COMPARATIVE STUDY

Leveraging Internet and Medical Care Platforms for Enhanced Home Care

Xiaorong Wang[1], Yaying Pu[2], Xianbin Wan[3]

Abstract

Objective: To evaluate the utility of "internet + big data + medical care" approach in providing comprehensive management and care services for the elderly in an ageing society.

Method: The study was conducted at Ya'an People's Hospital, China, from October 2021 to October 2022, and comprised elderly individuals aged at least 60 years who were randomly divided into intervention group A receiving care through an "internet + big data + medical care" platform, and control group B receiving conventional community-based care. The subjects were assessed at baseline as well as at 6 and 12 months of intervention in terms of quality of life, activities of daily living, self-management ability, and satisfaction with home care services. Data was analysed using SPSS 26.

Results: Of the 180 participants, 106 (59%) were male, and 74 (41%) were female, with an equal distribution of 90 individuals (50%) in each group. Participants aged 60 years and above were included in the study. Significant improvements were observed in the quality-of-life dimensions in group A compared to group B ($p<0.05$). Additionally, activities of daily living (ADLs) scores significantly increased in group A following the intervention ($p<0.05$), and overall satisfaction levels were higher in group A than in group B ($p<0.05$).

Conclusion: The "Internet + big data + medical care" approach could enhance self-management capabilities of the elderly, and improved the quality of life and rehabilitation outcomes.

Keywords: Elderly care, Internet + big data, Self-management, Quality of life, Rural areas.

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Introduction

Population ageing is a significant problem facing the world today. Since 1999, China has experienced rapid ageing.[1] According to a survey by the National Bureau of Statistics, by the end of 2017, China had 241 million people aged 60 and over, accounting for 17.3% of the country's total population. It is estimated that by 2050, the population aged 65 and above in China will exceed 320 million, accounting for 20% of the country's total population and 25% of the world's elderly population.[2,3] The ageing situation in China is already dire. Along with rapid development in the country's social economy and the changes in the population profile caused by industrialisation, urbanisation, and internal mobility, China's society also faces the issues of people ageing before getting rich, regional differences, and urban-rural inversion, representing concurrent characteristics of the modernisation, like aging, empty nest and disablities.[4-6] The emergence of ageing reduces labour supply, shrinks consumer demand, and reduces savings capacity, resulting in negative growth of the national economy. It also increases the dependency index of the elderly population, increases pension insurance expenditure, and increases the social pension burden.[7,8]

[1]Department of Neurology, Qiong Lai Medical Centre Hospital, Qiong Lai, China; [2,3]Department of Geriatrics, People's Hospital of Ya'an, Ya an, China.

Correspondence: Xiaorong Wang. e-mail: wxiaorong202307@163.com

ORICID: 0009-0006-3650-2346

Surveys show that about 60% to 80% of the elderly suffer from chronic diseases, and about two-thirds of the elderly suffer from two or more diseases at the same time. There are 260 million patients with diagnosed chronic conditions in China, of which the elderly account for 80%.[9,10] As such, the needs of the elderly for medical care and elderly care are increasing.[11] In addition to primary life care, the elderly also need medical care, spiritual comfort, cultural entertainment, security support, and other care, among which the need for medical care is the most urgent.[12]

To address the situation, the supply capacity of medical care and pension could be more robust, but there are problems, such as insufficient funds and efficiency.[13,14] There are currently 987,000 medical and health institutions in China, with 7.94 million beds catering to 8,183.11 million patient visits. The number of medical and health beds is 7.302 million, and the number of nursing beds per thousand older adults is only 31.6, which is far from the international standard of 50.[15,16] Besides, the medical and pension systems operate independently. Most medical institutions can provide inpatient medical services to the elderly only in the acute stage of the disease, lack specialised outpatient clinics and hospitals for geriatric diseases.[17,18] Due to the lack of medical services, the actual bed vacancy rate in nursing homes is as high as 50%.[19] Family pension, institutional pension and community home pension are the three main pension models in China at present.[20,21] Due to changes in the miniaturisation of the

family structure, and the weakening of the traditional concept of providing for the elderly, the function of family care for the aged is gradually weakening.[22] Institutional elderly care also does not meet the actual needs of the elderly due to low service levels and high service costs.[23] Although home-based care in the community can ensure that the elderly can enjoy their old age in a warm and familiar environment, it started late, lacking a high-quality medical service team, and the development of this model is not yet perfect.[24,25]

