

Visualization Analysis of Research Hotspots on Timing in Right Theory in the Field of Nursing

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Abstract: *Objective:* Based on the CNKI database, this study analyzes the current research status and hotspots of the Timing it Right (TIR) Theory in China, providing insights and references for its further development in the field of nursing. *Methods:* Using bibliometric methods and Citespace software, this study conducts a statistical and visual analysis of publications on TIR Theory from CNKI, focusing on annual publication volumes, author collaboration networks, high-frequency keywords, and emergent terms. *Results:* The study statistically analyzed the time distribution and research hotspots of 117 relevant papers. The annual publication volume shows a gradual upward trend, though the overall volume remains low. High-frequency keywords such as “family nursing,” “quality of life,” “acute myocardial infarction,” and “stroke” form the core research themes. *Conclusion:* Research on TIR Theory in China’s nursing field is still in the exploratory stage, and its attention and emphasis need to be enhanced. As it aligns with modern medical models, its application scope in nursing is expanding, promoting the high-quality, scientific, and diversified development of nursing services in China.

Keywords: TIR Theory; Research status; Hotspots; Frontier; Visualization

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1. Introduction

The core concept of Healthy China 2030 prioritizes health ^[1]. Against the backdrop of national decision-makers attaching great importance, public health management has become a crucial national strategy ^[2]. With rapid economic development, advancements in healthcare, and changes in lifestyle habits, the prevalence of chronic diseases in China has been increasing annually. Deaths caused by chronic diseases account for 87% of total national deaths, and the burden of chronic diseases makes up about 70% of the total disease burden in China ^[3]. Due to lagging healthcare and a lack of social support, caregivers play a vital role in patient care. Throughout the care process, caregivers’ physical, mental, and emotional health is continuously affected, with the extent of

impact dynamically changing with the patient's disease stage^[4].

Timing it Right (TIR) theory, also known as the appropriate timing intervention model, originated in 2008. It was proposed by Cameron and other scholars at the Toronto Rehabilitation Institute in Canada during their research on the changing needs of stroke caregivers at different stages of the disease^[5]. The model is based on different disease stages, primarily divided into five phases: event/diagnosis, stabilization, preparation, implementation, and adaptation. In each phase, the theory emphasizes providing caregivers and patients with varying degrees of informational, emotional, instrumental, and evaluative support, offering a theoretical framework for continuous care^[6].

Citespace software, developed by Dr. Chaomei Chen, is a tool with visualization analysis functions that integrates methods such as social network analysis, clustering analysis, and multidimensional scaling analysis. It focuses on analyzing, exploring, and identifying research hotspots and development trends within a particular discipline, presenting the findings through visualization^[7]. Therefore, to better understand the current research status and development trends of TIR Theory in the nursing field in China, a literature search based on the CNKI database was conducted, and Citespace software was used to perform a visual analysis of relevant studies on TIR Theory in nursing. This aims to provide a reference for further research in this area.

2. Materials and methods

2.1. Literature search strategy

Using the CNKI (China National Knowledge Infrastructure) journal paper database as the data source, the following search strategy was employed in the "Advanced Search" section: (TI = "TIR Theory" OR TI = "Timing Framework" OR TI = "TRI" OR TI = "Timing Family Support") AND (TI = "Nursing" OR SU = "Nursing"). The search period was limited from January 1, 2014, to August 16, 2021. By reading the titles and abstracts, irrelevant literature was excluded, and 117 valid papers were retained in the end.

2.2. Quality control

- (1) Inclusion criteria: literature related to the theme of "TIR Theory."
- (2) Exclusion criteria:
 - (a) Master's and doctoral dissertations, conference reports, news reports, yearbooks, patents, government documents, laws and regulations, bulletins, newspaper compilations, and experience-sharing meetings.
 - (b) Repeated publications of the same research or documents with incomplete content.

