Visualization Analysis of Literature Big Data on Elderly Service from the International Perspective

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Abstract. To investigate systematically the development status of literature big data on elderly service, this paper regarded 1268 SCI-E/SSCI/A&HCI literatures from 1983 to 2019 in the WoS core collection database as the research objects. Using CiteSpace 5.6R1 to draw the mapping knowledge domains, this paper investigated the research hotspots, research frontiers and development trends. The research results are as follows. (1) Literature big data on elderly service has witnessed a rapid increasing trend, which gradually adopts a multi-disciplinary and multi-view approach to conduct the elderly service research. (2) Research hotspots mainly focus on demand for elderly services, elderly service model and elderly service quality. (3) Research frontiers mainly include the concept and path of elderly service model, elderly service quality and elderly service innovation, which has gone through three development stages. Our findings provide insights into the promotion of the research and practice on elderly service globalization.

Introduction

The population aging and the COVID-19 pose the severe challenge to elderly service from the international perspective, which has aroused great concern in the theoretical and practical circles. In 2002, the Political Declaration adopted by the 2nd World Assembly on Aging pointed out that "The world population is undergoing unprecedented changes. It is estimated that the number of people over 60 years old will reach nearly 2 billion by 2050, accounting for 21% of the total population." Population aging is an important trend of social development. So actively coping with it has become a global strategic choice. The elderly service generated by population aging is the core content of the social welfare service, as well as the social security system. Our party and government attach great importance to elderly service. General Secretary Xi Jinping has made many important instructions on the standardization of elderly service. Against this background, how to promote elderly service from the international perspective is not only a theoretical issue, but also a strategic issue related to people’s lives and national image.

Given above, it is of great significance to investigate systematically the development status of literature big data on elderly service from the international perspective. Therefore, this paper regarded 1268 SCI-E/SSCI/A&HCI literatures from 1983 to 2019 in the WoS core collection database as the research objects. Using CiteSpace 5.6R1 to draw the maps of keyword co-occurrence, keyword cluster, and burst detection, this paper investigated the research hotspots, research frontiers and development trends. This paper may help new researchers to identify the most relevant and influential keywords, thus further establishing future research directions. Our findings provide insights into the promotion of the research and practice on elderly service globalization.

Sample and Methodology

Sample

This paper regarded the WoS (Web of Science) core collection database as the data-collection platform. The bibliometric search strategy can be illustrated as follows. TS= ("pension service" or
"elderly care" or "old-age service" or "elderly service"). Time span = 1983-2019. Language = English. Literature type = journal articles. Journal source = SCI-E, SSCI, A&HCI. The subject type is limited to all disciplines. After a distinct search, 1268 English literatures were finally obtained.

CiteSpace

This paper used CiteSpace 5.6R1 to draw the maps of keyword co-occurrence, keyword cluster, and burst detection for further analysis. CiteSpace is a multi-dimensional, time-sharing, dynamic citation visualization analysis software analyzing the knowledge contained in scientific literatures. CiteSpace is to identify and display developing trends and burst terms. The scientific knowledge maps contain the mathematical thinking, thus transforming the overall research information into scientific pictures. This combination of mathematical thinking and visual thinking can present the evolitional law of literature big data on elderly service from the international perspective. Consequently, people will have a more objective understanding. [1]

