

Knowledge Structure and Evolution of Elderly Care Services: A Visualized Analysis

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Keywords: Elderly care services, healthcare, pension service, evolution, visual analysis

Abstract: The irreversible global aging trend brings a rapid growth in demand for elderly care services, which also promotes the rapid development of relevant research, but there lacks a holistic review on it. This paper aims to conduct an analysis to reveal research hotspots and future directions with a visual display. The “Web of Science Core Collection” database is searched, and CiteSpace software is used to sort out the characteristics of related research and draw a scientific map of keywords clustering. Elderly care services research has obtained continuous attention for a long time and rapidly developed since 2017. Based on the keywords clustering, focuses of the research can be divided into five categories, namely care goals, basic pension models, innovation and provision of elderly services, as well as the demands of special elderly groups. It can be seen from keywords with strong burst that research frontiers contain care goal, endowment service institutions, frailty of the elderly, work of supply entities, and service for the aged in China. This paper proposes three directions for future research, including a multidimensional dynamic measurement of elders’ demands, the interaction between elders’ behavioral characteristics and services for them, and an integrated pension model combine actual contexts and novel technologies.

1. Introduction

According to the World Population Prospects 2022, the proportion of the global population aged 65 years or over could increase from 10 per cent in 2022 to 16 per cent in 2050. The population of persons aged 65 years or over will be more than twice than children under 5 by 2050. The average of global life expectancy will reach 77.2 years in 2050 [1]. The global growth of an aging population has been difficult to reverse, pension services have become an important issue that needs attention. How to match future supply and demand for elderly care is challenging governments, families and markets [2].

Vigorous development of elderly care is a complicated systemic project that depended on the full efforts of the entire society. To improve the well-being of elderly, researchers have conducted relevant researches from the perspective of service recipient and service provider. They have made substantial efforts to identify the care demands for elderly [3], to analyze the several willingness to choose pension models [4], and to improve the quality of the elderly’s life [5]. As technologies innovate, information and communication technology are offered as new parts of traditional care for the aged [6] and collaborative service providers are encouraged to provide better personalized

services [7]. The introduction of novel technologies offers the elderly and their family's new choices, and someone calls for the construction of an information platform for elderly's health which is integrated of medical, physical and nursing care [8].

New trends emerged in the elderly care services research make it necessary to review the literature, to visualize research hotspots, and to identify future directions. However, current researches focus on a particular pension services such as one specific pension model [9], assistive technologies supporting elderly services [10], and pension services in a certain country [11]. There is lack a comprehensive and just literature review that can display the evolution of research hotspots and reveal research frontier in extant reviews. Our aim is to conduct a holistic and objective overview to visualize research hotspots, and to identify future directions. The "Web of Science Core Collection" was searched, and 552 papers of elderly care from 2003 to August 31st, 2022 were found out. CiteSpace was used to display the knowledge map of co-occurrence of keywords, and the existing state and the research frontiers were visualized. This paper pays effort to reveal its development and new trends, and to give guidance to the entire society to better serve the elderly.

2. Methodology

2.1. Data Sources and Processing

"Web of Science Core Collection" was searched for data. The retrieval expression presents as TS="elderly care*" OR "elderly service*" OR "pension service*" OR "aging care*" (* is a wildcard), literature type is limited to article and review, and language is limited to English. Date of publication is limited to before August 31, 2022, and 1688 papers in English were obtained. The author reads these paper's titles, keywords and abstracts, and eliminated unrelated papers with the following rules: (I) papers that just pay attention to the characteristics of caregivers; (II) studies that only focus on geriatric diseases and treatments; (III) articles that analyse the workings of assistive technologies that can empower the elderly in their daily activities; (IV) researches that focus on the endowment service institutions, investigating the environment and facilities of these places. After excluding the duplicated articles, 552 papers were obtained finally, the earliest one was published in 2003.

2.2. Methods and Tools

A scientific knowledge map is used to visualize the research hotspots. It is a kind of graph which reveals the networks, structures, interactions, evolution between knowledge's units or groups of a discipline [12]. CiteSpace is a visual software used to draw a scientific knowledge map, which contains the quantitative analysis of the journals, authors, keywords, references from the sample literatures, and generates cluster, timeline, time zone and other forms of map [13]. This study can achieve clear topics and development trends from the results produced by this method, identifying updated research hotspots and frontiers, to offer an effective guideline for the development of elderly care services research [14].