2.3. Analysis tools and methods

Citespace 5.8.R1, developed by Dr. Chaomei Chen, was used as the primary research tool. A visual analysis was conducted focusing on annual publication volumes, authors, high-frequency keywords, and emergent terms, with the aim of exploring the research status, hotspots, and future research trends. The specific operational settings were as follows:

- (1) Timespan: 2014–2021
- (2) Years per slice: 1
- (3) Node types: Author, Keywords, etc.

- (4) Link: Cosine
- (5) Selection criteria: TopN = 50 or g-index k = 25
- (6) Pruning: Pathfinder + Pruning the merged network + Pruning the sliced networks

3. Results

3.1. Distribution of annual publications on TIR Theory

A total of 448 articles were retrieved, and after removing duplicates and excluding literature unrelated to nursing, such as conference papers, 117 valid records were obtained (see **Figure 1**). According to **Figure 1**, research on TIR Theory first began in 2014. Between 2014 and 2016, the annual number of publications remained low, with fewer than ten papers per year. However, the number of publications gradually increased afterward, though the overall volume remained low. The year with the highest number of publications was 2020, with 40 articles.

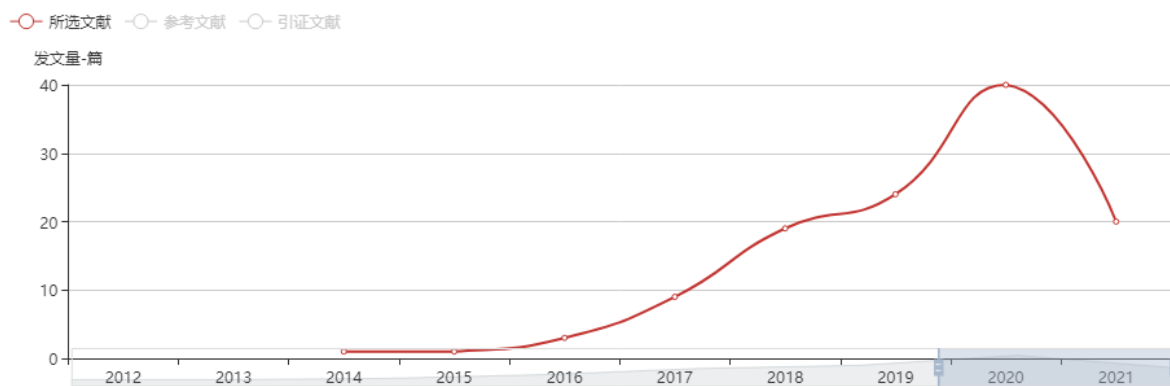


Figure 1. The trend of annual publications on TIR Theory

3.2. Distribution of institutions publishing on TIR Theory

A network analysis of institutions was performed with institutions as network nodes. According to the predefined research settings, 111 nodes and 0 links were identified, resulting in a network density of 0 (see **Figure 2**). Each node represents a publishing institution, and the lines between nodes indicate collaboration between institutions. The thickness of the lines reflects the degree of collaboration. As shown in **Figure 2**, institutions conducting research on TIR Theory in nursing are scattered, and there is no collaboration or communication between them. The publication volume is generally low. Among the 117 articles, only one institution had more than two publications, with the rest coming from clinical hospitals. The top three institutions in terms of publication volume were the Nursing School of Shanxi Medical University, the Second People's Hospital of Wuxi, Jiangsu Province, and Zhongnan Hospital of Wuhan University, each publishing two articles. Other institutions, such as the Nursing School of Qingdao University, the Second Affiliated Hospital of Zhengzhou University, and Nanjing Chest Hospital, each published one article. Among the top six publishing institutions, five are located in southern China, and one is from central China (see **Table 1**).