Descriptive Statistics

Annual Variations of Publications

Annual variations of publications are presented as Fig. 1. As can be seen from Fig. 1, there was an overall upward trend of publications on elderly service from 1983 to 2019. According to the published literatures on elderly service, the research can be divided into four stages. The first stage was from 1983 to 1990. There is little literature on elderly service, and the annual literature quantity was mostly 1. The second stage was from 1991 to 1999. The amount of literatures increased slowly, but did not exceed 20. The third stage was from 2000 to 2009. The growth of the annual literature quantity was fluctuant. With population aging more and more severe, countries have formulated policies to promote the development of the elderly care industry. For example, the Japanese government promulgated the Nursing Insurance System in 2000, which transformed the nursing system from a social welfare system to a social security system. However, the amount of literatures declined significantly in 2001, 2002 and 2004. One possible reason is that fewer papers are published in international core journals. The fourth stage was from 2010 to 2019. The amount of literatures increased dramatically in this stage. In 2012, the first China International Senior Services Expo was held in the Shanghai World Expo Exhibition and Convention Center. This expo set up a new platform to promote industrial exchanges at home and abroad. In 2013, in order to accelerate the government's purchase of elderly service, the Ministry of Finance and other four departments jointly issued the Notice on the Government's Purchase of Elderly Service. As a result, a large amount of literatures on elderly service emerged in this period. Among them, the amount of literatures in 2019 reached 152.

Figure 1. Annual variations of publications.
Subject Category Analysis

Discipline classification can reflect the fields of research results. According to subject category analysis, the subject distribution on elderly service from the international perspective was relatively concentrated. It mainly included nursing (221, 17.43%), geriatrics gerontology (148, 11.67%), public environmental occupational health (145, 11.44%), gerontology (122, 9.62%), health care sciences services (97, 7.65%), medicine general internal (75, 5.92%), health policy services (63, 4.97%), management (60, 4.73%), psychiatry (54, 4.26%) and social work (51, 4.02%). Besides, there are many interdisciplinary studies on elderly service, forming an expanding citation network. Comparatively speaking, the subject distribution on elderly service in our country presents a research structure of "uneven development", which requires a multi-disciplinary and multi-view approach to conduct in-depth research on elderly service.\(^2\)

Literature Source Analysis

The literatures on elderly service were mainly distributed in *Scandinavian Journal of Caring Sciences* (1.642, Q2), *Journal of Advanced Nursing* (2.376, Q1), *International Journal of Nursing Studies* (3.57, Q1), *Journal of Nursing Management* (2.386, Q1), *Age and Ageing* (4.511, Q1), *Journal of Clinical Nursing* (1.757, Q1), *Bmc Health Services Research* (1.932, Q3), *Bmc Geriatrics* (2.818, Q1 and Q3), *Plos One* (2.776, Q2) and *Social Science Medicine* (3.087, Q1). To be clear, there are impact factor of version 2018 in the WoS database and JCR partition in the above brackets. According to literature source analysis, the journal distribution was concentrated. Moreover, the journal impact factors are relatively high. There are many journals appearing in JCR Q1 and Q2, which has already laid a solid theoretical foundation for the development of elderly service research.

Research Hotspots Analysis

Keyword Co-occurrence Analysis

Keyword co-occurrence analysis can be used to analyze research hotspots.\(^1\) Based on this, running CiteSpace 5.6R1, top 10 frequency and centrality keywords distribution can be shown in Table 1.

| Frequency | Centrality | Keywords          | Frequency | Centrality | Keywords             |
|-----------|------------|-------------------|-----------|------------|----------------------|
| 330       | 0.37       | elderly care      | 46        | 0.90       | caregiver            |
| 102       | 0.00       | care              | 3         | 0.82       | home care            |
| 92        | 0.13       | older people      | 92        | 0.55       | dementia             |
| 92        | 0.00       | health            | 49        | 0.39       | perception           |
| 92        | 0.55       | dementia          | 330       | 0.37       | elderly care         |
| 90        | 0.04       | people            | 4         | 0.29       | nurse-patient interaction |
| 76        | 0.09       | elderly           | 4         | 0.29       | observation study    |
| 72        | 0.21       | nurse             | 16        | 0.28       | nursing              |
| 61        | 0.00       | impact            | 4         | 0.26       | ward                 |
| 60        | 0.09       | work              | 49        | 0.24       | prevalence           |

As shown in Table 1, elderly care ranks first (330) sorted by frequency, representing a hot topic on elderly care from the international perspective, which is consistent with our country \(^2\). Moreover, care, older people, health, dementia and people also appear frequently. The centrality of caregiver, home care, dementia, perception, elderly care, nurse-patient interaction, observation study, nursing, ward and prevalence are all above 0.1. It shows that the above keywords are of high academic
influence in the literature big data network. Among them, keyword with the highest centrality is caregiver (0.90), and there is a co-occurrence relationship between it and many other keywords. Given Table 1, elderly services definitely need money, but more importantly, they need caregivers.

