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Analysis of the Dilemma and Countermeasures of Smart Elderly Care Services in Rural Home from the Perspective of Active Aging

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Abstract: With the intensification of population aging and against the backdrop of the active aging concept, the traditional pension model in rural areas is increasingly unable to meet the growing demand for elderly care. The field of elderly care services faces many urgent pain points and difficulties that need to be addressed. To this end, the "Smart Health Elderly Care Industry Development Action Plan" clearly proposes to accelerate the construction of the smart elderly care industry. By December 2024, 27 provinces in China have successively introduced suggestions and guarantee measures for the development of smart elderly care, actively promoting the exploration and practice of smart elderly care. During the "14th Five-Year Plan" period, the government will continue to support the development of various innovative elderly care models such as "Internet + Elderly Care", "Property + Elderly Care", and "Medical Health + Elderly Care". It is expected that by 2025, community elderly care services will achieve full coverage and a complete community home-based elderly care service network will be established.

With the rapid development of the economy and society, the improvement of rural living standards, and the advancement of medical technology, under the background of active aging, the life expectancy of the population in our country continues to rise, and the degree of aging is deepening. According to the latest data, by the end of 2024, the population aged 60 and above will account for 22%, and the elderly aged 65 and above will account for 15.6%. The number of disabled and semi-disabled elderly people exceeds 44 million, and the degree of aging is showing a trend of continuous intensification[1].

1. The Current Situation of Smart Elderly Care in Rural Areas

(1) Unbalanced Development of Smart Elderly Care in Rural Areas

Compared to large cities, some rural areas have fewer elderly care service institutions, and the technological equipment is relatively backward. Smart elderly care mainly relies on new technologies such as artificial intelligence and the Internet of Things, which are not yet mature and still face technical bottlenecks that need to be overcome, making it difficult to provide good elderly

care services. Therefore, the application of smart elderly care in rural areas is limited. Families are gradually becoming smaller and childless, and due to work and other reasons, children have limited time and energy, leading to a gradual weakening of family care functions, an acceleration of elderly people living alone, an increase in intergenerational space, and difficulties for children in caring for the elderly, which brings a huge impact on social elderly care services.

(2) Lack of Standardization in the Development of Smart Elderly Care in Rural Areas

In the era of "Internet +", the role of rural governments urgently needs to change, transforming from managers to a combination of coordinators, guides, and supervisors. For the standardized development of smart community elderly care, the government urgently needs to unify the standard system and institutionalize and legalize it in the form of laws. The relevant regulations for smart community elderly care in rural areas are still guiding opinions at this stage, lacking mandatory normative constraints. Enterprises in various industries have their own interpretations, leading to a lack of coordinated industrial development. Smart elderly care is an emerging industry, with hardware facilities and service standards varying widely across regions, lacking uniformity and scalability. Some enterprises do not provide adequate training, resulting in low service quality. There is a need to focus on training in information technology and service personnel. Currently, the elderly care model in rural areas of our country mainly centers around home-based elderly care. However, there are many challenges. On one hand, there is a severe shortage of medical and nursing equipment, making it difficult to meet the daily health needs of the elderly; on the other hand, family members generally lack basic healthcare knowledge, making it hard to provide effective support for the health issues of the elderly. In addition, the elderly themselves do not place enough importance on regular health check-ups, and their understanding of their own diseases is also quite limited, which may lead to some health risks not being detected and addressed in a timely manner. Over time, the number of disabled and semi-disabled elderly people may gradually increase, further intensifying the pressure on social elderly care.

(3) Lack of Professionalization in Rural Smart Elderly Care Development

Although rural smart elderly care services emphasize technological innovation and humanistic concern, the current penetration of these services is low and the professionalization level is not high. The overall care level for the elderly needs further improvement. There is an urgent need for data security system construction and protection of the elderly's privacy to prevent leakage in rural smart elderly care[2]. The sustainable development of rural smart community elderly care includes two basic forms: nursing services and technical services. On one hand, high-quality service in rural smart community elderly care requires professional nursing personnel who can meet the daily care needs of the elderly as well as provide spiritual comfort. On the other hand, professional technical personnel are essential for achieving smart elderly care; the integration of various technologies such as the Internet of Things, big data, and artificial intelligence in the smart elderly care system platform ensures technological innovation and reform in elderly care services. Nursing and technical talents constitute the backbone of rural smart community elderly care development. However, as most existing rural elderly care personnel are not trained in gerontology, service shortcomings often arise, making it challenging to meet the needs of the elderly. The management of smart service platforms is not standardized, and the lack of professional staff results in low service quality in rural smart community elderly care, leading to low satisfaction and recognition of smart community elderly care among the rural elderly population.

