# Research on the Spatial Design of Township Health Service Based on Artificial Intelligence

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**Abstract:** With the development of the econoour, the living standards of residents are changing rapidly, and the residents' awareness of family and personal health management has gradually improved. People's awareness of health services and their requirements for health service quality are also getting higher and higher. The development of artificial intelligence technology is gradually applied in the spatial design of township health services, which has promoted the informatization level of medical services. The purpose of this article is to study the spatial design of township health services based on artificial intelligence. In this paper, by issuing questionnaires to residents near health service centers in three townships, it explores the lack of intelligence in the current township health service space design, and proposes corresponding improvement measures for the existing problems. And the research on artificial intelligence in the design and application of medical and health space.

**Keywords:** Smart Medical Care, Health Service Center, Space Design, Artificial Intelligence

## 1. Introduction

The township health service center is the basic unit of our country's medical and health services [1-2]. With the continuous deepening of our country's medical reform, a medical service network based on township health service centers has gradually formed [3-4]. Entering health service centers for minor illnesses and hospitals for serious illnesses can alleviate the strain on medical resources [5-6]. With the continuous development and application of scientific artificial intelligence technology, the spatial design of township health services has gradually become intelligent and informatized, and has become a key research object in the field of medical science and medical services [7-8].

Regarding the research on health services and space design, many scholars at home and abroad have conducted multi-faceted and in-depth discussions on them. For example, Ha took community health service centers as the research object and studied the effect of community-oriented primary care on chronic disease medical services[9]. Lyons J conducted research on emergency medical and transport services [10]. Ghosh K investigated the reasons why there are no doctors in rural medical services in India, and put forward countermeasures to optimize rural medical services [11]. It can be seen that the research on primary health services has received much attention in the academic circle and the industry. In order to improve the primary medical

and health services, the research on the spatial design of township health services based on artificial intelligence has important theoretical and practical significance.

This article mainly studies the spatial design of township health services based on artificial intelligence. This article first uses the questionnaire survey method, taking the health service centers of Zhujia Town, Shenjingzi Town, and Lixiang Town as examples, to explore the inadequacy of the residents' current township health service space design. Then, in view of the existing problems in the design of township health service space, an artificial intelligence-based township health service space design plan was proposed.

## 2.    Experimental Design

### 2.1 The Purpose and Significance of the Experiment

As there are certain differences in economic conditions and related policies in different provinces and cities across the country, the design of township health service spaces also have their own characteristics. This study investigated the township health service centers in Zhujia Town, Shenjingzi Town, and Lixiang Town. It mainly focused on the design of the health service space in the township and the introduction of intelligent equipment in the township to conduct a detailed investigation and analysis.

(1) Research purpose

Through field investigation and observation, we have a detailed understanding of the basic construction status of the township health service centers in Zhujia Town, Shenjingzi Town, and Lixiang Town, so as to discover the advantages and disadvantages of the existing township health service space design.

(2) Significance of research

On the one hand, it is necessary to understand the ideas of the residents of the township on the design of the health service space on the spot, so as to provide a basis for targeted improvement. On the other hand, it is to study the differences and interrelationships between spatial design factors and the actual construction of the spatial design of township health services, to find out the problems and find solutions.

(3) Research methods

By means of questionnaire survey and field investigation, the results of questionnaire survey were obtained through the Internet, online and offline distribution of questionnaires, collection of questionnaires and data statistics.

### 2.2 Questionnaire Survey Design

Through questionnaires, the cognition and utilization of health services in towns and villages were investigated, to clarify that residents were investigating and researching the current status of health service spaces in towns and towns and the introduction of artificial intelligence equipment, and to find out the points of attention in the current design of health service spaces in towns and towns.

## 2.3 Questionnaire Distribution

The respondents of the questionnaire were mainly residents in the jurisdictions of the health service centers in Zhujia Town, Shenjingzi Town, and Lixiang Town. A total of 1,200 questionnaires were distributed this time, and 1,169 were recovered, of which 1,147 were valid questionnaires, with an effective rate of 95.58%.

Among the 1147 valid questionnaires, 57.24% were female samples, 42.76% were male samples, and the sample ages ranged from 18 to 80 years old. The samples were mainly over 60 years old, accounting for 37.75%, and 40 to 60 years old accounting for 35.7%. The interval sample accounts for 73.45%.

