

Respond to the Social Crisis of Aging with Smart Pension

Shaoze Wang

RGS GUILDFORD NANJING, Nanjing, 210031, China

Shaoze09@outlook.com

Abstract. Population aging has become a significant challenge facing the world in the 21st century. China is expected to enter a super-aged society by 2035. This will pose immense challenges to society, such as in healthcare, elder care, and labor force issues, where traditional solutions are no longer sufficient to meet the deepening trend of aging. Smart elderly care technology offers a new solution to address this aging issue. This paper examines the specific situations and practical cases of China, Singapore, and Japan, exploring the multifaceted applications of smart elderly care in the pursuit of healthy aging. This article will integrate the policies of the three countries to create a systematic response plan addressing the challenges of aging. However, at present, intelligent elderly care still faces various issues, including fiscal pressures, significant urban-rural disparities, uneven acceptance levels, and unresolved safety concerns. In the future, the government must enhance policy development, innovate new technologies, and integrate technology into cultural and institutional aspects to promote personalized, low-cost, highly accepted, and safe intelligent elderly care services.

Keywords: Smart Elderly Care, Aging Population, Internet of Things, AI, Healthy Aging.

1. Introduction

Since the 21st century, one of the most significant trends in human society has been population aging, which has now become a key issue faced by countries worldwide. According to United Nations data, by 2050, the global population aged 60 and over is expected to reach 2.1 billion, accounting for over 21% of the total global population [1]. In Asia, countries like China are experiencing a particularly rapid aging process; data shows that by 2024, the population aged 65 and above in China will be 220 million, making up 15.6% of the national population [2]. In Singapore, the proportion of the population aged 65 and over climbed dramatically from 7.2% in 2000 to 17.3% in 2023 and is projected to reach 22.1% by 2030 [3]. Japan has reached a figure of 35.712 million people aged 65 and over, accounting for 29.4% of its total population [4]. This further confirms the deepening trend of aging, and various countries are facing many severe challenges. In light of these issues, the traditional Family eldercare model is struggling to cope, necessitating new solutions. Smart cities, particularly through emerging digital technologies such as the Internet of Things, big data, and artificial intelligence, can effectively connect and optimally allocate resources related to individual, family, community, and healthy elder care through data value chain activities [5]. The practical cases from China, Singapore, and Japan utilizing smart cities to effectively mitigate the impact of an aging society are worth learning from [6, 7]. This paper aims to systematically analyze the application of smart elder care in response to the aging society, exploring its advantages, solutions, shortcomings, and development directions, providing a reference for policy formulation and program improvements.

2. Aging Social Challenges

2.1. Increasing Pressure on Medical Security

The elderly population has a higher prevalence of chronic diseases, requiring long-term treatment and consuming significant medical resources, thereby exacerbating the pressure on social medical security. As the number of retirees continues to rise, the number of individuals contributing to medical insurance has relatively decreased, while the number of claimants has increased, further intensifying the financial burden on medical security [8].

2.2. Decrease in Labor Force

The young labor force in various countries is significantly declining, leading to a shortage of new talent in numerous industries and a considerable reduction in the number of individuals engaged in manual labor. This is primarily due to the declining birth rates, which cannot sustain the normal replacement of employees. According to data from China's seventh national census, the population aged 60 and above in rural areas has reached 23.81%, indicating severe aging of the rural population and decreased agricultural productivity [9]. In Japan, 51% of companies report a lack of full-time employees [10].

2.3. Family-based Elder Care

China's fertility rate in 2024 is projected to be only 1.2, while the replacement level is 2.1. This indicates that China's fertility rate is far below the required standard, signifying that the population has already entered negative growth. The traditional model of relying on children to support their parents is becoming increasingly difficult to maintain. These issues highlight the urgent need for an innovative solution to family elder care, and the rapidly developing technology of smart cities offers a potential direction for addressing this challenge.

3. The Application of Smart Cities in the Path towards Healthy Aging

3.1. The Concept and Development of Smart Cities

The concept of smart cities was proposed by IBM in 2008, which refers to urban forms that utilize digital technology to enhance the management and service levels of cities [11]. In 2009, the first smart city, Dubuque, was established in the United States. Subsequently, cities such as Singapore, Tokyo, Shanghai, and Beijing have also emerged as advanced smart cities.

