Research On the Implementation Path of Intelligent Technology Promoting Healthy Aging

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Abstract. With the acceleration of the aging process of the global population, smart healthcare technology has gradually become an important means to improve the quality of life of the elderly and optimize the allocation of medical resources. This article explores the concept of smart health care, its technical application, its impact on medical costs, and its social benefits. Smart healthcare technology covers many aspects such as smart health monitoring, telemedicine, and smart care. It can achieve early prevention of diseases, reduce hospitalization rates, and improve the efficiency of medical resource utilization. At the same time, it can alleviate social elderly care pressure and promote the development of the elderly care industry. However, this technology still faces challenges in data privacy protection and the technological adaptability of the elderly. In the future, with the continuous development of technologies such as artificial intelligence, big data, and 5G, as well as the strengthening of policy support, smart health care will play a greater role in improving the welfare of the elderly and promoting socially sustainable development.

Keywords: Smart health care; telemedicine; smart health monitoring; elderly care industry.

1. Introduction

As the global population ages, the challenges brought by aging have become an important issue that countries around the world need to address. According to United Nations statistics, by 2050, the global population over 60 years old will reach 2.1 billion, accounting for 22% of the global population. As one of the countries with the fastest aging rate, China's population over 60 years old has exceeded 280 million, accounting for nearly 20% [1].

With the rapid development of emerging technologies such as artificial intelligence, big data, and the Internet of Things, the concept of smart health care has emerged. Through these technologies, the health management of the elderly can be optimized, the quality of life can be improved, and the social burden can be reduced. Smart health care refers to the management of the health and quality of life of the elderly through advanced technical means. It includes technologies such as artificial intelligence, big data, the Internet of Things, and robots, which can provide remote health monitoring, personalized health services, and social interaction tools. Through these technologies, the vital signs of the elderly can be monitored in real time, and early diseases can be discovered through predictive analysis to formulate targeted health management plans. The practical application of smart healthcare technology is very extensive. First, the artificial intelligence system can monitor the health status of the elderly in real time and can promptly report an emergency. Big data analysis can process a large amount of health data, predict health trends, and implement early intervention [2]. IoT devices, such as wearable health trackers, can monitor the heart rate, blood pressure, and other vital signs of the elderly in real time. Once an abnormality is found, the system will sound an alarm. In addition, AI can also help reduce medical costs, choose the most effective treatment plan, and reduce hospitalization rates. In addition to its application in medical and health care, smart health care also plays an important role in mental health and social interaction. Many elderly people face loneliness and social isolation, and emerging technologies such as smart companion robots and remote social platforms can help the elderly stay in touch with family and friends, provide psychological support, and enhance happiness. Smart health care not only focuses on the physical health of the elderly but also pays attention to their psychological needs, thereby achieving comprehensive aging health management [3].

In summary, as an important means to cope with the aging of the population, smart health care can improve the health management level of the elderly, reduce the medical burden, and improve the quality of life. In the future, with the continuous advancement of technology and the change of social concepts, smart health care will become one of the important paths for the world to cope with the challenges of aging.

This study analyzes the path of smart health care and explores how to use advanced technology to promote the sustainable development of health care to meet the increasingly severe social needs.

2. Practical Application of Smart Healthcare Technology

2.1. Smart Health Monitoring

With the development of science and technology, smart healthcare technology is gradually changing the traditional elderly care model and improving the health management and quality of life of the elderly through intelligent means. Among them, smart health monitoring, telemedicine and smart care are important components of current smart elderly care technology. The application of these technologies can not only improve the convenience of life for the elderly, but also effectively reduce the waste of medical resources and optimize the social elderly care service system [4].

The application of smart health monitoring equipment plays an increasingly important role in the health management of the elderly. With the development of wearable devices and smart medical technology, many elderly people have begun to use smart watches, health trackers, and other devices to monitor their health in real time. For example, smart watches can monitor key health indicators such as heart rate, blood pressure, and blood oxygen saturation of the elderly and issue alarms in abnormal situations to remind the wearer or family members to take timely measures. Some high-end devices are also equipped with a fall detection function. When the wearer falls and fails to recover for a long time, it will automatically send a help signal to family members or medical institutions, thereby reducing the risk of accidents [5].

