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Development Path and Countermeasures of Smart Management of Care Risks in Nursing Institutions

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Abstract: Safety risks in elderly care institutions pose a severe threat to the health and lives of older adults, jeopardizing the healthy development of the eldercare sector. To achieve the smart management of care-related risks within these institutions, this paper addresses the existing problems and demands in current risk management practices. It conducts an in-depth exploration of development pathways for smart care risk management in elderly care institutions, encompassing five key aspects: improving the institutional safeguard system, promoting collaborative innovation involving "government, industry, universities, research institutes, and end-users" (government-industry-university-research-application synergy), facilitating the growth of the smart eldercare industry, strengthening the cultivation of smart management professionals, and widely disseminating the concept of smart eldercare. Furthermore, it proposes a "Five-Pronged" (Wuhua) development strategy: advocating for diverse stakeholder participation, establishing a multi-dimensional interdepartmental coordination mechanism, promoting the comprehensive coverage of smart management, enhancing the professional expertise in smart management, and fostering the sustainable development of smart management services.

1. Introduction

Actively responding to population aging is of great significance for adhering to the people-centered development ideology, realizing high-quality economic development, and maintaining national security and social harmony and stability[1]. The state attaches great importance to the issue of old age. General Secretary pointed out that "it is our common aspiration to ensure that the elderly have access to proper care, live a happy life, and enjoy a healthy and long life."[2]. At present, institutional care as an important part of the senior care service system, the safety risk of senior care institutions seriously threatens the health and life safety of the elderly and affects the healthy development of the senior care business. This paper focuses on the connotation of nursing care risk, risk factors, the development of wisdom management path and strategy, to provide a theoretical basis for the development of nursing care risk resilience governance and practical insights.

2. The Connotation of Care Risks in Long-Term Care Facilities

Nursing institution care risk refers to care accidents such as fractures, falls, burns, choking, wandering, and improper food and medicine, which occur in the course of daily life care, rehabilitation care, and recreationalactivities in nursing institutions[3].On December 27, 2019, the General Administration of Market Supervision and Administration of the People's Republic of China (GAMSA) and the National Standardization Administration of China (NSAC) formally approved and published the mandatory national standard of "Basic Norms for the Safety of Services in Nursing Institutions", which it specifies the requirements related to the prevention and disposal of nine types of service risks such as choking, pressure ulcers, falling out of bed, burns, falls, loss, other injuries and self-inflicted injuries, food and drug misuse, and accidents in cultural and sports activities in nursing care institutions[4].Care-related risks in elderly care institutions are primarily derived from four aspects: the system, care personnel, elderly residents, and facilities and equipment . System-related risks encompass the institution's service standards, program design, and assessment supervision; personnel-related risks are associated with service quality and workforce stability. The risk of the elderly living in nursing institutions comes from the physiological, psychological and social interactions of the elderly, which is reflected in three aspects, such as physical factors, psychological factors and interpersonal relationships; and the risk of facilities management in nursing institutions mainly includes the risk of the use of age-appropriate equipment, information management and technology application[5].

3. The Development Path of Intelligent Management of Care Risks in Nursing Institutions

Smart management refers to a management approach that utilizes advanced technologies, data, and methodologies to enhance management efficiency, optimize decision-making, and improve resource allocation. It integrates emerging technologies such as information technology, data analytics, and artificial intelligence. Through the collection, analysis, and application of data, it enables organizations to better understand their internal and external environments, thereby facilitating more informed decisions and management actions. It represents a comprehensive innovation of existing management practices based on the internet[6]. For government administrative departments, it constitutes a management approach that innovates governance models and enhances management levels and service quality, supported by new technologies like big data, cloud computing, and the Internet of Things[7]. This study posits that the development pathway for the smart management of care-related risks in elderly care institutions comprises the following five sub-paths.