3.2. Core Technologies and Their Applications in Smart Cities

The core technologies of smart cities include the Internet of Things, big data, artificial intelligence, cloud computing, 5G communication, and so on. These technologies have extensive applications in elderly care, providing a more convenient and efficient array of diversified services for the elderly population

Internet of Things like the intelligent detection system can utilize artificial intelligence for monitoring in IoT scenarios. Wearable devices can monitor the physical data of the elderly in real time and use AI algorithms to predict anomalies. There are already practical cases internationally, such as Singapore's Health Hub system, which helps users conveniently manage the health information of family members, providing diagnostic efficiency and reducing time costs [12, 13]. Additionally, an app for dementia prevention has been developed, which records users' walking speed using GPS location data. It compares the average walking speed for the day with previous data, and if any anomalies are detected, it promptly issues an alert to assist users in early detection of conditions, thereby improving the cure rate and reducing medical costs [14]. As of the end of 2021, five batches of smart health and elderly care demonstration enterprises, parks, streets, and bases have been released, with a total of 634 smart health and elderly care application pilot projects established [15]. Guangzhou has relied on a unified smart elderly care service platform to provide home care services for the elderly and optimize the supply system for smart elderly care services [16].

Big Data Technology Big data can be statistically analyzed to aggregate information and facilitate analysis, which can be applied in multi-party monitoring and policy distribution. In Shanghai, a promotion and upgrade initiative has been carried out on a community level, integrating street-level elderly care service resources and exploring new models for smart elderly care services, leading to a new development in the smart elderly care industry [17]. Shenzhen has employed smart wristbands to monitor the location and physical condition of elderly individuals, analyzing health indicators and providing timely alerts to users and their families, thereby reducing the pressure on family care. In

Japan, big data is utilized for talent allocation; their silver-haired talent policy encourages seniors to re-enter the workforce, using big data analysis to identify suitable companies or professions for the elderly, which increases labor supply and reduces costs.

Artificial Intelligence In the era of artificial intelligence, rapid advancements in AI have provided immense computing power and automation, significantly reducing the difficulty and cost of intelligent elderly care. For instance, AI health management systems can offer personalized advice to patients with chronic diseases and issue timely alerts upon detecting abnormalities, while smart home systems can automatically adjust indoor environments when family members are not present, ensuring the safety of elderly individuals and alleviating the pressure of family caregiving. In 2018, Beijing, China established a smart elderly care demonstration station (Table 1), primarily utilizing intelligent terminal devices to monitor the health status of elderly individuals, create personalized profiles for them, and provide more targeted integrated services [18].

Table 1. Statistics on Smart Elderly Care Applications

Service Category	Specific service content
Health Monitoring Category	Real-time vital sign monitoring, sudden disease alert system, medication reminders, and case summaries.
Life Assistance Category	Smart home control, assistance from intelligent robots, online shopping, and automated delivery.
Security Assurance	Fall Detection Automatic Warning System, Position Tracking System, Surrounding Environment Monitoring System.
Resource Allocation Type	Automatic matching of healthcare personnel, government subsidy distribution, and precise allocation of reemployment policies.

4. International Case Application

4.1. Singapore Smart Nation 2025 Initiative

Since 2014, Singapore has launched the Smart Nation 2025 initiative, aiming to transform Singapore into an advanced smart nation within the next decade. This initiative utilizes core smart city technologies to improve urban governance and various social safeguards. It is divided into three phases first Initial phase, aimed at optimizing housing design and infrastructure to assist the elderly in achieving an independent and comfortable late life. Second Acceleration phase, addressing the deepening aging population, where the government explores diversified solutions for elderly care to tackle this issue. Finally Current phase, where the smart city has essentially been preliminarily established, with continuous development of various technologies and an increasing application of smart elderly care, further enhancing the smart elderly care system and strengthening its effectiveness. Singapore also embraces the concept of intelligent health assistance, which integrates humanity into technology through the use of smart monitoring systems and telemedicine, encouraging the elderly to actively participate in social activities, thus enabling them to integrate actively into society instead of merely receiving passive care, achieving healthy aging.

4.2. Examples of Smart Elderly Care in Japan

Dementia Prevention App: This software utilizes GPS location detection of users and stores the data in a database, comparing the data from the current day with previous data. If any anomalies are detected, timely alerts are issued. Policies for Silver-Haired Talent: Encouraging the reemployment of the elderly and using big data to match job opportunities with elderly individuals, catering to their skills and the broader demand. Online Administrative Services: To improve convenience and accelerate administrative efficiency for elderly individuals with mobility issues, online services have been established. Elderly individuals can first review policy information or handle business transactions online, significantly reducing time costs.

