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DESIGN FOR COMMON AREAS OF A CONTINUING CARE RETIREMENT COMMUNITY IN CHINA: FOCUSED ON QUALITY OF LIFE

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A THESIS

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Abstract

China's senior population is equivalent to over 14% of its total population, so it can be easily concluded that China is an "aging society" (RenMin RiBao, 2014). In the next 20 years, China's population will begin to increase at the rate of 10 million each year (Hua Er Jie Jian Wen, 2014). Another relevant fact is that more than 260 million peasant workers are currently working in urban metropolitan cities (China's Employment, 2013). Therefore, the Continuing Care Retirement Community (CCRC) is essential to provide well-being and care to senior citizens in China. However, the development of CCRC in China is not keeping up with the annual increase in population. The codes and standards for senior housing design are also inadequate and inconsistent. The majority of CCRCs in China continue to focus only on physical facilities, not quality of life of seniors (Tao, Wang, & Ma, 2008). However, the resident's quality of life (QOL) has been considered as a very important factor when designing senior living facilities in other countries. Therefore, this study hypothesized that physical environments and quality of life both play significant roles in seniors' life and more attention should be paid when designing the senior housing in China.

Under these backgrounds, this research reviewed a range of available literature on senior living design including two main categories, which are physical environment and quality of life. The Physical environment part described information about housing and living environment for older people including the continuing care retirement community, senior living communities and building types in China, standards of the residential building design for the aged in China, wayfinding, and universal design. The second part

includes information about quality of life domains, such as safety, enjoyment, relationship, autonomy and choice.

This study focused on the common areas of the CCRC in Beijing, China. Both qualitative and quantitative methods have been used to collect and analyze the data. The researcher visited the CCRC, observe and measure physical environments of common areas (i.e. space planning, finish materials, furniture, lighting, universal design features) utilizing physical environment checklists. Data was also collected by conducting in-person surveys with residents and their families and friends, and semi-structured interviews with staff and a manager. The collected data were analyzed to investigate the relationship between CCRC common areas and residents' quality of life.

This facility is the new type of the CCRC in China by applying appropriate interior design standards. The overall space layout of common areas is well designed and planned, for example, every area is adjacent to elevators and restrooms so that residents can easily access them from their resident units. However, some areas are not adjacent to staff offices. The areas which have similar functions have been grouped together. Therefore, even though most of the areas are open to corridors, there is no acoustic problem between the quiet zone (i.e. library, reading area) and the entertainment and activity zone (i.e. table tennis room, dancing room). The open wall system is an appropriate design solution for seniors because it can enhance the relationship between residents by making them easily access activities as well as the resident safety in the emergency situation by quickly calling staff members without any obstruction. Most of the common areas have enough circulation space and clearance around furniture items

that help residents safely walk around. Variety types of furniture are arranged in each area to enhance resident's choice. Tables with rounded edges and the seating with arms that help seniors get in and out of the furniture are also related to resident's safety issue. All areas can receive sufficient daylight and access outside view through big windows, and these features can enhance residents' enjoyment. The lighting plan in some areas and corridors does not meet senior's reduced vision requirement, so the researcher suggested new lighting plan for those areas. This facility applies safe and durable flooring materials that allows wheelchairs and walkers to move smoothly over them. The most important concept when designing the senior living environment is home-like feeling, but the acoustic ceiling tile used in ceilings of common areas gives a hospital look. Handrails in corridors also do not assist senior's walking. Based on the survey and interview results with observation findings, the researcher designed the new staff working station near common areas to improve residents' relationship with staff and keep safer common areas, revised some common areas that are not frequently used by residents to enhance resident's choice and enjoyment, and suggested the new activity area to enhance the relationship between residents or between residents and their families and friends.

This research will contribute to the Chinese senior housing industry by incorporating the quality of life domains that emphasize human relationship, choice, and enjoyment along with safety in the physical environment. For future research, the researcher will develop a more comprehensive observation checklist and survey and interview questionnaires that can be applied to different types of senior housing in China to examine seniors' needs and expectations.

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CHAPTER ONE: INTRODUCTION

Background of the Study

According to the international standard, if a country or area has 7% of the population's age over 65 years old or 10% of the population more than 60 years old, this nation is an "aging society" country (RenMin RiBao, 2014). The census of population in China indicated that China has more than 190 million people who are over 60 years of age. Since China's senior population is equivalent to over 14% of its total population, it can be easily concluded that China is an "aging society" (Liu, Wang, & Zhang, 2012). In 20 years, China's population will begin to increase at the rate of 10 million each year. Another relevant fact is that more than 260 million peasant workers are currently working in urban cities and more and more young people seeking work opportunities are migrating to cities and large metropolitan communities that results in creating an imbalance of populations between urban areas and rural regions (China's Employment, 2013). However, their parents continue to live in their homes located in rural and small communities in outlying areas. Many of them cannot afford the relative high cost of living with which they would be confronted if they lived with their children in the city.

Chinese people continue to exhibit strong family values. Historically, Chinese culture has strongly encouraged, if not dictated, that seniors live with their children. Conversely, if aging parents had been placed in any senior care facility, other people may draw the conclusion that their children do not have any interest in taking care of their parents. Seniors are also vulnerable to feelings of loneliness and its consequent sadness. However, for the majority of people who were born after 1980, there is the only

one child born per household. Since the child is expected to take care of his/her parents, he/she bears an inordinate burden to take care of his/her parents in their old age. He/she neither has the resources nor the time to adequately address many of the needs and concerns of their elderly parents, thus depriving them of adequate care.

Therefore, senior living facilities in China have necessarily inherited much of the responsibility for addressing these issues in the future. In general, senior housing in China is typically categorized into three major types based on whether a facility is built by government, and whether a facility is operated for profit. It includes Government welfare type senior space, non-profit, non-government senior housing, and for-profit senior housing. Each type of the housing facility may have one or more senior living types, such as independent living, assisted living and nursing home (Wang, 2011). As a US type for-profit senior living, the CCRC is a new type of senior living facility in China as an essential to well-being and care for seniors by providing a continuum of care.

Statement of the Problem

The issue is that China is a developing country and the for-profit senior living facility in China began just over 20 years ago (Zhu, 2010). The development of CCRC in China is not keeping up with the annual increase in population. Codes and standards for designing senior living environments also are inadequate and inconsistent. For example, there are two senior living design guidelines in China which were published by government. However, they have the similar context and both just give the general design rules for architecture, such as door way size, slope, etc. Furthermore, interior designers do not generally have sufficient experiences to successfully implement design

innovations for the development of the CCRC in China. The majority of CCRCs in China continue to focus only on physical environments of facilities, not considering the development and the provision of high standards for senior's quality of life (Tao, Wang, & Ma, 2008). However, the resident's quality of life (QOL) has been considered as a very important factor when designing senior living facilities in other countries. Under these circumstances, understanding seniors' quality of life will become an important part in Chinese senior housing industry.

Purpose and Research Questions of the Study

The purpose of this study is to emphasize the importance of senior's quality of life by investigating the current senior housing design in China through evaluation of how well they encompass the quality of life domains for senior's health and wellbeing. To accomplish this purpose, this study will conduct a case study in a newly designed CCRC, especially common areas, in Beijing, China to collect physical environment observation data and users' (i.e., residents, staff, families, and friends) opinions, and then suggest design solutions that would enhance resident's quality of life.

The research questions of this study are:

1) What is the relationship between physical environments and senior's quality of life?
2) How do physical environments of CCRC common areas enhance senior's safety, relationships, enjoyment, autonomy and choice?

The findings will be meaningful in that they could contribute to the development of the design guideline of Chinese CCRC that enhance resident's quality of life for other researchers and designers.

CHAPTER TWO: LITERATURE REVIEW

This chapter reviews a range of available literature on senior living design which includes senior health, senior living environments in China, Continuing Care Retirement Communities (CCRCs), physical environments of senior living, and quality of life (QOL).

Senior Health

Aging is a normal biologic process. It involves decline in physiologic function. During natural aging process, individuals experience the change in body composition. The change of organ systems and rate of change vary among individuals, genetics, illnesses, socioeconomic, and lifestyles (Mahan, Escott-Stump, & Raymond, 2012). It is understood that the older adults have increase in fat mass and visceral fat, and decrease in muscle mass. The age-related decreasing in muscle mass, strength, and function, known as sarcopenia, eventually lead to poor quality of life (Mahan, Escott-Stump, & Raymond, 2012). Older adults are also found to have hearing and eyesight impairment as they age. The most common hearing loss is being insensitive to the high-pitched tone. The decline in vision is a part of normal aging that can be easily corrected by reading glasses, improved lighting, or larger print (Mahan, Escott-Stump, & Raymond, 2012). When individual grows older neurologic processes declines with age. These processes are responsible for cognition, steadiness, reactions, coordination, gait, sensations, and daily living activities. It is commonly seen in older adults experiencing memory difficulties and urinary incontinence (Mahan, Escott-Stump, & Raymond, 2012). Vann (2016) listed 15 most common health concerns for senior that include arthritis, heart disease, cancer,

respiratory disease, Alzheimer's disease, osteoporosis, diabetes, influenza and pneumonia, falls, substance abuse, obesity, depression, oral health, poverty, and shingles.

Falling

Falling is a major issue among older populations aged 65 and above. It significantly contributes to the mortality rate, functional limitations, dependence, and quality of life among the older adults. The incidence of fall and fall injury increases with age. According to the World Health Organization's (WHO) (2008) report, each year approximately 28-35% of older adults aged 65 and older fall, and the rate increases to 32 - 42% among people over 70 years of age. Medical attention might be required based on the seriousness of fall, which WHO showed are responsible for more than 50% of injury-related hospitalization among adults 65 years of age and older. The common health issues that require medical attention associated with falls are hip fractures, traumatic brain injuries, and upper limb injuries. As the older population is growing, many efforts have been made to implement fall preventive strategies to maintain the quality of life among seniors. Understanding the major risk factors contributing to falls is crucial and it ensure the effectiveness of the preventive strategies (WHO, 2008).

The risk factors of falls are biological, behavioral, environmental, and socioeconomic (WHO, 2008). The biological risks are non-modifiable factors, including age, gender, and race. The human body changes during natural aging process and it declines in physical, cognitive, and affective capacities. In addition, the length of stay associated with fall-related hospitalization increases while age is increasing. The behavioral risk factors involve actions, emotions, or daily choices (WHO, 2008). For

instance, medication used, alcohol used, or sedentary lifestyle increases the risk of a fall. The environmental risk factors are the individual's physical condition and surrounding environment, such as stairs, lighting, sidewalk condition, and entrance or exit area, bathroom design, and many others. For this reason, many healthcare facilities are making efforts to reduce the environmental risk factors during the planning stage of building a facility. Socioeconomic factors consider of the social and economic status of an individual; individuals with low income, low education, inadequate housing, lack of social interaction, and limited access to health and social care are at higher risk of fall and fall injury (WHO, 2008).

Fall prevention strategies should be comprehensive and multifaceted. The government, researcher, and public health take initiative to further explore the risk factors and develop effective preventive strategies. The government implements policies and regulations on the building design to remove potential fall hazards, institute health care provider training on evidence-based preventive strategies, and provide education of individuals and communities about fall risk awareness (WHO, 2016). For example, on August 1, 2012, Chinese government passed a regulation of barrier-free environments in urban areas to enhance accessibility to people with disabilities (Zhang, 2012). The Continuing Care Retirement Center (CCRC) made environmental modifications by including handrail features at the corridor, using porcelain for floors, and implement dancing classes to help maintain seniors' balance and flexibilities. Based on Merom et al. (2013), social dance is a holistic approach providing balance training for seniors.

Vision

According to the National Eye Institute (NEI) (n.d.), during the natural aging of the eyes, individuals experience vision changes, including difficulty seeing close distance objects, a declining ability to see colors, and the need for more light to see objects. Apart from natural aging in the visual system, older populations are prone to eye diseases related to age-related muscular degeneration, cataract, diabetic retinopathy, dry eye, glaucoma, and low vision. Approximately 65% of all people who are visually impaired worldwide are age 50 and older (WHO, 2014). As mentioned, there is an increasing fall risk among older adults that pose a significant threat to the population's overall well-being. One of the major risk factors includes the effect of lighting around an older adults' environment. Individuals rely heavily on the visual systems in maintaining balance while moving in and around environments (Figueiro et al., 2011).

The effect of vision impairment among seniors negatively impact seniors' quality of life. Seniors are more likely at risk of fall and fall injury when individuals are having difficulty seeing objects clearly, especially at close distances (American Foundation for the Blind, 2016). With aging, seniors are commonly diagnosed with other co-morbidity, such as hyperlipidaemia, hypertension, and diabetes mellitus. These co-morbidities require medication management. A compromised visual system in the older population can lead to misidentifying medication. A good visual system can grant a good quality of life because individuals depend on vision to perform daily activities. Therefore, seniors with vision loss have declined in independence. When vision impairment progresses, individuals might experience depression (American Foundation for the Blind, 2016).

Because seniors always are well respected among other younger generation of their families or society, with the vision loss, it lowers individual self-esteem. Individuals might gradually withdrawal themselves from others (American Foundation for the Blind, 2016).

The side effects of vision impairment are serious and affecting the older population, however preventive strategies are well documented and implemented. It is recommended that individuals receive routine eye screenings, and include comprehensive dilated eye exams for those aged 50 years and older (NEI, n.d.). A healthy lifestyle helps maintain good visual function or delays the progression of eye diseases. Healthy lifestyle factors include smoking cessation, being physically active, having a balanced diet that is high in vitamins and minerals, controlling diabetes, maintaining a healthy weight, and protecting eyes from the sun (NEI, n.d.). The lighting in the environment also plays an important role in providing better vision of surroundings and prevents falls. Bright light and perceptual cues of horizontal walking paths help control balance in seniors, and alternately reduce the risk for falling (Figueiro, Plitnick, Rea, et al., 2011).

Senior Living Environments in China

Senior Building Type in China

There are three main categories of senior buildings in China, which are institutional type senior living, residential type senior living, and community type senior living (Zhou, Cheng, Lin, & Lin, 2011). Institutional type of senior living includes nursing home for the aged and home for the aged. The difference between nursing home for the aged and home for the aged is that the nursing home for the aged focuses more on

the people who do not need to be in a hospital but cannot be cared for at home. Most nursing homes have nursing aides and skilled nurse on hand 24 hours a day. Home for the aged provides independent living, assisted living, healthcare and other actives. Residential type senior living includes retirement apartment and apartment for the elderly (see Table 1).

Table 1

The difference between Retirement Apartment and Apartment for the Elderly

Type	Retirement Apartment	Apartment for the Elderly
Definition	- Provides home type independent living and assisted living - Contain all the senior living facilities and assisted services	- The seniors as the core
Market Administration/ services	- Rent and pay the service fee - Unified management - Meals - Activities provided - Health care - Other services	- Sell - Public services and facilities from the community

Senior Living Communities in China

There are two different types of Senior living communities in China. The one is Large General Community with Senior Living Community; another one is Comprehensive Senior Living Community (Zhou, Cheng, Lin, & Lin, 2011).

Large General Community with Senior Living Community is a community that has general type of community and also includes a senior living type community (see

Figure 1). Normally, there are over 10 thousand people living in this kind of community in China (Zhou, Cheng, Lin, & Lin, 2011). It is located in the urban area with markets, hospitals, restaurants, libraries, schools, churches, theaters, and other facilities. The advantages of this kind of community are convenient transportation and location advantage. Senior living type community also can share the public spaces from the general type of community and residents can easily access social activities with family and friends who live in the general community. The target client is people who can live independently or need assistance living, but also want to live close to their family and easily access other facilities in urban areas.

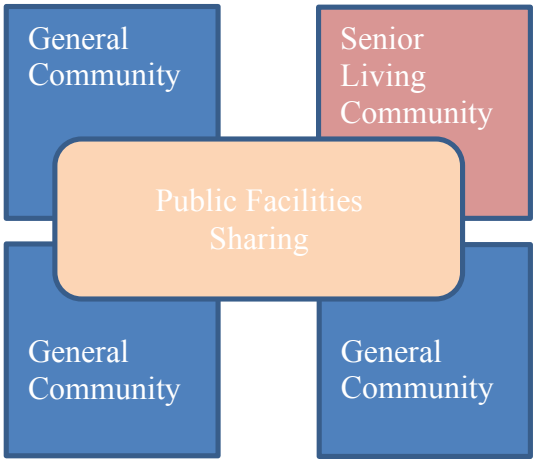


Figure 1. Large general community with Senior Living Community

Comprehensive Senior Living community is a Community designed for elderly people (see Figure 2). Usually, it is located in suburban area. Community Clinic, activities center, senior restaurants and visitor hotels are provided for residents and the visitors. The advantage of Comprehensive is the well-designed senior living facility,

beautiful living environments, professional assistant services, and rich social activities provided for senior people. The target client is people who need long-term care or want to live with fresh air and beautiful scenery.

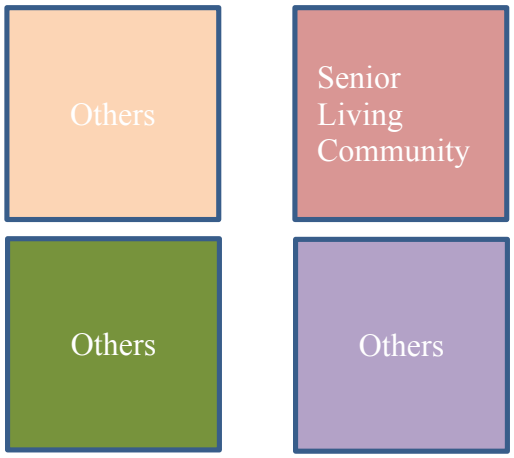


Figure 2. Comprehensive Senior Living Community

Continuing Care Retirement Communities (CCRCs)

Continuing Care retirement communities is a US senior facilities type that should be classified as a retirement apartment in China. The community-type senior living includes senior activities center, senior college, day care center for the aged and community services. Continuing Care Retirement Communities (CCRCs) were established decades ago (Eastman, 2013). A CCRC is an alternative, residential, and long-term care facility developed to assist seniors maintain their independence. Previously, CCRCs were community and religious-based, but they have evolved drastically since the mid-1980s, which offers their consumers more options of services

(Eastman, 2013). The services no longer only focus on health-care services, they also take in to consideration social and recreational activities, dining options, housekeeping, transportation, and wellness and fitness programs. The CCRC's service fees and other charges are available within a contract that is closely associated with the intensity of care for the resident, type of living unit and subscription services. The contract fees generally consist of entrance and monthly fees (Eastman, 2013). A CCRC generally includes features of independent living units, assisted living units, memory-support units, nursing care units, and home-and community-based care units (Eastman, 2013).