3. Descriptive Analysis

3.1. Number of Documents

The temporal change in the number of documents reflects to some extent the academic output and research enthusiasm of a discipline and can be used to predict future trends through this change [15]. As Figure 1 shows, the documents of elderly care services present an obvious exponential growth, and the publication trend can be divided into three stages. The first stage is from 2003 to 2010, an

average number of 6 articles was published every year. In this period, population aging got worse and better services provided for the elderly has become a pressing matter, which takes the notification of the scholars. In the second stage, from 2011 to 2017, the number of documents got a stable growth, an average number of 20 articles were published every year. In the third stage, from 2018 up to now, the related researches have increased rapidly, the average number of articles published each year has almost reached 75.



Figure 1: Time distribution of published articles

3.2. Core Researchers

Authors with high number of papers own strong academic productivity and those with more cited papers possess great academic influence in this field [15]. Based on the co-citation author’s analysis, CiteSpace counts the frequency of authors and cited authors. The proportion of distinguished researchers to the total can be calculated by the “Price Equation”:

$$R \approx 0.812 / \sqrt{\max} \quad (1)$$

The result is 36%, and it is far beyond the view of 10% researchers write half of the total papers from Price [12]. It indicates disperse research results and a large core author group.

This study selects top 10 core researchers for further analysis. Some high-cited researchers emphasize the improvements of elderly care services. As Table 1 shows, Josefsson et al. describe its characteristics, from the perspective of caregivers, so as to propose targeted propositions for creating high quality services for elderly [16]. Shao et al. construct a framework to evaluate performance of elderly care service centres [17]. Uittenbroek et al. develop a method to measure the quality of integrated elderly services [18].

Some researchers devote themselves to exploring intelligent devices that can support services for the aged. Pekkarinen and Melkas point out that the socio-technical transition of endowment services

can be hindered by technical incompatibilities, usability problems, professionalism and a lack of training [19]. Koceski and Koceska introduce the simulation and experimentation of an assistive telepresence robot. Safe and efficient operation of the robot is helpful to the independent life and social connections for elderly, as well as the nursing work of professional caregivers [20].

Furthermore, some more detailed issues are discussed. Van der Steen et al. paid special attention to the care of patients with Alzheimer's disease, revealing the optimization of communication between doctors and families in mental care [21]. Based on a Stackelberg game model, Song et al. explore the optimal market-oriented transformation policy of pension services supply to balance the conflicts between private interests and public interests [22]. Two forms of subsidy schemes are compared and the operating subsidy turns out to be superior to the construction subsidy in the context of uncertain demands [23].

Analysis of the works of authors with high citation manifests the focus of the scholars. The table 1 shows that reports on public health from the WHO, the UN and the EU are cited frequently. Authors with high citation rates pay attention to the development of aging and the physical and mental state of the elderly. Lawton et al. reveal six types of personal projects that contribute to the well-being of elderly [24]. Graneheim and his co-researchers shed light on the lonely experiences of solitary elderly people [25]. Fried cooperates with his partner to describe the health in aging [26].

Table 1: Top 10 published and cited researchers.

Rank	Top 10 published authors		Top 10 cited authors	
	Number of papers	Author	Citation frequency	Cited author
1	5	Josefsson	80	WHO
2	5	Pekkarinen	21	United Nations
3	4	Melkas	18	Lawton
4	4	Deliens	17	Katz
5	4	van der Steen	14	Wang
6	3	Shao	14	European Commission
7	3	Uittenbroek	14	Graneheim
8	3	Song	14	Feng
9	3	Koceski	13	Fried
10	3	Koceska	13	Zhang

3.3. Core Journals

Table 2: Top 7 core journals.

