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Spatial Configuration of Community Elderly Care Stations for Home-Based Elderly Care Services

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Abstract Currently, most community elderly care service stations are repurposed from existing buildings, with spatial configurations still favoring in-person usage by seniors, leading to a spatial mismatch with the operational demands of home-based services. Taking the community elderly care service stations in Haidian District of Beijing as a case study, this paper employs a combination of questionnaire surveys, in-depth interviews, and on-site measurements to analyze the demand for elderly care services among the elderly population and the actual operational characteristics of these stations from both demand-side and supply-side perspectives. The study reveals that seniors have significant demands for daily life care, with increasing needs for home-based services and service response timeliness. However, existing stations face practical challenges such as low utilization of infrequently used spaces, shortages of logistical support areas, and gaps in service dispatch spaces. Based on the operational logic of home-based services, the station space is deconstructed into physical service areas, logistical support zones, and dispatch hubs, proposing optimization strategies such as reducing underutilized spaces, expanding logistical support areas, and establishing entry dispatch nodes. These measures aim to establish a spatial organization model of "dispatch–logistics–service". By reconfiguring the functions of existing spaces, it enhances the stations' capacity to support home-based services, providing insights for the renovation and upgrading of similar community elderly care facilities.

Keywords Home-based elderly care, Community elderly care stations, Spatial allocation, Home service, Dispatch hub
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With the development of society, the needs of the elderly population have expanded from basic living security to diverse cultural entertainment and medical rehabilitation. The existing stations generally suffer from insufficient demand analysis, mismatched supply and demand of facility functions, and low space utilization. Mainstream on-site services also face practical problems such as manpower shortage and long appointment cycles. How to achieve precise adaptation between community elderly care services and the real needs of the elderly is a pressing issue that needs to be addressed in the current stage of elderly care construction.

The "9064" elderly care service pattern in Beijing has set the development goal of 90% home-based care, 6% community-based care, and 4% institutional care. Home and community-based elderly care have become the main choices for the elderly, and community elderly care service stations have been vigorously promoted as important hardware carriers. As of the end of 2023, Beijing has operated 1,498 community elderly care service stations[1-2]. With the development of society, the needs of the elderly population have expanded from basic living security to diverse cultural entertainment and medical rehabilitation. The existing stations generally suffer from insufficient demand analysis, mismatched supply and demand of facilities and functions, and low space utilization; mainstream on-site services also face practical problems such as manpower shortage and long appointment cycles. How to achieve precise adaptation between community elderly care services and the real needs of the elderly is a pressing issue that needs to be addressed in the current stage of elderly care construction.

1 Demands of elderly people for community elderly care services

1.1 Questionnaire design and basic characteristics of samples

In this paper, the Xueyuan Road Street and surrounding streets in Haidian District of Beijing was taken as the scope of demand research, and permanent elderly residents aged 60 and above were taken as the survey objects. Through a combination of questionnaire survey and in-depth interviews, a total of 97 questionnaires were collected, and 84 valid samples were obtained.

From the characteristics of the samples, the respondents were mainly elderly people aged 60–69, while also including a certain proportion of elderly and semi self-sufficient elderly people. The survey found that elderly people with different physical conditions have a certain degree of demand for home care services, indicating that home care services are not only supplementary services for disabled and elderly people, but also gradually becoming an important form of community home-based elderly care services.

1.2 Requirement characteristics of service contents

The questionnaire results show that the elderly's demand for elderly care services presents a more obvious rigid demand characteristic. Among them, there is a high demand for meal assistance services, medical and rehabilitation services, as well as home cleaning, nursing and other life care services, while the demand for traditional spiritual and cultural services such as chess and card games and reading is relatively low (Fig.1).

From the perspective of demand types, the demand for community elderly care services can be divided into three categories: basic living type, health maintenance type, and spiritual and cultural type. Basic lifestyle services mainly include meal assistance, medication delivery, emergency response, etc., with high frequency of use and strong timeliness requirements. Health maintenance services include rehabilitation, nursing, and other contents, usually with certain professionalism and appointment requirements.

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Spiritual and cultural services mainly include chess and card games, reading, and centralized activities, which are generally manifested as low-frequency and non rigid demands.

The demand characteristics of different types of services directly affect the spatial configuration of community elderly care service facilities. Basic lifestyle services have obvious mobility, and their spatial requirements are more reflected in material preparation, temporary storage, distribution, and service personnel organization. Health maintenance services require a relatively stable professional service space. Spiritual and cultural services mainly rely on the space for elderly people to stay in the store. From this, it can be seen that different service types have different ways of using space, and traditional functional rooms cannot be simply configured.

Based on field research, it can be found that some stations still use large areas for static spaces such as activity rooms and day care, while the support space related to meal assistance delivery, medical supplies storage, and on-site services is relatively limited, indicating a preliminary mismatch between spatial resource allocation and actual demand structure.