The concept of "combination of medical care" has no unified definition, and it covers various forms.[26,27] Whether it is a "medical nursing centre" established by a medical institution, a "nursing home" established by the Civil Affairs Bureau, or a "community service centre focussing on medical nursing" established by a community medical institution, they may only accommodate about 15% of the elderly population in total.[28] As such, a large number of older adults continue to live at home.

The health care of the elderly living in rural areas is a matter of particular concern. There are still many problematic areas in the task of providing effective medical care to the elderly.[29,30]

The use of information technology (IT) platforms under the "internet+big data+medical care" approach aims at providing health management to the elderly at home through wearable devices. The services provided include not only daily care, sports and social interaction and spiritual comfort, but also services related to prevention, healthcare, treatment, rehabilitation, nursing and hospice care. The platform covers cities as well as rural areas.[31,32]

The current study was planned to evaluate the utility of "internet+big data + medical care" approach in providing comprehensive management and care services for the elderly in China's ageing society.

Subjects and Methods

The study was conducted at Ya'an People's Hospital, China, from October 2021 to October 2022. The primary item pool comprised elements based on local and foreign literature on community-based home care, combined with reports issued by the country's Health Commission, the National Standards Committee, and the Ageing Committee.[33]

The sample was raised using the convenience sampling technique. All the participants provided informed consent, and the study was carried out in compliance with ethical research guidelines. The study received approval from the Ethics Review Committee (ERC) of Ya'an People's Hospital (Approval number: YH2020--452-23). Ethical guidelines outlined by the Declaration of Helsinki were strictly followed.[34] Those included were elderly individuals of either gender aged at least 60 years who had been living in Ya'an for at least 3 years. People with audio-visual, cognitive, or mental disorders who could not communicate or comprehend properly, and those suffering from severe or terminal diseases, were excluded, as were those unwilling to participate.

The enrolled subjects were randomly assigned into intervention group A and control group B. Randomization was achieved using computer-generated random numbers. For group A subjects, an "internet+big data+ medical care" platform model was generated, consisting of two parts. The first part aimed at community nurses, including remote training and remote consultation. The second part aimed at the elderly in the community, including assessment and filing, classification management, follow-up plans, health consultation, health lectures, free health consultation, etc. Group B controls continued to use the home-based nursing care model, including telephone follow-ups and health consultations every 3 months.

The "internet + big data+medical care" platform had the capacity to enable the elderly living in rural or remote mountainous areas to have their vital signs monitored through wearable devices that automatically uploaded health management data onto the platform that was used by medical staff in the hospital to detect any abnormality in the data, and remotely guide the patients' family members or the patients themselves through telephone, video screen or computer. In case, online guidance was not sufficient, the hospital notified the community-based family-contracted doctor to visit the relevant home. If even that failed to serve the purpose, the case could be directly referred to the hospital where it was triaged to the corresponding specialty through the green channel. Additionally, the model entailed regular flow of health education information on the platform to improve the level of health awareness related to geriatric issues.

The Medical Outcomes Study (MOS) 36-item Short From scale (SF-36)[35] was used to assess the quality of life of the elderly. The scale includes 8 dimensions: body pain (BP), general health (GH), physical function (PF), role physical (RP), vitality (VT), social function (SF), role emotional (RE) and mental health (MH). The score of each dimension ranged 0-100, with the higher the score indicating better quality of life.

The Barthel Ability Scale[36] was used to measure the activities of daily life (ADLs), with the total score ranging 0-100, and the higher the score indicating a better ADL level.

The Rating Scale of Health Self-Management Skill for Adults (AHSMSRS) was used to assess the health self-management ability of the subjects.[37] The total score ranged 38-190 points, and the higher score indicated higher self-management ability.

Through a literature review and expert meeting,[38] a home-based care service satisfaction questionnaire was designed that included the aspects of professional knowledge, technical level, service attitude, service effectiveness and service quality.