Rank	Journal	Impact factor	Number of publications	Proportion
1	International Journal of Environmental Research and Public Health	4.614	26	4.71%
2	BMC Geriatrics	4.070	16	2.90%
3	BMC Health Services Research	2.903	16	2.90%
4	Journal of Healthcare Engineering	3.822	12	2.17%
5	Sustainability	3.889	11	1.99%
6	Sensors	3.847	10	1.81%
7	Frontiers in Public Health	6.461	9	1.63%

Arranging the journals in a descending order according to the number of published articles helps position the core journal zone and obtain key articles quickly [15]. According to Bradford's Law,

periodicals can be divided into core, related, and discrete regions in a ratio of 1: n: n² [27]. Through statistical analysis, 288 journals are counted and 90 among them have published 2 or more papers. Take n=6 as the ratio and journals contained in the nucleus can be calculated to be about 7. As Table 2 shows, the top 7 journals publish 18.12 percent of the total literature. Papers of pension services are mainly published in public health or geriatrics, revealing that the aging population has become an urgent global public problem to be solved. The focus on elderly care models, elderly needs, and service providers has promoted the development of this research field.

4. Research Hotspots and Frontiers

4.1. Research Hotspots

Keywords highly summarize the research topics, and keywords with high frequency can help illustrate hot issues [15]. Using CiteSpace, the top 20 high-frequency keywords are chosen for analysis, as shown in Table 3, reflecting the research focus in field of pension service. Its high-frequency keywords are mainly concentrated in 2003-2005 and 2011-2015. “Elderly care” appears most frequently, revealing the research theme of the whole field. “Older adult”, “older people”, and “elderly” represent the research object, and researches are enriched from the perspective of “caregiver”. “Technology”, “home”, and “community” reflect different pension models, including intelligent old-age care using digital technologies, aged-care at home and community pension services.

Table 3: Top 20 research hotspots.

Rank	Count	Intermediary centrality	Year	Keywords
1	133	0.12	2004	elderly care
2	63	0.08	2003	health
3	57	0.03	2003	people
4	57	0.02	2013	older adult
5	51	0.37	2003	health care
6	45	0.05	2011	older people
7	35	0.24	2003	elderly
8	34	0.23	2003	dementia
9	30	0.04	2014	model
10	29	0.07	2008	long term care
11	29	0.11	2012	care
12	27	0.16	2005	caregiver
13	25	0.1	2013	system
14	25	0.01	2016	China
15	24	0.02	2007	impact
16	24	0.03	2015	technology
17	20	0.06	2005	long-term care
18	20	0.02	2013	home
19	19	0.09	2005	community
20	19	0.02	2013	quality of life

Clustering of keywords is displayed in the form of a timeline map, as shown in Figure 2, adopting the way of log-likelihood ratio. Modularity Q and Mean Silhouette in the timeline map show the basic characteristics of the keywords’ clusters. Modularity Q represents the effect of clustering. If the value

is bigger than 0.3, the clustering of keywords has compact internal connections and significant structures. Mean Silhouette represents the homogeneity of documents in the same cluster. The clustering is reasonable if the value is greater than 0.5. In the timeline map, the value of Modularity Q is equal to 0.7559 and the value of Mean Silhouette is equal to 0.6261, reflecting clear clusters and distinct research topics. The radius of a node indicates the frequency of occurrence of keywords, and the lines between nodes indicate the correlation strength between keywords. There are 13 clusters formed by CiteSpace and the researches can be divided into five categories.