(4) Low Level of Information Sharing, Existing Information Silos

Rural smart community elderly care services integrate various types of information, including elderly care service demand information, resource distribution information in the community, and talent information, among others. Affected by the administrative management system, China has long been in a state of governmental administrative top-down information submission in terms of

elderly care informatization construction. Information management is government-dominated, and different parties and institutions are trapped in information silos. Currently, there are significant limitations in information communication, sharing, and deep integration between departments and units, which severely hinders the collaborative development of smart elderly care services.

(5) Rural Elderly Services Failing to Meet Elderly Needs

With economic and social development and changes in elderly care concepts, rural elderly care services face numerous challenges. On one hand, as the number of disabled elderly people increases, there is a rising demand for elderly care facilities (rehabilitation institutions, medical care institutions, etc.), but rural communities, constrained by their economic development levels, find it difficult to develop high-quality elderly care facilities. On the other hand, the phenomenon of idle elderly care facilities is serious. In some rural communities, many care institutions have long been idle, and even some elderly activity centers no longer enjoy the vibrancy they once had. Currently, the rural elderly care industry is primarily composed of home service organizations, while other institutions lack the motivation to provide professional elderly care services due to the immature state of the elderly care sector, making it challenging to meet the diverse and multi-layered needs of the elderly.

2. Challenges Faced by Rural Smart Elderly Care

(1) Relatively Backward Key Core Technologies in Rural Areas

The development of smart health elderly care is closely related to the advancement of technology. Wearable devices, smart detection equipment, intelligent robots, remote management systems, and other technological products serve as the care equipment for smart health elderly care. They address the issues of insufficient caregiving personnel and difficulties in monitoring, thus promoting the healthy development of smart health elderly care. However, the design and development of smart equipment in rural areas are closely linked to information and communication technology and high-precision sensor technology. Mastery of technologies such as chip technology and high-precision sensor technology is essential for the development of smart health elderly care. Unfortunately, the research on core technologies like chip technology in our country started late and has been developing slowly, resulting in a significant gap compared with foreign enterprises. This situation constrains the high-end development of rural smart health elderly care.

(2) Uneven Resource Allocation for Smart Elderly Care Services in Rural Areas Nationwide

Currently, the development of the rural elderly care industry in China is predominantly government-led, making it more difficult to advance smart elderly care services. The government's financial allocations are the main source of funding for rural smart elderly care; however, these allocations are influenced by the level of economic development in different regions. As a result, the development of the smart elderly care industry varies according to economic conditions. Areas with higher levels of economic development and greater aging populations have better development levels in the smart elderly care industry. Geographically speaking, the aging level in the eastern coastal regions is higher than that in the impoverished western regions, leading to differences in the development of the rural smart elderly care industry between the east and the west. The central region is relatively economically underdeveloped but has a higher population aging level, while other rural areas have lower aging levels and varying economic development status, resulting in significant discrepancies in resource distribution for rural smart elderly care. Therefore, the disparity between the economic development levels of villages and the aging levels of the elderly hinders the overall coordinated development of the smart elderly care industry.

(3) Ambiguity of Government and Market Roles

Although the current "9073" elderly care pattern in China has gradually formed a multi-layered

service system for elderly care in rural areas, based on home care, supported by community services, and supplemented by institutions, there are still several issues in constructing the rural smart health elderly care service system. These include insufficient infrastructure construction, inadequate service supply, low application of technology, and a general state of low-level development. Compared with urban areas, there are significant disparities, which can be summarized as follows: the lack of city-level government departments responsible for the overall planning and regulation of rural smart health elderly care development; unclear guidance and positioning regarding rural elderly care services from county-level government departments that lack proper tools and carriers; and an unclear responsibility framework in the rural community elderly care service management system. This primarily manifests in overlaps in service content, target groups, and service standards among elderly care management centers and elderly care stations, leading to inefficient allocation of elderly care resources and creating notable inconvenience for elderly people in accessing services, which fails to provide effective support for sustainable development[3].

(4) Low Popularization Rate of Rural Smart Health Elderly Care

The development, improvement, and enhancement of relevant technologies for rural smart health elderly care are relatively weak, with practical technologies, core technologies, and foundational technologies being insufficient relative to the vast market demand, resulting in their limited impact in the field. Due to technological weaknesses, rural smart health elderly care products are often homogenous and low-end, which severely restricts their widespread use. Additionally, while some rural elderly care products aim to upgrade their quality, the application of information technology is quite common and often complicated, leading to poor usability and operational difficulties for elderly users. The high price of these products also results in low purchasing willingness among elderly individuals and their children, despite the relatively high market penetration.