Independent living units are the most common feature of CCRCs to the public. It is mimicking a common living lifestyle that targets generally healthy seniors with little needs of assistance in the activities of daily living. The living units may include a cottage, townhouse, cluster home, or apartment. The services offered include of meals, housekeeping, laundry, repairs, and maintenance (Eastman, 2013).

Assisted living units are designed for frail individuals, to benefit and maintain a level of independence. It provides individuals an independent living, but provides a certain level of assistance in daily activities, such as dressing, eating, medication administration, and bathing. The apartment setting in assisted living units is commonly a studio or one-bedroom apartment with easy-to-assess kitchen facilities (Eastman, 2013).

Nursing care units are generally available onsite or at an easily accessible location. The convenient location is crucial because seniors with acute/chronic illness or injury requiring immediate medication could receive appropriate treatment. The setting of

nursing care units generally consists of private or shared rooms with a bathroom (Eastman, 2013).

Memory-care support units are designed to provide a safe physical environment to residents with memory challenges. It serves to optimize and maintain the levels of function and independence of individuals. The goals are also involved in maintaining individuals' dignity. The memory-care support is a newer area of care added to CCRC compared to other features and has growing needs of the service noted (Eastman, 2013).

Home-and community-based care could be considered an extensive service provided to individuals in their home, community settings, or other health-care settings. The services are personalized to individual needs (Eastman, 2013).

Senior Living Design Guidelines in China

There are two senior living design guidelines in China. The one is Code for Design of Residential Building for Aged, and another one is Code for Design of Buildings for Elderly Persons. The Code for Design of Residential Building for Aged was published by Ministry of Housing and Urban-Rural of People's Republic of China (MOHURD) and General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China in 2003 (Ministry of Housing & Urban-Rural Development of People's Republic of China, 2003). Code for Design of Buildings for Elderly Persons is a new guideline published by MOHURD and Ministry of Civil Affairs of the People's Republic of China in 1999. The two guidelines have the similar context: the Code for design of Buildings for Elderly Persons is the new one and has more detailed context than the older one.

The Code for Design of Building for Elderly Persons has eight parts, which include general rules, terminology, base environment design, architecture design, habitable room, architecture equipment, interior facility, and appendix and explanation of words used (Harbin University of Civil Engineering and Architecture, 1999). The terminology part has explanations of eleven terms which include the aged phase, self-helping aged people, device-helping aged people, under nursing aged people, house for the aged, apartment for the aged, home for the aged, nursery for the aged, net width of corridor, net width of stairway, and net width of doorway. The architecture design includes 10 domains which include general rules, guideline of passageway, hallway and corridor, stairs, slope and elevator, habitable room, kitchen, bathroom, balcony, door and window and interior design (Harbin University of Civil Engineering and Architecture, 1999). For example, the minimum wheelchair turning circle is 1500mm; the minimum distance between handrails and the wall is 40mm; and the distance between the floor and the top of the cabinet in the kitchen should not be lower than 750mm. However, these two guidelines did not include more detailed guidelines for interior design, such as details of lighting, furniture and materials.

Physical Environments of Senior Living

Furniture

Furniture plays a significant role in senior living design. It is related to both physical environment and quality of life of seniors. Spaces in senior facilities often have a specific requirement for types and sizes of furniture. The designer must carefully discuss this with the management during designing to ensure that the right piece of

furniture is specified for each application (Piotrowski & Rogers, 2007). Safety is the most important consideration that should be kept in mind by designer at all the time, so furniture in senior living facilities should be maintained for seniors' safety and enhance residents' living abilities. All of the furniture should not easily fall over and be stable for seniors, a home feeling of warmth is also an important aspect that designer should consider to make the residents more comfortable.

Sofa and Chair. The height and depth of sofas and chairs are important for comfortability and use. For example, the height of the seating should let seniors easily get in and out. The height of the seating for Chinese should be around 450 mm (Zhou, Cheng, Lin, & Lin, 2011). Because of the reduction of body flexibility and muscle strength, Seniors need more support from the arms when they stand up or sit down, So Arms on chair and sofa should be the full length from the edge of the seat to the back. A comfortable seat back is also important for seniors' enjoyment and safety. Casters on front legs of the chairs is an appropriate furniture selection for a senior facility, particularly in dining areas, because they assist residents in pushing up to and back from a table (Bruce et al., n.d.).

Kitchen Working Station. Due to the special physical situation of seniors, the working station, cabinet, washing sink, and wall cabinet in the kitchen should be carefully designed for seniors (Zhou, Cheng, Lin, & Lin, 2011). For example, the depth of the kitchen working station surface is between 550-700mm, but for seniors, the size should be between 600-650 mm. If the depth is not enough, it is hard to set things on, but if it is too much then it is hard for seniors to reach what they need. The height of a

working station surface should be 800-850 mm (Zhou, Cheng, Lin, & Lin, 2011). The cabinets and washing sinks should be wheelchair accessible. Normally, the height of the wheelchair seating is 450 mm and the space for people's legs is approximately 200 mm, so the height from the flooring to the bottom should be 650 mm (Zhou, Cheng, Lin, & Lin, 2011). In order for wheelchair accessibility, the depth should maintain a minimum of 350 mm. In a general residence, the height from the floor to the bottom of the wall cabinet is 1600 mm, and the depth is 300-350 mm (Zhou, Cheng, Lin, & Lin, 2011). The regular size is not an appropriate design for seniors, so a lower wall cabinet is a design option for seniors.

Lighting

Seniors have reduced visual acuity. They need three times more light than a younger person to see clearly. Due to their health process, seniors often have cataracts reducing the ability to see full color (Piotrowski & Rogers, 2007). Poor lighting will dramatically reduce depth perception for the elderly; and the areas misjudgments in depth perception can be most harmful. However, adding more and brighter lighting will not make it safer unless that light is free from glare and shadows, which obscure details and make navigating more difficult (Brielmaier, 2015). Thus, lighting design plays a very significant role in senior living facility design.

Fluorescent light is usually preferred for senior facilities because its energy efficiency and cost. Downlights and cove lights are good choices for senior facilities because of glare-free (Jorge, 2010). It is recommended to avoid bright spots of light in senior facilities. Decorative wall sconces can be a better choice for common areas such as

corridors or hallway rather than spotlight to produce balanced lighting effect without glare (Jorge, 2010). Table lamps can provide a residential feeling environment for seniors, and another advantage of the desk lamp is reducing eye strain. Ambient lighting serves a particular purpose, but desk lamp makes reading easier on the eyes as glare and shadows are minimized (Jorge, 2010).

Indirect linear fluorescent lighting directs light upwards towards the ceiling. The advantage of indirect lighting includes soft and even illumination, computer friendly, no visible lamp image, increased perception of comfort within the space, and light is applied to ceilings. It is a good design selection for seniors' aging eyes and activities in common areas (Alera Lighting, n.d.).

There are a lot of researches that show LED lighting has positive effects on health including reduced headaches, nausea, Alzheimer's disease and related dementias, mood disorders, stress, vision loss, and eye disorders. Another advantage of the LED lighting is energy savings. LED lighting is a smart choice for healthcare and senior living facilities, because of the health benefits from LEDs (LED Journal, 2016).

Another area of concern is the light source which reflects on the flooring. Designers should make sure that the light can avoid shadows and spots, which might cause some seniors confusion (Piotrowski & Rogers, 2007).

Another issue related to mechanical systems is daylight. Sun is the most powerful source of ambient light (Brielmaier, 2015). Daylight from windows and skylights can provide ambient lighting. Seniors' health can benefit from the daylight. Window coverings such as sheer curtains and window shade are important in controlling day light

levels and reducing glare. It can also balance daylight and artificial light within a room. For example, on a sunny day, sheer curtains can reduce the hard light from the outside.

Outside View

One of important interior design elements for healthcare and senior living facilities is having a natural environment. A natural view serves as a distraction to evoke positive emotions and stress relief, and enhances pain management. Dijkstra, Pieterse, and Pruyn (2008a) showed the presence of indoor plants possessed a positive stress-relieving effect by enhancing the perceived attractiveness of the hospital room. Ultimately, a better coping mental status promotes patients' recovery rate. Although a natural environment benefits overall well-being in an individual, indoor plants pose a potential hazard to individuals from soil, water, and allergens. The building design, therefore, must be modified to connect indoor and outdoor views through a window from a facility. Raanaas, Patil, and Hartig (2011) studied the effects of connecting indoor and outdoor views on patient outcome in a residential center. The study indicated natural surroundings show positive health effects on certain patients in a residential rehabilitation center. The effects on physical health, however, varied among genders and health status of individuals (Raanaas, Patil, & Hartig, 2011). Incorporating natural environments through windows is therefore becoming an important feature in planning the interior design of a senior living facility.

Color

The physical environment affects both emotion and behavior of an individual. This means a person may act or feel according to his or her surrounding environment. It

is of particular importance to healthcare facilities in understanding how to indirectly enhance patients' well-being (Dijkstra, Pieterse, and Pruyn, 2008b). Hidajyetoglu, Yidirim, and Akalin (2012) also found the indoor color used together with the intensity of light affects spatial perception. The cost-effective way to alter the atmosphere in an existing environment is changing the wall colors.

Therefore, colors are divided into different categories, which are neutral (gray), cool (green, blue, purple), and warm (yellow, orange, and red) groups. Warm color such as orange for a wall color yield feeling of arousal and attractiveness, compared to the cool color of green that has a positive effect of soothing and calming (Dijkstra, Pieterse, & Pruyn, 2008b). While warm color provides more sense of orientation, cool color can be considered to be spatially orientated if they paired with high indoor brightness levels (Hidayetoglu, Yidirim, & Akalin, 2012). As color affects an individual's cognitive and emotional thinking, implementing an appropriate wall color could possibly benefit an individual's quality of life indirectly.

Therefore, Color is proving to be a powerful tool for designers, having an impact on both aesthetics and functionality. Carefully applied color not only provides wayfinding assistance, but can also be fully integrated into the aesthetic vision of the facility (Building Design & Construction, 2015).

Universal Design

An optimal senior living space is crucial where seniors feel safe and comfortable to live. According to the Center for Universal Design in NSCU (2014), the universal design is a guideline of the design creating a friendly environment to individuals

regardless of age, size, and ability. It helps enhanced accessibility, function, and performance within a space. According to the National Disability Authority (2012), a total seven principles of universal design have established; these are equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort, size and space for approach and use (National Disability Authority, 2014).

The equitable use principle highlights designs that are user-friendly to individuals with diverse abilities. The guidelines of this principle are providing the same means of use for all users; avoid segregating or stigmatizing any users; provisioning for privacy, security, and safety should be equally available to all users; and making the design appealing to all users. (Charles & Hudson, 2016) The principle of flexibility in use is to focus on designs that satisfy a broad range of individual preferences and abilities. It takes into consideration providing users with a choice in methods of use, accommodating right- or left-handed access and use, facilitating the user's accuracy and precision, and providing adaptability to the user's pace. The concept of simple and intuitive use is providing easy to understand design, regardless of the user's knowledge, experience, language skills, or current concentration level. The designs should remove unnecessary complexity, be consistent with user expectation and intuition, accommodate a broad range of literacy and language skills, arrange information consistent with its importance, and provide effective prompting and feedback during and after task completion.

The principle of perceptible information emphasizes that the design communicates necessary information effectively to the user, regardless of ambient

conditions or the user's sensory abilities. The guidelines include using different modes for redundant presentation of essential information, providing adequate contrast between essential information and its surroundings, maximizing legibility of essential information, differentiating elements in ways that can be described, and providing compatibility with a variety of techniques or devices used by people with sensory limitation. (Charles & Hudson, 2016) The tolerance for error is designed to minimize hazards and the adverse consequences of accidental or unintended actions. The guidelines are to make space most accessible, identify a hazard, eliminate, isolate, and shield over the hazardous element; provide warnings of hazard; provide fail-safe features; and discourage unconscious action in tasks. The design with low physical effort is to maximize efficiency and comfort and minimize fatigue. The guidelines allow users to maintain a neutral body position, use reasonable operating forces, minimize repetitive actions, and minimize sustained physical effort. Last but not least, the principle of size and space for approach and use is to make elements accessible and convenience regardless of individuals' body size, posture, or mobility. The guidelines include providing a clear line of sight to important elements, making reach of all components comfortable, accommodating variations in hand and grip size, and providing adequate space for the use of assistive devices or personal assistance.

Universal design emphasizes the hazard-free environment. One of the major components is flooring design. A soft carpet, tile, hardwood, and cork are the ideal choices. Soft carpet offers little resistance for a wheelchair, is easy to clean, and easy to maintain. Tile is a top choice for areas such as the kitchen and bathroom, because of its slip-resistance function. It is also cost-effective option. Hardwood floor is another great

option; it enhances the appearance of any room, mobility, is able to handle wear and tear, and easy to clean. Cork is an eco-friendly material. This material is softer than tile and hardwoods, which makes it ideal for facility that has higher falling incidence. Cork serves as a better floor material in a living room and kitchen due to its heat retaining property (Charles & Hudson, 2016).

Wayfinding

Many times, individuals are stressed during the first-time visiting a place. The major stress factor is enhanced by being in a strange place and being confused about the direction. Effective navigation help minimizes anxiety and aggravation of visitors and also lowering unnecessary cost related to the loss of productivity when employees step away from their work station to give directions to the lost visitors (Huelat, 2007). To design a good navigation system, it is important to understand individual's spatial behavior or orientation, which is known as wayfinding. In other words, the implementation of navigation system should target individual's cognitive mapping process (Huelat, 2007). The components of good wayfinding system take into consideration of individual's decision-making process for direction and knowledge of the individual, as well as incorporating tools and clues to aid in successful decision-making and clear recognition of pathways and destination.

According to Huelat (2007), one of the methods for successful wayfinding system is the Building Block Model. The concept emphasizes that each building has its natural circulation system and relies on each other for a solid foundation. The Building Block Model involves components such as master plan, landscape, interior architecture, interior

design, signage, graphics, and facility amenities. A good master plan addresses future growth and expansion plan of the facility, and how the visitors will use future expansions. Landscape, such as trees, plantings, flagpoles, water features, and outdoor furnishings can provide landmarks for visual cues. The interior architecture is another part of the model. The easy-to-identify entrances, clear pathways, easy-to-see visitor elevators and landmarks that create visual cues at decision points help individuals with spatial orientation. Interior design is another crucial piece of the puzzle for the Building Block Model. It includes color palettes, materials, and lighting to benefit the user-friendly wayfinding system. Signage provides information to individuals, which offers information, direction, identification of the specific area, and regulatory sign. Graphics is similar to signage, but it is through a universal language. The last of the components is facility amenities. The staff who service assigning appropriate staff offer help lost visitor with a direction (Huelat, 2007).

The wayfinding system in any building is important to the comfort of residents and visitors, especially those who feel insecure in their environment (Eastman, 2013). Compared with younger generations, seniors are poorer at judging the wayfinding abilities and their perceptions of distance. A wayfinding system should go beyond simple signage, and it should be a multilayered system of spatial cues. It is composed of architectural and interior design techniques, such as signage, lighting, finishes, artworks, floor coverings, accent furniture, objects, and even people, as well as the map in the hallway junction (Eastman, 2013).

Normally, having a visual is an essential aspect of wayfinding for seniors (Eastman, 2013). For example, seniors can see the adjacent space through windows, open doorways, and low-walls to know the function of the space, and the activities in the space. The color and finished flooring materials also can be used to set apart different areas. The artwork, furniture, lighting, wall finished materials, ceiling materials, and a map also can be used as a sign to enhance senior's wayfinding ability. People can also discern their location by different ceiling heights, materials, and color.

The floor plan must be conceived with the navigational ease of the residents in mind. Also, a variety of visual cues should be placed into the proper spots to ensure spatial recognition. Long, straight hallways with few turns, if any, are best for minimizing confusion for residents with memory issues (ASI, 2012). Flooring materials, wall materials, ceiling materials, lighting type, doorway, ceiling height, furniture, artworks, and color can be a cue for seniors to distinguish different areas. For example, a nice painting in the corridor allows for decorations and signifiers. Comfortable sofas and chairs can promote social interaction among residents and lead to improved cognitive functioning.

Seniors who suffer from dementia react more positively to landmarks than they do to directions. Therefore, visual indicators should be incorporated into interior design in the senior facility, so the resident have concrete view for where they are. Residents can use painting, finished material, and lighting as cues; these visual indicators should always be prominently displayed, particularly at the intersection of hallway and corridor, where the direction can be made by landmarks.

Signage also play a very important role in wayfinding system in senior living facilities. It can work in tandem with visual indicators to effectively direct residents. For example, pictures and simply worded signage can trigger memory in residents (ASI, 2012). Color's prominent role in wayfinding has become a focus in architecture. Humans use color as a primary means of sorting and grouping and color is employed to help visitor and residents to locate their destinations.

Quality of Life

The term "Quality of life (QOL)" has become a critically important concept for senior living facility in recent years. The World Health Organization (1997) defines QOL as the individual perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectation, standards and, concerns. It is a broad ranging concept affected in a complex way by person's physical health, psychological state, level of independence and their relationship to salient features of their environment. QOL can be defined as the physical, psychological, and social outcomes of the interactions between residents and environment (Kane, 2001). Federal regulations on QOL state that a care facility must care for residents in the environment that promotes enhancement of resident's QOL. Kane (2001) distinguished 11 domains of QOL, as shown in Table 2.

Many long-term care facilities have been established to accommodate the growing population of older adults. Older adults aged 75 years old and older were found to have eight times greater disability risk than younger individuals (Wedgwood, 1985). Common factors contribute to multiple medical diagnoses related to age that later that lead to

functional limitation. Long-term health care services such as residential care facilities or continuing care retirement communities are developed to help maintain individuals' independence and overall well-being. CCRCs provide board and care, 24-hour personal supervision and assistance with activities of daily living (ADLs), medication oversight, and transportation as needed. These facilities are different from nursing homes, as they emphasize resident independence, autonomy, and privacy.