In addition, smart health monitoring equipment can also help doctors understand the physical condition of the elderly more comprehensively through data accumulation and analysis. For example, blood glucose monitors can automatically record the blood glucose fluctuations of the elderly and generate trend analysis reports based on historical data. Doctors can adjust treatment plans and optimize medication recommendations based on these data. For patients with cardiovascular diseases, remote ECG monitoring equipment can record ECG activity around the clock and notify doctors when abnormal heart rhythms are found, reducing the risk of sudden heart attacks. With the assistance of these smart devices, daily health management for the elderly has become more convenient and efficient.

2.2. Telemedicine

Telemedicine is an important part of smart health and elderly care technology, which can effectively alleviate the problems of difficulty in medical treatment for the elderly and uneven distribution of medical resources. For the elderly who are unable to move or live in remote areas, going to the hospital for face-to-face consultation often requires a long wait or a long journey, while telemedicine technology allows them to get professional advice from doctors at home.

At present, many medical institutions have established remote consultation platforms, where the elderly can make video calls with doctors through smartphones, tablets or special telemedicine equipment, consult health problems, and obtain diagnosis and treatment advice. For patients with chronic diseases, telemedicine can also provide long-term health management plans. Doctors can evaluate and adjust medication or lifestyle recommendations based on the health data uploaded by patients. This not only improves the utilization rate of medical resources but also reduces the inconvenience of frequent trips to and from the hospital for minor illnesses for the elderly.

In addition, some intelligent telemedicine devices can also achieve remote diagnosis and treatment. For example, portable ultrasound machines, remote ECG monitors, and other equipment allow

primary doctors or family members to complete basic examinations at home and then transmit the data in real time to professional doctors for diagnosis. This method is particularly suitable for the emergency treatment of sudden illnesses. For example, when the elderly suddenly has chest pain or difficulty breathing, they can quickly determine whether it is myocardial infarction or pulmonary embolism through remote ECG monitoring equipment, thereby improving the efficiency of treatment and reducing unnecessary waiting time.

2.3. Intelligent Care

In addition to health management and medical services, smart elderly care technology also plays an important role in the convenience and safety of the daily life of the elderly. The intelligent care system helps the elderly improve their quality of life and reduce their dependence on traditional caregivers through smart home devices, voice control technology and artificial intelligence assistants.

The smart home system is one of the more popular smart care methods. The elderly can control home appliances such as lights, curtains, TVs, air conditioners, etc., through voice, avoiding frequently getting up and operating due to mobility problems. For example, smart voice assistants can help the elderly set reminders for things such as taking medicine, drinking water, and exercising on time, thereby improving the regularity of life and the initiative of health management. Some high-end smart home systems are also equipped with automatic sensing functions. For example, when the elderly gets up at night, the sensor light will automatically light up to reduce the risk of falling.

In addition, smart companion robots are also an important innovation in smart elderly care. These robots can not only conduct simple conversations to alleviate the loneliness of the elderly but also provide entertainment, news broadcasts, health reminders, and other services. Some advanced companion robots can even judge the emotional state of the elderly through facial recognition technology and take the initiative to comfort and accompany the elderly when they are depressed. The application of this technology is particularly suitable for elderly people living alone or bedridden for a long time, which helps to improve their mental health and happiness in life.

In addition to smart homes and companion robots, smart elderly care communities are also a new model that has developed rapidly in recent years. Smart elderly care communities integrate technologies such as remote health monitoring, smart home control, and emergency assistance systems to provide a safer and more comfortable living environment for the elderly. For example, sensors in the community can monitor the daily activities of the elderly. Once a long period of inactivity or abnormal behavior is detected, the system will automatically notify community staff or family members to provide timely assistance. This community model not only improves the level of intelligence in elderly care services but also reduces the care pressure on family members and society.

3. The Role of Smart Healthcare Technology in Reducing Medical CostsRole of Smart Healthcare Technology in Reducing Medical Costs

With the increasing aging of the global population, medical expenses are becoming an important economic burden faced by governments and families. How to effectively reduce medical costs and improve the utilization rate of medical resources has become an urgent problem to be solved in the current medical and elderly care industries. The rapid development of smart healthcare technology has provided a new solution to this problem. Through intelligent monitoring, telemedicine, data analysis, and other means, smart healthcare technology can play an important role in preventing diseases, reducing treatment costs, and reducing hospitalization rates, thereby significantly reducing the pressure of medical expenses.

