Analysis on the Configuration Condition and Spatial Position Relationship of the Main Functions in Residential Type Nursing Home for the Elderly in Japan

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Abstract. The residential type nursing home, as a main kind of the elderly facilities in Japan, is popular for the elderly because of its relative lower fee and less limitation. And the residential type nursing home has its own relative stable and mature system after decades of development, so it is significative to provide inference value for others countries, especially the countries that are beginning to the age. For certain, different kinds of the elderly facilities have different configuration conditions depend on the different requirements of the elderly. Therefore, it is important to be considered clearly that what interior configurations the residential type nursing home should have, and how to arrange the interior spaces, can satisfy the living requirement of the elderly who live in. Because previous study has explored the spatial composition of the nursing home, this paper is mainly aimed to exploring and analysing the spatial position relationship of the main spaces in the nursing home to realize more that how to arrange the spaces in nursing home more reasonably, so as to provide suggestions and directions for the designs of nursing homes in the future.

1. Introduction
In Japan, the residential type nursing home, which is the research object, is a main type of elderly facilities. In order to meet the needs of the residents, the nursing home needs to be equipped with a variety of facilities which will constitute various of spaces. Obviously, the facilities in the nursing home will not be placed irregularly. The type and position of these facilities will be arranged on the premise that the layout of functional space is reasonable and users' needs and comfort are satisfied as much as possible without excessive space waste. So, exploring the spatial composition and spatial position relationship will be the main research purposes of the following paper, and it will provide some guidance and directions to architecture designers of elderly facility. Therefore, this paper will adopt the research methods of quantitative analysis and typology to sort out and summarize the spatial position relationship of Japanese residential type nursing homes randomly collected. And 168 residential type nursing homes are the research objects of this paper, The locations of them as follow: Hokkaido Region (3 units), Tohoku Region (9 units), Kanto Region (27 units), Chubu Region (27 units), Kinki Region (65 units), Chugoku (8 units), Shikoku Region (8 units), Kyushu & Okinawa Region (21 units).
2. Analysis on the configuration condition of the main functions in residential type nursing home

2.1 The Room

As the main place for the elderly to rest, the room is the most important space in the nursing home. The internal environment of the room, such as temperature, humidity, size and so on, will directly affect the comfort of the elderly living. Therefore, the main purpose of this chapter is to explore the current situation about the size and configuration of the rooms in the residential type nursing homes. First, in the terms of size, all the rooms are between 6.75 m² and 88 m², the average is 15.63 m². 90.85% of the rooms are between 9 m² and 20.9 m², while 24.63% of the rooms concentrate on between 17.1 m² and 18 m²(Figure 1). Second, in terms of configuration condition in rooms, the rooms mainly include the following 7 elements: living space (L), storage (S), toilet (T), dresser (D), kitchen (K), bathroom (B) and living room (LR). And according to the condition that the rooms are equipped with these elements, the rooms can be divided into 14 main types (Figure 2 and Table 1). Obviously, the room types (L+T+D and L+T+S+D) occupy the most (33.60% and 34.76%), while others occupy relatively few. In addition, it can be obtained the condition about the configuration ratios of 7 elements in the room through further analysis on the space composition of all rooms. And the result is as follows: toilet (85.05%), dresser (90.66%), storage (52.6%), kitchen (14.45%), bathroom (5.79%) and living room (2.4%). So, the configuration priority of the space elements in the room is: living space > dresser > toilet > storage > kitchen > bathroom > living room.

![Figure 1](image1.png) The ratio of the different room types in the nursing homes
![Figure 2](image2.png) The distribution about the room size in the nursing homes

| Room Type          | Percentage |
|--------------------|------------|
| L                  | 4.90%      |
| L+T                | 2.62%      |
| L+D                | 3.70%      |
| L+S                | 1.90%      |
| L+S+D              | 3.53%      |
| L+T+D              | 33.60%     |
| L+T+S+D            | 34.76%     |
| L+T+D+K           | 5.92%      |
| L+T+S+D+K         | 0.07%      |
| L+T+S+D+K+B       | 3.10%      |
| L+T+S+D+K+B+LR    | 2.40%      |

Table 1. The configuration condition of the different rooms (S=1/200)

2.2 The activity space includes the dining room, living room, rehabilitation room and talking room

Activity space as the main part of the common space is the centre space of the nursing home to
provide a place for the elderly to stay and do some activities. And in the nursing homes, activity space consists of four main spaces including the dining room, living room, rehabilitation room and talking room. And it is worth mentioning that in the nursing home, activity space is open space, and the definition of functions is relatively vague. Figure 3 and 4 shows the proportional distribution of four types of activity spaces and condition about four activity spaces shared to be used in the nursing homes. First of all, the most obvious is that the activity space related to the dining room occupies the most (57.3%), while nearly half of dining rooms share space with other activity space, and it can be shared with all types of activity spaces. Second, about a third of the activity spaces are related to the talking room. Third, the activity spaces related to rehabilitation room and living room occupies 15.3% and 14.3% respectively.