Table 2

Quality of Life Domains (Kane, 2001)

QOL DOMAINS	**DEFINITION**
Safety	Overall sense of security, safety, and order
Physical comfort	Being free from physical pain and discomfort, comfortable in terms of temperature and body position
Enjoyment	Pleasurable experience
Meaningful activity	A range of discretionary experience, excluding activities of daily living tasks
Relationship	Any relationships that the resident found meaningful, including those with residents and staff, and facility, and associates outside the center
Spiritual Wellbeing	Can be independent of religiousness
Autonomy and Choice	Making decisions and directing one's own life
Functional Competence	Within residents' physical or cognitive abilities, residents were as independent as they wanted to be
Dignity	Each person is treated with dignity regardless of whether he or she can perceive dignity
Privacy	Four aspects of privacy include solitude, intimacy, anonymity, and reserve
Individuality	Consumer's sense of being known as a person and being able to continue to experience and express his or her identity, and to have desired continuity with the past

Traditionally, health care facilities only focused on the medical care area and mainly emphasized providing the most advanced medical services. However, the focus of current health care services shifted to multidisciplinary health care system. Apart from medical service, it also includes holistic care. With the emphasis of holistic care, the concept of QOL has become an essential element of health care services, which is used to indicate the treatment outcomes. The higher QOL correlates with better prognosis (Mitchell & Kemp, 2000).

Quality of life is a multidimensional construct, and it measures a broad spectrum of individuals' well beings. From the psychological perspective, individual's QOL is examined through social domains, health conditions, and environment. Mitchell and Kemp (2000) found the QOL is highly correlated to social climate, interpersonal relationships and social involvement, and health status. A high cohesive environment is developed on a personal level by staff members spending one-on-one time with a resident, and residents are involved with each other (Mitchell & Kemp, 2000). Another element of QOL is the resident's interpersonal relationships and social involvement. It showed that individuals who have better relationship with family members and actively participate in social activities have higher life satisfaction and lower depression scores. The family bonds and social involvement viewers represent a powerful psychological supportive factor (Mitchell & Kemp, 2000). Other than cohesive environment, interpersonal relationships, and social involvement, health status plays an important role in affecting an overall QOL of an individual.

With a strong relationship between QOL and social activities and family members' interaction, the facility environments play an important role in supporting these elements (Barnes, 2002). The design of a caring environment takes into consideration layout, wayfinding, and special environments; sensory environments; and privacy, space, and autonomy (Barnes, 2002). A good layout of group-living setting facility should offer a more homelike environment, with residents living in small independent groups with separate facilities. Memory challenges are common among senior population as they age. Residential homes which facilitate their residents' spatial orientation and wayfinding showed better quality of life among the residents. Wayfinding is the basic problem-solving ability to get from point A to point B. Lighting is an important part of wayfinding. Also, effective wayfinding features include building with well-articulated entrances, staircases, and landmarks (Barnes, 2002). Sensory stimulation involves features of sight, smell, hearing, and touch. Multi-sensory environments possess sensory stimulation that offers positive benefits of promoting happiness and calmness, and reducing sadness and fear. A garden is an excellent example of a sensory environment, and it involves sound, color, and fragrance. The external environment provides spaces for privacy, activity, and stimulation, which later contributes to better quality of life (Barnes, 2002).

CHAPTER THREE: METHODOLOGY

This chapter describes the methods used to collect and analyze data for common areas of the CCRC and residents' quality of life. First, data collection methods are described including setting, participants, instruments and the procedure. Second, the data collected through the survey and interview as well as the measurement of physical environment are analyzed to investigate the relationship between CCRC common areas and residents' quality of life and to propose design suggestions.

Data Collection

The purposes of this study are 1) to assess the physical environment of the common areas of continuing care retirement communities (CCRC) in China; and 2) to examine the effect of physical environments of common areas on residents' quality of life. To accomplish this, data were collected from the CCRC in Beijing, China. The researcher observed and measured the physical environments of the facility, and conducted survey and interview with residents, family and friends, a manager, and staff.

Setting

The CCRC used for this case study is located in downtown Beijing, only one mile from the central business district. There are shopping malls, hospitals, international schools, and high quality neighborhoods nearby this facility. The residents' families and friends can easily visit the residents, because there are several subway lines, bus lines, and one highway across this facility area. The facility offers a peaceful and quiet home with the benefit of location advantages for the residents.

An international architecture design firm designed this facility and it was occupied in 2012. It is considered one of the best CCRCs in Beijing. The building floor area is 139,930 square feet and is comprised of two parts (269,098 square feet gross area): the north part is a three-story building and the south part is a ten-story building. The first floor connects the north part and the south part of the building as a shared area. Common areas for this study are in this shared first floor level.

The rooftop garden in the north part has been designed for resident's social activities and to reduce the heat gain to the building during the summer time. Residents can also use the backyard garden area for walking and exercise. The facility offers assisted living, memory care, independent living, and nursing home to meet residents' different needs. The residents who need dementia care live in the north part of the building, and others live in the south part. The CCRC provides four different types of resident unit such as single bedroom, standard bed room, single bed suite, and standard bed suite, which contains a total of 269 units and 400 beds for all seniors across the country. Currently, 258 residents are living in this facility and the rate of occupancy is 64.5%.

There are 14 common areas in the first floor of this facility: lobby area, meeting room, multi-media classroom, dancing room, game table room (formerly pool table room), table tennis room, staff meeting room (formerly gym), multi-functional room (formerly reading area), handwork and painting room, library, hairdressing and beauty, private dining rooms, small dining room, and big dining room. While the majority of common areas are in the first floor, a public living room and a staff working station are

also provided in each floor where resident units are located. Residents can conveniently meet with other residents, their family, and friends in those public living areas, and also easily access assistance from the staff. This study excluded these public living areas and focused on common areas located in the first floor level in order to study social relationships among residents from all level of floors.

Participants

The target participants of this study were residents who used common areas of this CCRC located in Beijing, China. Among a total of 258 residents living in this facility, 33 residents participated in the face-to-face survey and the response rate was 12.8%. All of the respondents answered most of the questions, so a total of 33 respondents' answers were used for data analysis. As shown in Table 3, 51% of participants were female and 49% are male; the average age of 85% of participants was over 76; and 36% have lived there around two years. The majority of residents (70%) decided to move to this facility because of the location advantage followed by concern about their health (49%) and desire for social activities (46%). In addition, 64% of residents live alone, and 55% residents walk independently. Walking disability (46%), arthritis (46%) and vision and eye problems (36%) are main health issues of residents.

The researcher also conducted semi-structured interviews with 10 residents' families and friends. 70% of visitors are residents' sons and daughters. One manager and 13 staff members working in this facility participated in semi-structured interviews. 31% of staff members have been working in the facility for more than two years, 62% have the

responsibility of nursing and 54% work eight hours per day. Staff cares for approximately 21-30 residents.

Table 3

Demographic Information of Residents

Categories		**N=33**	**%**
Gender	Male	16	48
	Female	17	52
Age	Less than 60	0	0
	61-65	2	6
	66-70	0	0
	71-75	3	9
	76-80	11	33
	81 and over	17	52
Period of living	Less than 1 year	3	9
	1 year	9	27
	2 years	12	37
	3 years	5	15
	4 years	4	12
Factors of selecting this facility (select all)	Uncared-for	7	21
	Concern about health or spouse's health	16	49
	Desire for a low maintenance housing option	4	12
	Not convenient living with family	7	21
	Desire for social activities	15	46
	Better living environments	11	33
	Others (Location advantage)	23	70
Walking ability	Independent walking	18	55
	Walking with cane	6	18
	Part-time wheelchair using	7	21
	Full-time wheelchair using	2	6
Main health issues (select all)	Vision and eye problem	12	36
	Dementia	1	3
	Walking disability	15	46
	Arthritis	15	46
	Respiratory diseases	1	3
	Depression	1	3
	Others	10	30

Instruments

The researcher developed the physical environment checklist (see Table 4) through literature review of books and journal articles. This literature about senior living facilities categorized physical environments into several attributes such as space allocation and circulation, furniture, materials and finishes, color usage, lighting, codes, wayfinding, accessibility, and barrier-free design. Based on collected information, the researcher identified physical environment checklist categories (i.e., space planning, finish materials, furniture, lighting, universal design) and then specified sub-categories (i.e., layout, circulation, adjacency, wayfinding, furniture arrangement, maneuverability) for observation and measurement of common areas' physical environments.

Table 4

Physical Environments Observation and Measurement Checklists

Categories	Checklists
Space planning	Layout, circulation, clearance Dimensions of rooms Widths of doorways and corridors Locations and dimensions of doors and windows Adjacency to staff offices Adjacency to elevators, entrances, restrooms Access to outside view Wayfinding cues (i.e., signage system, materials and color used, orientation, layout, architectural features, etc.)
Finish materials	Materials of floors, walls, and ceilings Color of finish materials
Furniture	Types, materials, dimensions, the number of furniture items Furniture arrangement
Lighting	Types and the number of lighting fixtures Lighting effect (artificial light, daylight, glare problem)
Universal design	Adaptable, accessible, supportive, safe products and structure Clear and wide circulation spaces Accessible doorways and corridors Maneuverability within a space

The researcher developed survey and semi-structured interview questionnaires to evaluate the relationship between the CCRC common areas and residents' quality of life and to discuss their satisfaction with the overall facility based on perceptions and perspectives of residents, their families and friends, staff, and a manager.

The resident survey questionnaire (see Appendix 1 & 5) is composed of two sections: the first section is about demographic information, and the second one is the quality of life domains such as safety, relationships, enjoyment, autonomy, and choice which Kane (2001) defined from her study of "Long-term Care and a Good Quality of Life: Bring Them Closer Together." Kane introduced 11 quality of life domains: safety, physical comfort, enjoyment, meaningful activity, relationships, spiritual wellbeing, autonomy and choice, functional competence, dignity, privacy, and individuality. This study focused on safety, enjoyment, relationship, and autonomy and choice domains and survey questions were developed to evaluate those four domains as shown in Table 5.

Survey questions for families and friends (see Appendix 2 & 6) are more related to relationships with residents such as their preferred common areas for meeting with residents and overnight stay experiences as well as overall satisfaction level with their visit. The interview for the manager (see Appendix 4 & 8) is composed of questions about enjoyment and choices of residents such as options and availability of activities conducted in common areas and meal choice, and about communication with residents for new activities, as well as selection of materials and furniture. The staff interview questions focus more on safety of residents such as assistance for and interaction with residents, and about their working experiences (see Appendix 3 & 7).

Table 5

Survey Questions Related to Quality of Life Domains

Quality of Life	**Contents of Questions**
Safety	Floor plan for easy navigation
	Accessible doorways, hallways, rooms
	Safe floor materials for walking and activities
	Handrails for walking
	Clean and free of odors
	Lighting conditions for activities
	Size and safe structure of furniture
	Easy getting in and out of furniture
	Furniture arrangement for safe mobility
	Wayfinding
	Availability of staff for shower or bathing activities
	Easy access to staff
Enjoyments	Frequency of using common areas
	Attractive and aesthetically pleasing material
	Daylight and artificial lighting conditions
	Aesthetically pleasing, functional, comfortable furniture
	Clean and durable furniture
	A variety of options for different activities
	Access to outside view
Relationships	Outdoor social space
	Furniture type and arrangement for social relationships
	Room availability for socializing with other residents
	Preferred areas and reason for meeting with families and friends
	Activities for relationships between residents and staff
	Staff's assistants with activities of daily living
	Easily meet with staff in the office
	Easy access to staff
Autonomy & Choice	Multiple furniture options
	Access and use of any areas whenever they want
	A variety of different activities
	Choice of any activities whatever they want
	Conduct any activities whenever they want
	Seats and meal menu choices in dining areas
	Involvement in the decision of material and furniture selection
	Availability of daily schedules of activities and events

Procedures

The researcher of this study contacted a well-known university research team studying senior living spaces in China over 15 years. They have published articles and books about senior living design and the most famous book is "*Housing for the Elderly*" (Zhou, 2011). They are very familiar with the senior living situation in China. Therefore, the researcher explained the purpose of the study and asked about the current CCRC developing situation in China. A member of research team helped the researcher to get into contact with the senior manager of the facility of this study, located in Beijing.

First, the researcher contacted the senior manager of the CCRC by email to express the purpose of the study and to request permission to surveys and interviews with residents, residents' families and friends, staff, and a manager in the facility. The senior manager sent a permission letter allowing the researcher to conduct the case study with this facility through physical environments measurement and observation, interviews, and surveys.

Second, the researcher took the online training course on National Institute of Health (NIH) Office of Extramural Research and achieved the PHRP training certificate. Next, the researcher developed in-person survey questionnaires for residents, families and friends, and semi-structured interview questionnaires for a manager and staff. Informed consent forms and debriefing scripts were also developed. All questionnaires and forms were created in two different languages: Chinese and English.

Third, after getting UCO IRB approval, the researcher went to Beijing to meet with a manager of this facility to discuss the data collection schedule, and to observe and

measure the physical environment of common areas using physical environments checklist and floor plan drawing as well as taking photos. To collect survey and interview data, the researcher visited the facility multiple times and explained the purpose and procedure of the study, potential risks and benefits, and rights of the participants to stop or withdraw from the survey and interview to residents, families and friends, staff, and a manager. The researcher then asked whether or not they could participate in the study. The participants who were willing to join the study have been requested to read and sign the informed consent form and answer the survey and interview questions. After completing in-person surveys with residents, families, and friends, the researcher met with staff and a manager for interviews. Participants have been reminded that all the information provided would be kept private and stored securely, and they could choose to withdraw their responses at any time.

Data Analysis

The researcher collected the physical environment data by taking photos, hand-sketching furniture plan, measuring and observing environments. The collected physical environment measurement data (i.e., dimensions of windows and doors, furniture dimensions, furniture quantity, corridor widths, handrail dimensions, quantity and type of artificial lighting) were recorded using Microsoft Word. The furniture types and arrangement were drawn in the furniture plan using Autodesk CAD. All photos were categorized according to common areas as well as physical environment observation and measurement of checklist categories. All these sources were used to analyze the existing physical environments of common areas.

The researcher created the coding sheet to assign codes to survey questions, answers, and measurement scale. The collected data from in-person survey were then put in Microsoft Excel using these codes. This Excel sheet was imported into IBM SPSS software to produce descriptive statistics data information such as mean, standard deviation, and frequency. Interview data were grouped by similar themes or answers, and then recorded into Microsoft Word files. All these coded and grouped sources were used to analyze the relationship between physical environments of common areas and residents' quality of life in the senior living facility, CCRC.

CHAPTER FOUR: RESULTS

This chapter presents the research findings which are composed of three parts: the first part is about the physical environment observation and the measurement findings of common areas in the CCRC facility; the second part is about findings of in-person surveys with residents, residents' families and friends and semi-structured interviews with a manager and staff; and the last part is about design suggestions. The researcher could identify physical environment factors that influence the improvement in the resident quality of life (QOL) through observation and measurement of furniture items, lighting, materials, circulation spaces, clearances around furniture, openings, as well as universal design features. The survey and interview findings enabled the researcher to understand the residents' experiences in and expectations about this facility's common areas for their QOL. These findings were used to suggest new design ideas and solutions that can enhance the physical environment of common areas.

Physical Environment Observation and Measurement Findings

The researcher visited the facility multiple times to observe and measure the physical environments of common areas (see Figure 3) by utilizing the physical environment checklists and floor plan drawings. This facility has large common areas designed to encourage residents' socialization and to embrace a variety of seniors' activities. The overall space layout is well designed and planned; for example, circulation routes are easy to travel with minimal distance from elevators to any common area so that residents can easily access that space from their resident units.

Figure 3. Color coded floor plan of CCRC common areas

In senior living environments, staff should unobtrusively monitor residents throughout indoor and outdoor common spaces for resident safety. This facility has openings and no doors on wall in the common areas along main circulation paths for the visual connection between residents and staff. These visually-connected spaces can enhance relationships among residents and between residents and staff because residents can easily see and join other residents' activities. Furthermore, during an emergency, staff members can quickly respond and gain access to residents. Even though most common areas do not have doors and walls are open to corridors, similar functions of areas are grouped together into one of three zones quiet zone (i.e., library, reading area), entertainment zone (i.e., table tennis room, dancing room), and dining zone (i.e., private dining room, small and big dining areas) and these separated zones prevent noise transmission from one part of a building to another.

Doorways, corridors, circulation paths, and clearance spaces around furniture are wide enough to accommodate wheelchairs and are free of obstacles that help residents safely walk around. Handrails help seniors' ease of accessibility and mobility, but handrails of this facility are not helpful due to the thick board in the common areas of the facility that hinders residents easily grabbing it for their walking. Good wayfinding plans in senior living environments reduce disorientation and limit confusion. However, most of the common areas except for the closed rooms in this facility do not have room signage and there is also no distinctive wayfinding cue such as orienting landmarks and place maps. The building layout itself may reduce the wayfinding problem, but still the

wayfinding plan throughout the building is necessary for residents who have memory issues, new residents, and visitors (i.e., residents' families and friends).

Each common area has large windows that make it possible for residents to receive sufficient daylight and access outside view. This feature result in increased enjoyment as well as for staff to monitor residents who are in outdoor spaces. Incorporating wall openings allows as much natural light as possible in interior corridors. Sheer curtains are used in common areas to provide diffused daylight and eliminate glare problems while maintaining views. All windows are easy to open and close for natural ventilation to keep the clean indoor air quality for senior's health.

This facility provided multi-options of artificial lighting such as recessed lights with energy efficient incandescent bulbs, ceiling light, chandelier, cove lighting, table lamps, and floor lamps to keep balanced with daylight for uniform light level beneficial for ageing eyes. Especially, indirect lighting such as cove lighting contributes to produce the uniform brightness for seniors. However, the light level in some areas and corridors does not meet seniors' vision requirements.

Most of the common areas of this facility applied durable, slip-resistant, glare-free, and easily cleanable flooring materials, such as vinyl sheets, sprung wood flooring, and short loop carpet. No high-contrast patterns of finish materials that can visually disturb aging eyes are used. Those materials allow both wheelchair users and walkers to move smoothly over them and to navigate safely as well as help reduce the risk of a fall. There was no step in the doorway between each common area and the main corridor although different types of flooring materials were used alongside each other.

There were a variety of types of furniture arranged in each area to enhance resident's choice. Tables with rounded edges and seating with arms that can help seniors get in and out of the furniture are also related to resident's safety issue. Furniture in this facility was scaled specifically to seniors. Furniture products in this facility were designed and manufactured by the high-end senior furniture manufacturer located in Beijing that provides high- quality customer furniture for senior living environments.

