Affective and Pleasurable Design, Vol. 41, 2022, 170–177
https://doi.org/10.54941/ahfe1001794

Environmental Design of Medical Main Street from the Perspective of Supportive Design Theory

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ABSTRACT

As the main public space of the hospital, Medical Street connects various functional zones and has attributes such as transport, leisure, social interaction and commercial services. It is a mainly concentrated place for patients to stay for a long time during medical treatment. Providing supportive design for medical space helps to better establish a safe, efficient and humanized hospital, and plays a positive role in improving patient health. It is found that there are some phenomena such as complex streamline layout, serious homogenization of functional space and the lack of unified planning of landscape and sign in Chinese medical streets (Chang Guan et al. 2021). Therefore, from the perspective of supportive design theory, this study conducted field research and analysis of the newly built medical streets in China, summarized patients' behavior preferences, and proposed targeted design strategies for medical street. Help build safer, more efficient and dynamic interactive medical streets gradually, and improve hospital support.

Keywords: Supportive design theory, Medical street, Environmental behavior, Humanization

INTRODUCTION

With the transformation of domestic medical concept from "treatment" to "preventive health care" and the diversification of patient needs, the proportion of social attributes and non-medical space in hospitals have also increased significantly. As the main public space of the hospital, Medical Street is the main place where patients stay for a long time during medical treatment. However, in the face of the large number of outpatients and the large demand for waiting in domestic hospitals, how to provide effective supporting factors in this process, relieve patient anxiety, and improve the efficiency of medical treatment remains to be solved and optimized.

"Supportive" refers to the environmental characteristics that support or promote coping and restoring stress for concomitant illness and hospitalization. Through recovery and cushioning for stress and enhanced response and other health resources, supportive designed medical environments can improve health outcomes (Ulrich, 1991, 1999). Therefore, the application of supportive design theory in the medical street design can effectively relieve the pressure of patients.

OVERVIEW OF SUPPORTIVE DESIGN THEORY

The supportive design theory is based on a large number of "indirect" related research in health psychology, environmental psychology, behavioral medicine, and other health-related fields. The supportive design emphasizes the inclusion of features and opportunities to calm patients, reduce stress, and strengthen coping resources and health processes (Ulrich, 1991, 1999, 2000). To help identify evidence-based design strategies, Ulrich conducted a multidisciplinary review of theoretical and scientific research and proposed the following general guidelines for creating a supportive medical environment:

- Strengthen Controllability (SC), including privacy
- Promoting a Sense of Social Support (SS)
- Provides close proximity to nature and other positive distractions. Positive Distraction (PD)

In terms of controllability, many studies have found a strong desire to control the surrounding environment. Uncontrollable circumstances are often stressful. In the setting of health care, the lack of control is a common problem, leading to stress and adverse outcomes (Ulrich, 1995). Social support is the emotional support and tangible help that a person receives from others (Ulrich, 1991). Patients who can receive supportive services can reduce stress and thus improve medical outcomes (Ulrich, 1995). Positive distraction refers to a subset of environmental and social conditions characterized by improving mood and the ability to effectively promote stress recovery (Ulrich, 1991,1999, 2000). The measure is to improve the positive feelings of patients through environmental factors, effectively distract attention from pain or reduce anxiety, so as to produce positive effects on physiological functions (Ulrich, 1995). Supportive design theory can be seen as a design means to effectively relieve psychological stress on patients, families and healthcare workers.

THE RELATED RESEARCH OF MEDICAL STREET

In the 1960s, British and American architects noticed the medical concept of "patient-centered" and gave psychological basis to "space healing power". Therefore, researchers began to pay attention to the healing of medical space. There is a link between visual landscapes and mental health (Ulrich R, 1979). Restorative landscape and daylighting are important in medical Settings (Ulrich R et al, 2004). Color design with biophilic characteristics plays an important role in improving patient experience and stimulating self-rehabilitation ability (Huifang Shang et al, 2020). Visual interactive installations can provide interesting interactive art experiences for patients. (Chen A Y C et al., 2009). The art installation is intentional and have a role in 'empathy', 'messaging', 'wayfinding', etc (Rollins J, 2021). Wayfinding difficulty, as a chronic problem in hospitals, requires the help of physical environment. Outpatient space streamline design should follow the principle of "high brightness" and "low density" (Zhixin Lv, 2013). Hospital layout has a significant impact on visibility (Hadi K et al., 2016).