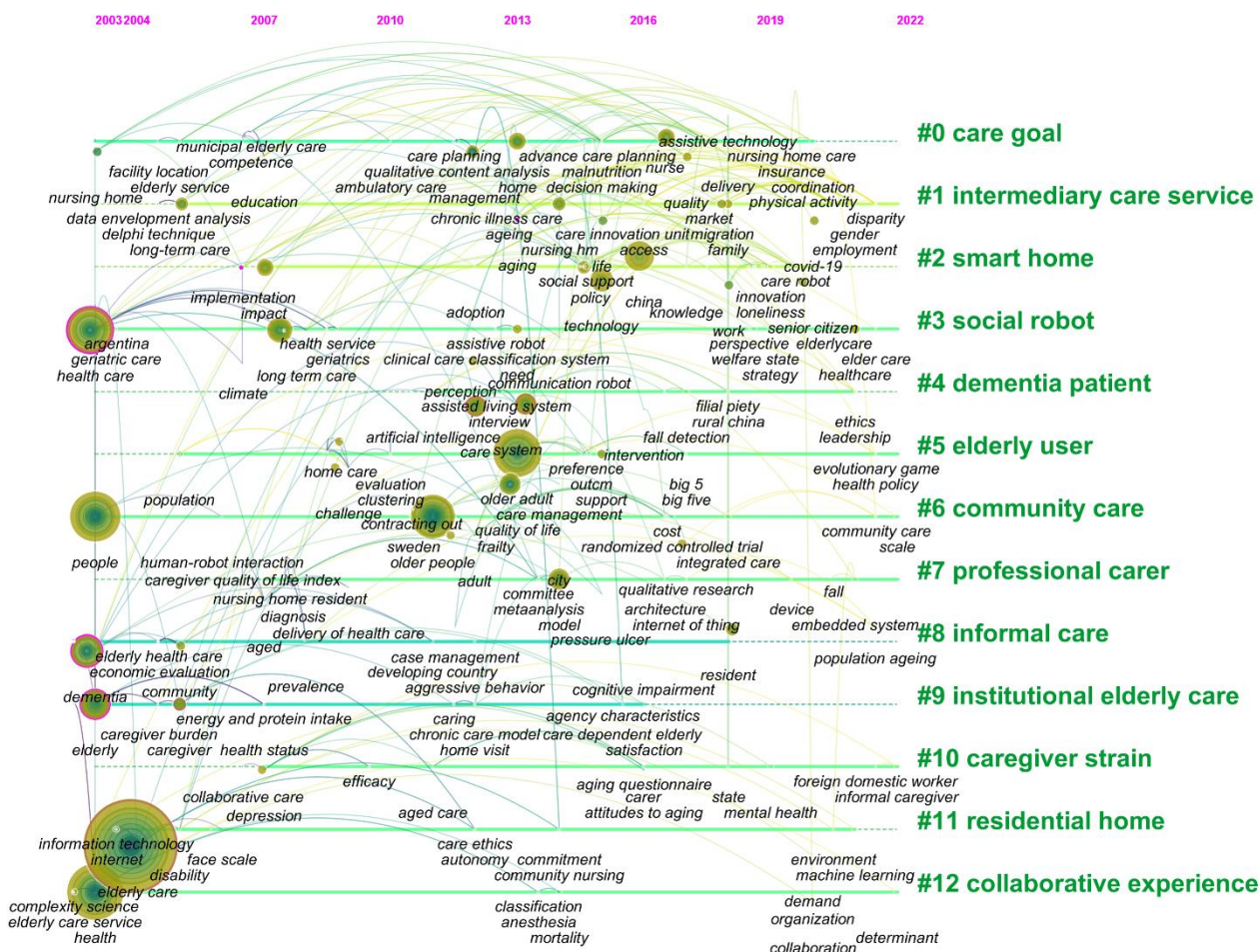


Figure 2: Evolution of research hotspots.

(1) Goal of elderly care services: #0 cluster “care goal” concentrates on the improvement of the quality of elderly life from physical and mental aspects. As the trend of diverse development of content, level, and form is presented in pension demands, it is recommended that human-centred care be used to achieve this goal. Antonsson et al. advocate a learning organization which is built on human-centred care to strengthen the elderly’s role in private or public institutions after eight semi-structured interviews [28]. Personal needs and preferences of the elderly are regarded to be the first in quality improvements of elderly life. Corlin et al. point out how caregivers’ personalities impact the way that caregivers interact with older person is central to meeting the goal through a questionnaire investigation [29]. Healthcare professional engagement and social support are considered as facilitators of person-centred care in Grol et al.’s case studies [30]. The mixed method of interview data by Bokberg et al. shows that human-centered care is positively correlated with the quality of life of elderly people [31]. Based on a regression model, Skoldunger et al. draw the

conclusion that person-centred care is beneficial to quality of elderly life and burden alleviation of care staff [32].