2.3 The common toilet
Common toilet is essential in nursing homes, in all cases, each nursing room is equipped with at least one common toilet. And the common toilets are divided into two types including common toilet (T1) with simple support function and wheel toilet (T2) which is able to use wheel and have some support functions, and in T2 toilet, there are a few toilets with special and complete barrier-free facilities named multi-function toilet. Obviously, T2 toilet occupies the most (67.7%). (Figure 5).

2.4 The common bathroom
The common bathroom is an extremely important element of a nursing home, in all cases, each nursing home has at least one common bathroom. And in order to meet the needs of different elderly people, different common bathroom types are set in the nursing homes, mainly include four types: (T1, 64.7%, the most) unit bathroom [it can be used for one people one time], (T2, 20.9%) special bathroom [bathroom is equipped with complete support facilities], (T3, 8.2%) common bathroom [a bathroom with several baths can be used by several people at the same time], (T4, 7.9%) spring bathroom [a bathroom with a big bath can be used by several people at the same time].(Figure 6)

2.5 The kitchen and office
The kitchen and office are the main part of the staff space which is a place for staffs to work and have a rest, in terms of space type, it belongs to grey space, which has a clear boundary with the other spaces.

In term of kitchen, 95.8% nursing homes are equipped with kitchen, and most of them (96.39%) have one kitchen, then all the kitchens are divided into three types (Figure7): (T1, 41.26%, the most) independent kitchen [kitchen are set independently to be used by the staff only.], (T2, 38.12%) half-
opened kitchen [kitchen can be used by the staff and elderly.], (T3,9.82%) opened kitchen [kitchen is opened completely to be used by the elderly to heat food.]. In term of office, 96.6% nursing homes are equipped with offices, 32 nursing homes have more than one office, and 34 nursing homes are equipped with the offices which is aim to support the service for the elderly outside the nursing homes named injury office, and 8 offices are shared with regular offices. Mainly, the common office occupies the most (92.3%). (Figure 8)

3. Analysis on the spatial position relationship of the main functions in residential type nursing home

This chapter will be realized more about relation, accessibility and visibility of the space in the residential type nursing home through analyzing spatial position relationship of the main functions.

3.1 Spatial position relationship between the dining room with living room, rehabilitation room and talking room

Table 2. The classification about position relationship between the dining room with living room, rehabilitation room and talking room

| 1. Shared type | 153 units (52.58%) |
|----------------|--------------------|
| Definition: Shared type means that dining space is shared with living space or rehabilitation space or talking space. |
| 47 units (16.15%) | 65 units (22.34%) | 41 units (14.09%) |

| 2. Adjacent type | 8 units (2.75%) |
|------------------|-----------------|
| Definition: Adjacent type means that dining space is placed close to living space or rehabilitation space or talking space, but there is a clear separation between them. |
| 1 unit (0.34%) | 2 units (0.69%) | 5 units (1.72%) |

| 3. Separate type | 130 units (44.67%) |
|------------------|--------------------|
| Definition: Separate type means that dining space is clearly separated with living space or rehabilitation space or talking space. |
| 14 units (4.81%) | 22 units (7.56%) | 94 units (32.3%) |

According to 2.2, compared with the other three shared space, the dining space is indispensable in the nursing homes, to a certain extent, the dining space can also be regard as the centre of the shared space of the nursing home [3]. And as the four main shared spaces, the distribution relationship between them will be one of the important factors affecting the space of nursing homes. In these cases, there are three kinds of position relationships around the dining space, such as shared type (52.58%), adjacent type (2.75%) and separate type (44.65%) (Table 2). In comparison, when the nursing home sets up the dinning space and the other three spaces, it tends to choose the shared type and the separate type, while the adjacent type is rare. The shared type and the adjacent type belong to a relatively similar type, but the former occupies more than 50%, and the other is only a few. It can be understood
that the dining space has great compatibility with the other three spaces in space use. This phenomenon can be seen from that many of living space, rehabilitation space and talking space share with the dining space, therefore, sharing the dining space with other spaces can not only save a lot of space, at the same time, it is also possible to concentrate on caring for the elderly, while the singularity of space is a shortcoming of this type. On the other hand, according to the separate type occupancy of nearly 45%, it can be seen that since these shared spaces have functional differences with each other, this type is also frequently used in consideration of mutual interference of the spaces.