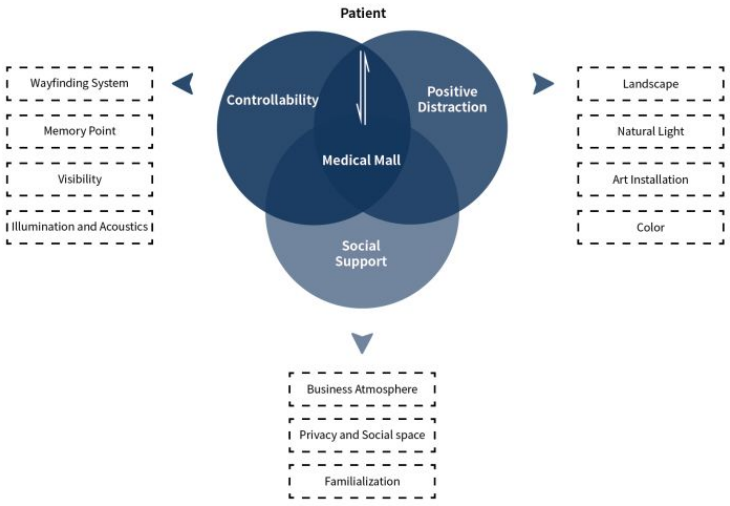


Figure 1: Analysis map of supportive design elements in Medical Street (self-drawn).

In addition to nature, art and wayfinding, the researchers also focused on the commercial and social value of the hospital. Both social and private should be incorporated into the same physical environment (Anker A et al. 2018). The introduction of commercial and entertainment functions can help create an accessible atmosphere (Totaforti et al., 2018). The "familiarity" and "accessibility" of the healthcare environment can be increased through the concept of "family culture" and "hospital community" (Bates et al., 2018).

Through literature research, it is found that the concept of medical street in foreign countries is mainly inclined to the commercial street in hospital. In China, Medical Street is defined as a public activity space composed of traffic line and leisure area. Facing the current situation of high traffic in domestic hospitals, scholars focused on the optimal design of spatial layout and wayfinding system in the early stage in order to improve the efficiency of medical treatment. However, the detailed design such as landscape, artistic design and spatial preference need to be further discussed.

Therefore, based on the supportive design theory, this paper classifies and analyzes the design elements of medical street, such as wayfinding, landscape and art (see Figure 1). Based on the supportive design elements, this paper conducted field research and analysis of domestic hospitals, summarized patients' preferences, and proposed corresponding improvement strategies.

ANALYSIS OF CURRENT SITUATION OF DOMESTIC MEDICAL STREET

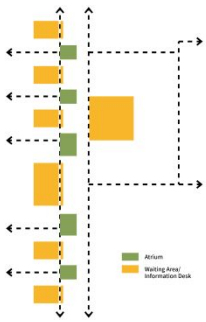
Research of Medical Street

It is found that "Abstract Functional", "Introverted" and "Extroverted" medical streets (Yan Hai et al, 2011) have significant features through literature research and the present situation of the domestic comprehensive hospital. Therefore, the field investigation and current situation analysis were

Table 1. Hospital introduction (self-drawn).

Name	Location	Year	Type	Medical Street
The First Affiliated Hospital, Zhejiang University	Hangzhou, Zhejiang	2020	University Hospital	Abstract Functional
Wuhan Union Hospital (Jinyin Lake Hospital)	Wuhan, Hubei	2021	Local hospital	Introverted
Taikang Tongji (Wuhan) Hospital	Wuhan, Hubei	2020	Private hospital	Extroverted

Table 2. The First Affiliated Hospital, Zhejiang University (self-drawn).