In order to achieve the nursing goal of improving the quality of life of the elderly, it is essential to establish an evaluation index system for elderly care services. Using the "5A" theoretical analysis framework of Penchansky and Thomas, Hu et al. established an evaluation system consisting of three primary indicators, including the accessibility of home based community care, institutional care, and administrative services [33]. Xu et al. construct a quality evaluation indicator system aimed at smart community service for the aged, and the feasibility of the method has been verified in four typical cities in Jiangsu Province [34]. Li et al. put forward a model of multi-dimension concentration convolutional neural networks to reflect pension services objectively and accurately [35].

(2) Basic pension models: According to the results of keywords clustering, the paper distinguishes three types of basic pension models, including home-based pension services, community care for the aged and institutional endowment. Some new types of elderly care emerge in 1# cluster "intermediary care service" and 8# cluster "informal care" are also discussed in this study.

#6 cluster "community care" is a response to the call of aging in facilities. Many facilities have been built to help the elderly live better in familiar environments and realize their desire to age in place [36]. It was found that people have a strong demand for elderly care hotlines, establishing health records, on call nursing and doctor visits, medical lectures, regular physical examinations, and exercise and fitness [37]. Based on Maslow's customer satisfaction theory and demand hierarchy theory, Shi et al. pointed out that elderly people living in communities are interested in basic needs, environment, personal characteristics, and liveability [38]. Differentiated and refined endowment services are required for aging-friendly communities. It is a general trend to build a "Internet plus" intelligent platform for elderly care in communities. Wang and Xu discussed the possible paths and practical challenges of applying the Internet, the Internet of Things, mobile networks, big data, and cloud computing to community elderly care [39]. Also, some scholars attach importance to physical environment and facilities of communities, including site selections, noise pollution, elevator establishment and space [40], and wireless sensors are placed in communities to realize the parameter estimation of collected indicators of ecological environment [41].

#9 cluster "institutional elderly care" focuses on the researches of sustainable operation of nursing homes [42], challenges confronted with institutions [43], and proposing solutions. According to Wang et al.'s investigation, main clients of elderly care institutions are empty nesters or spouse-bereft and living alone aged people [42]. Nursing homes bring the fingerprint indoor-positioning technology as the base of a sustainable elderly healthcare system, which not only ensures the safety of elderly but also enhances the management efficiency [43]. Accurate alerts from positioning technologies are useful to give timely treatments to the elderly who fall down or get injured, which saves the time and physical cost of medical staff to find them. Currently, a threat that institutions are facing is the growing number of care labor shortage. Wright proposes that institutions have a choice between increasing the number of migrant caregivers and taking robots or other emergent technologies as carers [44]. According to Chen et al.'s interviews, available healthcare, friendly environment, and social communication are needed most by residents [45]. Consequently, the priority of institutions is to conduct a continuous, dynamic process of communication among healthcare professionals, older adults and their families. Advance care planning can effectively grasp the preferences and values concerning future care continuously and dynamically. Piers et al. develop several recommendations for caregivers on applying advance care planning, containing all stages from initiation to the implementation [46]. According to a cluster randomized controlled trial, Aasmol et al. identified the daily work and staff involvement of nursing homes as key facilitators for implementing pre care plans [47].

#11 cluster “residential home” refers to the most fundamental home-based care for aged. It can maximize social cost savings, but the care resources provided by a single entity are difficult to meet the daily care needs of the elderly. Based on a survey of utilization situation and demands on old-aged care at home, Zhao et al. recommend strengthening its socialization in terms of enriching service contents and delivery methods [48]. Jiang and Li suggest establishing a multi-level and multi-functional guarantee system based on home-based elderly care, supplemented by community elderly care and government elderly care [49]. Due to insufficient services provided by the government, it has become common for the government to purchase home-based elderly care from social organizations. But the decision made by a multi-attribute group is often irrational, Lu et al. integrate the cumulative prospect theory into the TODIM (Interactive and Multicriteria Decision Making) method to calculate the performance of the government’s purchase [50]. Xu and Zhang construct an efficient resource-allocated model to help governments make decisions on purchases of home care [51]. Meanwhile, Lu et al. discuss the governments’ anti-risk ability of purchasing pension service from the perspective of complex network theory [52]. Additionally, by contrast, the net benefits of government-supported tele-homecare model is only a quarter of the non-government-supported one, the reason may be no prequalification are instituted prior to funding [53].