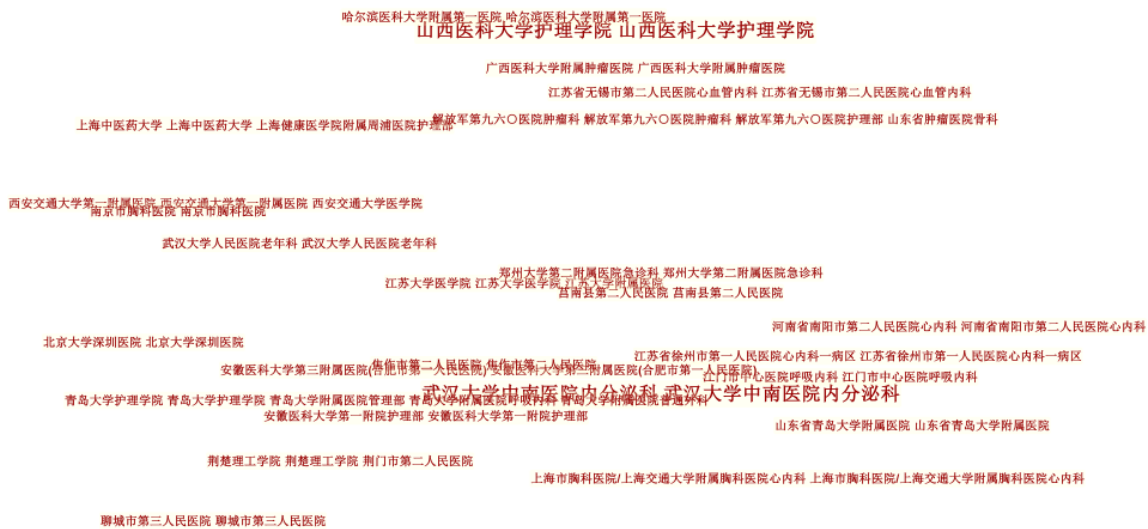


Figure 2. Visual network of institutions publishing on TIR Theory

3.3. Distribution of authors publishing on TIR Theory

A network analysis of authors was conducted with authors as network nodes. According to the research settings, 146 nodes and 132 links were identified, resulting in a network density of 0.0125 (see **Figure 3**). The size of the nodes represents the number of articles published by each author; larger nodes indicate a higher number of publications. The links between nodes represent a collaboration between authors. As shown in **Figure 3**, the collaboration between eight authors, with Zhou Junhui as the core, is the most frequent, forming the largest collaborative group. In addition, there is one group of six authors, three groups of five authors, three groups of four authors, and four groups of three authors. The earliest collaboration, between the six-person group led by Wang Shanshan, appeared in 2014, followed by the eight-person group led by Zhou Junhui in 2015, and the four-person group led by Yao Mingying in 2020.

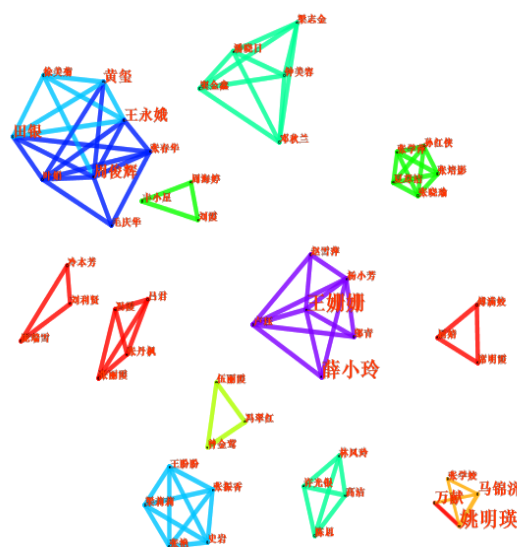


Figure 3. Visual network of authors collaborating on TIR Theory

3.4. Research hotspots in TIR Theory

A network analysis was conducted using “TIR Theory” as the keyword, following the research settings. The result included 155 nodes and 254 links, with a network density of 0.0213 (see **Figure 4**). Keywords serve as indexing terms in scientific papers, summarizing and refining the concepts of the literature. The centrality of keywords highlights their importance in the entire co-occurrence network, making keyword analysis crucial for understanding the research hotspots in a particular field. The size of the nodes represents the frequency of keyword occurrence; larger nodes indicate higher frequencies [8]. The top four keywords, in terms of frequency, were TIR Theory, family nursing, quality of life, acute myocardial infarction, and stroke (see **Table 1**). Emergent terms, which detect words with a high rate of frequency change, reveal the research frontiers and development trends by measuring the rate of frequency increase, not just the frequency itself [8]. In the field of nursing research related to TIR Theory, 10 emergent terms were identified, including family members, caregiving experience, and caregiving ability (see **Figure 5**).