## 2.4 Analysis of the Reliability of the Questionnaire

This questionnaire adopts the reliability analysis method, and the formula used is:

$$R = \frac{n \times K}{1 + (N-1) \times \overline{\overline{K}}} \quad (1)$$

Among them, R stands for reliability, K refers to the degree of mutual agreement between two scorers, and refers to the average of the degree of mutual agreement between the scorers. The K value calculation formula is:

$$K = \frac{2M}{N_1 + N_2} \quad (2)$$

M is the column that both agree completely, the number of columns analyzed by the first marker, and the number of columns analyzed by the second marker [12].

## 3.  Data Analysis

### 3.1 Problems in the Design of Township Health Service Space

The problems in the design of the health service space in towns and villages are shown in Table 1: among the problems in the design of the health service space in the three townships, 527 people think that "the waiting space is insufficient", accounting for 45.95%; 493 people think that the environment of the recovery room is built "Not in place", accounting for 42.98%; 481 people think that "public aisles are narrow", accounting for 41.94%.

**Table 1.** Problems in the design of township health service space

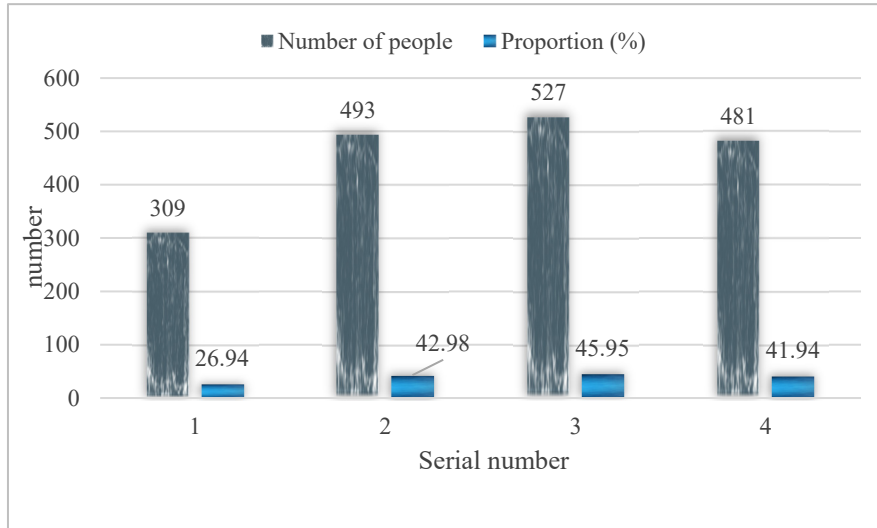| Serial number | Problem | Number of people | Proportion (%) |
|---|---|---|---|
| 1 | Unreasonable toilet location | 309 | 26.94 |
| 2 | The environment of the recovery room (inpatient ward) is not in place | 493 | 42.98 |
| 3 | Insufficient waiting space | 527 | 45.95 |
| 4 | Narrow public walkways | 481 | 41.94 |

**Figure 1.** Problems in the design of township health service space
(This question is multiple options, so the percentage is greater than 1)

Looking at Figure 1, it can be found that the main problems in the design of the sanitation service space in the three townships are insufficient waiting space, inadequate construction of the recovery room environment, and narrow public walkways. After investigation, it is found that the outpatient building of the Health Service Department of Shenjingzi Town is equipped with relatively complete outpatient departments, which are distributed on different floors, and there is a waiting space in different diagnosis and treatment areas. However, in the peak waiting period, the waiting space is obviously insufficient. In addition, the width of the aisle between the outpatient rooms is narrow, and there are no single or bilateral seats to rest. Patients can only wait in the aisle or the entrance of the clinic, which causes great waiting for patients.

In addition, the township health service center does not pay enough attention to the construction of the recovery room (inpatient ward) convalescence environment, and there are problems such as lack or insufficiency of the convalescence environment. The poor accessibility results in the unsatisfied needs of patients for indoor recuperation.