#1 cluster “intermediary care service” and #8 cluster “informal care” describe some new types of care supply modes such as integrated intermediary care services and medical care for the aged. Aung et al. take community integrated intermediary care as a backup respite care to provide free services for the elderly who cannot obtain continuous care [54]. Wang et al. explore the model of integrated medical and nursing services, which can satisfy the elderly and reduce the risk of disease [55].

(3) Innovative ways of elderly care services: #2 cluster “smart home”, #3 cluster “social robot”, and #5 cluster “elderly user” contain a large number of researches on smart elderly care, an innovative model of integrated intelligent and care services, which can provide efficient, instrumented, interconnected and intelligent elderly care at a low cost based on sensor network system and information platform. Researches focus on the exploration of realization path [56], the acceptability of products/services [57], advantages and risks of smart elderly care. On the basis of the symbiosis theory and the logistic growth model, the maximize value of pension service can be realized through the reciprocal symbiosis model of multiple resource agents in the smart pension ecosystem. Zhang et al. use real cases to dynamically imitate the model and verify its validity [58]. Intelligent devices provide the elderly with friendly, mutual, and personalized interactions [59]. Depending on comprehensive monitoring and dependable algorithm processing, a set of intelligent nursing system can eliminate many hidden dangers in elderly care [60]. While smart aging platforms bring convenience, low level of regulation of platforms is likely to cause privacy disclosure. Shi et al. construct a three-party game system among the elderly, service providers and government to analyze the cost-benefit of supervision [61]. A quantitative evaluation of regulatory proposed by Hao et al. can reduce the cost of social pension [62].

(4) Demands of special aged population: #4 cluster “dementia patient” shows concern for the elderly with dementia, comprised of characteristics of dementia care [63], special care programme aimed at dementia sufferers [46], and corresponding actionable solutions. Severe dementia tends to live with poor neuropsychiatric status, depressive symptoms and low quality of life from Lee et al.’s clinical data [64]. What’s worse, dementia care is underfunded and unavailable to ordinary people, which increases the life burden of sufferers’ families. The above problems must be solved by family responsibility and specialized training classes [63]. According to Josefsson et al.’s questionnaire survey, more conflicts are found in dementia group compared with the general care, thus more professional nursing knowledge and more emotional companionship are necessities of dementia nursing [16]. Fortunately, the emergence of intelligent technologies and specific care programs offers the provision of the optimal solutions for dementia nursing [65]. Examples of robot therapy for elderly

with dementia are provided by Shibata and Wada [66], and the role of technology in monitoring, intervening, and supporting actions of dementia sufferers has been confirmed [67].

(5) Provision of elderly care services: #7 cluster “professional carer”, #10 cluster “caregiver strain”, and #12 cluster “collaborative experience” take the provision into account. The socialization [68] and marketization [22] paths of elderly care, as well as the personal situation of caregivers [69], are covered in the studies. How the state should act more on endowment services is the core issue to its socialization. Government has the responsibilities to put more manpower into the staff training [68], intervene resource allocations [70] and rationally layout the senior service facility system [71]. Environmental policies for mature regions and core instruments for immature regions are necessary [72]. At the same time, due to the finite capabilities of the government, plenty of private enterprises pour into the pension industry. Scholars put high value on the reasons for the elderly care marketization [73], factors for private enterprises’ entry in the pension industry [74], and performance evaluation of private pension enterprises [17]. Further, from the point of government-enterprise cooperation, some scholars have a heated debate on the risk assessment of the governments’ procurement from private providers [75] and optimal subsidy for the endowment services marketization [22]. In the above studies, caregivers’ workload, self-health, personality and other characteristics also achieve the attention of scholars [69].

4.2. Research Frontiers

With increased aging, elderly care research has more diverse forms, broader perspectives, and more various contexts, and research frontiers have changed accordingly. Keywords with strong citation burst manifest the research trends in this field. Burst refers to a sharp increase in the citation of a keyword in a short period of time. There are five keywords with strong burst representing the research frontiers, as shown in Table 4. Green parts of the lines represent the duration of which the keyword has become research hotspot in this field, while the grey parts refer to the entire period. The strength of these keywords does not differ much and the duration of “China” reaches 2022.