Traditional medical models are often based on treatment. Many diseases have developed to a more serious stage when diagnosed, requiring expensive drug treatment or surgery. Smart health care technology emphasizes the concept of "prevention first". With the help of smart monitoring equipment and data analysis, it can help the elderly detect health problems early, take intervention measures at the early stage of the disease, and reduce subsequent treatment costs. For example,

wearable health devices (such as smart watches, blood pressure monitors, blood glucose meters, etc.) can monitor key health indicators such as heart rate, blood pressure, and blood oxygen saturation in real time. Once an abnormality occurs, the system will issue an alarm in time to remind users to seek medical treatment as soon as possible to avoid minor illnesses from becoming major illnesses.

In addition, big data analysis and artificial intelligence technologies can predict individual health risks based on long-term health data and provide personalized health management plans. For example, by analyzing the diet, exercise and sleep of the elderly, the intelligent health management system can formulate scientific lifestyle adjustment suggestions for them to help them reduce the risk of chronic diseases, thereby reducing the long-term treatment costs caused by chronic diseases such as diabetes, hypertension, and heart disease.

Hospitalization expenses are an important part of medical expenses. Many elderly people need long-term hospitalization due to poor management of chronic diseases or sudden illnesses, which brings heavy economic pressure to individuals and families. Smart health and elderly care technology can reduce the demand for hospitalization to a certain extent and improve the utilization rate of medical resources.

First of all, the remote health monitoring system allows doctors to keep track of the patient's health status at any time and provide remote diagnosis and treatment suggestions, when necessary, preventing the elderly from frequently going back and forth to the hospital due to minor illnesses and reducing unnecessary outpatient and hospitalization. For example, some hospitals and nursing homes have established telemedicine platforms where the elderly can have video consultations with doctors through smartphones or other devices. Doctors can make diagnoses based on remote monitoring data and give medication or care advice, thereby reducing the deterioration of the condition due to lack of timely medical treatment, reducing the hospitalization rate.

Secondly, smart health warning systems can help the elderly prevent health risks in advance. For example, some smart mattresses can monitor the sleep status and heart rate of the elderly in real time and automatically send alarms to family members or medical institutions when abnormalities are detected, ensuring that the elderly can receive timely treatment in the event of sudden health conditions and avoid hospitalization due to delayed treatment. In addition, smart health devices can also help manage the medication use of the elderly, reminding them to take medication on time and reducing health problems caused by the improper use of drugs.

4. Social Benefits of Smart Healthcare Technology

4.1. Alleviating Social Pressure on Elderly Care

With the aging of the global population, the issue of elderly care has become the focus of attention of governments and society. Providing high-quality elderly care services for the growing elderly population with limited resources is a social challenge that needs to be solved urgently. The rise of smart healthcare technology provides an innovative solution to this problem. Through the application of advanced technologies such as artificial intelligence, big data, and the Internet of Things, smart elderly care can not only alleviate social elderly care pressure and reduce the economic burden of the government and families but also improve the quality of life of the elderly, promote the development of the elderly care industry, and inject new impetus into economic growth.

The traditional elderly care model mainly relies on family care and elderly care institutions, but with the changes in family structure, more and more elderly people are facing the situation of living alone or empty nests, and their children are difficult to provide all-weather care. At the same time, the limited resources of elderly care institutions and the shortage of nursing staff have led to an increasingly prominent contradiction between the supply and demand of elderly care services. The application of smart healthcare technology provides society with a more efficient and sustainable elderly care model.

First, the smart health monitoring system can reduce the high medical expenses incurred by the elderly due to sudden illness or worsening chronic diseases. Governments in many countries have

begun to promote smart health devices, such as smart watches, blood pressure monitors, and remote ECG monitoring systems, so that the elderly can conduct daily health monitoring at home, reduce their dependence on medical institutions, and thus reduce public medical expenses. For example, in recent years, the Japanese government has actively promoted the construction of "smart elderly care communities" and used smart devices to conduct remote health management for the elderly, which has greatly reduced the hospitalization rate and long-term care costs of the elderly.

Secondly, smart elderly care devices can also help families reduce elderly care costs. Traditional home care often requires hiring caregivers, which is expensive, while smart care robots, smart voice assistants, and other devices can replace manual care to a certain extent, provide basic daily care and emotional companionship for the elderly, and reduce the economic burden on the family. In addition, the smart elderly care system can also help the government optimize the allocation of elderly care resources, improve the service efficiency of elderly care institutions, and enable limited resources to benefit more elderly people, thereby effectively alleviating social elderly care pressure.

4.2. Promote the Development of the Elderly Care Industry

One of the core goals of smart health elderly care technology is to allow the elderly to maintain an independent and autonomous lifestyle while enjoying the convenience brought by technology and improve their quality of life and happiness.