3.1 Pathway for Enhancing the Institutional Safeguard System

The first is to establish a nursing care service quality assessment index system covering the three dimensions of basic life care, medical care, and psychological support, and to conduct regular dynamic monitoring and assessment of key indicators such as self-care ability, living environment, health status, medical service satisfaction, mental health status, and social participation. Secondly, the civil affairs department should take the lead in setting up a special supervisory organization or committee to develop a regular inspection mechanism, supervise and rectify in a timely manner and punish according to the law those elderly institutions with poor service quality, imperfect facilities and chaotic management, so as to effectively safeguard the rights and interests of the elderly. Third, expedite the revision and refinement of relevant laws and regulations. To address the pressing issues of inadequate regulatory oversight, disparities in service quality, non-transparent pricing, and insufficient protection of elderly rights, strengthen legal constraints and enforcement mechanisms.

This will ensure standardized service delivery and transparent operations within elderly care institutions, ultimately fostering the high-quality and sustainable development of China's elderly care sector.

3.2 "Government-Industry-Academia-Research-Application" Collaborative Innovation Pathway

To advance the development of China's eldercare service system, a three-pronged strategy is proposed. Firstly, a collaborative innovation platform integrating government, industry, academia, and research institutions should be established, wherein the government establishes regulatory frameworks and facilitates platform construction, while industry stakeholders assume responsibility for service delivery, technological innovation, and business model development, with academia providing theoretical foundations and scientific-technological support; this multi-stakeholder collaboration enables data sharing and resource integration to drive innovation and enhance both quality and efficiency in eldercare services. Secondly, the government should allocate dedicated funds specifically targeting eldercare, primarily supporting research and development (R&D) in artificial intelligence (AI), the Internet of Things (IoT), and big data technologies to promote the deployment of intelligent service systems and nursing robots for improved service quality and operational efficiency, while concurrently funding pilot programs for innovative models such as community-based eldercare and mutual-aid eldercare to address limitations inherent in traditional family-based and institutional care; with additional focus on incentivizing universities and vocational colleges to establish eldercare-related academic programs and conduct vocational skills training to expand the professional workforce pipeline, and ultimately subsidizing upstream and downstream enterprises for new product R&D and service expansion to foster a comprehensive, sustainable, and efficient eldercare industry chain. Thirdly, international exchange and collaboration must be strengthened through the adoption of advanced global best practices to elevate the international standards of China's eldercare services, exemplified by introducing and contextually adapting the US "Vibrant Aging" model—emphasizing enriched social activities integrated with professional care to enhance senior autonomy and quality of life—for community-based implementation within China, integrating mature assistive technologies from Japan, such as intelligent mobility aids and remote monitoring systems, via localization to develop a smart assistive ecosystem suitable for Chinese seniors, and incorporating Germany's "Integrierte Pflege" (Integrated Care) philosophy to promote social inclusion of the elderly, thereby facilitating the development of a diversified, human-centered, and socially integrated eldercare paradigm that collectively advances the international sophistication of China's eldercare system.

3.3 Development Path of Intelligent Elderly Industry

The first is to promote the integration of elderly care, health, and rehabilitation care; integrate medical, elderly care, scientific research, and technological resources to construct an intelligent elderly care industry chain; introduce artificial intelligence, the Internet of Things, and big data, develop smart devices, and build smart communities to meet the comprehensive needs of the elderly; establish health records, provide personalized health management, develop rehabilitation centers, train talents, introduce policies to encourage innovation, and expand the international market. The second is to promote intelligent, informatized and personalized senior care services, monitor physiological status through intelligent equipment, predict demand through intelligent systems, build a standardized information platform, share resources, customize services according to seniors' health status and interests, and improve quality of life. Third, cooperation between the government and industry associations; the government formulates policies, increases R&D

investment, and standardizes the market; industry associations coordinate enterprises, formulate standards, and promote technologies; both sides jointly hold exhibitions to promote smart senior care and promote the sustainable and healthy development of the industry.

3.4 Path to cultivate intelligent management talents

First, set up training institutions for elderly care professionals, offer relevant courses and training programs, focus on the combination of theory and practice, invite experts to give lectures, follow up on industry dynamics in a timely manner, and continuously improve the professional level and service skills of practitioners. Second, establish a mechanism for the training of junior, intermediate and senior nursing personnel: junior personnel will strengthen their abilities in life care, health monitoring and rehabilitation through vocational training; intermediates will rely on professional education in higher vocational colleges and universities to improve their organization, management and guidance; and senior personnel will be trained by undergraduate colleges and universities, with a focus on improving policymaking and leadership, and supplemented with continuing education and incentives for advancement. Thirdly, the government has formulated policies such as incentives and subsidies, set up a talent incentive fund, and provided career promotion channels and treatment enhancement, while simplifying the approval process and lowering the threshold of market access, so as to encourage social capital and more talents to devote themselves to the field of elderly care services.