This facility integrated homelike elements such as carpet flooring, fabric drapery, upholstered furniture, warm color theme, indirect lighting, and incandescent lighting, but were keeping more western style. However, some areas used acoustic ceiling tiles to reduce the noise, and the use of can lights with exposed bulbs, which offered more commercial-feeling in common areas.

The following parts indicate each common area's physical environment observation and measurement findings.

Lobby Area

The lobby area was a large-scale, multi-functional area which includes the reception area, waiting area, and coffee bar (see Figure 4). It was the most popular common area in the facility: 81.8% of the residents use this area every day. Residents and visitors could get a daily schedule and any information from the reception desk. The waiting area was well-designed; it not only presents the high quality of the living environment, but it was also very convenient for residents and visitors to socialize with each other. The coffee bar was open from 9:00 am to 3:00 pm, and staff provided complimentary coffee and tea services to residents. After the coffee bar service ended

water and sometimes fruit were available. The facility also provided residents with daily newspapers and books in the lobby area.

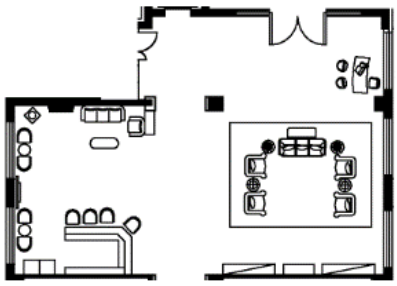
Figure 4. Photographs of the lobby area

There was a spacious seating area available for residents to relax, read books, chat with other residents, or wait for family and friends. As shown in Table 6, the different types of furniture met various demands of residents for their enjoyment and relationships. The upholstered seating with smooth arms and tables with round edges were arranged for senior safety. The clearance and wide circulation space helped senior's ease of mobility. This area receives adequate light levels through both daylight and artificial lights. The chandelier concealed light sources with shades and cove lighting, and provided uniform lighting with in the waiting area. The warm and bright color scheme, the floral patterns of finish materials and upholstered furniture made this area aesthetically pleasing and welcoming. The porcelain floor tile was not highly polished, and was still slip-resistant while providing luxurious atmosphere. An area carpet in the waiting area gave warmth and created feelings of comfort, but with the high contrast and big floral patterns may be

disturbing to aging eyes. Although transition strips were not used to reduce the trip hazard, the flush transition from porcelain tiles to a carpet was not successfully created.

Table 6

Physical Environment Checklists of the Lobby Area

Checklists	**Type (Count / Dimensions)**
Space planning	Circulation space (2100-2500mm), Enough clearance around furniture, Windows (5 / 2400x1300mm), Access to outside view, Adjacent to staff and manager offices, No cues for wayfinding, Adjacent to elevators and restrooms
Finish materials	Floor: Porcelain tiles, Area carpet Walls: Paint, Wallcovering, Wood veneer panel Ceiling: Paint
Furniture	Reception desk (1), Office chair (3), Three-seater sofa (2), One-seater sofa (1), Arm chair (4), Chair (9), Side table (5), Console table (1), Coffee table (1), Round table (2), Bar-counter (1), Built-in bookshelf (2)
Lighting	Wall sconce (2), Recessed can light (24), Chandelier (1), Table lamp (2), Cove lighting (1)
Universal design	No step entry, Wide circulation space, Enough maneuvering space, Multi-level bar countertop, Easy control of windows to open and close, Chairs and sofas with arms, Round edges of tables, Slip-resistant flooring, No good choice of an area rug
Furniture Plan	 15600 x 10900 (mm)

Multi-Media Classroom

The multi-media classroom was located near the crossroad of the hallway. The location was one of the advantages of this room: residents from elevators, a lobby area, or

other common areas can easily access this room. As shown in Figure 5, this multi-media classroom was the closed areas unlike other common areas to provide a quiet place with residents for having classes. This closed space was good for keeping private and also would not affect other areas regardless of any types of classes. There were professional media equipment including speakers, a projector, a movie player, a wall screen and a piano that met various types of classes.

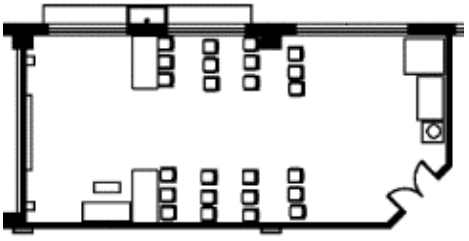
Figure 5. Photographs of the multi-media classroom

The size of the door was 1400mm, which was wheelchair accessible. In the back area of the classroom there were enough spaces for wheelchair users (see Table 7). The dark curtains could block the daylight through windows to provide a good movie environment for residents. There were stackable chairs that were easy-to-store, but the chair used in this room did not have the upholstered back, seat, and padded arms; they also had a low back, and might not be comfortable for seniors to sit on during the whole class. The chair size fits residents who had a normal weight, but bariatric stacking chairs might be needed to accommodate all people. There was also no working table for residents, but the classroom might need to be flexible by rearranging chairs and tables to

embrace various classes. This area also used the acoustic ceiling tiles with recessed can light and blue color sheet vinyl flooring that do not give a warm and welcoming atmosphere.

Table 7

Physical Environment Checklists of the Multi-Media Classroom

Checklists	Type (Count/Dimensions)
Space planning	Door (1425mm), Circulation space (2500-3050mm), Walking aisle between chairs (920mm), Windows (3 / 2600x1300mm, 3400x1300mm), Access to outside view, Adjacent to staff and manager offices, Room signage for wayfinding, No staff working station, Adjacent to elevators and restrooms
Finish materials	Floor: Sheet vinyl flooring Walls: Wallcovering Ceiling: Acoustic ceiling tile
Furniture	Stackable chair with arms (more than 24), Desk (2)
Lighting	Recessed can lights (16)
Universal design	No step in the doorway, Wide circulation space, Enough maneuvering space, Easy control of windows to open and close, Chairs with arms, Non-slip flooring, No floor obstructions
Furniture Plan	 12,750 x 5,650 (mm)

Dancing Room

The dancing room might be noisy when music was playing for learning dancing and the sound might be easily transmitted to other common areas, but there were still openings on walls along the main corridor in order to make it possible for residents to

easily access this area, and join to dance together, as well as for staff to monitor residents' activities and quickly respond in the emergency situation (see Figure 6). There were two dancing classes organized every week. The residents had the choice to attend any of the classes. There was a specific staff member who was responsible during the dancing time.

Figure 6. Photographs of the dancing room

As explained in Table 8, sprung wood flooring was used as a protective flooring for seniors' health and safety. A large mirror was placed on the east wall, so the residents could adjust their pose by watching themselves in the mirror. With the placement of the mirror, the room was visually extended. Built-in cabinets on the low wall on the corridor side could safely store residents' personal items during dance class time while keeping the area neat and clean. Different types of furniture were available in this area, which offered residents a place to relax whenever they want and chat with other residents. Acoustic ceiling tiles for absorption of the noise and bulb exposed can lighting without other types of direct and indirect lighting gave an institutional atmosphere to this area.

Table 8

Physical Environment Checklists of the Dancing Room

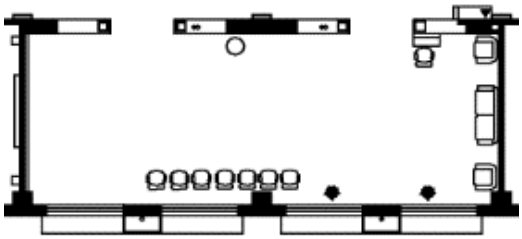
Checklists	Type (Count/Dimensions)
Space planning	Doorways (2 / 2000mm), Enough clearance around furniture, Windows (4 / 2400x1300mm), Access to outside view, Convenient adjacency to staff and manager offices, No cues for wayfinding, No staff working station, Adjacent to elevators and restrooms
Finish materials	Floor: Sprung wood flooring Walls: Wallcovering Ceiling: Acoustic ceiling tile
Furniture	Two-seater sofa (1), Armchairs (2), Chair with arms (7), Side table (1), Chair (1)
Lighting	Recessed can lights (24)
Universal design	No step in the doorway, Enough maneuvering space, Easy control of windows to open and close, Chairs with arms, Protective flooring, No floor obstructions
Furniture Plan	 14,700 x 5,360 (mm)

Table Tennis Room

Table tennis is a sport for all ages with varied physical ability. It is one of the most popular games in China. There was only one game table and four single armchairs in corners available in the table tennis room at the facility as shown in Figure 7. The chairs were placed far away from each other which makes it difficult for residents to communicate. There were enough circulation and clearance spaces around this table tennis table, so it was possible to add an additional table tennis table in this area.

Figure 7. Photographs of the table tennis room

This is because with the current available table tennis table might not be able to meet the residents' needs for their relationship and enjoyment. Residents could use the low built-in cabinets to store their personal items during their play.

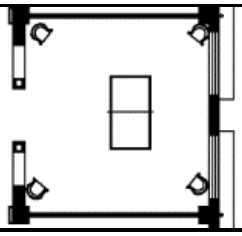
Acoustic ceiling tiles were applied to reduce the noise, but with blue color sheet vinyl sheet flooring, this type of ceiling conveys an institutional look for the area (see Table 9). Sheet vinyl flooring was slip-resistant, durable, and easily maintained, but did not provide underfoot comfort for activities, like table tennis, without cushioned backing. Although there were windows which face south, the overall amount of artificial light might not satisfy seniors' vision requirement. The wall was very boring because there was only one television on the wall with no other decorations.

Game Table Room (formerly Pool Table Room)

The game table room was also located in the entertainment zone next to the table tennis room and the opposite side of the dancing room. This room was used for pool play, but the facility decided to move the pool table to the handwork and painting room. Instead of the pool table, the game table was provided for residents' socialization and

Table 9

Physical Environment Checklists of the Table Tennis Room

Checklists	Type (Count/Dimensions)
Space planning	Doorway (2000mm), Circulation space (2200-3200mm), Enough clearance around furniture, Windows (2 / 2400x1300mm), Access to outside view, Convenient adjacency to staff and manager offices, No cues for wayfinding, No staff working station, Convenient adjacency to elevators and restrooms
Finish materials	Floor: sheet vinyl flooring Walls: Wallcovering Ceiling: Acoustic ceiling tile
Furniture	Armchair (4), Table tennis table (1)
Lighting	Recessed can light (12)
Universal design	No step in the doorway, Wide circulation space, Enough maneuvering space, Easy control of windows to open and close, Chairs with arms, Non-slip flooring, No floor obstructions
Furniture Plan	 7,350 x 6,950 (mm)

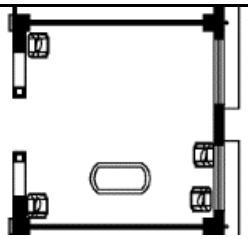
interaction (see Figure 8). There were four upholstered chairs available for residents, but similar to the table tennis room, the type and arrangement of seating did not promote resident's relationship with each other.

Figure 8. Photographs of the game table room (formerly pool table room)

Furthermore, there was wide wasted space; adding one more game table could make the space more efficient. The track light had been designed to illuminate the artwork on the wall, but nothing was on the wall, so it looked very dull. This room also used institutional looking blue color sheet vinyl flooring and acoustic ceiling tiles that did not give a warm and home-like feeling to residents (see Table 10). Even though there were large windows that face south, the amount of artificial light was not enough for seniors' aging eyes.

Table 10

Physical Environment Checklists of the Game Table Room (formerly Pool Table Room)

Checklists	**Type (Count/Dimensions)**
Space planning	Doorways (2000mm), Circulation space (1100-5000m), Windows (2 / 2400x1300mm), Access to outside view, Convenient adjacency to staff and manager offices, No cues for wayfinding, Adjacent to elevators and restrooms
Finish materials	Floor: Sheet vinyl flooring Walls: Wallcovering Ceiling: Acoustic ceiling tile
Furniture	Armchairs (4), Game table (1)
Lighting	Recessed can lights (12), Track spot light (10)
Universal design	No step in the doorway, Wide circulation space, Enough maneuvering space, Easy control of windows to open and close, Chairs with arms, Non-slip flooring, No floor obstructions
Furniture Plan	 7,350 x 6,950 (mm)

Multi-Functional Room (formerly Reading Area)

Multi-functional Room was a big open space located centrally among the three zones (entertainment zone, quiet zone, and dining zone,) and was close to elevators. There was a big aquarium designed as a wall to separate this area from the hallway. Three large-sized windows provided enough daylight for senior's activities in this area (see Figure 9).

Figure 9. Photographs of the multi-functional room (formerly reading area)

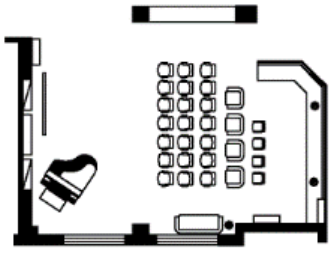
The built-in and removable bookshelves displayed some classic books and magazines. This room could hold a big activity which more than 30 residents can join in. The easily movable folding chairs made this room more flexible. A grand piano and a large-screen television were placed in this room to meet multifunctional options.

The tight loop broadloom carpet was used for noise absorption and softness underfoot, but there was a little change in level between carpet and porcelain tiles in hallways and this might be causing hazard to seniors. Multiple options of seating complemented residents' choices and enhanced their interaction with other residents. However, the type, size, and materials of folding chairs might not allow seniors to safely

lift themselves and to feel comfortable. A variety of artificial lighting was balanced with natural light while producing uniform brightness for residents' activities (see Table 11).

Table 11

Physical Environment Checklists of the Multi-Functional Room (formerly Reading Area)

Checklists	Type (Count/Dimensions)
Space planning	Doorways (4000mm, 1500mm), Circulation space (1100-2400mm), Walking aisle between chairs (290mm), Windows (2 / 2400x1300mm), Access to outside view, Convenient adjacency to staff and manager offices, No cues for wayfinding, No staff working station, Adjacent to elevators, backyards, and restrooms
Finish materials	Floor: Broadloom carpet Walls: Wallcovering Ceiling: Paint
Furniture	Folding chair with arms (25), Armchair (8), Three-seat sofa (1), Built-in bookshelf (2), Credenza (1), Bookshelf (2), Built-in desk (1)
Lighting	Recessed can lights (24), Desk lamp (2), Floor lamp (1), Cove lighting (1)
Universal design	No step in the doorway, Easy control of windows to open and close, Chairs with arms, Non-slip flooring, No floor obstructions
Furniture Plan	 11,600 x 8,140 (mm)

Handwork and Painting Room

The handwork and painting room played an important role in common areas. It was near the elevator, so the residents could easily access this area from their resident units. A traditional Chinese painting was placed on the wall. The bookshelf exhibited a lot of small artwork. People could use this area for reading, communication, painting, and

writing and playing cards. The painting class was held in this area every week for residents. The facility moved a pool table to this area from the Game Room (formerly Pool table room) in order to provide more activity options for residents (see Figure 10).

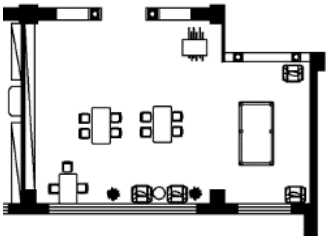
Figure 10. Photographs of the handwork and painting room

As described in Table 12, the comfortable arm chairs and large working tables were placed close to the big windows so that residents could access the outside view of the backyard garden while receiving natural light. Rectangular shape tables with radius corners could prevent resident's injury when they walk by tables and provided more working tabletop area. However, this type of table made it hard to accommodate a variety of activities and the side panels were not appropriate for wheelchair users.

The warm color sheet vinyl with subtle patterns that were the perfect match with the wall-covering and the built-in bookshelf. The sheet vinyl flooring has a variety of widths available to reduce seams, but bright color scheme without bold or high-contrast patterns show seams well in this large space. This material was also ease of maintenance and less slippery, so color stains from the pigment used in painting could be easily cleaned.

Table 12

Physical Environment Checklists of the Handwork and Painting Room

Checklists	Type (Count/Dimensions)
Space planning	Doorway (2000mm), Circulation space (1600-2500mm), Enough clearance around furniture, Windows (2 / 2400x1300mm, 6600x1300), Access to outside view, Not adjacent to staff and manager offices, No cues for wayfinding, No staff working station, Adjacent to elevators, backyards, and restrooms
Finish materials	Floor: sheet vinyl flooring Walls: Wallcovering Ceiling: Paint, Acoustic ceiling tile
Furniture	One-seater sofa (4), Working table (3), Chair with arms (11), Built-in bookshelf (1), Side table (1), Pool table (1)
Lighting	Recessed can light (24), Ceiling light (2),
Universal design	No step in the doorway, Wide circulation space, Enough maneuvering space, Easy control of windows to open and close, Chairs with arms, Round edges of tables, Non-slip flooring, No floor obstructions
Furniture Plan	 12700 x 8150 (mm)

The type of acoustic ceiling tiles used in this area could help absorbing the unwanted noise caused by a variety of activities, but gave an institutional feeling along with recessed can lighting. The exposed can light bulbs might produce direct glare that hinders senior's ability to see. There was a vanity sink with a cabinet in this area that allowed residents to easily access the sink for hand washing or cleaning items like paint brushes. This was a very thoughtful design that considered seniors' mobility issues.

Library

The library was a very comfortable area for residents to enjoy reading books or using computers, as well as to socialize with others. There were hundreds of books which contain multiple categories for the different range of readers. The daily newspapers and magazines were also provided in this area. As shown in Figure11, it had a stunning view of the garden through windows that made residents feel enjoyable and peaceful when they use this area.

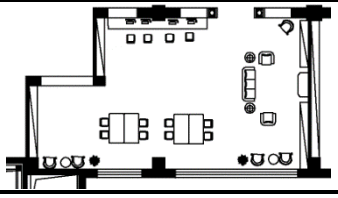
Figure 11. Photographs of the library

The various furniture options were available for residents for their choices (see Table 13): they could grab a book and select the seat that they prefer for reading, choose an armchair and a sofa to communicate with others to enhance their relationships, or sit by the computer desk for searching online and reading e-books. This area also placed rectangular tables supported by side panels, but this type could not accommodate a wheelchair user as well as creating a limitation in facilitating interaction through different types of activities. The sofa zone used cove lighting and the chandelier for producing indirect lighting as well as table lamps on side tables for task lighting. The reading zone did not have any task lighting or indirect lighting, but placed tables close to windows for

receiving enough natural light during day time and uses tablecloths to minimize reflected glare on the table surface.