The subjects were assessed at baseline as well as at 6 and 12 months of intervention in terms of quality of life, ADLs, self-management ability, and satisfaction with home care services.

Data was analysed using SPSS 26. Data was expressed as either frequencies and percentages, or as mean±standard deviation, as appropriate. Chi-square and "*t*" tests were used, as appropriate. P<0.05 was considered significant.

Results

Of the 180 subjects, 106 (59%) were males and 74 (41%) were females. Participants aged 60 years and above were included in the study. Subjects were evenly divided into urban (90, 50%) and rural (90, 50%) groups. There were 90 (50%) participants in each of the two intervention groups. Significant differences were found between groups in quality-of-life dimensions, including RP, BP, GH, VT, SF, RE, and MH ($p<0.05$). Scores related to ADLs improved significantly in group A compared to group B ($p<0.05$). Satisfaction levels were also significantly higher in group A than in group B ($p< 0.05$) (Table 1).

Table-1: Comparison of the quality of life of the elderly.

Project	Research group (n=90)	Control group (n=90)	*t*-test	*p*-value
PF	68.34±12.04	65.41±8.67	1.873	0.063
RP	76.34±12.07	72.97±9.73	2.062	0.041
BP	66.07±6.86	63.85±7.51	2.071	0.040
GH	60.27±8.24	57.26±7.66	2.538	0.012
VT	68.76±9.76	65.94±9.51	2.156	0.032
SF	67.49±5.47	61.83±6.08	6.565	0.000
RE	69.74±15.94	58.13±16.08	4.865	0.000
MH	65.68±8.53	63.09±5.49	2.422	0.016

BP: Body pain, GH: General health, PF: Physical function, RP: Role physical, VT: Vitality, SF: Social function, RE: Role emotional, MH: Mental health.

Table-2: Comparison of Barthel Index scores before and after the intervention.

Project	Research group (n=90)	Control group (n=90)	*p*-value
Barthel index score			
Before the combination of medical care	37.52±8.56	38.14±7.59	0.608
6 months after the combination of medical care	55.74±5.94	48.63±6.71	0.000
12 months after the combination of medical care	63.14±4.61	52.70±5.09	0.000

There was no significant intergroup difference with respect to ADLs at baseline ($p>0.05$). After 6 and 12 months of intervention, the ADL level improved in both the groups, but the improvement was more significant in group A compared to group B (Table 2, Figures 1-2).

After the intervention, there was a significant difference in

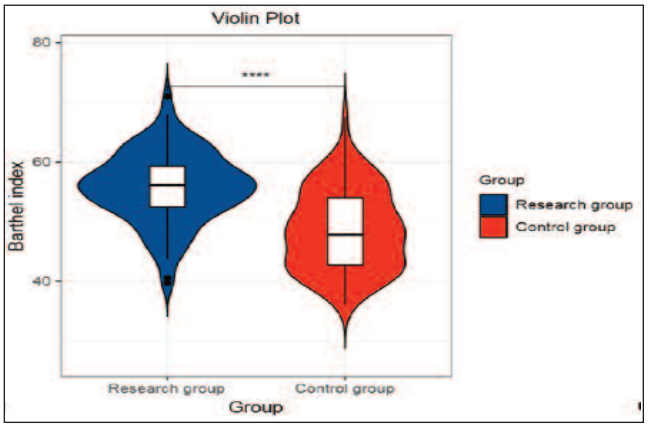

Figure-1: Violin plot of the Barthel Index score comparison after 6 months of intervention.

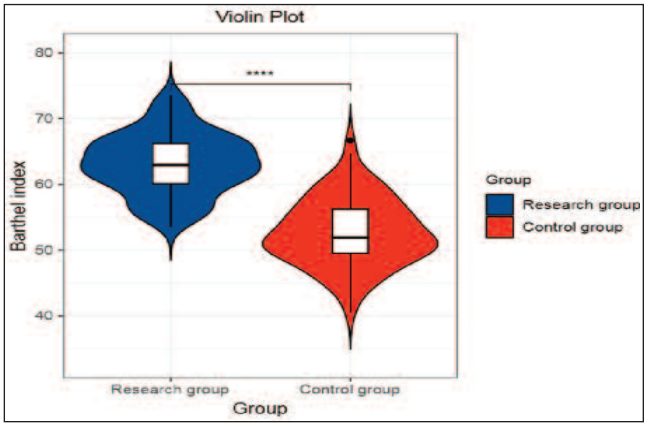

Figure-2: Violin plot of the Barthel Index score comparison after 12 months of intervention.