3.5 Dissemination Pathways for Wisdom Concepts

Firstly, utilizing diverse dissemination channels—including television, online platforms, and community activities—to sustain publicity campaigns that propagate the concept of smart eldercare, thereby enhancing overall societal awareness and acceptance; secondly, establishing an information disclosure platform for eldercare services to routinely publish core operational data such as service quality metrics and evaluation results for eldercare institutions, thereby increasing transparency and fostering public trust; thirdly, encouraging active participation from social organizations and volunteer agencies in advocacy efforts, facilitating the dissemination of smart eldercare concepts, characteristics, and advantages through lectures, seminars, and experiential activities, which cultivates a social atmosphere of respecting, honoring, and caring for the elderly while assisting this demographic in understanding and adopting smart eldercare solutions to improve their quality of life; fourthly, promoting in-depth collaboration among social organizations, volunteer agencies, governmental departments, and eldercare enterprises to pool resources—including policy support, funding, and technological expertise—thereby fostering synergistic partnerships for the joint promotion of smart eldercare services.

4. Development Countermeasures for Smart Management of Care Risks in Elderly Institutions

This study explores specific developmental strategies for the smart management of care-related risks in eldercare institutions through a 'Five-Pronged' approach: advocating for 'diversified' stakeholder participation, establishing 'multidimensional' interdepartmental coordination mechanisms, promoting 'comprehensive' coverage of smart management systems, enhancing the 'professionalization' of smart management practices, and fostering the 'sustainable development' of smart management services .

4.1 Advocating Diversified Participation Subjects

Establishing a multifaceted collaborative network is paramount. Senior care institutions coordinate with governmental departments, community organizations, enterprises, and volunteer organizations to deliver comprehensive services for older adults. Collaborations with government entities secure policy support, funding, tax incentives, and foster a conducive operational environment. Partnerships with community organizations facilitate recreational activities such as fitness programs, calligraphy, painting, and choir groups, thereby enriching the residents' cultural and spiritual lives. Collaborations with enterprises enable the introduction of advanced medical equipment and technologies, enhance service quality, and attract specialized professional talent. Engagements with volunteer organizations support the delivery of companionship, psychological counseling, and daily living assistance, providing essential emotional support and care. Concurrently, active participation of older adults and their families in governance is strongly encouraged. This involves establishing resident committees or family representative councils endowed with clearly defined responsibilities and substantive voice in institutional decision-making. Regular training sessions, workshops, seminars, and experience-sharing forums are conducted to augment participants' understanding of the senior care sector and management competencies, while also facilitating the exchange of familial caregiving expertise. Strict adherence to privacy protection regulations is maintained throughout all processes to ensure the security of personal information. Furthermore, robust feedback and evaluation mechanisms are implemented to periodically assess the effectiveness of participatory initiatives, enabling timely adjustments and refinements. This ensures the participation framework remains closely aligned with the evolving needs of older adults and their families and adapts proactively to emerging trends in senior care service provision.

4.2 Establishing a multi-dimensional interdepartmental coordination mechanism

First, establish a cross-sectoral collaboration mechanism. Elderly organizations must strengthen information sharing and collaboration among nursing, medical, and psychological support departments to ensure seamless and efficient operation of services; at the same time, they should integrate external resources such as families, communities, and enterprises, and carry out home visits, community activities, and volunteer services, so as to provide the elderly with all-around, multilevel services, enrich their social lives, and improve their quality of life. Second, an inter-departmental coordinating body should be set up to coordinate resources and services of various departments, resolve conflicts in collaboration in a timely manner, and promote overall optimization. This organization should be equipped with a perfect communication mechanism: holding regular coordination meetings, building a platform for project collaboration, and constructing a new communication system. The agency should be equipped with improved communication mechanisms: regular coordination meetings, project collaboration platforms and shared databases to realize information flow, rational allocation of resources and process synergy. Break down departmental barriers and promote resource integration and efficient utilization.