Table 13

Physical Environment Checklists of the Library

Checklists	**Type (Count/Dimensions)**
Space planning	Doorway (2000mm), Circulation space (1550-3380mm), Walking aisle between chairs (1000mm), Enough clearance around furniture, Windows (2 / 2400x1300mm, 6600x1300mm), Access to outside view, Not adjacent to staff and manager offices, No cues for wayfinding, No staff working station, Adjacent to elevators, backyards, and restrooms
Finish materials	Floor: Broadloom carpet Walls: Wallcovering Ceiling: Paint
Furniture	Thee-seater sofa (1), One-seater sofa (2), Working table (4), Chairs with arms (12), Armchair (5), Built-in bookshelf (4), Side table (4), Built-in desk (1)
Lighting	Recessed can light (32), Chandelier (1), Table lamp (2), Cove lighting (1)
Universal design	No step in the doorway, Wide circulation space, Enough maneuvering space, Easy control of windows to open and close, Chairs with arms, Rounded edges of tables, No lifting edges on carpet, Non-slip flooring, No floor obstructions, Table lamps for tasks
Furniture Plan	 15,080 x 8,150 (mm)

This area was located a little far away from the main hallway and entertainment zone to provide a quiet reading environment with residents who want to enjoy their reading. In addition, the noise could be reduced by carpet flooring and acoustic ceiling tiles. The tight loop broadloom carpet used in this area was beneficial for reducing noise

and was compatible with walking-assisted devices while providing comfort and softness underfoot. The fireplace, built-in bookshelves, upholstered seating, vine patterned broadloom carpet flooring, draperies, chandelier, table lamps, and art work provide a residential appearance for seniors.

Private Dining Rooms

Two private dining rooms are located in the dining zone which provide a private eating environment for residents and their families and friends. Two rooms are the same size and design (see Figure 12).

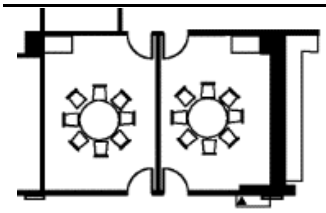
Figure 12. Photographs of private dining rooms

Walls were covered with transitional style wall-covering that was durable and easy to maintain. Warm color sheet vinyl flooring, table-cloths, fabric chair coverings, artwork, accessories on the credenza, TV, chandelier, and cove lighting provide a calming, peaceful, and homey atmosphere. These rooms were not located on the side of exterior walls, but residents could look at outside view through windows of this room and corridors. The sheer curtain was installed to easily control the amount of natural light while keeping outside view and visual privacy. The round table used in this room could

reduce distances from each other for conversation and be easier to navigate around it. However, the chairs without arms made it hard for seniors to get in and out of.

Table 14

Physical Environment Checklists of the Private Dining Rooms

Checklists	Type (Count /Dimensions of Each Room)
Space planning	Door (900mm), Circulation space (770-1800mm), Can access to outside view through windows of the room and corridor, Not adjacent to staff and manager offices, Room signage for wayfinding, Adjacent to the kitchen, elevators, backyards, and restrooms
Finish materials	Floor: Sheet vinyl tile Walls: Wallcovering Ceiling: Paint
Furniture	Dining chair (8), Round dining table (1), Credenza (1)
Lighting	Chandelier (1), Cove lighting (1)
Universal design	No step in the doorway, Wide circulation space, Easy control of curtain in windows to access outside view, Non-slip flooring, No floor obstructions
Furniture Plan	 3,820 x 5,530 (mm) per room

Small Dining Room

The small dining room was located between the large dining room and private dining room. It was a half open space with the lovely iron balustrade used to separate the small dining room area and the corridor. The awning was installed to present the street mode restaurant look, which could enhance resident's enjoyment (see Figure 13). People who sat in the small dining room had a nice view from the backyard garden during their

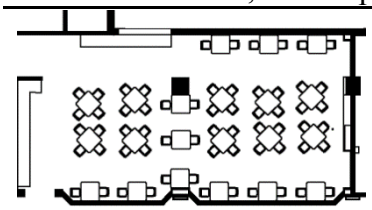
enjoyable mealtime. The small dining area provided a buffet on the catering tables every day, so residents could choose food based on their preferences.

Figure 13. Photographs of the small dining room

There are 21 tables and 62 chairs available for a large group of people to enjoy their meals at the same time (see Table 15). Coffered ceiling with ceiling lightings, wood veneer wall panel, artwork, and wall accessories provide a residential feeling with warm color palette on materials and furniture. The square with round-edges dining tables avoid the hazard of sharp corners and can be easily grouped together to accommodate any range of people. The pedestal type of the dining table without side panels or deep size aprons allows easy access for both chairs with arms and wheelchairs. The cushioned back and seat of chairs are very comfortable for seniors during long meal time.

Table 15

Physical Environment Checklists of the Small Dining Room

Checklists	Type (Count//Dimensions)
Space planning	Doorways (1500mm), Circulation space (1500-2000mm), Walking aisle between chairs (450mm), Access to outside view through corridor windows, Not adjacent to staff and manager offices, Menu platform for wayfinding, Adjacent to the kitchen, elevators, backyards, and restrooms
Finish materials	Floor: Sheet vinyl flooring Walls: Wallcovering, Wood veneer panel Ceiling: Paint
Furniture	Dining chair (22), Dining chair with arms (40), Square dining table (21), Catering table set (2)
Lighting	Recessed can lights (6), Ceiling light (12)
Universal design	No step in the doorway, Wide circulation space, Chair with arms, Rounded edges of tables, Pedestal type of the table base for wheelchair access, Non-slip flooring, No floor obstructions
Furniture Plan	 16,300 x 8,100 (mm)

Big Dinging Room

The big dining room is located far from other common areas, but close to elevators, so it is easy to access from residents' units. It is adjacent to the kitchen and outdoor backyards. Catering table set is put on the wall which is close to the kitchen, so staff can easily prepare the food and residents can choose any food by themselves (see Figure 14). The coffered ceiling with wood panels, ceiling lightings, floral pattern wallcovering over wood veneer wainscoting, TV, and artwork provide the home feeling with this large size of the dining room.

Figure 14. Photographs of the big dining room

As shown in Table 16, the multiple colors of sheet vinyl materials are applied to create more enjoyable atmosphere. There are 108 chairs with arms and 34 tables in this area that is possible to cover any big event. The pedestal table with rounded edges which is a protective furniture can reduce the hazard and make it easier for wheelchair access as well as for grouping together. Big windows with sheer curtains allow residents to have nice outside view and natural lighting while reducing the glare problem during mealtime. The sink with a cabinet is designed to let residents and staff members wash their hands.

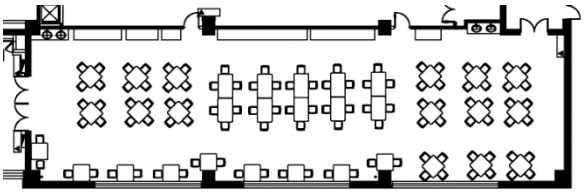
Table 16

Physical Environment Checklists of the Big Dining Room

Checklists	**Type (Count/Dimensions)**
Space planning	Doors (3000mm), Circulation space (1350-2600m), Walking aisle between chairs (650mm), Windows (3 / 5800x1300mm), Access to outside view, Not adjacent to staff and manager offices, Room signage for wayfinding, Adjacent to the kitchen, elevators, backyards, and restrooms
Finish materials	Floor: Sheet vinyl flooring Walls: Wallcovering, Wood panel Ceiling: Paint, Wood panel beam
Furniture	Dining chair with arms (108), Square dining table (24), Rectangle dining table (10), Catering table set (4), Credenza (2)

Table 16

Physical Environment Checklists of the Big Dining Room continued

Checklists	Type (Count/Dimensions)
Lighting	Recessed can lights (24), Ceiling light (10)
Universal design	No step in the doorway, Wide circulation space, Chair with arms, Rounded edges of tables, Pedestal type of the table base for wheelchair access, Non-slip flooring, No floor obstructions
Furniture Plan	 29,100 x 8,320 (mm)

Corridors

Corridors link common areas and people in this facility and were planned to minimize the distance between each zone. They are wide enough to be free from obstacles and to accommodate wheelchairs. As shown in Figure 15, main corridors used two different colors of porcelain tiles for luxurious look and residents' safety. Edges of corridors are defined by the dark color tiles that help residents who have poor vision to easily recognize when they need to be off the corridor path.

Figure 15. Corridors in common areas

Most areas do not have raised edges that can cause a trip hazard in the doorway from corridors, but some areas that applied the carpet flooring do not create flush transitions between two different materials. Handrails are installed in corridors for residents' safety, but the size and shape were difficult for seniors to grab, especially handrails in corridors of open common areas did not allow residents a continuous accessible path throughout common areas. There were no wayfinding cues such as room signage, a zoning map, or any other orienting landmarks for most of common areas except for closed rooms, so new residents may lose their ways or feel it is hard to find their destination. Although corridors between two open common areas can receive natural light through windows and wall openings, using only ceiling lighting may not provide enough light level when considering seniors' aging eyes after daytime. There is a long corridor to get to the big dining room, so there are armchairs with side tables on the window side for seniors' rest along the way.

Some other common areas are not used anymore for residents, not used by residents frequently, or added different function. For example, the meeting room located near the lobby and staff offices has been used as a multi-functional room during the researcher's visiting period. This room was also used as an Assessment Center to evaluate new resident's health condition before checking in this facility. The checking domains include walking, sitting down, standing up, laying down, getting up, climbing stairs, eating, and the eye vision. To keep the privacy of the residents, the researcher was allowed to take a look at the room without taking photos. The design of this room was not like a general assessment center; it was a home-like environment with four armchairs, a

coffee table, desk lamp, and warm color finish materials. Residents and doctors can have a seat and communicate with each other in this relaxed environment so that the new residents may have a good impression about living in this facility. Hairdressing and Beauty room was closed when the research visited this facility because residents did not use this area due to the high-price service and inconvenient open hour. Therefore, the researcher could not collect any physical environment data about this common area. Another common area that was not used anymore for residents is Staff Meeting Room in the entertainment zone. This area was used for Gym before the researcher's visit, the facility changed this room for staff meeting room from the Gym due to the safety issue. This area is located far from staff offices, so the facility had concern about monitoring residents used in the Gym, but they claimed there was no any accidents.

Therefore, the researcher will suggest new design solutions for those unused areas for improvement of resident's enjoyment, safety, choice, and relationship using survey and interview results with residents and staff.

Survey and Interview Findings

When the researcher asked about factors that made residents select this facility, 61% of residents said they selected this facility because of the location advantage, 49% considered their own and their spouse's health, 46% desired social activities, and 34% want better living environments.

The Lobby area was the most popular area in the facility. 82% of respondents said they use the lobby every day. The library was another popular area. 15.2% of respondents said they used the library every day and 36.4% used that area over one to two times per

week. Multi-media room was also the frequently used room, which 76% of the participants use this room over one to two times per week.

Residents were asked about their main health issues. 46% of respondents said they had walking disability and arthritis, and 36% have vision and eye problem. Residents thought handrails (97%), finish materials (82%) and furniture size, type, and arrangement (79%) were helpful factors for their health conditions. They also thought that their health conditions could benefit from a variety of activity areas (42%), access to daylight (30%), and lighting conditions (24%). When considering these factors that could influence residents' health conditions, it was important to look at how resident's quality of life was supported by physical environments of common areas.

Quality of Life: Relationships

The lobby area was the most welcome area. 82% of residents preferred to socialize with other residents in the lobby. 21% of residents liked to socialize with others residents in the library as well as the handwork and painting room. The multi-media classroom served as another preferred area for relationship building, which 12% of residents selected multi-media as a preferred area of socialization. The main reasons of their choices for their socialization and interaction with other residents were because those areas provide comfortable environments (88%) and meal and drinking options (58%) followed by their convenient location (21%). Residents rated that the overall room availability to socialize with other residents in common areas is good or very good (M = 4.18, SD = .39) and they agreed that they can also socialize with each other in outdoor

spaces (*M* = 3.48, *SD* = .71). They also agreed that furniture type and arrangement of common areas enhance social relationships between residents (*M* = 3.70, *SD* = .59).

When researcher asked about the relationship with staff of this facility, residents agree that this facility provides activities to enhance relationships between residents and staff (*M* = 4.15, *SD* = .57) and that staff members are available to provide 24-hour assistance with activities of daily living if residents need help in common areas (*M* = 4.18, *SD* = .53). They also agreed that residents can easily meet with staff in the staff office (*M* = 3.91, *SD* = .39). All respondents thought that they can easily access staff in the Lobby area because there is a staff working station there and staff members are constantly monitoring the residents in the common area. If residents had some activities in the common areas such as a class, there were teachers or staff members there to provide the assistant service with residents. In addition, this was a large facility and over 200 residents live there. When something happens, other residents also could help to get the assistance from staff. This was the reason residents in this facility did not feel it was hard for them to access staff.

All respondents agreed that common areas of this facility are convenient for frequent visits of residents' families and friends. 12% of residents preferred a private dining room to meet with their families and friends and 9% selected the lobby area as a preferable meeting area. The main reason for residents to choose those two areas was because of meal and drinking options for both residents and their families and friends (15%). The privacy (sound and visual) was another reason to use the private dining room (15%). 25% of residents' families and friends chose a lobby area among common areas

for meeting with residents. However, 83.3% of them would like to meet other residents in the resident's unit.

Quality of Life: Autonomy and Choice

As shown in Table 17, residents agreed that the facility provides a variety of different activities (*M* = 4.10, *SD* =0 .52) and daily schedules of activities and events are clearly posted and residents can easily check schedules (*M* = 4.1, *SD* = .63). They also agree that they can choose any activities they want to participate in (*M* = 4.72, *SD* = .45); can conduct any activities whenever they want (*M* = 4.51, *SD* = .51); and access and use any common areas at any time (*M* = 4.10, *SD* =.38).

Table 17

Residents' Survey Findings about Autonomy and Choices (n=33)

ITEMS	Mean	SD
Residents can choose any activities they want to participate in	4.73	.45
Residents can conduct any activities whenever they want	4.52	.51
Residents can access and use any common areas whenever they want	4.09	.38
The facility provides a variety of different activities	4.09	.52
Daily schedules of activities and events are clearly posted and residents can easily check schedules	4.09	.63
Common areas provide multiple furniture options for residents' choice	3.88	.65
There are menu choices at meals	3.45	.67
Residents' families and friends are allowed to join residents for meals	3.27	.57
Residents have opportunity to be involved in decision-making about the materials and furniture selection in common areas	2.15	.76
Residents can choose the seats in dining areas	1.00	.00

Furthermore, residents also slightly agreed that common areas provide multiple furniture options for residents' choice (*M* = 3.88, *SD* = 0.65); there are menu choices at meals (*M* = 3.45, *SD* = .67); and families and friends are allowed to join residents for meals (*M* = 3.27, *SD* =.57). However, residents disagreed that they have opportunity to be involved in decision-making about the materials and furniture selection in common areas (*M* = 2.15, *SD* =0 .76) and also strongly disagree that they can choose the seats in dining areas (*M* = 1.00, *SD* = .00).

Quality of Life: Safety

As shown in Table 18, residents strongly agreed that floor materials of common areas are safe for their walking and activities (*M* = 4.18, *SD* =.53) and that common areas are clean and free of odors (*M* = 4.18, *SD* =.53). Residents also strongly agreed that doorways, hallways, and rooms of common areas are accommodating to wheelchairs and walkers (*M* = 4.06, *SD* = .50). They agreed that the floor plan in common areas is easy to navigate (*M* = 4.00, *SD* =.00) because all responded they memorized ways to get to any destination in common areas, not using signage system, floor map, or any other wayfinding cues. Respondents agreed that furniture is safe with firm cushions, arms, and back supports (*M* = 4.06, *SD* = .56); furniture is easy to get into and out of even for those with limited mobility (*M* = 3.82, *SD* = .64); furniture is correct size for seniors (*M* = 3.79, *SD* = .48); and furniture arrangement allows for safe mobility (*M* = 3.30, *SD* = .73). However, they disagreed that handrails are available to aid in walking in common areas (*M* = 2.30, *SD* = .53) although 97% of respondents said the handrail is an important physical environment factor that is helpful for their health conditions.

Table 18

Residents' Survey Findings about Safety (n=33)

ITEMS	Mean	SD
Floor materials are safe for walking and activities	4.18	.53
Common areas are clean and free of odors	4.18	.53
Doorways, hallways, and rooms in common areas are accommodating to wheelchairs and walkers	4.06	.50
Furniture is safe with firm cushions, arms, and back supports	4.06	.56
The floor plan in common areas is easy to navigate	4.00	.00
Furniture is easy to get into and out of even for those with limited mobility	3.82	.64
Furniture is the correct size	3.79	.48
Furniture arrangement allows for safe mobility	3.30	.73
Handrails are available to aid in walking	2.30	.53

Quality of Life: Enjoyment

Residents agreed that materials used in common areas are attractive and aesthetically pleasing (M = 4.15, SD = .67) and furniture is functional and comfortable (M = 4.03, SD =.59), and also clean and durable (M = 3.82, SD =.39). However, they disagreed that furniture is aesthetically pleasing (M = 2.00, SD = .00). They thought common areas have sufficient daylight (M = 4.12, SD = .55), but 15% of residents said they felt uncomfortable when playing table tennis in the table tennis room due to the insufficient light. 21% of residents and 30% of residents' families and friends also mentioned that lights in corridors makes them feel uncomfortable because of the insufficient light.

Overall Resident's Satisfaction with Common Areas and Quality of Life

Respondents were satisfied with the overall quality of life in this facility (*M* = 4.24, *SD* = .56) and overall quality of common areas (*M* = 4.05, *SD* = .66). Among common areas, they were more satisfied with a small dining room (*M* = 4.12, *SD* =0.55), a big dining room (*M* = 4.06, *SD* = 0.56) and a lobby area (*M* = 4.00, *SD* = 0.75) than other common areas because those areas have a working station or some staff members work there all the time, so they feel they can easily get access to staff.

The researcher also asked about what new common areas this facility needs to provide for residents. Residents suggested a mortuary, full time coffee bar, a farm in back yard garden, and an exhibition room for displaying their artworks and photos. also have been suggested by two residents. A few residents also mentioned that artworks and furniture arrangement should be changed year by year, otherwise, it make this facility be very boring for residents and visitors.