Table 4: Strongest citation bursts keywords.

Keywords	Year	Strength	Begin	End	2003-2022
quality of life	2003	3.83	2013	2015	
nursing home	2003	3.39	2013	2017	
frailty	2003	3.3	2013	2017	
work	2003	3.48	2018	2019	
China	2003	4.31	2021	2022	

“Quality of life” represents researches on how to realize the goal of improving the quality of elderly life. Taking requirements of the elderly seriously, researchers carry out a quantity of researches on the person-centred care and the design of pension evaluation system. On the basis of the Internet of Things, Bajenaru et al. develop a user-oriented approach which can identify the needs and preferences of the elderly [76]. Some novel technologies like convolutional neural networks are used into the evaluation [35].

“Nursing home” puts emphasis on the endowment services institutions. As the younger generation tends to live in urban cities and social resources allocate unevenly, home care and community care is unable to fully meet the needs of the elderly. Nursing care proves to be the best alternative for the elderly. The sustainable operation of nursing homes has received the focus of scholars. Yang et al. apply fingerprint indoor positioning that can send alert messages to nursing workers technology to provide a sustainable care system for nursing homes [43]. A patient-accessible information system

that cut down redundant treatments can help nursing homes to undertake parts of medical care [77]. Given the fact that the frail aged leave their families and live in nursing homes, indoor environments [78], adequate nourishment [79], and pain relief management [80] of the nursing homes are tested by the scholars. Migrant caregivers and robots are valid substitutes for shortage nursing workers [44].

“Frailty” highlights the researches on the situation of the elderly and targeted preventive care. The growing elder population is a vulnerable group with complex needs. They are likely to suffer from increasing heat, poor quality food, physical deterioration and mental diseases. Halbmayr et al. pursue to create spaces of high living quality, increasing plants and greenery by technical means [78]. Eslami et al. design a clinical decision support system to promote general practitioner to adhere to the quality indicators for assessing care of frail elders [81].

“Work” concentrates on the work of several entities that provide elderly care from the perspective of contents, characteristics, and performance. Josefsson et al. describe the work situation and characteristics of registered nurses in general and dementia care [16]. Governments take the responsibilities to make policies on updating the skills of care staff [68], care resources allocation [70], and layout of senior service facilities [71].

“China” indicates the expansion of the contexts of elderly care research. Due to the severe aging trend in China, scholars give more sights to the characteristics of the elderly in China [82]. Taking real cases in China as samples, they make a comparison of subsidy policies which can benefit the endowment service marketization [23]. The exploration of old-age care in a specific context can develop diverse pension modes and formulate appropriate services policies, and promote an integration of several service supply entities, satisfying the personalized needs of elderly population.

5. Future Directions

On the basis of above analysis, it is necessary to sustain the elderly care services research and many practical problems need to be solved. As shown in Figure 3, this article constructs a framework for the future direction based on the logic of target actions.

First, researchers should make efforts to design a multidimensional dynamic measurement that can classify and integrate demands of different elderly groups. Demands of elderly citizens are random and scattered, characterized by regional differences and dynamic changes. There lacks a reasonable indicator system to measure the fragmented elders’ needs, especially the elderly with dementia, disability, and spouse-bereft. A more careful measurement can help better combine different types of pension services in terms of service type and quality, provide support for auto service recommendation, and improve the efficiency of services supply. How to classify and combine demands of different types of elders, and realize variety of elderly care combination are the key to the personalized recommendation of elderly care services.

Second, how the behavioral characteristics of elders interact with elderly care need to be explored. Differences between the elderly and ordinary people lie in not only fitness and daily life, but also in cognitive and behavioral styles. Exploration on the behavioral characteristics of different elderly groups is the premise for the analysis. The analysis of behavior and preferences of older adults can give reference to service providers in the practice of nursing care. Researches on how the elderly act and what their preferences are in different contexts of distinguished pension models need to go deeper.