4.3 Promoting Comprehensive Coverage of Smart Management

First, establish a comprehensive information management system. Nursing institutions should develop a unified platform encompassing resident information management, medical care documentation, and service evaluation. This platform must facilitate real-time data sharing and intelligent analysis to enhance service precision and personalization. The system shall integrate core functionalities including: electronic health records (EHRs), real-time monitoring with emergency

response capabilities, closed-loop service evaluation and optimization, data analytics for decision support, and training/knowledge-sharing modules. Second, promote the universal adoption of smart devices and technologies. Widespread implementation of intelligent health monitoring systems, telemedicine, and similar technologies is essential to provide convenient and intelligent experiences for the elderly. Relevant departments and enterprises must reduce operational complexity, optimize elderly-friendly user interfaces, and ensure system stability and security, with particular emphasis on robust data encryption and privacy protection. Concurrently, governments should enact regulations and standards, encouraging industry to establish unified technical specifications and data formats. This will ensure device compatibility and interoperability, thereby facilitating the efficient implementation of intelligent eldercare services.

4.4 Improving the Level of Specialization of Smart Management

Strengthening personnel cultivation and recruitment constitutes a key measure for enhancing the professional competence and service quality of aged care workers. Establishing a specialized training system for aged care personnel is essential. This system should encompass not only fundamental aged care skills but also interdisciplinary knowledge in Psychology, Medicine, Nutrition, and other relevant fields. Concurrently, attracting high-caliber professionals by offering competitive remuneration packages and robust professional development opportunities is crucial to recruiting more qualified individuals into the aged care sector. Furthermore, establishing specialized management teams is essential for elevating the professional level of intelligent management within aged care institutions. This can be achieved, for instance, by leveraging modern information technologies such as big data and the Internet of Things (IoT) to implement refined management of care services, thereby improving resource utilization efficiency.

4.5 Promoting the Sustainable Development of Intelligent Management Services

Firstly, establish performance appraisal and incentive mechanisms to enhance the operational efficiency of intelligent management within senior care facilities. Implement a performance evaluation system encompassing key indicators such as service satisfaction, operational efficiency, and data analysis capabilities. This system clarifies institutional objectives, stimulates workforce motivation, and facilitates continuous improvement by leveraging strengths and addressing weaknesses identified through regular assessments. Secondly, strengthen supervision and evaluation mechanisms. Conduct regular inspections, audits, and performance evaluations of intelligent elderly care services. This enables the timely identification and rectification of potential risks, including technical malfunctions, operational errors, and data breaches. Comprehensive monitoring of all operational processes allows for the detection and resolution of bottlenecks, thereby improving service efficiency and ensuring the sustainable development of intelligent eldercare. Thirdly, continuously advance technological innovation and application. Through deep mining of big data on lifestyle habits and health profiles of elderly individuals, coupled with real-time monitoring of physiological indicators via smart wearable devices, personalized health management and early intervention are achieved. Artificial intelligence robots and voice assistants are introduced to assist the elderly in their daily activities and alleviate the burden on staff. Blockchain technology can be utilized to ensure the secure circulation and transparent management of institutional information, financial data, and material data, thereby comprehensively improving the efficiency of resource utilization.

5. Conclusion

Against the backdrop of continuously accelerating population aging, intelligent management of care-related risks in elderly care institutions has become an imperative path to safeguarding the health, safety, and dignity of older adults. Centered on the logical framework of "Risk Identification –Pathway Construction–Strategy Implementation," this study systematically analyzes the connotation and causes of care-related risks. It proposes development pathways for intelligent management across five dimensions: institutional frameworks, collaborative mechanisms, industry development, talent cultivation, and conceptual paradigms. Using the "Five-Dimensional" strategy (Diversified, Multi-dimensional, Holistic, Professionalized, and Sustainable) as a key lever, the study formulates an integrated solution that is operationalizable, replicable, and transferable. This research provides an analytical framework, integrating theoretical depth and practical value, for the intelligent management of care-related risks in elderly care institutions. Its conclusions also offer significant reference value for the intelligent transformation of care risk management within such institutions.

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