4.3. China's Smart Elderly Care

Transforming elderly care communities and building a network of elderly services. Utilizing the core technologies of smart cities, people can renovate elderly care communities and establish a better service system. First, the construction of smart elderly care communities requires technologies such as the Internet of Things (IoT) and artificial intelligence (AI) to monitor the health data of the elderly, enabling personalized services, such as elderly centers, fitness facilities within communities, and community medical institutions, thereby providing convenient services nearby. Second, the introduction of smart devices and technologies, such as smart locks and smart monitoring devices, enhances the convenience and security of the community. Additionally, training the elderly on how to use smart devices can help them acquire essential skills. Third, a smart medical model offers online consultation platforms, allowing elderly individuals to receive healthcare without having to leave their homes. By leveraging big data and artificial intelligence, people can provide appropriate health services for elderly people, including management of chronic diseases and guidance on medication usage. Furthermore, elderly individuals can access medical information through devices, schedule appointments, and consult doctors, thus enjoying telehealth services. Fourth, online social participation enables the elderly to meet new friends and engage in activities and chats via online platforms, helping alleviate feelings of loneliness. They can also explore famous sites, play games, and watch online television through the internet, enriching their leisure lives.

5. Directions for Reform and Recommendations

5.1. Optimize Costs and Increase Financial Support

Most agents utilizing smart city technologies face the issue of excessively high costs. It is necessary to balance the quality of technological services with usage costs, reduce unnecessary expenditures, allocate funds to crucial areas, and seek social capital to collaborate with others, ensuring sustainable development.

5.2. Narrowing the Regional Gap in Welfare

Due to differences in fiscal revenue, population, and transportation across various areas, there are significant disparities in retirement benefits between urban and rural areas. The protection enjoyed by people in different places varies. It is necessary to establish a unified standard for pension between urban and rural areas, allowing regions with high fiscal revenues to provide financial policy support to low-income areas, thereby achieving balanced pension distribution.

5.3. Enhance Technology Acceptance

Due to the varying levels of economic development in different regions, as well as differences in age and education among the elderly, their acceptance of new technology varies widely. It is advisable to conduct training on smart devices for seniors, ensuring that they are capable of using the equipment. Furthermore, establishing suitable service survey methods is crucial to ensure elderly satisfaction, and incorporating this data into government assessments.

5.4. To Ensure Data Security

An intelligent monitoring and early warning system will inevitably collect user information. To ensure the proper handling of user information, it is necessary to establish a unified digital security standard, implement secure methods for data transportation, utilize AI monitoring, impose restrictions on data exports, define rules to protect against data leaks, and appoint responsible individuals.

5.5. Technological Innovation

Most products today are still limited to devices like detection wristbands. In order to improve usage rates and convenience, as well as enhance the efficiency of smart elderly care, it is necessary to develop diversified and personalized elderly care products.

6. Conclusion

Intelligent aging is still in its initial stages in China, with various issues arising during implementation. For instance, the returns on intelligent aging services are not very ideal, as these projects require high investment and cost. A significant amount of time and effort is spent in the early stages; however, they do not achieve general acceptance among the elderly during practical operation. The high costs and prices are primary reasons for resistance among the elderly. Additionally, the ease of operation is a concern, as many elderly individuals struggle even with basic devices like smartphones. Improvements are necessary in these two areas moving forward. Government departments can collaborate with elderly care institutions, procuring equipment directly from factories to reduce costs. For training on basic device operation, community organizations could offer free courses, targeting family members, staff from care institutions, and capable elderly individuals living independently. This approach can help quickly grasp new technologies and significantly aid the promotion of intelligent aging. In the future, the intelligent aging industry will continue to mature; therefore, greater attention should be paid to hardware service products, ensuring that product standards are upheld upon leaving the factory. All product functions should be made acceptable to the elderly, avoiding overdevelopment of non-essential resources to prevent idleness and waste, thus establishing a basis for a diverse value network. Countries like Japan and Singapore, with smaller populations and a relatively even economic landscape but higher levels of aging, need to deepen the innovation of new technologies and applications while expanding the range of services. Given that the needs of elderly individuals vary based on different circumstances, future services should be tailored accordingly to provide personalized elderly care. Furthermore, long-term monitoring is necessary to evaluate how the application of new technologies affects the quality of life for the elderly. This evaluation must consider diverse perspectives, acknowledging that historical contexts and national circumstances differ across countries and regions, allowing for mutual learning and exchange. In conclusion, intelligent aging is not merely about providing technology to the elderly but rather about integrating technology with humanity, systems, and personalization in a systematic approach. It is the hope that intelligent aging can effectively address the challenges posed by an aging population in the future.

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