1.3 Service mode and response time

In addition to the service content, the needs of the elderly for service methods and response time also affect the spatial organization of community elderly care service facilities. According to the survey, 85% of respondents stated that they "need home to home services more" or "both home and in store services are needed", indicating that home to home services have become an important component of the demand for community elderly care services.

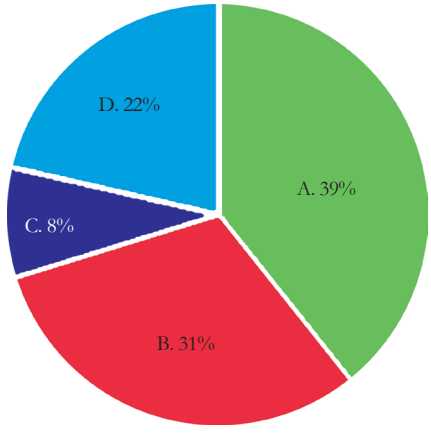
Further analysis of the reasons why elderly people are unwilling to go to physical relay stations reveals that factors such as "long physical distance" and "limited internal space" are more prominent (Fig.2). This indicates that although physical stations still undertake the functions of in store services and community activities, not all elderly care services are suitable for completion through elderly people visiting the store. For elderly people with weak mobility or temporary care needs, home service can reduce travel costs and therefore has a strong practical demand foundation.

In terms of service response time, different types of services exhibit significant differences. Basic life services such as meal assistance and emergency calls have strong immediacy, and most respondents expect to receive a response within 1 h (Fig.3). Although low-frequency services such as bath assistance and deep cleaning can be booked in advance, the waiting time that most respondents can accept is mainly concentrated within one day (Fig.4). This indicates that community elderly care services have shown varying degrees of timeliness requirements.

Overall, the current demand for community elderly care services mainly presents three characteristics: firstly, the service content shifts from simple activity needs to life care and health maintenance needs. Secondly, the service mode has shifted from a single in store service to a composite model of "in store+door-to-door". Thirdly, some services have a strong demand for immediate response. These changes mean that community elderly care service stations need to undertake more complex service organization functions, and their space should shift from simple elderly activity venues to comprehensive service nodes.

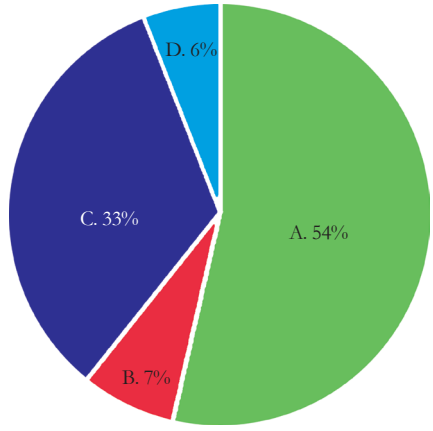
2 Current situation of community elderly care stations

To comprehensively evaluate the support capacity of existing spatial carriers for the above needs, the research perspective shifts to the supply side. Through field research and spatial mapping of the elderly care service stations (hereinafter referred to as "stations") currently operating in Zhongguancun Street, Haidian District, the spatial form attributes and functional configuration logic of the existing station are systematically sorted out. Combined with demand side data, the systematic dislocation



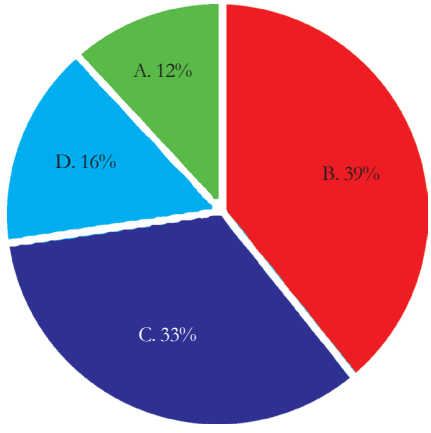
A. Meal assistance service
B. Medical and rehabilitation services
C. Daily life care
D. Spiritual and cultural services

Fig.1 Elderly people's preferences for service content of community elderly care stations



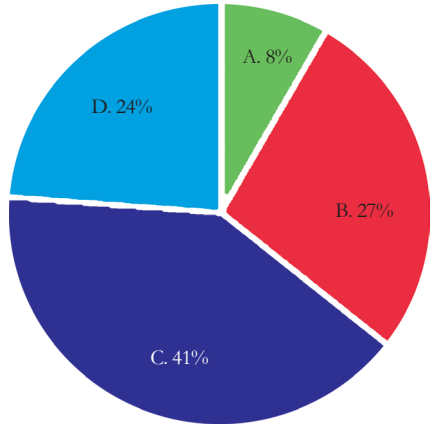
A. Too far physical distance, exceeding the physical load of walking
B. Lack of rest facilities or unsafe road conditions along the way
C. Too small internal space in the station or poor facilities
D. Personal lifestyle habits, do not like to go out and gather together