Theory	Feature	Pattern	Photo
Controllability	Way-finding		
	Memory point		
	Visibility		
Positive distraction	Natural lighting		
	Color		
Social support	Private space		

carried out respectively for the three comprehensive hospitals newly built in China (see Table 1).

As an "Abstract Functional Medical Street", the First Affiliated Hospital of Zhejiang University focuses on transport. The main road is suitable in scale and has good visibility. The functional departments are distinguished by different colors to improve memory points and patients' perception of the environment. Patients are mostly concentrated in the triage area of each department. The semi-enclosed wall separates the waiting room and traffic space from each other to meet the private needs. This kind of medical street has more advantages in controllability, but lacks social support elements, such as business, family atmosphere and other elements to meet social needs. In terms of positive distraction, there is a lack of indoor natural elements and artistic devices to help shift attention from disease (see Table 2).

Taking Wuhan Union Hospital (Jinyin Lake Hospital) as an example, the "Introverted Medical Street" refers to the commercial street in the hospital, which is suitable for hospitals with fewer outpatient volume. The atrium of the medical street is a public leisure space, the ceiling is a glass top, and the surrounding areas are connected with various functions in the form of corridors, supplemented by small businesses. The visibility is well, and the guiding signs are eye-catching. However, each floor has a high degree of similarity and single color. The atrium space is open and unobstructed, while it lacks a certain degree of privacy. This kind of medical street has advantages in social support, but it still lacks of elements to meet privacy needs. In terms

Table 3. Wuhan Union Hospital (Jinyin Lake Hospital) (self-drawn).

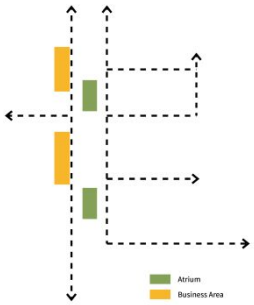
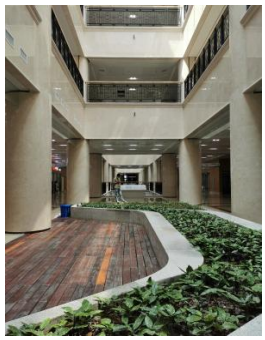
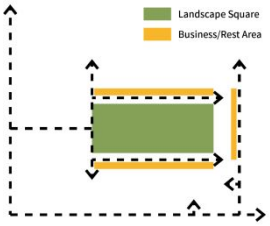
Theory	Feature	Pattern	Photo
Controllability	Way-finding		
	Visibility		
Positive distraction	Natural lighting		
	Landscape		
Social support	Business		
	Social space		

Table 4. Taikang Tongji (Wuhan) Hospital (self-drawn).

Theory	Feature	Pattern	Photo
Controllability	Visibility		
Positive distraction	Natural lighting		
	Landscape		
Social support	Business		
	Social space		
	Family atmosphere		

of controllability, it is good in way-finding and visibility design, but the lack of memory points is easy to make patients lose their direction. The landscape facilities and nature lighting provide good positive distraction elements, but lack the color and artistic elements to help relieve the tension of the hospital (see Table 3).

The "Extroverted Medical Street" represented by Taikang Tongji (Wuhan) Hospital sets up non-medical space between the outpatient building and the inpatient department, forming a Semi-open Medical Street which is developed by landscape square. Commercial space is arranged along the two sides of the building on the first floor, providing an ecological mode of leisure which merge entertainment and business as one. Meanwhile, it provides services for surrounding communities and introduces community vitality. However, because of the excessive scale and the lack of privacy, almost no one uses the landscape square. The overall environment is overexposure to buildings, increasing the sense of pressure. In this kind of medical street performs well in positive distraction and social support, but there is some lack in controllability. Although it is better in the spatial visibility, the privacy and memory points of the space still need to be improved (see Table 4).

Investigation and Analysis

According to the field research, the newly built medical street has been relatively mature in terms of overall planning and spatial permeability, but the corresponding services such as private space and commercial atmosphere need to be improved. In this study, by means of fixed-point observation and crowd counting, the number of patients with different behaviors in three types of medical streets was counted in units of 10 minutes to obtain the density of patients. The distribution of people who stay for a long time, such as being alone, communicating, and waiting, as well as people who stay for a short time, such as inquiries and viewing guides, is analyzed to obtain the behavioral preferences of patients to provide a reference for the design of medical street.