Interview Findings with Staff and a Manager

Thirteen staff members joined the semi-structured interview with the researcher. 31% of them have been working in this facility around two years and is considered a good working period for both residents and staff because they get to know each other better, and the staffs can provide better services to meet residents' needs. 62% of participants are taking responsibility for nursing services and 77% of participants need to take care of more 20 residents. 54% are working eight hours per day and 46% are working more than eight hours every day. 77% of participants are somewhat satisfied with their works, but three staff members mentioned that sometimes they think it is hard

and they become tired taking care of residents because they could not get help from other employees if many residents need an assistant at the same time. 54% of participants suggested providing more lights in corridors and 23% suggested redesigning the handrails in the facility for residents' safety and mobility.

Finally, more questions had been developed to evaluate residents and their family and friend's expectation, for example, about need of public bathroom and opinion about overnight stay, but no one had commented about those topics. Traditionally, seniors like to go to the public bathroom to get professional services in China. However, the respondents expressed dislike the idea because if they need any assistant for bathing in the resident unit, they can easily receive the assistance from staff. Some of them live with their husband or wife, so they can get assistance from each other. Another reason was residents who are living in this facility have a higher education background, and they take more privacy to heart. The residents and their families and friends may require overnight stay because of the location advantage of this facility. That means that this facility is located at the downtown of Beijing and residents' families and friends can easily visit and leave without overnight stay. They also mentioned that if the facility is located far away from the downtown, so they might consider the overnight stay a requirement.

Design Suggestions for CCRC Common Areas

This part will introduce design suggestions for common areas which were not efficiently used by residents such as open hallways, game room, and hairdressing and beauty room, and which were not planned well such as table tennis room, multi-media

classroom, corridors, handrails, and signage system to improve residents' quality of life based on physical environment observation, survey, and interview findings.

Self-Service Kitchen

The researcher renovated the Hairdressing and Beauty room to suggest a new function of the room because currently this room was not used by residents due to the price, service quality, and open hour issues. There was a small room next to this area, but that room was also not used for seniors and sometimes was used for a manager hair-cut. Therefore, these two rooms were combined to suggest the new common area. This room was located in the dining zone and close to elevators and the outdoor space. Therefore, residents could easily access from any common areas as well as their resident units. In addition, the researcher also will suggest the staff working station opposite side of this area so that residents can easily access staff members whenever they need staff assistance. With this location benefit, the researcher suggests self-service kitchen to enhance residents' safety, enjoyment, relationship, and choice because survey and interview findings indicated that residents wanted to keep privacy for meeting with their families and friends and to do new activities for their social relationship and enjoyment.

As shown in Figure 16, the large glass window provides the outdoor view from the backyard garden through the corridor. The sheer curtain can keep privacy in this room and also control the lights to give seniors a homey feeling. The relationship and enjoyment can be enhanced by cooking and talking with other residents or families and friends in this room.

Figure 16. Self-service kitchen 3D renderings

This kitchen works with residents who have special needs by creating a completely functional, modified and wheelchair accessible kitchen. It has two washing sinks and two gas ranges that make it possible for two families or a large group of people to meet and cook together at the same time. The kitchen cabinetry is wheelchair accessible, for example, the bottom cabinet has open space with 650 mm height and 600 mm depth, so residents in a wheelchair can easily use a stove top and a sink without any obstacle. The wall cabinet is installed 1116 mm high to enable residents using a wheelchair easily access it (Zhou, Cheng, Lin, & Lin, 2011). Under cabinet LED lighting can light up the counter tops and make it vibrant, which is good for seniors' vision and tasks.

The luxury vinyl tile (LVT) with the wood pattern which looks quite authentic is used as the flooring material to provide a homey feel with this kitchen and to easily maintain and clean. LVT offers some resilience and warmth that porcelain or wood cannot. It also meets safety requirement for flammability, slip resistance, and water resistance, as well as other safety codes. The acoustic coffered ceiling was suggested for noise control and a homey atmosphere, which is good for a closed space. The cove light and a chandelier can reduce the glare problem for seniors' aging eyes through a soft indirect and direct lighting to the kitchen area.

Residents can use a pedestal type of a square table with flip-up sides that converts it to a round table to have a meal and communicate with other people (see Figure 17). This type of table can meet various activities and different arrange requirements. The dining chair has casters on front legs for residents' safety and mobility, so chairs can be

lifted slightly from the back, but cannot roll away from the table when residents are sitting and standing up. The arms of the chair provide a safe and stable support to seniors when they get in and out of the chair (Bruce et al., n.d.).

Figure 17. Drop-leaf table example (manufactured by Legacy Furniture Group, Inc.)

Staff Working Station

The staff working station is an important installation in senior living facilities. It provides information service for residents and offers a space for staff's working and relaxing. Even though there are some staff members who keep working in common areas to monitor residents' activities and to give residents the assistant service on time, residents still feel they cannot easily get access staff because the dining zone (i.e., private dining room, self-services kitchen) and the quiet zone (i.e., library, hand working and painting area) are far away from the lobby area and the staff office. Therefore, a working station is a necessity in common areas for both resident's and staff's better quality of life.

This working station is located between a dining zone and a quiet zone, in an open hallway. This area is in the opposite side of the Self-service Kitchen and easily accessed

from the elevator. When the residents come down from their resident units, they can get the daily information and services from this working station. Residents who are using the Self-services Kitchen also can benefit from the location advantage.

As show in Figure 18, the nice porcelain tile flooring and wall covering were kept. A custom reception desk has been designed to meet universal design demand. For example, the height of countertop is 1050 mm, which is very convenient for communication between residents and staff members. The height of the lower desktop is 550 mm. The kick space height is 300 mm, which is feet and wheelchair accessible. The quartz countertop has the nice pattern and is easy to clean. Wood panel on the desk surface and pendant lighting give a homey feeling to residents. There is also a staff working space and wall cabinets for handling daily work and locking documents. Seating with arms and coffee table are arranged in this area so that residents and staff can easily meet here and communicate each other.

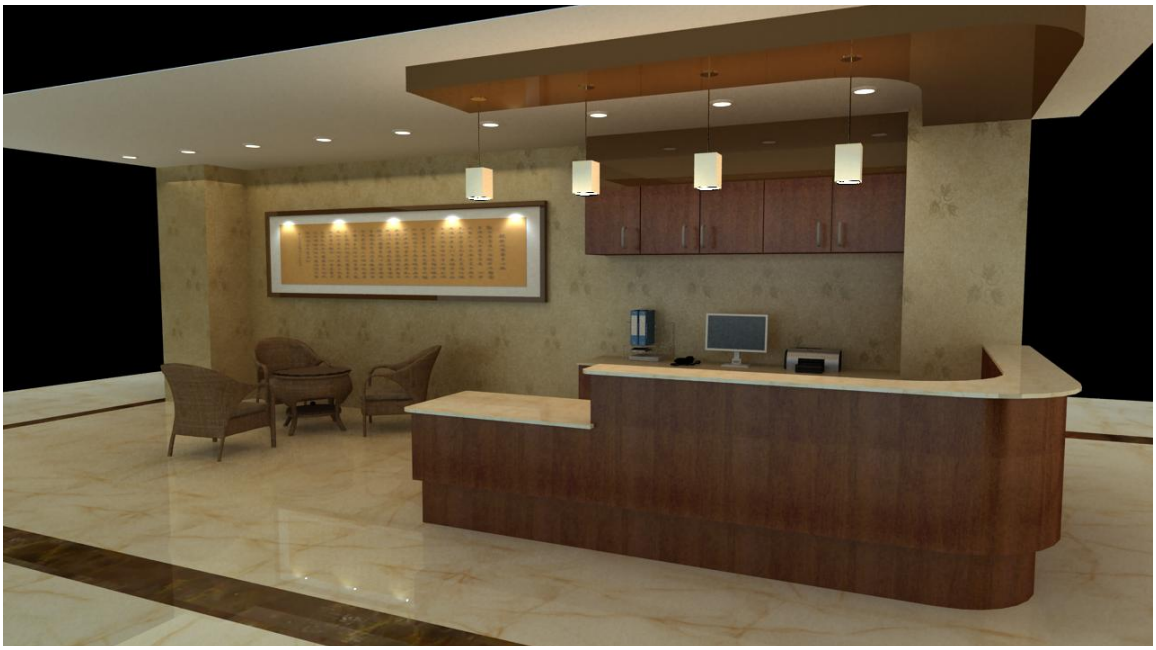


Figure 18. Staff working station 3D rendering

Gallery

Gallery design is suggested in the open hallway for residents to exhibit their art work, such as photography and paintings. This big open space is located in the entertainment zone of common areas, but has not been effectively used. There are armchairs for residents to rest, but the multiple furniture options are not provided and the lack of lights cannot meet seniors' vision requirement, so residents did not use this area frequently. The facility sometimes displayed residents' artworks using removable easels in this area (see Figure 19). However, removable easels are not stable and they may easily fall down when people touch it by accident.

Figure 19. Existing open hallway

Two participants who joined the in-person survey mentioned that they would like a gallery to present their works. A professional gallery design suggestion is very necessary for this facility to enhance seniors' enjoyment and motivation to attend some social activities such as painting class and photography class. The gallery exhibition can utilize two parts: existing walls and operable folding display panels. The operable folding

Figure 20. Operable folding display panels and LED track lighting

display panels are comprised of 7 pieces of wood boards: the height is 2000 mm and the width is 800 mm.

The circulation space between existing walls and these folding panels is 3000 mm and it is wheelchair accessible. Both sides of panels can be used to display artworks. Display boards can be folded and stored in the cabinet (see Figure 20). These are gliding on the ceiling track with a pulley block so that it can be easily folded and moved, furthermore, through this system, panels are very stable and safe. Recessed LED can lights and LED track lighting have been suggested in this area to produce ample lighting for residents watching the artworks, and also give the artistic atmosphere.

The residents can use this gallery to share their class work with other residents. The residents' enjoyment and relationships with other people can be enhanced because residents can easily see and join the exhibition.

Table Tennis Room

Table tennis is a sport that suitable for individuals with any age and physical ability. It is one of the most popular games in China. However, based on the results of the observation and survey, there is some aspect in the table tennis room that should be improved to enhance seniors' quality of life, such as one ping-pong table, no various furniture options, the lack of artificial lighting, and the institutional look of acoustic ceiling tiles and blue color sheet vinyl flooring. The wall also looks very boring because there is only one television on the wall with no other decorations. Therefore, as shown in Figure 21, the researcher renovated this area for residents' better quality of life.

The flooring has been changed to luxury vinyl tile; LVT is different than other vinyl goods in the way it is manufactured and in its overall aesthetics. It can precisely replicate the character, graining, and look of real hardwood. It is durable, water resistant,

Figure 21. Renovated table tennis room 3D rendering

and easy to maintain and clean. More importantly, LVT meets safety requirements such as slip resistance, flammability, as well as other safety codes. Nice acoustic coffered ceiling tiles have been suggested to give the homey feeling to residents and reduce noise problem for residents' comfort and enjoyment.

The large recessed lighting with covers produce ambient lighting and reduce the glare to keep seniors' eyes comfortable while maintaining enough light. The LED track lighting is also suggested to provide better lighting reach as well as more decoration options. Some pictures on the wall show the most well-known ping-pong players. The

winner of the ping-pong competition in the facility also can put their picture on the wall to enhance their enjoyment and motivation. Two-seater sofa and armchairs with side tables are recommended to arrange against the window wall, to enhance the relationship and interaction among residents. The window blinds and curtains will allow the resident to control the natural light, and also give the homey feeling.

Gym

The gym is originally located in the entertainment zone which is next to the table tennis room. The facility closed the gym to use that room for staff meeting room. However, many studies indicated the importance of exercise can maintain seniors' fitness, so the gym room is an appropriate design suggestion for residents' health. Therefore, the researcher renovated the existing game room for design of a gym to increase seniors' motivation to join various activities for their health as well as enjoyment and relationships.

The researcher also considered safety issues when designing a gym because it is always a vital part of senior and elder fitness. A high-intensity sport is not a smart choice for seniors. Leg exercises such as walking and biking are a vital part of senior and elderly fitness (Eldergym Senior Fitness, 2016). Strengthening the lower body is one of the most effective and efficient methods of preserving seniors' independence and improving their health. Strengthening exercise has many health related benefits which reduce disease and improve residents' quality of life including improving seniors' lean muscle mass, reducing senior' blood pressure, which reduces their risk of stroke and coronary disease.

Therefore, three indoor air walker equipment and three indoor cycling were suggested in the gym, as shown in Figure 22.

Figure 22. Gym 3D rendering

Four nice armchairs with side tables are available for resident's relaxing and communicating with other residents. The rubber cork flooring was applied because it provides underfoot comfort and noise reduction for gym activities. This flooring material is also incredibly durable, dimensionally stable, sound absorbent, static resistant, eco-friendly, recyclable, naturally resilient, and low maintenance. Acoustic coffered ceiling tiles, recessed lighting, window blinds, and curtains can keep the balance between natural light and artificial light while providing sufficient light for residents' activities and eye vision by reducing the glare problem.

Multi-Media Classroom

Residents have used stacking chairs in the Multi-Media Classroom. A stacking chair is easy to store, but the chair used in this room is not comfortable for seniors during class time. No working table is also available for residents in this classroom. To improve room condition for residents' quality of life, the multi-purpose folding table and the chair with casters on the front leg and cushioned back and seat (see Figure 23) were used as good design solutions for resident's comfort and enjoyment. Residents can use the table for writing and storing personal items. The tables that flip or fold can be rolled for storage when they are not used. These types of furniture make this room more flexible. The distance between tables is 900 mm, so it allows residents to walk behind the table and chairs. Bariatric stacking chair can be also suggested to accommodate a range of people.

Figure 23. Stackable chair with casters example (manufacture by Steve Silver) and folding table arrangement

Handrails

Based on observation and survey findings, the size and shape of existing handrails in corridors were not easily grabbed by seniors and residents are not satisfied with the use of the existing handrails. Therefore, the researcher re-designed handrails for seniors' mobility and safety according to senior living guidelines (see Figure 24). The material of handrails is wood and it has two round handles on the top and the bottom to meet residents' demand of walking and wheelchair using: the height of the top one is 900 mm and the height of the lower handle is 650 mm, which is appropriate for wheelchair users. The distance between the handle and the wall is 69 mm, which is enough space for easy and comfortable hand grab (Zhou, Cheng, Lin, & Lin, 2011).

Figure 24. Handrail design suggestion

Signage Design

Visitors, new residents, and residents who have memory problems can struggle to find their ways in common areas of this facility because there are no wayfinding cues

such as a floor map or signage. Only closed rooms have room signage. However, to reduce residents' disorientation and confusion in finding their way, the researcher designed the signage systems for each common area and for corridors and hallways.

The identifying signage (i.e. room signage) was designed as a visual indicator for confirming a particular location in order to help residents and visitors to identify the room (see Figure 25). The room name with a pictorial symbol that represent that room's function can trigger the memory in residents (see Figure 26). The signage was designed on the warm, bright color background with white color texts to make it easy for residents to read.

As shown in Figure 27, directional signage was also designed for corridors and hallways to help residents and visitors know their current location and guide them to their destination. This type of signage can be placed at the intersection of circulations.

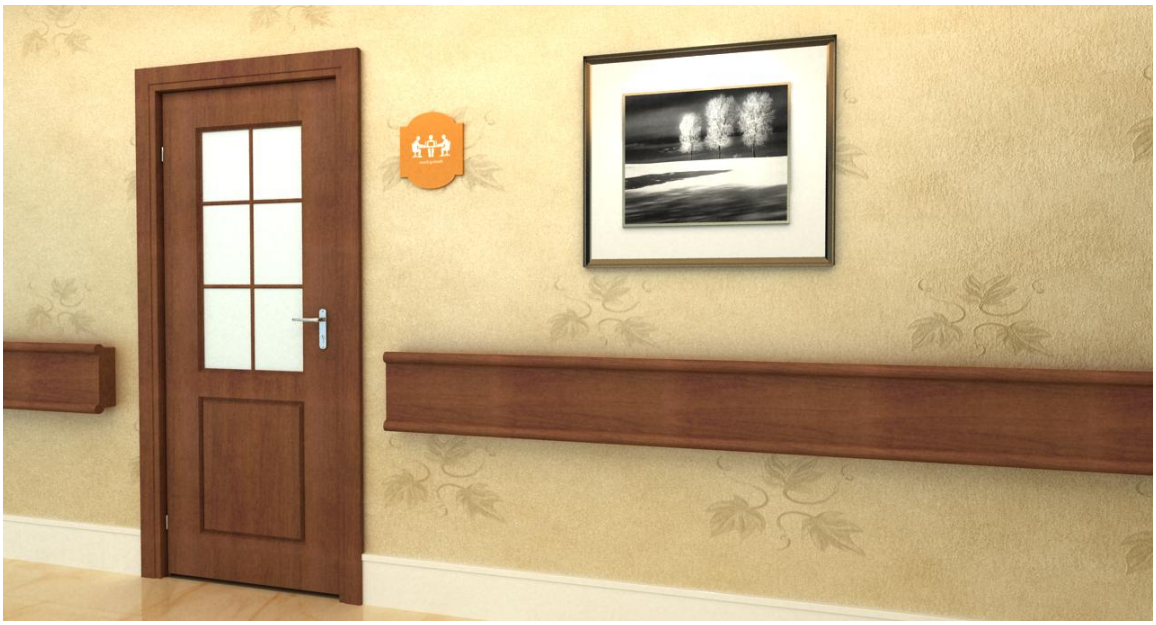


Figure 25. Identifying signage application

Figure 26. Identifying signage design

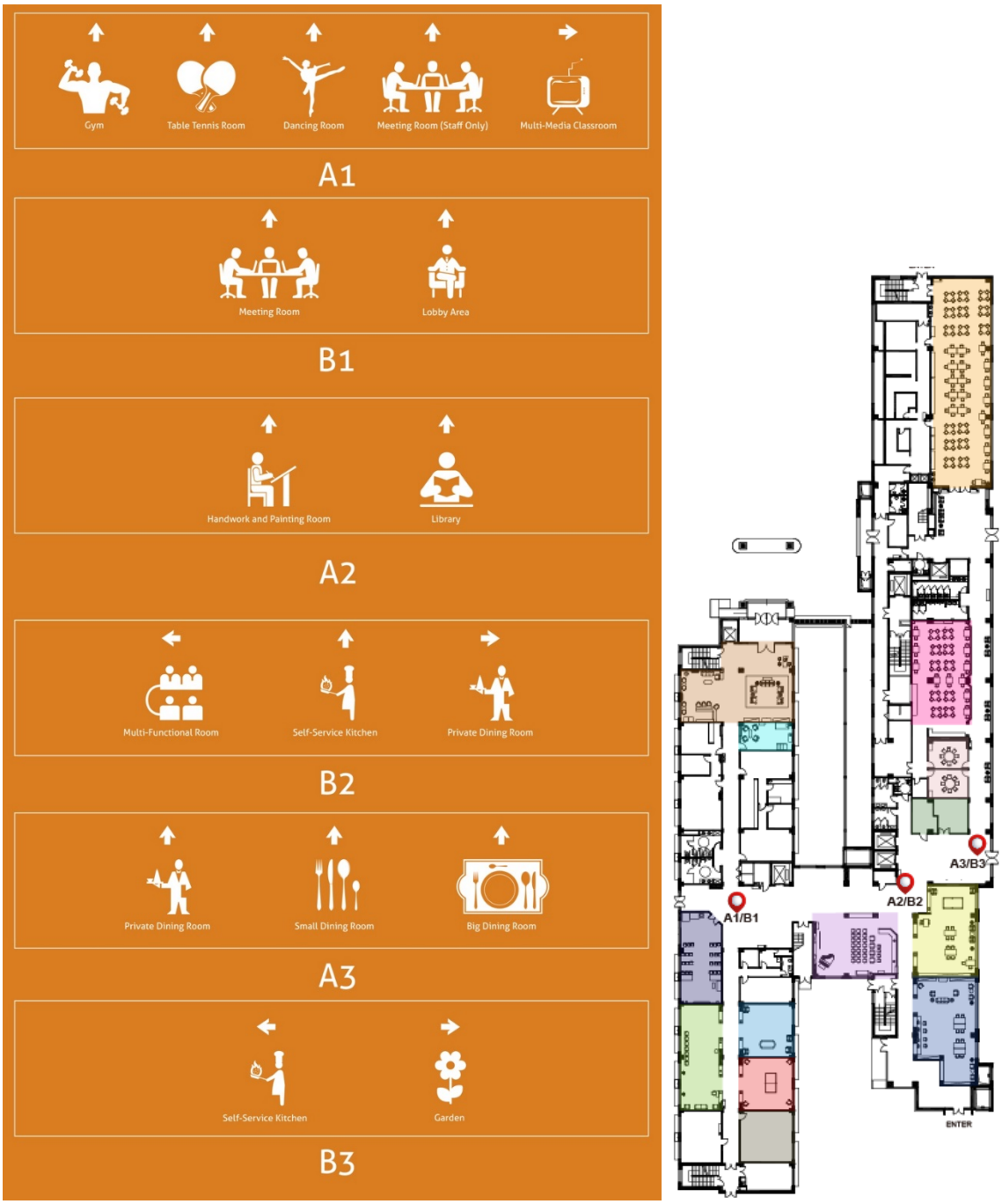


Figure 27. Directional signage examples and applications for corridors and hallways