**Keyword Cluster Analysis**

The larger the scale of keyword cluster, the smaller the number is, and the more important the cluster is. CiteSpace 5.6R1 is used to classify similar research contents. Running CiteSpace 5.6R1, the keyword cluster view can be presented as Table 2. Given Table 2, we clarified three research topics on elderly service.

1. Demand for elderly services. Research on demand for elderly services mainly includes #1 methicillin-resistant staphylococcus aureus [3], #3 long-term elderly care setting [4], #5 health-related profile [5], and #7 social class [6]. Among them, #1 mainly includes sub-cluster members: national survey, family communication, and communication model. #3 mainly includes behaviour difficulties, central role, and mental health. #5 mainly includes pain matter, elderly acceptance, and preventive mobile health service. #7 mainly includes social care, domestic labour, and cross-sectional analysis. Overall, the content, level, form, and influencing factors of the demand for elderly services are more diversified.

2. Elderly service model. Research on elderly service model mainly includes #2 general medical ward [7] and #8 screening tool. Among them, #2 mainly includes stroke unit, collaborative stroke training programme, and action plan. #8 mainly includes dietary supplement, different family structure, and different countries. Overall, elderly service model is more diversified, which will help better meet the demand for elderly services.

3. Elderly service quality. Research on elderly service quality mainly includes #0 elderly-community nurses experience [8], #4 caregiver empowerment [9], #6 registered nurses [10], and #9 nurses knowledge [11]. Among them, #0 mainly includes cluster members: elderly patient communication, non-verbal behaviour and elderly activity recognition. #4 mainly includes cluster members: caregivers job satisfaction, skilled nursing centre and descriptive study. #6 mainly includes troubled conscience, municipal elderly care and elderly care-a. #9 mainly includes cluster members: pilot study, hidden nursing information and nurse communication.

### Table 2. Keyword cluster distribution.

| Cluster ID | Silhouette | Cluster name                          | Cluster ID | Silhouette | Cluster name         |
|------------|------------|---------------------------------------|------------|------------|----------------------|
| #0         | 0.99       | elderly-community nurses experience   | #5         | 0.91       | health-related profile|
| #1         | 0.72       | methicillin-resistant staphylococcus aureus | #6         | 0.94       | registered nurses     |
| #2         | 0.89       | general medical ward                  | #7         | 0.91       | social class          |
| #3         | 0.83       | long-term elderly care setting        | #8         | 0.83       | screening tool        |
| #4         | 0.88       | caregiver empowerment                 | #9         | 1.00       | nurses knowledge      |

**Research Frontiers and Knowledge Evolution Analysis**

Burst detection method can reflect research frontiers and knowledge evolution on elderly service.[1] Running CiteSpace 5.6R1, the burst terms obtained in corresponding period are presented as Table 3.

As shown in Table 3, the burst terms paid the longest attention include elderly people, rehabilitation, communication, diagnosis, women, social support and prevention. The burst term with the highest burst degree is questionnaire. Given literature big data on elderly service from the international perspective, related literatures can be divided into three stages.

During the first stage from 1993 to 1999, elderly service research was in its initial stage. With the increasing number of elderly people, the traditional elderly service model was difficult to meet the needs of elderly services. At the same time, the price of elderly service was rising and the pressure on the public finances was increasing. In this context, the government began to seek social support and allow social organizations to enter the elderly service market. Finally, the principle of
multi-welfareism with government, family, market and social organization as subjects was formed. Scholars began to study the concept and path of diversified elderly service model.