Personalized health management is an important part of smart elderly care. Through smart monitoring equipment and data analysis, the elderly can get personalized health advice for their health conditions. For example, some smart health management platforms can provide customized health plans based on the elderly's diet, exercise, sleep, and other data to help them maintain a good physical condition. In addition, the smart medication reminder system can ensure that the elderly take their medication on time and reduce the health risks caused by forgetting to take medication or taking medication incorrectly.

The popularity of telemedicine also makes it easier for the elderly to obtain medical services due to mobility problems. Through video consultations, online consultations, and other methods, the elderly can receive remote diagnosis and treatment advice from doctors at home, avoiding the inconvenience of frequent trips to and from hospitals, especially in remote areas. This model greatly improves the accessibility of medical resources for the elderly. In addition, the smart health early warning system can automatically notify family members or medical institutions when the elderly has health abnormalities, ensuring that they can get help in the first place and improve their sense of security.

The application of smart home systems has further improved the living environment of the elderly. Through the intelligent voice control system, the elderly can easily adjust the indoor temperature, lighting, curtains, and other equipment to reduce the inconvenience caused by mobility problems. Some smart mattresses, fall detection systems and other equipment can also automatically alarm when an accident occurs to the elderly, ensuring their home safety. At the same time, applications such as smart entertainment systems and social platforms also allow the elderly to stay connected with the outside world, reduce loneliness, and improve their mental health.

The promotion of smart health care technology not only improves the quality of elderly care services but also brings new opportunities for the development of the elderly care industry. With the acceleration of population aging, the elderly care industry is becoming one of the fastest growing industries in the world, and the application of smart health care technology has made this industry more intelligent and technological, attracting a large amount of capital and enterprises to enter the market, and promoting the innovation and development of related industries.

5. Conclusion

Smart health care is an important, innovative means to cope with the aging population. Its core lies in improving the health management level of the elderly through technological innovation, optimizing

the allocation of medical resources, and thus reducing the pressure on social elderly care. With the development of technologies such as AI, 5G, and big data, applications such as smart health monitoring, telemedicine, and smart homes are driving the elderly care industry to evolve in the direction of precision and efficiency. The government, through policy support, infrastructure construction, and standard setting, and enterprises, through product research and development, jointly build a more sustainable elderly care model.

However, the promotion of smart elderly care still faces dual challenges. On the technical level, data privacy and security are the primary issues, and a sound health data protection mechanism needs to be established; at the same time, the stability and aging-friendly design of smart devices need to be optimized, such as simplifying the operating interface and enhancing voice interaction functions. On the social level, the phenomenon of low acceptance of new technologies among the elderly is common, and digital education needs to be carried out through multiple channels, such as community training and family guidance, to eliminate barriers to use.

The future development trend will show three characteristics: first, the integration of technology will be accelerated, and the combination of the Internet of Things and medical equipment will improve the service response speed; second, the policy support will be strengthened, and financial subsidies and tax incentives are expected to stimulate market vitality; third, social synergy will be enhanced, and through the "technology + humanities" model, the transition from product promotion to cultural recognition will be gradually realized. Only by considering both technological innovation and social acceptance can the dual goals of "reducing burden and improving quality" of smart elderly care be truly achieved, and the process of healthy aging for all people can be promoted.

References

[1] Sánchez-Izquierdo M, Fernández-Ballesteros R. Cognition in healthy aging. International Journal Of Environmental Research And Public Health, 2021, 18(3): 962.

[2] Grover S, Fayzullina R, Bullard B M, Levina V, Reinhart R M. A meta-analysis suggests that tACS improves cognition in healthy, aging, and psychiatric populations. Science Translational Medicine, 2023, 15(697): eabo2044.

[3] Mozumder M A I, Armand T P T, Uddin S M I, Athar A, Sumon R I, Hussain A, Kim H C. Metaverse for digital anti-aging healthcare: an overview of potential use cases based on artificial intelligence, blockchain, IoT technologies, its challenges, and future directions. Applied Sciences, 2023, 13(8): 5127.

[4] Xiao F H, Yu Q, Deng Z L, Yang K, Ye Y, Ge M X, et al. ETS1 acts as a regulator of human healthy aging via decreasing ribosomal activity. Science Advances, 2022, 8(17): eabf2017.

[5] Frizzell T O, Glashutter M, Liu C C, Zeng A, Pan D, Hajra S G, et al. Artificial intelligence in brain MRI analysis of Alzheimer's disease over the past 12 years: a systematic review. Ageing Research Reviews, 2022, 77: 101614.