Note: The floors of the medical street of the First Affiliated Hospital of Zhejiang University are almost similar, so the representative second floor is selected for investigation and analysis. Due to the small number of patients in the medical street of Taikang Tongji (Wuhan) Hospital, most patients are concentrated in the outpatient hall, so the rest area of the outpatient hall was added during the survey.

1. Long Stay Preference (Waiting Mainly)

According to the survey, patients prefer private space and areas with dense distribution of sitting facilities to stay for a long time (see Table 5). In the First Affiliated Hospital of Zhejiang University, patients tend to stay in semi-private waiting space and relatively secluded corner. Individual patients who seek quiet mostly stay at the landscape windows with relatively few people. In Wuhan Union Hospital (Jinyin Lake Hospital), most patients stay in commercial space and landscape atrium for a long time, but the number of users in the atrium is relatively small. In Taikang Tongji (Wuhan) Hospital, patients mostly stay in the outpatient hall away from the entrance and close to the floor-to-ceiling glass. The open medical street, coupled with temporarily closed commercial services, almost no one stays. Some prefer to stay by the seat on the side of the building.

2. Short Stay Preference (Wayfinding Mainly)

Compared with long-term stays, patients prefer to stay briefly at information desks, self-service equipment and atriums. Compared with patients in the First Affiliated Hospital of Zhejiang University who tend to inquire at the triage desk, patients in Wuhan Union Hospital (Jinyin Lake Hospital) stayed longer in front of the guide signs. In addition, the colors of the triage areas in the First Affiliated Hospital of Zhejiang University also convey effective information to patients, reducing the time patients spend before guide signs. Patients in Taikang Tongji (Wuhan) Hospital prefers to stay at outpatient halls.

According to the survey, patients prefer semi-open space, accessible landscape, space with commercial and family atmosphere as the choice of long-term stay. In terms of short-term stay, clear suggestive elements and

Table 5. Patient distribution (self-drawn).

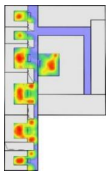
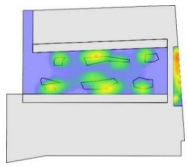
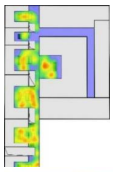
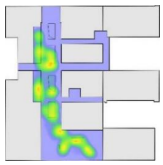
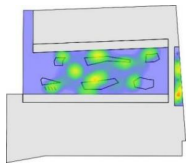
	The First Affiliated Hospital, Zhejiang University	Wuhan Union Hospital (Jinyin Lake Hospital)	Taikang Tongji (Wuhan) Hospital
Long stay preference (waiting mainly)			
Short stay preference (wayfinding mainly)			
Density			

Table 6. Relationship between behavior and supporting elements (self-drawn).

	Behavior	Supporting Elements
Long stay preference	Sitting and rest	Relatively private space
	Overlooking	Landscape window
	Chatting	Enclosed layout
		Familiar atmosphere
	Standing	Leaning point
Short stay preference	Inquiry	Guide sign
		Information desk
	Shopping	Business

convenient information areas can effectively reduce wayfinding time and anxiety generation of patients (see Table 6).

CONCLUSION

According to the research, wayfinding, memory elements, natural landscapes, commercial services and privacy are the primary choices of patients when they are waiting, and proposes corresponding design strategies for medical streets:

1. Add suggestive elements to reduce the difficulty of wayfinding.
2. Increase relatively privated space.
3. Add french window to introduce healing natural landscape.
4. Create business atmosphere with “familiarity” and “intimacy”.

From the perspective of supportive design theory, this study discusses the impact of the elements of the medical street on improving patient experience and helping to build a safe, efficient and humanized medical environment. As far as the current situation of the medical street, it has gradually transformed from a basic service type to a compound function type. More and more researchers and designers are also paying attention to the patient experience in hospital and how to provide patients with a more supportive environment and atmosphere. It is also the main research direction of the future medical street.

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