Fig.2 Main reason why elderly people do not go to the stations



A. Must respond within 1 h
B. Can arrange for home visits within half a day
C. Can accept a reservation one day in advance
D. Acceptable to schedule 3 d or even longer in advance

Fig.3 Preference for response time of instant services



A. Must respond within 1 h
B. Can arrange for home visits within half a day
C. Can accept a reservation one day in advance
D. Acceptable to schedule 3 d or even longer in advance

Fig.4 Preference for response time of regular services

mechanism of the current elderly care service facilities in the spatiotemporal and functional dimensions is deeply analyzed.

2.1 Station scale and service capability

To analyze the support capacity of existing spatial carriers for the demand for elderly care services, field research and spatial mapping are conducted on the community elderly care service stations currently operating in Zhongguancun Street, Haidian District, Beijing, with a total of 8 stations surveyed.

In terms of spatial scale, 4 out of 8 stations have an area of less than 200 m², accounting for 50%. There is one station with an area between 200 and 400 m²; there are three stations with an area greater than 400 m², showing an overall characteristic of a larger number of small-scale stations and a relatively limited number of large-scale stations[3].

From the perspective of service capability, only one of the eight stations has a medical room and meets the basic conditions for providing day care services. The station covers an area of over 400 m². The other stations mainly undertake functions such as meal assistance, home care, and basic health services.

There are certain differences in service content among stations of different scales. Small-scale stations are limited in size and mainly provide basic services such as meal assistance and home care, while also taking into account community activities. Larger stations can accommodate more service functions, but their actual operation also includes more on-site service content[4]. From this, it can be seen that there is a certain correlation between the station area and service capacity, but the spatial area itself cannot solve the organizational problems in service operation.

2.2 Space configuration and service operation characteristics of stations

Field surveys and operational observations indicate that the space of existing stations is still mainly configured for in store services, with physical service spaces such as activity rooms and day care occupying a large proportion. Some larger spaces are located in areas with better lighting and usage conditions in the building. This type of space is mainly used for elderly people to come to the store for activities, but the usage time is relatively concentrated and the usage rate is lower during non activity periods. Compared to this, the logistics and organizational space required for on-site services are relatively insufficient. Most stations do not have independent spaces for meal packaging, material storage, and service scheduling. Tasks such as meal assistance and medical supplies distribution are usually temporarily completed through the front desk, office area, or passage, allowing the same space to undertake multiple functions.

From the perspective of actual operation, the stations undertake both in store and doorstep services. In store services mainly include routine physical therapy and community activities, and a few stations can also provide day care; professional nursing, cleaning, bath assistance and other on-site services are mainly organized and implemented through appointments and platform dispatching. Service personnel go to the stations to collect equipment or confirm tasks according to the task arrangement. Meals and some service materials are stored and distributed centrally by the stations.

Therefore, in actual operation, the stations not only serve as a place for elderly people to receive services in the store, but also undertake functions such as personnel distribution, material transfer, and service connection. But the existing spatial layout has not yet fully adapted to this change. Due to the lack of relatively independent service scheduling nodes, personnel gathering, task confirmation, equipment collection, and meal distribution are often dependent on the front desk, office area, or activity space for completion.

When the volume of on-site service business increases, service personnel, elderly people, and materials are prone to cross at the entrance and public areas, while some traditional activity spaces have low utilization during non activity periods, forming a spatial configuration feature of "more physical service space, insufficient logistics support space, and lack of scheduling space". Therefore, the main problem with existing stations is not simply a lack of space, but rather a mismatch between the spatial functional configuration and the actual service operation mode.

3 Deconstructing the internal space of the stations and optimization suggestions

Based on the analysis on the service needs of the elderly population and the current situation of space supply in community elderly care stations, it can be found that there is a certain degree of mismatch between the spatial configuration and actual operation mode of existing community elderly care stations[5]. This leads to a large number of key communication nodes being mistakenly placed in public areas with excessive foot traffic, and frequent personnel movements interrupting the communication scenes of the elderly. At the same time, the communication space of elderly care service facilities should strive to achieve "separation of movement and stillness, separation of people and things, and separation of cleanliness and dirt".

This phenomenon is not only reflected in the allocation of functional areas, but also related to the internal spatial organization and service operation logic of facilities. To further explain the operational problems of existing facilities under the dominant mode of "door-to-door service", it is necessary to deconstruct the spatial composition of community elderly care stations from the perspective of spatial systems and optimize the internal spatial ratio of the stations.