Finally, researches on the innovative elderly care service system ought to be strengthened. Many researches have been conducted on the current models while some innovative and integrated models are ignored. The development of intelligent technologies, changes in pension culture and specific institutional environments offer opportunities to the emergence of novel pension models. An integrated endowment services system combined with specific contexts and culture, and based on intelligent technologies is the future research focus.

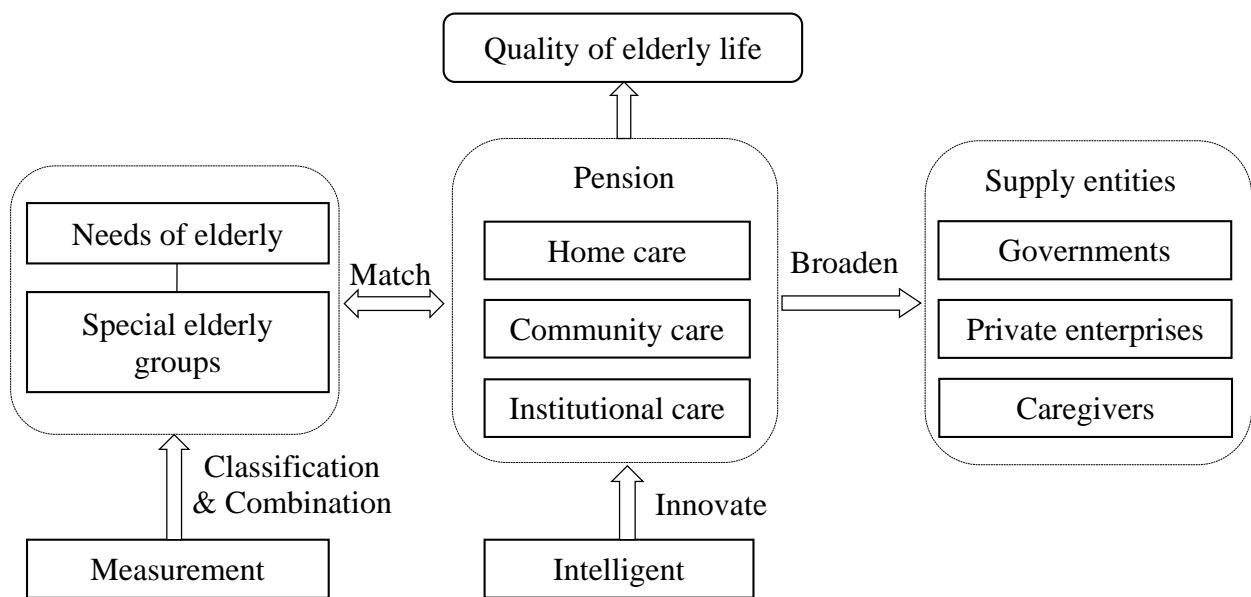


Figure 3: Integration framework of elderly care research.

6. Conclusions

Using a scientific knowledge map, this paper visually displays the characteristics, research hotspots, and frontiers of 552 papers on pension services. Based on the visualized result, this study draws some important conclusions as follows.

First, researches on elderly care services have received continuous attention for a long time. Its development can be divided into three stages. From 2003 to 2010, the global aging was getting worse and how to serve the elderly aroused the scholars' attention. From 2010 to 2017, it developed slowly; and after 2017, the researches have increased rapidly and are mainly published in the field of public health or geriatrics. Research results are dispersed and a large core author group are emerged.

Second, based on the results of keywords clustering, this paper finds that researcher hotspots focus on care goal, basic pension modes, innovation and provision of elderly care services, as well as demands of special aging groups. There are three basic pension models, namely old-age care at home, community care of elderly, and institutional elderly care. Keywords with strong burst indicate the research frontiers, including care goal, aged support agencies, frailty of the elderly, work of supply entities, and elderly care services in China.

Finally, three future directions are proposed. It is necessary to design a multidimensional dynamic measurement to classify and integrate demands of different elderly groups. Researches on the interaction between behavioral characteristics of elders and elderly care need to go deeper. Ultimately, taking the actual contexts into consideration, an integrated pension model based on novel technologies is worth further development.

Acknowledgement

This research was supported by the Anhui Philosophical and Social Science Program (Grant No. AHSKY2019D030).

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