### 3.2 Application Status of Artificial Intelligence in the Spatial Design of Township Health Services

Artificial intelligence is applied in township health service centers. On the one hand, the use of smart devices not only reduces the labor burden of human resources, but also provides a faster basis for scientific and accurate judgments of medical staff; on the other hand, in the design of township health service spaces. The introduction of artificial intelligence in the CM can provide many conveniences for patient diagnosis and treatment. In the survey of the spatial design of health services in three townships, the residents' awareness of the application of artificial intelligence, the results are shown in Table 2:

**Table 2.** Whether to introduce artificial intelligence into the design of township health service space

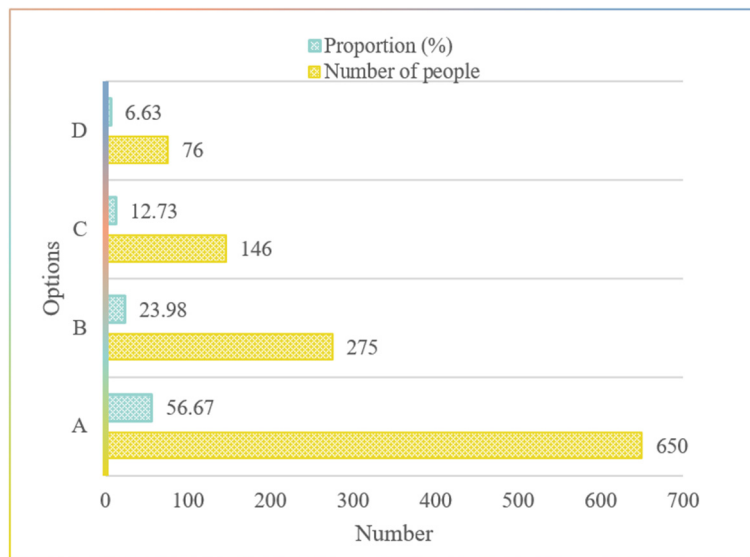| Options | Content | Number of people | Proportion (%) |
|---------|---------|------------------|----------------|
| A | I don't know, I didn't pay attention | 650 | 56.67 |
| B | no | 275 | 23.98 |
| C | Partly | 146 | 12.73 |
| D | There are many, and provide a lot of convenience | 76 | 6.63 |



**Figure 2.** Whether to introduce artificial intelligence into the design of township health service space

As can be seen from Figure 2, about whether artificial intelligence equipment is introduced in the design of the township health service space, 650 people chose "I don't know, I didn't pay attention", accounting for 56.67%; 275 people chose "No", accounting for 23.98%; 146 people chose "Yes", accounting for 12.73%; 76 people chose "a lot of them and providing convenience", accounting for 56.67%. It can be seen that the introduction of artificial intelligence equipment in township health service centers is insufficient, and most residents have not fully enjoyed the convenience brought by artificial intelligence. Therefore, governments at all levels should attach great importance to the development of township health service centers, and vigorously promote the application of artificial intelligence and other technical equipment in the township medical service space.

## 4. Spatial Design Of Township Health Service Based On Artificial Intelligence

(1) Toilet

Taking into account the convenience of the disabled, barrier-free toilets are set up in the township health service centers. The toilet door adopts infrared intelligent sensor door, which

has the advantages of convenience and safety. On the one hand, it can prevent bacteria from spreading through the door handle after going to the toilet. On the other hand, it is convenient for the disabled to enter and exit, and the clear width of the door is greater than or equal to 1m. The bathroom uses an antibacterial smart toilet. On the one hand, sanitation and environmental protection are one of the advantages of smart toilets; on the other hand, ordinary toilets and seats are prone to breed harmful bacteria, which is detrimental to human health. The smart toilet is made of ABS antibacterial material, and there is a protective layer on the seat cushion to prevent the growth of bacteria. So as to reduce cross-contamination, it is healthier and cleaner to use. The smart faucet installed in the hand basin firstly has the advantage of saving water resources; secondly, it provides convenience to people such as infusion patients who go to the toilet alone.

Among them, in the outpatient and emergency areas, the toilets are arranged in a centralized manner. The restrooms are arranged centrally near the entrance hall. In order to save time in queuing, the hospital can uniformly set up non-gender restrooms. In addition, a smart sensor is installed on the door handle, the toilet is automatically marked red when there are people, and the unmanned indicator is green, so that people can quickly find the toilet to go to.

(2) Clinic room

The outpatient clinic is mainly used to diagnose and provide treatment plans for patients, and to further examine the area of the patient's body, which is a highly private space. Therefore, in order to protect the privacy of patients and ease the nervousness of patients, an enclosed closed space design is adopted. Smart glass can be used to create a private space, and the emotional state of the patient can be sensed through biosensors, and the glass state can be adjusted accordingly. The outpatient clinic adopts intelligently adjustable lighting facilities. Under different medical environment, the lighting can be adjusted according to their own needs, thereby creating a more harmonious and comfortable lighting. These operations are very convenient. You can adjust the brightness and darkness of the light by pressing and holding the local switch. You can also use a centralized controller or a remote control to adjust the brightness of the light. Adapting to different medical needs, this design can effectively avoid the patient's uneasy psychology, improve the depressive atmosphere in a closed environment, and create a warm diagnosis and treatment environment.