(5) Shortage of Talent in the Rural Smart Elderly Care Industry

The most significant difference between the rural smart elderly care industry and traditional elderly care is the need for substantial investment in experimental research and development, leading to high costs and long return cycles, along with considerable income volatility during the investment period. The rural smart elderly care industry spans multiple fields, including information technology, hardware, healthcare, services, finance, and education. However, there is a scarcity of multidisciplinary talents with expertise across these diverse fields, which slows the overall development of the rural smart elderly care industry[4].

3. Analysis of the development strategies of rural smart and healthy elderly care

(1) Actively develop key core technologies for rural smart elderly care

Based on the pilot work of rural smart elderly care communities, solutions can be further explored in response to the problem of relatively lagging core technologies. Education support and scientific research investment in the field of rural smart health elderly care should be strengthened, and the iterative upgrade and systematic improvement of key technologies should be systematically promoted. The actual needs of the elderly should be taken as the core, and cutting-edge information technology should be integrated with the physical and mental characteristics, interests, hobbies and daily habits of the elderly, and the software and hardware development of rural smart health elderly care products should be accelerated. At the same time, we actively deploy cutting-edge technical fields such as mechanical exoskeletons, genetic engineering, and elderly care robots to accelerate the transformation and technical application of innovative achievements, and provide strong support for the development of the elderly care industry. By building a smart elderly care comprehensive service platform, it can effectively integrate professional medical resources and health monitoring service networks for the elderly. By establishing a standardized resource classification system, the

platform systematically collects service entities such as medical institutions, health monitoring institutions, and clearly identifies key information such as market-oriented service content and charging standards, providing transparent basis for selecting services for the elderly and their families. In terms of operation mechanism, the platform ensures daily operation and maintenance by charging appropriate proportions of management fees, while creating sustainable profit space for service providers and forming a virtuous business cycle. This model can not only promote the intensive management and efficient allocation of resources in the elderly care industry, but also effectively help the elderly to easily obtain surrounding life services, achieve the people's livelihood goal of “nearly elderly care and instant service”, and ultimately achieve a win-win pattern of industrial development and elderly care services improvement.

(2) Build a smart elderly care service platform led by rural government departments

Rural government departments in rural areas, build a smart service elderly care platform operation service mechanism dominated by rural communities, with villages as the basic unit, focus on the comprehensive utilization of existing health service information platforms, elderly care service platforms and other information facilities, and the unified access and sharing of public and private platforms, formulate unified technical standards and service standards, build a unified smart elderly care information platform, and build a comprehensive and multi-level smart elderly care service network (including medical treatment such as remote diagnosis, medical treatment, and health care, professional nursing categories such as life care and rehabilitation treatment, psychological support categories such as psychological assistance and spiritual comfort, life supply, housekeeping services, elderly education, entertainment activities, etc.), integrate rural elderly care service resources and improve service efficiency [5]. In the development of the information age, the government needs to adjust and optimize the management methods of all sectors, whether it is managing enterprises or the people, and to adapt to various new management methods in the information age to make service management more convenient and efficient. Therefore, for this smart community home-based elderly care service model, the government level should also strengthen regulation and actively guide the development of this model to make the development of this model more standardized and specific, and use various information technology, communication technology, etc. to allow the overall model to gradually and effectively develop.

(3) Establish and improve the rural elderly care service system

In terms of the construction of a smart elderly care service system, the government should effectively play a role in overall planning, planning and guiding to promote the development of the smart healthy elderly care industry. At the same time, we must vigorously promote the rural smart health care demonstration project, and combine it with actual conditions to ensure that relevant work is implemented and effective. In terms of the development of smart and healthy elderly care, we will continue to explore and introduce policies and systems to lead the development direction of smart elderly care, improve the standards of smart and healthy elderly care products, and build a public platform for smart and healthy elderly care services with complete functions, standards and specifications, and interconnected functions, including remote care, online health consultation, psychological comfort, environmental monitoring, and data centers, in order to improve the efficiency and quality of elderly care services. At the same time, the government needs to strengthen supervision of the platform. The government combines government forces with market forces, plan ahead, and make positive preparations to deal with population aging. Actively guide relevant technology companies to develop an elderly-friendly intelligent cloud service platform system that adapts to the characteristics of rural elderly people. The following functions should be realized: First, through cloud data management technology, digital service archives are established for every rural community elderly, and the transformation of paper archives to intelligent electronic archives is realized; second, a multi-party information linkage mechanism is established to allow

government departments, service enterprises and community organizations to timely understand the basic situation and main needs of the elderly; third, a communication and sharing of elderly-related information among relevant subjects, precise allocation and optimization of community limited elderly care resources, immediate service communication, transparent service process, standardized and standardized service, timely service communication, and intelligent elderly care model. This digital solution path will solve the rural elderly care dilemma of information asymmetry and achieve accurate and personalized services.