Artificial Lighting

Most areas in this facility use energy saving light bulbs which are an appropriate selection for sustainable design. However, Light Emitting Diodes (LEDs) is a rapidly evolving technology and LED lighting uses at least 75% less energy than incandescent lighting. It also reduces operating and maintenance costs and lasts longer than both incandescent and fluorescent lighting. More importantly, LED lighting does not have flicker which is good for seniors' vision. Therefore, instead of exposed can light, covered LED down lights can be a great choice for the lighting plan of this facility's common areas to provide ambient and balanced lighting with residents.

Decorative wall sconces can be suggested in the corridor to provide ample lighting for residents walking and looking at the artwork on the wall, as well as the signage. Indirect wall sconces with light that is directed up are the better choice than spotlight or down lights because they can provide diffuse light in corridors without glare and produce fewer shadows which can cause seniors' confusion.

Some common areas provide table lamps, but there is no task lighting on the tables in the library, and the handwork and painting room. This type of lighting can provide high levels of illumination good for seniors' reading.

Figure 28 shows design solutions for the gym and table tennis room, as well as corridors with handrails, wall sconces, and room signage.

Figure 28. Design Solutions with handrails, wall sconces, room signage

CHAPTER FIVE: CONCLUSIONS

This chapter discusses the main research findings, limitations, implications and future research.

Discussion of Findings

Findings of this study indicated that there is a connection between the physical environment of the CCRC and senior's quality of life. Senior's quality of life can be enhanced by improving physical environments. The physical environments of CCRC common areas, such as layout, finished materials, lighting, furniture arrangement, and wayfinding system can enhance senior's safety, relationships, enjoyment, autonomy and choice in multiple ways.

This facility is the new type of the CCRC in China by applying appropriate interior design standards. The overall space planning is well designed and planned; for example, every room/area in the common areas are adjacent to elevators and restrooms so residents can easily access them from their resident units. However, some areas are not adjacent to staff offices. The rooms/areas which have similar functions have been grouped together. Therefore, even though most of the areas are open to corridors, there is no acoustic problem between the quiet zone (i.e. library, reading area) and the entertainment and activity zone (i.e. table tennis room, dancing room). The open wall system (opening with the low partitions) is an appropriate design solution for seniors because it can enhance the relationship between residents by making them easily access activities as well as insuring resident safety in an emergency situation by quickly calling staff members without any obstruction. Most of the common areas have enough

circulation space and clearance around furniture items that help residents safely walk around. A variety of types of furniture are arranged in each area to enhance resident's choice. Tables with rounded edges and seating with arms that can help seniors get in and out of the furniture are also related to resident's safety issue. The stackable chairs are easy to store, but the chairs in a multi-media classroom do not have upholstered back and seat and padded arms; as well, they have a low back, so they may not be comfortable for seniors to sit on during the whole class. Casters on front legs of the chairs is an appropriate furniture selection for a senior facility, particularly in dining areas, because they assist residents in pushing up to and back from a table. There is no working table for residents in this room, so the designer suggested the folding table in this room to meet resident's needs. All areas can receive sufficient daylight and access outside view through big windows, and these features can enhance residents' enjoyment.

The lighting plan in some areas and corridors does not meet senior's reduced visual acuity, so the researcher suggested new lighting plan for those areas. For example, decorative wall sconces as an accent light in the corridor not only provides ample lighting for residents' activities but also produce good low lighting without glare. Indirect recessed lighting in the table tennis room and gym can meet seniors' reduced vision demand. LED lighting has positive effects on health including reducing headaches, nausea, Alzheimer's disease and related dementias, mood disorders, stress, vision loss and eye disorders. In addition to the energy savings, the health benefits make LEDs the ideal choice for healthcare and senior living facilities. This facility applies safe and durable flooring materials (i.e. sprung wood flooring, commercial grade vinyl sheet, short

loop type carpet) that allow wheelchairs and walkers to move smoothly over them. The most important concept when designing the senior living environment is a home-like feeling, but the acoustic ceiling tile used in ceilings of common areas gives a hospital look. The acoustic coffered ceiling in the proposed self-service kitchen is suggested to retain the ambiance of hubbub, enhance the clarity of table top conversation and quiet intrusions from across the room. The hidden light can reduce the glare for seniors and produce a soft and homey atmosphere. Nice coffered ceilings replace the existing ceiling materials in this table tennis room; they are not only materials to give the homey feeling to residents but also manage noise control in large or small areas to keep acoustics in the balance for occupant comfort.

Handrails are installed in corridors for residents' safety, but the size and shape do not look easily grabbed by seniors. Furthermore, handrails in corridors of open common areas did not allow a continuous accessible path throughout common areas. The researcher designed a new handrail in the corridor by following the design guidelines to assist residents walking and in wheelchairs. Based on the survey and interview results with observation findings, the researcher designed the new staff working station which is located between the dining zone and quiet a zone, in the main circulation, and easily accessible from the elevator. When residents come down from the elevator, they can get daily information and services from the working station. The reception desk is wheelchair accessible and can meet individual needs. The researcher revised some common areas (i.e. game room,) that are not frequently used by residents to enhance resident's choice and enjoyment; for example, based on observation and survey questionnaires, as well as

the research, the game room was changed to a gym to enhance seniors' motivation to join in the activates. More importantly, seniors' fitness can be maintained and enhanced by exercise. There is a self-service kitchen designed by the researcher to enhance the relationship between residents or between residents and their families and friends. Self-service kitchen design also relates to several quality of life domains includes safety, enjoyment, privacy and choice.

Limitations

This study excluded the outdoor space and public living area in resident unit floors to investigate social relationships among residents from all floor levels and to focus more on design suggestions for the indoor space. These areas may be one of the important factors that can influence a resident's better quality of life and therefore the researcher needs to consider these areas in future research. There is a limitation to in-person survey because the researcher only collected data from residents who used common areas in the first floor level, but some residents may not frequently use the first floor common areas due to the distance from their resident units, no activity options that they like to join, and so on, therefore, the researcher might not collect data from those groups of seniors. However, their responses also would be beneficial to suggest design solutions to enhance the physical environment as well as resident's quality of life. There are more quality of life domains suggested by researchers in senior living field, so by considering other domains additional design solutions can be produces for senior living environments.

Implications

This research will contribute to the Chinese senior housing industry by incorporating the quality of life domains that emphasize human relationship, autonomy and choice, enjoyment, and safety into physical environment design. As a case study, this research can be an example for other researchers who are studying and developing guidelines for design of continuing care retirement communities in China. The survey interview questionnaires for residents, families and friends, and staff as well as physical environment observation checklist developed by the researcher may contribute to other researchers' instrument development and data collection. In China, more and more researchers focus on the senior living design area and it may draw more attentions to seniors' quality of life from society, the government and institution to seniors' quality of life that will result in the development of detailed design guidelines for senior living environments and successful application of these guidelines into design projects.

Future Recommendations for Research

A more comprehensive observation checklist and survey questionnaire can be developed to apply to different types of senior housing in China to examine seniors' needs and expectations about their living environments and quality of life. Due to the lack of detailed design guidelines for senior living environments in China, the recently developed and designed high quality of senior housing might apply international design standards and codes, but the cultural difference can influence residents' quality of life. Future research can consider the culture as an important variable to design senior housing in China. To do this, first interior design codes, standards and guidelines from other

developing countries with the Chinese situation can be combined to suggest a detailed interior design guidance for senior living in China.

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APPENDIX 1: SURVEY QUESTIONS FOR RESIDENTS

[Demographics]

1. What is your gender?
   ① Male
   ② Female

2. What is your age?
   ① Less than 60 years old
   ② 61-65 years old
   ③ 66-70 years old
   ④ 70-75 years old
   ⑤ 76-80 years old
   ⑥ 813and over

3. How long have you lived in this facility?
   ① Less than 1 year
   ② 1 year
   ③ 2 years
   ④ 3 years
   ⑤ 4 years

4. What factors made you select this facility?
   ① Uncared-for
   ② Concern about health or spouse's health
   ③ Desire for social activities
   ④ Desire for a low maintenance housing option
   ⑤ Not convenient living with family
   ⑥ Better living environments
   ⑦ Others

5. How many family members are living together?
   ① Living alone
   ② Living with a spouse
   ③ Living with a friend
   ④ Others

6. What's your walking ability?

① Independent walking
② Walking with cane
③ Part-time wheelchair using
④ Full-time wheelchair using
⑤ Others

7. What are your main health issues? Please check all.
   ① Vision and eye problem
   ② Dementia
   ③ Walking disability
   ④ Arthritis
   ⑤ Respiratory diseases
   ⑥ Depression
   ⑦ Others

8. What physical environment factors of common areas in this facility are helpful for your health conditions? Please select all.
   - Furniture size, type, and arrangement
   - Finish materials
   - Lighting conditions
   - Handrails
   - Easy to find way
   - Clean and free of odors
   - Access to daylight
   - Having an outside view
   - A variety of activity areas
   - Others

[Quality of Life Domains – Safety, Enjoyment, Relationships, Autonomy and Choice]

1. How frequently do you use the following common areas in this facility?
   1= Never, 2 = one to two times per week, 3 = three to four times per week, 4= five to six times per week, 5 = More than seven times per week
   1) Lobby
   2) Hairdressing and beauty
   3) Handwork and painting room
   4) Library
   5) Table tennis room
   6) Pool table room
   7) Gym
   8) Dancing class room

9) Multi-media classroom
10) Meeting room
11) Reading area (newspaper and online search)
12) Private dining room
13) Small dining room
14) Big dining room

2. On a scale of 1 to 5, where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, and 5=Strongly Agree, please indicate your opinions concerning the following physical environment characteristics of common areas in this facility:
   1) The floor plan in common areas is easy to navigate
   2) Doorways, hallways, and rooms in common areas are accommodating to wheelchairs and walkers
   3) Floor materials are safe for walking and activities
   4) Handrails are available to aid in walking
   5) The common areas are clean and free of odors
   6) Materials used in common areas are attractive and aesthetically pleasing
   7) The facility has outdoor spaces for residents to socialize with each other
   8) The common areas have sufficient daylight

3. How can you find your way in common areas?
   ① Use of the signage system
   ② Materials and color used in each room and corridors
   ③ Floor layout with a map
   ④ Memory of way
   ⑤ There are no cues for finding way
   ⑥ Others ( )

4. Which common areas' lighting conditions make you feel uncomfortable when conducting any activities? Please select all.
   ① Lobby
   ② Hairdressing and beauty
   ③ Handwork and painting room
   ④ Library
   ⑤ Table tennis room
   ⑥ Pool table room
   ⑦ Gym
   ⑧ Dancing class room
   ⑨ Multi-media classroom
   ⑩ Meeting room
   ⑪ Reading area (newspaper and online search)

⑫ Private dining room
⑬ Small dining room
⑭ Big dining room

5. Please tell me why the lighting condition in those areas make you uncomfortable to conduct any activities? Select all.
   ① Insufficient light – not enough light for the need
   ② Glare – too much light for the need
   ③ Improper contrast
   ④ Poorly distributed light
   ⑤ Frequently Flicker
   ⑥ No or not sufficient daylight
   ⑦ No personal lighting control options
   ⑧ Others

6. On a scale of 1 to 5, where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, and 5=Strongly Agree, please indicate your opinions concerning the following furniture characteristics of common areas in this facility:
   1) Furniture is aesthetically pleasing
   2) Furniture is functional and comfortable
   3) Furniture is the correct size
   4) Furniture is safe with firm cushions, arms, and back supports
   5) Furniture is clean and durable
   6) Furniture is easy to get into and out of even for those with limited mobility
   7) Furniture arrangement allows for safe mobility
   8) Furniture type and arrangement enhance social relationships between residents
   9) Common areas provide multiple furniture options for residents' choice

7. Do you need assistant when you take a shower or a bath?
   ① YES
   ② NO

8. What type of the bathing area do you prefer if this facility provides it in common areas?
   ① I will take a shower and a bath in public bathing area
   ② I will take a shower and a bath in private bathing area
   ③ Either public bathing area or private bathing area is good for me
   ④ I will never use it

9. On a scale of 1 to 5, where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, and 5=Strongly Agree, please indicate your opinions concerning the following choice issues

in common areas of this facility:

1) Residents can access and use any common areas whenever they want
2) This facility provides a variety of different activities
3) Residents can choose any activities provided by this facility whatever they want to participate in
4) Residents can conduct any activities whenever they want
5) Residents can choose seats in dining areas
6) There are menu choices at meals
7) Residents have the opportunity to be involved in decision-making about the material and furniture selection in commons areas
8) Residents' families and friends are allowed to join residents for meals
9) Daily schedules of activities and events are clearly posted and residents can easily check schedules

10. How would you rate the overall room availability to socialize with other residents in common areas?
    ① Very poor
    ② Poor
    ③ Fair
    ④ Good
    ⑤ Very Good

11. Which common areas do you prefer to socialize with other residents? Please select three.
    ① Lobby
    ② Hairdressing and beauty
    ③ Handwork and painting room
    ④ Library
    ⑤ Table tennis room
    ⑥ Pool table room
    ⑦ Gym
    ⑧ Dancing class room
    ⑨ Multi-media classroom
    ⑩ Meeting room
    ⑪ Reading area (newspaper and online search)
    ⑫ Private dining room
    ⑬ Small dining room
    ⑭ Big dining room

12. Please tell me why you prefer those common areas to socialize with other residents? Select all.
    ① Time flexibility

② Multiple furniture options
③ Comfortable environments
④ Convenient location
⑤ Meal and drinking options
⑥ Easy to communicate with other residents
⑦ Others

13. Are common areas of this facility convenient for frequent visits by family and friends? If YES, skip to Q15. If NO, please answer the following question.
    ① YES
    ② NO

14. If NO about Q13, what is the main reason?
    ① No common areas available for the early or the late visit of family and friends
    ② No common areas available for the overnight stay of family and friends
    ③ No visual and sound privacy in common areas when meeting with family and friends
    ④ Others

15. Which common areas do you prefer to meet with your family and friends? Please select three.
    ① Lobby
    ② Hairdressing and beauty
    ③ Handwork and painting room
    ④ Library
    ⑤ Table tennis room
    ⑥ Pool table room
    ⑦ Gym
    ⑧ Dancing class room
    ⑨ Multi-media classroom
    ⑩ Meeting room
    ⑪ Reading area (newspaper and online search)
    ⑫ Private dining room
    ⑬ Small dining room
    ⑭ Big dining room

16. Please state why you prefer those common areas to meet with your family and friends.
    ① Time flexibility
    ② Multiple furniture options
    ③ Comfortable environments

④ Convenient location
⑤ Privacy (sound and visual privacy)
⑥ Meal and drinking options
⑦ Others

17. On a scale of 1 to 5, where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, and 5=Strongly Agree, please indicate your opinions concerning the following relationships with staff in common areas of this facility:
    1) This facility provides activities to enhance relationships between residents and staff
    2) Staff are available to provide 24-hour assistance with activities of daily living (ADLs: eating, bathing, dressing, toileting, transferring, continence) if residents need in common areas
    3) Residents can easily meet with staff in their offices

18. In which common areas can you easily get access to staffs? Please select all.
    ① Lobby
    ② Hairdressing and beauty
    ③ Handwork and painting room
    ④ Library
    ⑤ Table tennis room
    ⑥ Pool table room
    ⑦ Gym
    ⑧ Dancing class room
    ⑨ Multi-media classroom
    ⑩ Meeting room
    ⑪ Reading area (newspaper and online search)
    ⑫ Private dining room
    ⑬ Small dining room
    ⑭ Big dining room

19. Please state why you think you can easily get access to staff in those common areas?
    ① There is a phone for residents to call staff in those common areas
    ② Those areas are close from staff offices
    ③ There is a staff working station in those common areas
    ④ Staff keep watching residents in those common areas
    ⑤ Others
20. In which common areas can't you easily get access to staff? Please select all
    ① Lobby
    ② Hairdressing and beauty
    ③ Handwork and painting room
    ④ Library