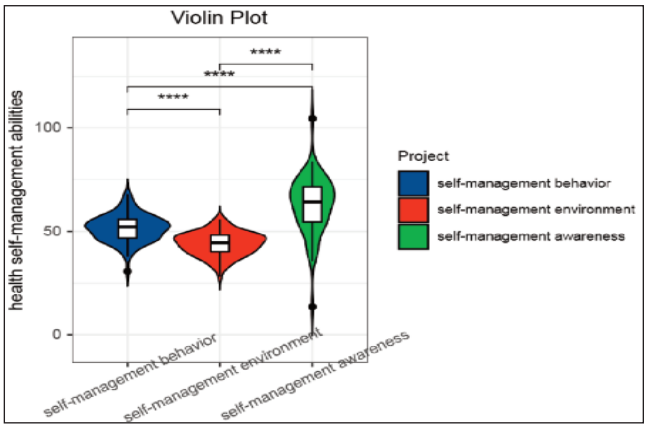

Figure-3: Violin plot of health self-management abilities of the intervention group.

Table-3: Comparison of health self-management abilities.

Project	Research group (n=90)	Control group (n=90)	*t*-test	*p*-value
Self-management behaviour	51.61±6.53	46.37±12.01	3.636	0.000
Self-management environment	43.95±5.66	40.17±7.18	3.922	0.000
Self-management awareness	62.87±13.07	58.42±11.62	2.414	0.017

Table-4: Comparison of satisfaction with home care services.

Project	Satisfied	General	Dissatisfied	*t*-test	*p*-value
Professional knowledge					
Research Group	50	33	7	6.010	0.014
Control Group	41	36	13		
Technical level					
Research Group	58	30	2	12.099	0.001
Control Group	41	33	16		
Service attitude					
Research Group	58	26	6	2.883	0.090
Control Group	39	38	13		
Service effectiveness					
Research Group	59	26	5	5.625	0.018
Control Group	37	38	15		
Service quality					
Research Group	54	31	5	6.523	0.011
Control Group	38	36	16		

the scores of each dimension of the health self-management ability of the groups, but the mean scores of group A were higher than group B (Table 3, Figure 3).

There were significant differences between the groups in terms of satisfaction with the care provided ($p<0.05$), with the exception of service attitude ($p>0.05$) (Table 4).

Discussion

With the increase in the ageing population in China, the combination of medical care and elderly care services has become a critical factor to focus on.[39] Due to the rapid development of the internet, the information platform of "internet + big data + medical care" has become a new choice as it rationally allocates resources, and further optimises medical care.[40,41]

In countries like the United States, Sweden, France, Japan, South Korea, Australia and others, many studies have been carried out on long-term care for the elderly, financing models, and pension models.[39] While learning from foreign experience, it is imperative to continuously explore the model of combining medical care and nursing care that suits China's society. At present, most Chinese cities do not have full-time medical and elderly care service personnel[42] because professional education level is generally low. Besides, there is a lack of adequate professional training, especially in terms of spiritual comfort for the elderly. Also, the social recognition of senior care workers is low, with low social security and salary benefits that make the profession unattractive. In addition, most medical and elderly care institutions[43,44] provide only catering, entertainment and recuperation services, and are still community-based home care centres for the elderly, lacking full-scale medical services.

Through technological innovation, a "virtual nursing home" can be realised, providing intelligent and convenient elderly care.[45,46] The platform is supported by medical data and integrates online and offline medical care information through the advantages of the internet technology.[47]

The current study has limitations as the sample size was not calculated which could have affected the power of the study, and the generalisability of the findings.

Conclusion

The combination of medical care and elderly care could meet the health needs of the elderly care industry to a certain extent. The information platform of "Internet + big data + medical care", through the integration of various resources, will provide new impetus for the development of China's smart elderly care industry.

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