(4) Improve the popularity of rural smart and healthy elderly care.

Rural areas vigorously improve the popularity of rural smart products and service market share, design convenient and simple smart technology products such as mobile-sensitive wear, intelligent and easy-to-operate, and enhance rural areas' awareness and concepts of smart and healthy elderly care, and vigorously promote smart and healthy elderly care products. In response to the difficulties existing in the elderly in using smart terminals, they can help them cross the digital divide by carrying out offline physical store experience activities. Let rural elderly people use smart health care platforms and services conveniently and flexibly. Form a one-stop online and offline service model to make rural elderly care more convenient and in line with reality, so that smart and healthy elderly care can enter thousands of households and have a place to support the elderly.

(5) Actively carry out rural smart elderly care and training of related professional talents

Rural areas build a professional talent training system for rural smart elderly care. Specifically, we should promote from three dimensions: First, we will open professional courses related to rural smart elderly care in the higher education stage, focusing on cultivating high-end management talents; at the same time, we will strengthen the construction of the vocational training system, carry out special skills training for medical staff, community workers, etc., and form a multi-level talent echelon. Secondly, in view of the current severe shortage of professional service personnel, we will focus on solving two problems: on the one hand, we must introduce technical talents in the fields of Internet of Things, cloud computing, etc., and improve the support of smart elderly care systems; on the other hand, we must strengthen the professional skills training of elderly care service personnel, open relevant majors in higher vocational colleges, adopt the "theory + practice" teaching model, and increase the proportion of internships in nursing homes. Finally, rural elderly care institutions need to improve the talent incentive mechanism, reasonably improve the salary and benefits of practitioners, enhance the attractiveness of careers, and make more middle-aged and young talents willing to participate in this important undertaking that concerns the welfare of rural elderly people.

(6) Establish laws and regulations on rural smart elderly care

The state should improve relevant supporting laws for the rural smart elderly care industry. On the one hand, it should create a healthy development environment for the rural smart elderly care industry, and on the other hand, it should make measures to adapt to rural elderly care needs. The government should give full play to its leading role and establish and improve a full-process coordination mechanism for the development of smart elderly care. The government focuses on building a "three-in-one" cooperation system: first, strengthen the government's overall planning function and formulate smart elderly care industry development policies; second, guide enterprises to participate in technological innovation and service supply; at the same time, support social organizations to play a supplementary role. By establishing a normalized communication and coordination mechanism, we can achieve the organic integration of policies, technologies, services and other factors, and promote the standardization, standardization and sustainable development of rural smart elderly care industries.

Against the backdrop of China's increasing population aging, innovating the traditional service concept of the elderly care industry, vigorously developing smart elderly care models, and using the deep integration of technology and data to create a safe and comfortable elderly care environment

for rural elderly people, is of great positive significance for promoting the healthy development of China's rural elderly care industry. The integrated development of rural smart communities and home-based elderly care has injected innovative momentum into the traditional rural elderly care service system. This new service model has achieved three major breakthroughs through the deep integration of intelligent means with community elderly care resources: one is to break the time and space limitations of traditional home-based elderly care, the second is to improve the accuracy and timeliness of elderly care services, and the third is to optimize resource allocation efficiency. Its innovation is mainly reflected in the construction of a new service paradigm of "Internet + home-based elderly care", and the rural elderly care service system deeply embedded in modern information technology, effectively solving the pain points such as insufficient supply of rural elderly care services, low quality, the ability to promote the maximum utilization of social resources, and the rationalization of resource allocation, and providing new ideas and new paths for the development of rural elderly care. At the same time, it can also meet the elderly care needs of more and more rural elderly people, greatly reduce the elderly care burden of more and more rural families. The happiness of families will promote the harmonious development of rural, urban and national areas, and various smart communities that support it will also make the rural elderly care service model smarter and can be developed continuously.

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