Table 3. The classification about position relationship between the entrance and the shared space

| Type                | Feature plan | Definition                                                                 | Case       |
|---------------------|--------------|-----------------------------------------------------------------------------|------------|
| Direct type         |              | Direct access to the first shared space through the entrance.               |            |
| Hall transition type|              | Reaching the first shared space through a buffer space like hall.            |            |
| Corridor transition type|          | Reaching the first shared space through a long and narrow space like corridor. |            |

| Type                | Feature plan | Definition                                                                 | Case       |
|---------------------|--------------|-----------------------------------------------------------------------------|------------|
| 1. Four-sided enclosure | 12 units     | Other functional spaces are concentrated in the center of the plane and surrounded by the room. |            |
|                     | (1.93%)      |                                                                             | [Image]    |
| 2. Three-sided enclosure | 123 units   | The rooms are distributed on three sides of other functional spaces.         |            |
|                     | (19.81%)     |                                                                             | [Image]    |
| 3. Two-sided enclosure  | 228 units    | Other functional spaces are concentrated on a part of the plane and surrounded by the room on both sides. |            |
|                     | (36.71%)     |                                                                             | [Image]    |
| 4. Half enclosure     | 149 units    | The other functional space is concentrated in a side of the plane and is not surrounded by the room. |            |
|                     | (23.99%)     |                                                                             | [Image]    |
| 5. Completely separated | 71 units     | No room is set on the entire plane, all used by other function spaces.       |            |
|                     | (11.43%)     |                                                                             | [Image]    |

The entrances here include the entrance to the nursing home and the entrance by elevator to each floor, and the shared space here include the four spaces mentioned above and other spaces can provide long-
term stay for the elderly [4]. Since there is a certain difference in spatial distribution between the first layer plane and other layer planes, 186 first planes with shared space and 233 other layer planes with shared space are studied separately. And there are mainly three types of spatial position relationships between the entrance with shared space after classification (Table 3). According to the data in the table, all three types exist in the spatial relationship of the nursing home, while hall transition type and corridor transition type are more than direct type, which can explain the necessity of the existence of buffer space. Hall transition type is relatively more, indicating that the location of the shared space in the nursing home should not be too far or too close, so that can keep the occupants with a certain degree of privacy while maintaining contact with the outside world.

3.3 Spatial position relationship between the room with the other space
According to the plan of 621 nursing homes, the relationship between the rooms in 612 (93.88%) plan and other functional spaces belongs to the five positional relationships in the Table 4. The common feature is that other functional spaces are concentrated in a certain area of the nursing home [5]. The advantage of this distribution is that it can keep the residents together while maintaining the relative integrity of the nursing home space, which is beneficial to the management and care of the staff. Among them, Type 1 is very rare, which indicates that there are insufficient distribution patterns, such as insufficient daylighting and weak contact with the outside, if the daylighting by atrium, it will cause loss of user space. Among the other four types, Type 3 accounts for the largest proportion, which means that the use of space is economized and the accessibility of the area is higher under the premise of maintaining necessary daylighting.

4. Conclusion
By collecting the residential type nursing home data, classifying and analyzing the information, the conclusions as followed:

(1). To constitute a complete nursing home, rooms, activity space, common bathroom, common toilet, and staff space are essential.

(2). In term of room, in general, the room which is equipped with toilet, dresser and storage (to some extent, storage can be replaced, such as wardrobe and other furniture.) and the room area around 18 m² is the best chose of nursing home. In term of common space, dining room should be chosen as activity space at first, common toilet and bathroom should be considered to be used by the elderly with limited mobility, at the same time, common bathroom should consider the privacy.

(3). About spatial position of activity space, generally, several activity spaces are best to share space to each other to save the space if they are arranged closed. On the contrary, they should be arranged relatively far away to make their functions more specific.

(4). About spatial position between entrance and the shared space, in all floor, the position of shared space and entrance should have buffer space, such as hall or relative short corridor, which can keep a certain privacy and keep convenience at the same time. The first floor should focus more on this situation.

(5). About spatial position between the room and other space, first of all, in all nursing homes, the arrangement of the room is relatively centralized. Second, in most nursing home, strip type is chosen as the plan type, and the rooms are distributed on either side. Third, the shared space should be arranged in the centre of the plane to keep it convenient. Finally, all the space should be considered the daylight and the space availability.

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