andrea, Tampakis, Tsolakidou & Anastasia (2020) [16] state that the hospital's interior and outdoor areas were studied in terms of environmental characteristics and psychological impact on its users. Based on Karanikola's study, this study proposes taking into account the outdoor scene within the eye's reach while keeping inpatient's mental health. Additionally, staff stress impacts their moods and their services will lead to the inpatient behavior.

For the literature review, dominant themes focus on the patient's experience of the environment, provision of psychological interventions to prevent mental illness, and the relationship between the inpatient and medical workers. Therefore, as mentioned in the literature review, this study will make much greater use of the basic information (gender, age, variety of disease and satisfaction) of resident patient combined with the analysis of their behavior through human ethology, then the influence of environment and psychological intervention is used to guide the behavior of inpatients.

3.4 The material and space used in Chinese public hospital

In this section, the study will focus on the environment where the inpatients live in the hospital after it understands their behavior habits. Leather et al. (2003) [20] highlighted on providing support for the concept of a therapeutic hospital environment through their common demographic characteristics and their similar health profiles. Based on Leather's study, the inpatient characteristics and cultural environment can be used to control people's actions, and provide ideas for indoor renovation. Waroonkun & Tanut (2018) [43] highlighted on determine what was important to them as users of the hospital. Based on Waroonkun's study, the inpatient's life safety is naturally the most important when they come into hospital. The second critical factor will be their mental health. This study considers the comfort of inpatient living only after that. The Wieslander's study found that the material, lighting and construct of interior have a positive effect on patient's health [44]. These factors must also be taken into account comprehensively in the interior structural modification when embarking on the study. Sengke et al., (2019) [35] highlighted on the observational path that creates an optical flow that contains dynamic and ongoing visual information during movement. Pati et al., (2015) [29] highlighted on the physical environment has a critical role in aiding navigation in healthcare facilities. Based on Pati's study, since people's responses to the physical environment are varied, different physical environment matching responses are classified in this study is important. Morgan et al., (2020) [26] highlighted on interior architecture influences informal communication and collaboration between staff. Based on Morgan's study, the influence of indoor environment on communication and collaboration among employees also affects the behavior of resident patients to a certain extent. Therefore, this study also will consider about the medical workers communication impact from the interior structure.

Many prior researches on the interior of the hospital tend to focus on the feeling of usage, visual, material and collaboration between the inpatients and medical workers. Also, they utilize the material properties in analyzing the health effects. These studies ignored that guide the flow of people also can avoid infection. In summary, the study found the material of the interior also can ease the resident patient's way finding which could reduce infection or other risks. Therefore, this study proposes to focus on analyzing how different interior factors would affect resident patients, and conduct evidence-based design (EBD) according to this effect. Then, the study can use these elements to contribute in minimizing the risk of infection and guiding the wayfinding flow of people in high-risk wards.

3.5 Proposition for Managing Behavior

Based on the selected literature review, the study would like to recommend further study on developing the relationship between behavior, management and interior design. This study proceeded with the view of improving the "visual perception" quality of the public space environment of the hospital. It deeply penetrated the creation of a good visual environment into the establishment of an orderly building space system to impact inpatient behavior. Optimized management recommendations are utilized to manage the patient's behavior. These objective findings are expected to provide necessary recommendations for changing inpatient behavior and population management in China. To lay the foundation for further regional and aspect investigation and change. Balancing the benefits for the management of hospitals with the inpatients will be a future challenge.

4 Discussion

In this section, the study will discuss the benefits of merging the management, space and behavior of inpatients mentioned the problem statement. First, crowd management we can get it from the policy and criteria for relevant projects and literature. However, these criterions formulated for people when we talk about crowd management. Thus, the biggest problem is how to manage and guide them, because some of them will ignore these rules. It will make management work well when the research knows what factors will affect the inpatient what behavior. Then, we can obtain the final conclusion by combining the management and inpatient behavior. That is the analysis of the management and influence in Chinese public hospitals in guiding the behavior of inpatients.

Second, through the literature review, the study proposes to obtain factors from two aspects which are inpatient's own causes and external causes. For resident patient's own causes, researchers may get the method to manage by understanding of their basic information (refer to attribution theory). For the outward causes, the study recommends to analyse the material and structure of interior to find ways how to guide the inpatient. Then, the study proposes combining personal behavior with the environmental factors. The recommendation from the mergence may allow the study to concentrate on the analysis affecting inpatient's behavior affected to the indoor factors (materials, space, lighting, etc.). In general, this study highlights the potential of integrating behavioral factors affecting inpatients for combining with the interior material and crowd management of public hospitals in China. The study proposes the following guide regarding the flow of people to avoid bigger risk of situation. Hence, the study recommends the theoretical relationships of the above recommendations in the following **Figure 1**. "Synthesized theoretical proposition for protecting inpatient health and well-being as guided by the E.A.G.L.E. approach" [14].

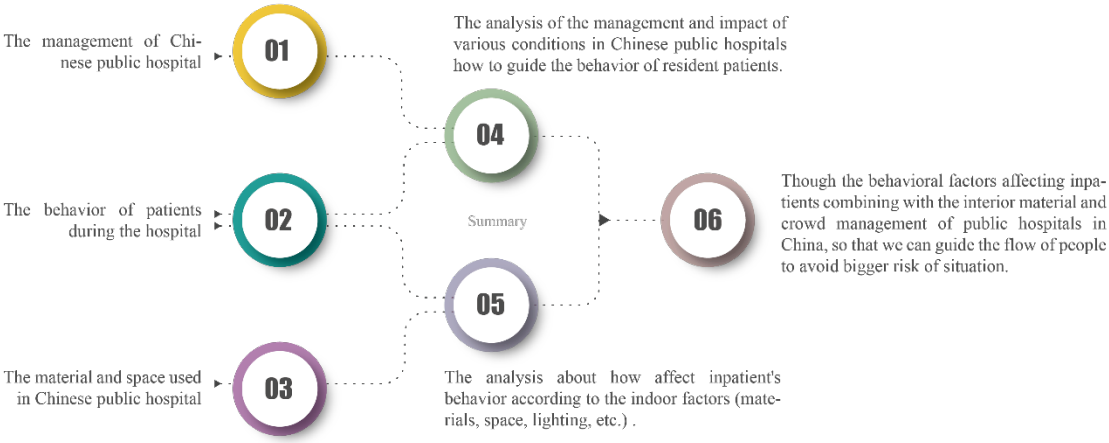

Fig. 1. Synthesized theoretical proposition for protecting inpatient health and well-being as guided by the E.A.G.L.E. approach (Adapted from Ibrahim and Mustafa Kamal, 2018).

5 Conclusion

The purpose of this study is to collect potential theoretical understanding on inpatient's behavior in Chinese public hospital before conducting crowd management analysis. Key results from this study reveals that if the public hospitals want to reduce the infection, they must control the movement in space of resident patients since the free spatial movement will be detrimental to the physical and mental health of patients. While most literature documents inpatient behavior were related to mental illness rather than the COVID19 epidemic, this study hopes to extend the study on inpatient behavioral analysis to support Chinese public hospitals in improving their management of the crowd and caring the well-being of their resident patients. Only when hospitals are managed as safe areas, people will not be afraid to be hospitalized and society will not panic. This study will fill the gaps in how hospitals could respond to patient management during an epidemic outbreak. The study contributes in management of resident patients' behavior to avoid unwarranted series of accidents caused by crowding specifically in infectious pandemic like COVID19.

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