⑤ Table tennis room
⑥ Pool table room
⑦ Gym
⑧ Dancing class room
⑨ Multi-media classroom
⑩ Meeting room
⑪ Reading area (newspaper and online search)
⑫ Private dining room
⑬ Small dining room
⑭ Big dining room

21. Please state why you think you can't easily get access to staff in those common areas?
    ① There is no phone for residents to call staff in those areas
    ② Those areas are not close from staff offices
    ③ There is no staff working station in those common areas
    ④ No staff keep watching residents in common areas
    ⑤ Others

22. How would you rate your satisfaction with your overall quality of life in this facility?
    ① Very dissatisfied
    ② Somewhat dissatisfied
    ③ Neither dissatisfied nor satisfied
    ④ Somewhat satisfied
    ⑤ Very satisfied

23. How would you rate your satisfaction with the overall quality of common areas?
    ① Very dissatisfied
    ② Somewhat dissatisfied
    ③ Neither dissatisfied nor satisfied
    ④ Somewhat satisfied
    ⑤ Very satisfied

24. On a scale of 1 to 5, where 1=Very Dissatisfied, 2=Somewhat Dissatisfied, 3=Neither Dissatisfied or Satisfied, 4=Somewhat Satisfied, and 5=Very Satisfied, please rate your satisfaction with each common area in this facility.
    ① Lobby
    ② Hairdressing and beauty
    ③ Handwork and painting room
    ④ Library
    ⑤ Table tennis room
    ⑥ Pool table room

⑦ Gym
⑧ Dancing class room
⑨ Multi-media classroom
⑩ Meeting room
⑪ Reading area (newspaper and online search)
⑫ Private dining room
⑬ Small dining room
⑭ Big dining room

25. What new common areas do you think that this facility needs to provide for residents? Please state the reason.

26. Please give me some suggestions about common areas in this facility to enhance your quality of life.

APPENDIX 2: SURVEY QUESTIONS FOR FAMILIES AND FRIENDS

1. What's the relationship between you and the resident?
   ① Parents and children
   ② Relative
   ③ Friends
   ④ Others

2. How often do you visit the resident living in this facility? ( ) per week

3. Normally, how many people comes with you? ( ) people

4. Can you visit the resident at any time? If NO, please answer the following Q5. If YES, skip to Q6.
   ① YES
   ② NO

5. What factors make it hard for you to visit the resident at any time?
   ① The facility is not open in the early morning and late night
   ② There is no meeting area available in this facility
   ③ The resident is living with other people
   ④ Others

6. For which of the following areas would you most prefer to meet with the resident when you visit this facility? Please select two.
   ① Lobby
   ② Resident's unit
   ③ Library
   ④ Private Dining Room
   ⑤ Small Dining Room
   ⑥ Big Dining Room
   ⑦ Meeting room
   ⑧ Others

7. Please give more comments about Q4: why do you prefer to meet with the resident in those areas?

8. Have you ever stayed here overnight? If YES, please answer the following Q9 to Q10. If

not, skip to Q11.

① YES
② NO

9. If you say YES to Q8, what area do you normally use to stay overnight or for a few days?
   ① Resident' room
   ② Guest room type of area
   ③ Other

10. How would you rate your overall satisfaction with your overnight stay in this facility?
   ① Very dissatisfied
   ② Somewhat dissatisfied
   ③ Neither dissatisfied nor satisfied
   ④ Somewhat satisfied
   ⑤ Very satisfied

11. If you selected "1" and "2" about Q10, would you give me comments why you are not satisfied with your stay overnight in this facility?

12. If you selected "4" and "5" about Q10, would you give me comments why you are satisfied with your stay overnight in this facility?

13. How would you rate your overall experience when you visit and stay in this facility?
   ① Very poor
   ② Poor
   ③ Fair
   ④ Good
   ⑤ Very Good

14. Please give me more comments and suggestions about common areas of this facility for your future visit.

APPENDIX 3: INVERVIEW QUESTIONS FOR STAFF

1. How long have you worked in this facility?
2. Would you state your job responsibility in this facility? For example, administrative/management, social activities, nursing, housekeeping/maintenance, food services.
3. How many hours do you work every day?
4. How many residents do you need to care every day?
5. For those residents needing personal care, is the same caregiver consistently assigned to them?
6. Would you please tell me what physical environment factors of common areas make you feel it is hard to care for residents?
7. Would you please state how well you like your working spaces?
8. Can you give responses for timely assistance to residents who use common areas? If not, why?
9. Which common area is residents' favorite one?
10. Overall, how satisfied or dissatisfied are you working in this facility?
11. Would you please state any final comments what physical environments of common areas and staff offices in this facility need to be improved for the staffs' quality of life and interactions with residents?

APPENDIX 4: INTERVIEW QUESTIONS FOR A MANAGER

1. What is your staff-to-resident ratio?
2. What kind of experience and training does your staff possess?
3. How many staff are on duty overnight?
4. What kinds of activities are offered in this facility and who schedules them?
5. Is there an organized activities program with a posted daily schedule of events?
6. What is the average of residents' participation in each activity?
7. Is there any common area that is open at all times for residents? If so, what supplies are available?
8. Are there any classes offered in common areas?
9. Do residents have opportunity to be involved in suggesting activities and events?
10. Do residents have opportunity to be involved in decision-making about the material and furniture selection in commons areas?
11. What kinds of meal service do you offer and do residents have many choices as to what to eat?
12. What kinds of methods are managers and staff using to communicate with residents?

APPENDIX 5: SURVEY QUESTIONS FOR RESIDENTS (CHINESE)

居民问卷调研和面谈

【人口学的】

1. 您的性别？
   - ① 男
   - ② 女

2. 您的年纪？
   - ① 60 岁以下
   - ② 61-65 岁
   - ③ 66-70 岁
   - ④ 70-75 岁
   - ⑤ 76-80 岁
   - ⑥ 81 岁以上

3. 您在这儿居住多久了？
   - ① 少于一年
   - ② 一年
   - ③ 两年
   - ④ 三年
   - ⑤ 四年

4. 您选择这个老年公寓的原因？
   - ① 无人照顾
   - ② 为自己或者配偶的健康考虑
   - ③ 渴望社交活动
   - ④ 和家人住一起不方便
   - ⑤ 更好的居住环境
   - ⑥ 其他

5. 您现在的居住情况？
    ① 独自居住
    ② 和配偶一同居住
    ③ 和朋友一起居住
    ④ 其他

6. 您的行走能力？
    ① 独立行走
    ② 需要拐杖行走
    ③ 偶尔需要轮椅代步
    ④ 完全需要轮椅代步

7. 您主要的健康问题？
    ① 视力问题
    ② 老年痴呆
    ③ 行走问题
    ④ 关节问题
    ⑤ 呼吸道问题
    ⑥ 情绪问题
    ⑦ 其他

8. 在这间养老公寓，什么物质环境因素对您的健康情况有益？请选择。
    - 家具尺寸，类型，摆放。
    - 地板，墙面，天花板的材料和颜色。
    - 灯
    - 栏杆扶手
    - 容易找到路
    - 干净新鲜的空气
    - 日光
    - 室外景色
    - 多种多样的活动区域
    - 其他

【品质生活领域——安全，享受，与他人关系，自主选择】

1. 您使用一下公共区域频率

1= 从不， 2=一周一至两次，3=一周三至四次， 4=一周五至六次， 5=一周七次或七次以上

1) 大堂
2) 美容美发店
3) 手工和画画教室
4) 图书馆
5) 乒乓球室
6) 台球室
7) 健身房
8) 舞蹈教室
9) 多媒体教室
10) 会议室
11) 网上阅读和休闲区
12) 包间
13) 小餐厅
14) 大餐厅

2. 从 1-5，1=强烈不同意，2=不同意 3=中立 4=同意 5=强烈同意，请对老年公寓中以下公共区域的环境表明你的观点：

1) 公共区域容易到达
2) 行人和轮椅容易使用公共区域的门口，走廊。
3) 行走和活动安全的地面材料
4) 扶手能帮助老人行走
5) 公共区域干净和情节的气味
6) 公共区域的材料迷人和给人视觉上的愉悦
7) 老年公寓有室外区域给老人社交活动
8) 公共区域有充足的日照

3. 如何找到你想到达的公共区域？

1) 使用视觉系统
2) 材料和颜色的使用在每一个区域和走廊
3) 平面图
4) 记忆
5) 没有线索寻找
6) 其他

4. 以下哪个公共区域的灯光使你觉得不舒服？
① 大堂
② 美容美发店
③ 手工和画画教室
④ 图书馆
⑤ 乒乓球室
⑥ 台球室
⑦ 健身房
⑧ 舞蹈教室
⑨ 多媒体教室
⑩ 会议室
⑪ 网上阅读和休闲区
⑫ 包间
⑬ 小餐厅
⑭ 大餐厅

5. 请告诉我当您活动时，以下哪些区域的灯光情况会让您不舒服？
① 光线不足——
② 刺眼——
③ 不适当的对比——
④ 分布不足——
⑤ 频繁的闪烁——
⑥ 没有足够的日光——
⑦ 没有个人可控制的灯
⑧ 其他

6. 从 1-5，1=强烈不同意，2=不同意 3=中立 4=同意 5=强烈同意，请对老年公寓中以下公共区域的环境表明你的观点：

1) 家具美观
2) 家具舒适实用
3) 家具尺寸正好
4) 家具有安全的垫子，扶手和靠背
5) 家具干净和耐用
6) 家具容易实用
7) 家具摆放允许安全移动
8) 家具类型和摆放有助于老年人门活动交流
9) 公共区域提供多种家具类型供老年人选择

7. 您洗澡时候需要别人辅助么？

① 需要
② 不需要

8 您希望老年公寓在公共区域提供哪种洗浴方式？

① 我希望在公共浴室淋浴和沐浴
② 我希望在公共区域的单人浴室淋浴和沐浴
③ 公共浴室和单人浴室都可以
④ 我不会用公共浴室

9. 从 1-5，1=强烈不同意，2=不同意 3=中立 4=同意 5=强烈同意，请对老年公寓中以下公共区域的环境表明你的观点：

1) 居民可以进入并使用公共区域当他们有需要时。
2) 老年公寓提供各种不同种类的活动。
3) 居民可以选择是否参加老年公寓提供的各种活动。
4) 居民可以参加任何活动当他们希望加入时。
5) 居民可以选择餐厅的座位。
6) 用餐时有菜单，可以自己点菜。
7) 居民有机会参与老年公寓公共区域家具和材料的选择
8) 居民的家人和朋友有被允许一起参加老年公寓的活动

9) 居民可以容易的查阅老年公寓日常活动安排

10.总体来说你对公共区域内与其他居民互动满意度？

① 非常不满意
② 不满意
③ 一般
④ 满意
⑤ 非常满意

11.你希望在以下哪些区域与其他居民互动交流？多项选择

① 大堂
② 美容美发店
③ 手工和画画教室
④ 图书馆
⑤ 乒乓球室
⑥ 台球室
⑦ 健身房
⑧ 舞蹈教室
⑨ 多媒体教室
⑩ 会议室
⑪ 网上阅读和休闲区
⑫ 包间
⑬ 小餐厅
⑭ 大餐厅

12.请告诉我为什么你希望在那些公共区域与其他居民互动？多项选择。

① 时间便利
② 多种家具选择
③ 舒适的环境
④ 便利的位置
⑤ 食物和饮品的选择
⑥ 容易与别人交谈
⑦ 其他

13.老年公寓的公共区域方便家人和朋友随时访问？如果是的请调到 15 题，如果不是请回答 14 题。

① 是的
② 不是

14.如果 13 题选择不是，什么是主要的原因？

① 没有公共区域允许朋友和家人早晨或晚上来访。
② 没有公共区域供朋友家人过夜。
③ 公共区域没有视觉和谈话的隐私。
④ 其他

15.以下哪些公共区域，你愿意会见你的朋友和家人？多项选择。

① 大堂
② 美容美发店
③ 手工和画画教室
④ 图书馆
⑤ 乒乓球室
⑥ 台球室
⑦ 健身房
⑧ 舞蹈教室
⑨ 多媒体教室
⑩ 会议室
⑪ 网上阅读和休闲区
⑫ 包间
⑬ 小餐厅
⑭ 大餐厅

16. 请问为什么你愿意在那些公共区域会见你的家人和朋友？

① 时间灵活
② 多种家具选择
③ 舒适的环境
④ 便利的位置

⑤ 食物和饮品的选择
⑥ 容易与别人交谈
⑦ 其他

17. 从 1-5，1=强烈不同意，2=不同意 3=中立 4=同意 5=强烈同意，请对老年公寓公共区域与护理人员的互动关系表明你的观点。

1） 老年公寓举行活动促进居民与护理人员的关系。

2） 员工能提供 24 小时的日常生活照顾。（吃饭，沐浴，穿衣，上厕所，移动）如果老年人在公共区域时需要这些照料。

3） 员工可以很容易的见到员工

18.在以下哪些公共区域你可以很容易找到护理人员？多项选择。

① 大堂
② 美容美发店
③ 手工和画画教室
④ 图书馆
⑤ 乒乓球室
⑥ 台球室
⑦ 健身房
⑧ 舞蹈教室
⑨ 多媒体教室
⑩ 会议室
⑪ 网上阅读和休闲区
⑫ 包间
⑬ 小餐厅
⑭ 大餐厅

19.请选择那些区域为什么你可以容易找到护理人员？

① 那些公共区域有电话或呼叫设施可以随时找到护理人员
② 那些公共区域离护理人员办公室很近
③ 那些公共区域有护理站
④ 有会人员在公共区域巡视
⑤ 其他

20 那些公共区域你很难找到护理人员

① 大堂
② 美容美发店
③ 手工和画画教室
④ 图书馆
⑤ 乒乓球室
⑥ 台球室
⑦ 健身房
⑧ 舞蹈教室
⑨ 多媒体教室
⑩ 会议室
⑪ 网上阅读和休闲区
⑫ 包间
⑬ 小餐厅
⑭ 大餐厅

21.请说明你在哪些公共区域为什么很难找到护理人员？

① 那些公共区域没有电话和呼叫设施
② 那些区域离护理人员办公室很远
③ 那些公共区域没有护理站
④ 那些公共区域没有巡视人员
⑤ 其他

22.您在对年年品质生活在这个老年公寓满意程度怎么样？

① 非常不满意
② 有时不满意
③ 一般
④ 有时满意
⑤ 非常满意

23. 从 1-5，1=强烈不同意，2=不同意 3=中立 4=同意 5=强烈同意，请对以下公共区域满意度打分。

a) 大堂
b) 美容美发店
c) 手工和画画教室
d) 图书馆
e) 乒乓球室
f) 台球室
g) 健身房
h) 舞蹈教室
i) 多媒体教室
j) 会议室
k) 网上阅读和休闲区
l) 包间
m) 小餐厅
n) 大餐厅

24.您希望老年公寓提供哪些新的公共区域给居民，请说明原因。

25.请给我一些关于公共区域能提高您生活品质的建议。

APPENDIX 6: SURVEY QUESTIONS FOR FAMILIES AND FRIENDS (CHINESE)

1. 您和老人的关系？
    1. 父母与子女
    2. 亲属
    3. 朋友
    4. 其他

2. 您看看老人的次数？（　　）次/每周
3. 通常几个人会和您一起来？（　　）个人
4. 您能随时来看望老人么？如果不能请回答第 5 题，如果可以请调到第 6 题.
    1. 可以
    2. 不可以
5. 什么因素导致你不能随时来看望老人？
    1. 老年公寓早晨和晚上不开门。
    2. 没有开放的公共区域
    3. 老人和他人住在一间屋子
    4. 其他
6. 您喜欢和老人在以下哪些公共区域会面，请选择两个。
    1. 大堂
    2. 房间
    3. 图书馆
    4. 小包厢
    5. 小餐厅
    6. 大餐厅
    7. 会议室
    8. 其他

7. 请给问题 4 一些补充。为什么您喜欢在那些公共区域与老人会面。

8. 您曾经在这里过夜过么？如果是请回答第 9 题，第 10 题，如果不是请调到第 11 题。
    1. 有
    2. 没有

9. 如果第 8 题回答是的，通常您会在哪里过夜或者居住几天？
    1. 老人的房间
    2. 客房
    3. 其他

10. 总体来说你对公共区域内与其他居民互动满意度？
    ⑥ 非常不满意
    ⑦ 不满意
    ⑧ 一般
    ⑨ 满意
    ⑩ 非常满意

11. 如果您第 10 题选择“1”或者 “2“，能否告诉我为什么您留在这过夜会让您不满意？

12. 如果您第 10 题选择 “4”或者“5”，能否告诉我为什么你在这儿过夜会感到满意？

13. 总体来说当您访问这个老年公寓是怎么样的体验？
    1. 非常不好
    2. 不好
    3. 一般
    4. 好
    5. 非常好

14. 请给我一些关于老年公寓公共区域的意见。

APPENDIX 7: INTERVIEW QUESTIONS FOR STAFF (CHINESE)

1. 您在这里工作多久了？
2. 您在这里的工作职责？例如行政/管理，社会活动，护士，保洁/维护，食物准备。
3. 您一天工作几个小时？
4. 您一天需要照顾多少老人？
5. 当老人需要照顾时候，您照顾指定的老人？
6. 请您告诉我公共区域的哪些因素使您感到难以照顾老人？
7. 您能告诉我您喜欢这里的工作么？
8. 当老人需要您时，你能及时给予他们帮助吗？如果不能，为什么？
9. 哪一个公共区域是老年人最喜欢的？
10. 总体来说，您对您的工作满意么？
11. 您能告诉我哪些公共区域和员工办公室需改进？

APPENDIX 8: INTERVIEW QUESTIONS FOR A MANAGER (CHINESE)

1. 医护人员和居民的比例？
2. 医护人员有怎么样的培训程序？
3. 晚上有多少医护人员值班？
4. 老年公寓有什么样的活动，谁来做日程安排？
5. 有没有有组织的活动日程安排和通知体系？
6. 老人参加活动的平均比例？
7. 有没有 24 小时开放给老人的公共区域？如果有，哪些东西有供应？
8. 公共区域有没有公共课程？
9. 老人是否有机会参与活动的建议？
10. 老年人有没有机会参与公共区域家具和材料的选择？
11. 老年公寓提供了哪些类型的用餐？老年人能否选择他们想吃的食物？
12. 经理和护理人员用哪些方式与老人交流？