(3) Recovery room (inpatient ward)

The recovery room is mainly a room for rehabilitation of patients who need to be hospitalized after the operation. It must be close to the operating room to shorten the distance from the patient to the recovery room after the operation and reduce the risk of secondary infection. The recovery room needs a high degree of privacy protection and to ensure that patients have enough sleep. Therefore, the space layout is abandoning too complicated decoration, and the main tone is simple, clean, warm and comfortable. The intelligent monitoring bed in the recovery room helps to detect the basic physiological indicators of the patient in real time. Once the patient has fainting, falling, or sudden illness, the detection system will take the initiative to call for rescue to ensure the patient's life safety at all times. At the same time, the intelligent monitoring bed can also complete activities such as ordering meals and entertainment through interactive terminals, providing patients with a safer, smarter, convenient and efficient hospitalization environment. At the same time, the ceiling of the inpatient space should be equipped with an intelligent infusion slide, which is to control the position of the hook and the length of the extension through a remote control. The original inlaid manual rail has a high maintenance cost,

requires labor, and is inconvenient to use. The intelligent infusion slide can improve the aesthetics of the hospital environment from the perspective of space design. From the perspective of use, on the one hand, it solves the physical exhaustion of the original manual pulley on the doctors and nurses; on the other hand, it improves the safety of patients turning over during night infusion.

In the inpatient ward, natural sunlight is introduced through the windows, and intelligent technology is used to adjust the indoor light environment and air. Because different types of patients have different requirements for indoor environmental conditions, patients with visual impairments have higher requirements for indoor light, while patients with respiratory diseases have higher requirements for indoor air humidity and so on. This area uses a controllable intelligent lighting system, which can be adjusted to the appropriate temperature, humidity, brightness, etc. according to the specific needs of the patient.

(4) Corridor

The survey found that most of the publicity boards in the corridor space of the original township medical service center are information from a few years ago or even 10 years ago. In recent years, due to the comprehensive reform of our country's medical industry, medical publicity has also become the focus of medical space design. Therefore, in the face of constantly updated medical information, sufficient smart publicity display boards should be set up in the corridor space. It is responsive and stable; it has strong versatility and does not need to modify the circuit; it is safe and convenient; it is more user-friendly and anti-electric shock; it has a long life and saves costs.

Taking into account the peculiarities of the primary medical care groups in towns and towns— the majority of elderly patients are elderly patients, so they have higher requirements for the facilities and services of the medical space. Smart mobile devices should be installed on the walls of the corridor and on the side of the stairs to move the elderly to the clinics and wards intelligently. On the one hand, it changes the mobility inconvenience caused by the absence of elevators in the traditional township medical service center buildings; on the other hand, it moves efficiently and relieves the pressure on the flow line.

Secondly, the corridor of the consultation room is an important area for psychological transition before the patient is formally diagnosed and treated. Therefore, the diagnosis and treatment outside the clinic combines visual sensors and human sensors to provide patients with lighting brightness and music repertoire in line with their current emotions to relieve anxiety. On the corridor side combined with the ecological natural area can introduce a large number of natural light sources to bring users feel natural, relaxed, and positive. A smart identification system is used in the corridor, and patients can click on the destination on the display screen, and the system interface will provide a communication plan to facilitate the patient to reach the destination faster for diagnosis or treatment.

## 5. Conclusion

As a new medical service method to deepen the reform of the medical and health system, township health service centers provide basic medical and public health services to meet the medical and health needs of township residents.The survey concluded that the insufficient

introduction of artificial intelligence equipment in township health service centers is mainly due to the long construction time of township health centers and the lack of effective renovation and maintenance. The distrust of township residents in the diagnosis and treatment technology of medical places at the service center level has led to the scarcity of personnel, and the high cost of artificial intelligence transformation has been ignored. In addition, the same reasons above lead to the poor environment of inpatient wards and public corridors also need to be solved. Based on this, Through the survey, we obtained reliable survey data, and understood the residents' strong expectations for the artificial intelligence technology and space transformation of township health service centers. This paper probes into the problems existing in the design of township health service space and the shortcomings of the introduction of artificial intelligence equipment, and puts forward the renovation scheme of township health service space design based on artificial intelligence technology.

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