Table 1. Top 10 keywords in TIR Theory

Rank	Keyword	Frequency	Centrality
1	TIR Theory	103	0.58
2	Family Nursing	27	0.34
3	Quality of Life	25	0.16
4	Acute Myocardial Infarction	19	0.21
5	Stroke	10	0.54
6	Caregiver	10	0.23
7	Caregiving Experience	9	0.50
8	Continuity of Care	8	0.17
9	Caregiving Ability	7	0.34
10	Based on the TIR Theory	6	0.44

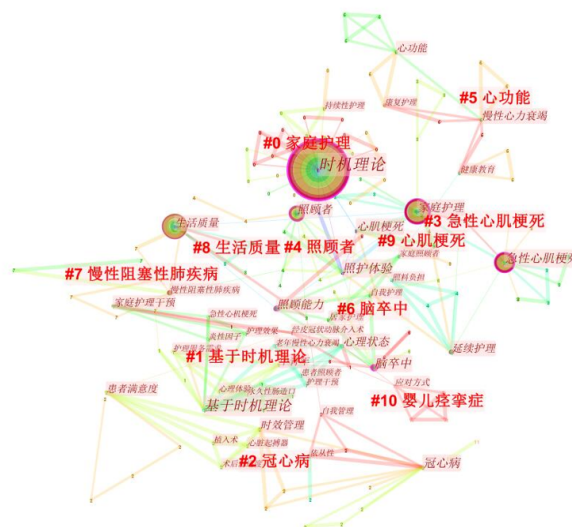


Figure 4. Visual network analysis of keywords in TIR Theory

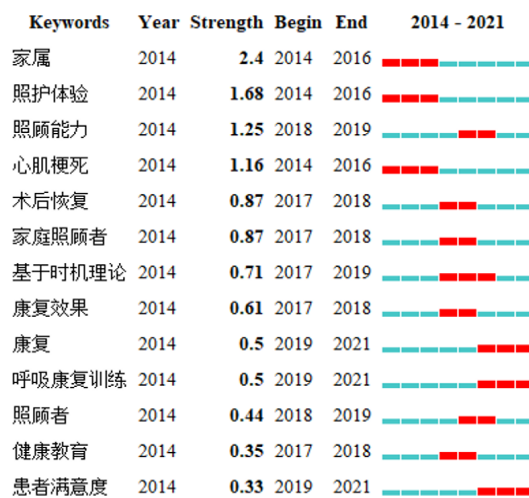


Figure 5. Emergent terms in TIR Theory

4. Discussion

4.1. Development trends of TIR Theory in nursing-related research

The distribution of publication volumes shows that research on TIR Theory by domestic scholars began in 2014. Wang and others ^[9] applied TIR Theory-based nursing interventions to the care experiences of patients with acute myocardial infarction, promoting the health of both patients and caregivers. This marked the beginning of TIR Theory research in China's nursing field. In recent years, there has been a gradual increase in the exploration of TIR Theory in nursing, with experts using it as theoretical guidance, focusing on the needs of patients and their caregivers at different stages of illness. This approach motivates family members to take an active role in care, utilizing them as primary caregivers. TIR Theory is also applied in health education and continuity of care across various diseases, enhancing the caregiver's ability, the patient's self-care capacity, and adherence to medical advice, ultimately improving the patient's quality of life. Although the application of TIR Theory in nursing research is gaining more attention, the overall volume of publications remains low, indicating that further research is needed to advance its integration into nursing in China. Currently, domestic research on TIR Theory includes both quantitative and qualitative studies, with quantitative research being dominant, accounting for 96.6% of the selected literature. Qualitative studies mainly apply TIR Theory in fields such as cancer, gynecology, and pediatrics ^[10-13]. Overall, the research trend is still in an exploratory phase, which may be partly due to the study's reliance on a single database, suggesting that further exploration is needed in future research.