During the second stage from 2000 to 2009, elderly service research emerged a large number of burst keywords, such as questionnaire, nursing, depression, mental health, strain, risk factor, municipal elderly care, quality of care, burnout and symptom, which mainly focused on elderly service quality. With the development of population aging, increased demand for elderly care services led to a surge in supply. Then it was difficult to meet the quality requirements. Therefore, scholars mainly focused on the psychological state of the elderly in the whole process of elderly service from the perspective of the demand side. As the increasing demand for spiritual comfort, cultural entertainment and value realization, the quality evaluation of elderly service was no longer limited to daily care and medical care, but gradually showed a trend of diversified development.

During the third stage from 2010 to 2019, system, quality of life, performance and long-term care have become the new fields of elderly service research. The development of technologies such as artificial intelligence, the internet of things, big data and robotic technology provide the foundation for elderly service innovation. Thus, the concept of smart care has become popular. How to accelerate the in-depth integration of the internet and elderly service, build a multi-level smart care system, and create a new model of elderly service have become frontier topics.

| Period       | Keywords                          | Burst | Period          | Keywords                      | Burst |
|--------------|-----------------------------------|-------|-----------------|-------------------------------|-------|
| 1993-1999    | elderly people                    | 5.24  | 2000-2009       | questionnaire                 | 7.10  |
|              | rehabilitation                    | 5.00  |                 | nursing                       | 5.68  |
|              | communication                     | 4.91  |                 | depression                    | 4.72  |
|              | diagnosis                         | 4.70  |                 | mental health                 | 4.72  |
|              | women                             | 4.49  |                 | strain                        | 4.29  |
|              | social support                    | 3.98  |                 | risk factor                   | 4.09  |
|              | prevention                        | 3.92  |                 | municipal elderly care        | 3.98  |
| 2010-2019    | system                            | 6.05  |                 | quality of care               | 3.97  |
|              | quality of life                   | 5.19  |                 | burnout                       | 3.68  |
|              | performance                       | 4.76  |                 | symptom                       | 3.68  |
|              | long-term care                    | 4.61  |                 |                               |       |

Summary

This paper regarded 1268 SCI-E/SSCI/A&HCI literatures from 1983 to 2019 in the WoS core collection database as the research objects. Using CiteSpace 5.6R1 to draw the mapping knowledge domains, this paper investigated the research hotspots, research frontiers and development trends. The research results are as follows. (1) Literature big data on elderly service has witnessed a rapid increasing trend, which adopts a multi-disciplinary and multi-view approach to conduct in-depth research on elderly service. (2) Research hotspots mainly include elderly care, care, older people, health, dementia, people, elderly, nurse, impact, and work, which mainly focus on demand for elderly services, elderly service model and quality. (3) Research frontiers mainly include the concept and path of elderly service model, elderly service quality and innovation, which has gone through three development stages. From 1993 to 1999, the traditional elderly service model gradually transformed to the diversified elderly service model. Scholars mainly studied the concept and path of the diversified elderly service model. From 2000 to 2009, it mainly focused on how to improve the quality evaluation system of elderly service from multiple perspectives. From 2010 to 2019, the research paid more attention to upgrade the in-depth integration of the internet and elderly service, build a multi-level smart care system, and create a new elderly service model.
In general, the profound background of the times has continuously promoted the development of elderly service. New research topics have emerged in this field, and scholars have achieved abundant accomplishments. In the future, we need to focus on the following aspects. (1) Improve the research framework of elderly service. Most scholars only focused on one aspect of elderly service, but few conducted a systematic study of elderly service. Moreover, the existing research lacked a clear main line to connect it into a complete theoretical system. Therefore, systematic research should be strengthened to improve the scientific research. (2) Adopt a multi-disciplinary and multi-view approach to conduct the research on elderly service. Existing literatures mostly studied the effect of elderly service in nursing, geriatrics gerontology, public environmental occupational health, and gerontology. However, with the continuous development of elderly service, scholars should pay attention to the role of elderly service in psychology, computer science and technology, economics and other disciplines. The interdisciplinary study can make the different disciplines permeate each other and act synergistically on the theoretical development of elderly service.

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