3.1 Deconstruction of station space functions

Traditional community elderly care service stations often use functional rooms such as activity rooms, rehabilitation rooms, offices, and storage rooms as spatial division units. This approach can reflect the specific purpose of the space, but it is difficult to reflect the role of different spaces in the service operation process. With door-to-door service becoming an important supply method for community elderly care services, the function of stations has expanded from a single in store service location to a composite node that combines services, material transfer, and personnel scheduling. Therefore, starting from the spatial operation attributes, the internal space of the stations is deconstructed.

Based on field research and the operational characteristics of community elderly care services, the space of community elderly care stations is divided into three basic spatial types from the perspective of spatial usage and operational attributes, namely physical service space, logistics support space, and dispatch hub space.

Among them, physical service space refers to the spatial unit that directly provides in store services to the elderly, including daytime activity space, rehabilitation training space, reading space, and activity space. This type of space is mainly used for stationary purposes, emphasizing comfort and activity carrying capacity. It is the main component of traditional community elderly care service stations and the core space for elderly people to provide in store services.

Logistics support space refers to the auxiliary space that provides logistics support for service operations, including office space, material storage space, and medical supplies

storage space. This type of space mainly undertakes the functions of material storage and management, and has relatively fixed spatial attributes.

The dispatch hub space is a transitional space based on the demand for on-site services, responsible for the distribution of service personnel, task allocation, and service departure functions. This type of space plays an important role in the operation of door-to-door services, with main functions including personnel gathering, material distribution, and service path organization. It is also the missing space in most stations.

From the perspective of service operation, three types of spaces form different spatial roles within community elderly care stations. The physical service space mainly undertakes the function of store services, where elderly people stay and participate in activities. The logistics support space mainly undertakes the support function, and service materials are stored and managed in this space. The scheduling hub space serves as a node connecting internal and external services, allowing service personnel and materials to be distributed through this space.

3.2 Spatial structure characteristics of existing stations and optimization directions

Based on the above spatial deconstruction, the spatial update of community elderly care service stations should not simply add new functional rooms, but should be reconfigured through existing space to better support the current service operation mode with limited building area.

3.2.1 Compressing a single activity space for low-frequency use. For activity spaces with low frequency of use, single function, and large area occupation, the proportion of independent area can be reduced through space merging, composite use, and other methods. While retaining necessary activity and rehabilitation functions, it could provide renovation margin for logistics and scheduling space[6].

3.2.2 Providing additional logistical support space. In response to the problem of insufficient space for material storage, meal temporary storage, and packaging, corresponding logistics space should be set up based on actual service content, and convenient communication should be maintained with dispatch nodes. It can reduce mutual interference between different services by properly separating the storage, preparation, and distribution of materials from the activity space.

3.2.3 Establishing an entrance scheduling hub. Due to the frequent entry and exit of on-site service personnel, the entrance area should be responsible for functions such as personnel gathering, task confirmation, material collection, and service departure. By setting relatively independent scheduling nodes, a continuous process of "personnel arrival–task confirmation–material collection–service departure" is formed, and the intersection with the activity flow of the elderly is reduced.

Through the above adjustments, a spatial structure of "scheduling–logistics–service" can be formed, with scheduling hubs as nodes, logistics support space as support, and physical service space as service carriers. Among them, the dispatching space connects the internal and external service flow lines, the logistics space supports service preparation and material management, and the physical service space retains the necessary functions of in store service.

Therefore, the focus of the spatial update of community elderly care service stations is not on expanding the area, but on reconfiguring the existing space according to the service operation mode, transforming the stations from traditional elderly activity venues to composite community elderly care service nodes that combine in store services, material transfer, personnel distribution, and service scheduling functions[7-9].

4 Conclusions and prospects

In this paper, the community elderly care service stations in Haidian District of Beijing are taken as the research objects. Through questionnaire surveys and field research, the demand for elderly care services and the spatial operation characteristics of the stations are analyzed. Research has found that the current demand for community elderly care services is characterized by a prominent need for daily care, an increase in on-site services, and an improvement in response time requirements. However, the existing station space is still mainly configured with activities and in store services, which is somewhat mismatched with the actual service operation.

In response to this issue, starting from the service operation attributes, the station space is divided into physical service space, logistics support space, and scheduling hub space. Optimization strategies such as compressing low-frequency activity space, supplementing logistics support space, and establishing entrance scheduling nodes are proposed to form a spatial organizational structure of "scheduling–logistics–service". The core is to improve the organization and support capabilities of the stations for on-site services by reconfiguring the existing space.

The research sample of this paper mainly focuses on some community elderly care service stations in Haidian District, with limited sample size and regional scope. The relevant conclusions still need to be further verified through more regions and different types of stations. In the future, different spatial organizational models can be quantitatively evaluated by combining personnel flow, material circulation, and service response efficiency.

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