4.2. Research institutions and authors in nursing-related studies on TIR Theory

The cooperation networks of authors and institutions show that institutions are scattered, and there is no collaboration between them, with low publication volumes and a lack of institutions with substantial output. As seen in **Figure 3**, the academic communities in TIR Theory nursing research are still relatively small, with the main core teams led by Zhou Junhui and Wang Shanshan. Their collaboration periods are distinct, and many authors have only contributed single papers. Therefore, research on TIR Theory in nursing needs to be

strengthened through communication and collaboration among different institutions and authors, as well as interdisciplinary cooperation and the joint application of multiple theories. This would promote the development of TIR Theory in nursing research, ultimately enhancing the health levels of patients and caregivers.

4.3. Research hotspots in nursing-related studies on TIR Theory

The keyword visualization map shows that aside from “TIR Theory,” terms such as “family nursing,” “quality of life,” “acute myocardial infarction,” and “stroke” are research hotspots in the field of nursing. This suggests that the scope of research on TIR Theory in nursing is expanding, but the depth of research needs further improvement. Overall, the application of TIR Theory in nursing focuses on two main aspects: (1) research on caregivers, focusing on their special needs during different stages of a patient’s illness. Studies indicate that caregivers have various needs throughout the disease process, including disease-related knowledge, pre- and post-operative information, medication guidance, rehabilitation care skills, family support, and patient-provider communication. These needs exhibit dynamic changes across different stages, requiring nurses to propose targeted interventions based on caregivers’ evolving needs to reduce caregiving pressure, improve caregiving ability and confidence, and thereby promote patient recovery^[14]; (2) research on patient interventions, which has shown good results across different diseases, particularly in conditions like myocardial infarction, stroke, and chronic obstructive pulmonary disease. For example, Zou^[15] conducted a study on 70 first-time stroke patients, finding that patients receiving TIR Theory-based health management interventions showed significantly better self-care abilities and quality of life than the control group. This suggests that nursing interventions based on TIR Theory have a positive effect on stroke patients and are valuable in improving their quality of life.

From the changes in emergent terms and the distribution of keywords, it can be seen that the current application of TIR Theory in nursing primarily focuses on family nursing, caregiving experience, and caregiving ability, with an emphasis on internal medicine diseases. Although research on TIR Theory has developed rapidly in recent years, there are still many shortcomings in practical application. In the future, the potential for interdisciplinary integration of TIR Theory with other theories should be explored to construct a more comprehensive theoretical framework, which could become a new trend in the development of health promotion theories^[16].

5. Conclusion

This study conducted a visual analysis of research outcomes in TIR Theory in nursing by examining annual publication volumes, author distribution, institutional distribution, and keyword co-occurrence. The results indicate that while the number of publications is gradually increasing, the overall volume remains low. Collaboration between authors and institutions is also limited, with “family nursing,” “quality of life,” “acute myocardial infarction,” and “stroke” emerging as key research hotspots. As a theoretical framework for continuity of care interventions, TIR Theory meets the evolving needs of both patients and caregivers at different stages, boosting caregivers’ confidence while improving patients’ quality of life. Although research on TIR Theory in China started relatively late, its application in disease care has already yielded significant results. At present, TIR Theory is primarily applied to internal medicine patients, such as those with myocardial infarction, stroke, or chronic obstructive pulmonary disease, while its use in surgery is still in its infancy, and related research in gynecology and pediatrics is mainly qualitative. Although this study relied on a single

domestic database for visual analysis, which presents certain limitations, it is hoped that this research can serve as a catalyst for further exploration of TIR Theory in nursing, providing methods and references for future nursing-related research.

Disclosure statement

The authors declare no conflict of interest.

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