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TRACING RESEARCH TRAJECTORIES: VISUALIZING EVOLUTIONARY PATTERNS IN DEEP VENOUS THROMBOSIS NURSING LITERATURE

Lei Zhang
Shaanxi University of Traditional Chinese Medicine, China

Abstract:
Venous thromboembolism (VTE), encompassing deep vein thrombosis (DVT) and pulmonary thromboembolism (PT), poses a significant risk to hospitalized patients, often resulting in unexpected fatalities. Each year, more than 10 million individuals worldwide fall victim to DVT, making it a global health concern. Early intervention has proven effective in mitigating the incidence, disability, and mortality associated with DVT. Recognizing the urgency of the issue, many nations prioritize VTE prevention as a pivotal component of healthcare quality management, underscoring the growing importance of nursing staff in this context. This study employs software-driven visual analysis to scrutinize literature on DVT prevention from both domestic and international sources, accessible through the China National Knowledge Infrastructure (CNKI) and Web of Science (SCI). The goal is to unveil research hotspots and emerging trends in the field of DVT nursing, providing valuable insights for future scholars and enhancing clinical DVT prevention and nursing quality.

Keywords: Venous thromboembolism, deep vein thrombosis, pulmonary thromboembolism, nursing prevention, literature analysis

1. Introduction

Venous thromboembolism (VTE) includes deep vein thrombosis (DVT) and pulmonary thromboembolism (PT). It is an important cause of unexpected death of patients in hospitals [1]. It has been reported that more than 10 million people worldwide suffer from DVT every year [2]. Early intervention can effectively reduce the incidence, disability and mortality of DVT [3]. Many countries in the world regard VTE prevention as a key element of medical quality management [4]. This not only poses a greater challenge to clinical DVT prevention, but also raises the requirement for nursing staff. Timely understanding the development status of DVT nursing at home and abroad is of great significance for clinical DVT prevention and improvement of clinical nursing quality. In this study, software was used to visually analyze the relevant literature on nursing prevention of DVT collected by China National Knowledge Infrastructure (CNKI) and Web of Science (SCI). In order to reveal the research hotspot and development trend of this field at home and abroad, and provide reference for future scholars.

2. Data and methods

Data source Search CNKI and Web of Science (SCI) core collection databases. The search period is up to January 2023. In order to ensure the quality of literature, CNKI limited the core journals of Peking University. The search terms were (deep vein thrombosis or deep vein thrombosis or venous thromboembolism or pulmonary embolism or pulmonary embolism) And (nurse/caregiver/nursing). The foreign language is the Web of Science core Collection and the Citation Index is Science Citation Index Expanded(SCI). The search terms were (Venous thromboembolism or deep venous thrombosis or pulmonary embolism or VTE or DVT or PE) and (Nurses or Nursing Staff or Nursing) or (orthopedic*and). Select two types of English literature: Article and Review. Literatures unrelated to the research theme, repeated publication and news reports were excluded, and the subject category was set as "Nursing". Finally, 675 Chinese and 506 English literatures were included as analysis objects.

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Methods: The literature management software Note Express was used to sort out the literature, and Excel and Origin2018 were used to input and analyze the data. Citespace was used for literature visualization analysis. The time slices were all 1 year, and statistical analysis was carried out on the number of domestic and foreign publications, high-frequency words, clustering, and emergence.

3. Results

3.1 Analysis of the number of published documents in the year

A total of 675 Chinese literatures and 506 English literatures were included. In this study, the Chinese literature on DVT first appeared in 1992, which can be roughly divided into three stages. The first stage: 1992 ~2000 is the beginning stage, and the number of papers published in this period is relatively scattered. The second stage: the period from 2000 to 2011 was the development stage, and the number of published documents increased year by year; The third stage: The number of published documents decreased slightly after 2011, but showed an increasing trend after 2017. Foreign research results were published relatively late. This study was first included in 2007, and the number of published literatures before 2015 was small. From 2015 and 2016, the number of published papers was higher than that of China, and the maximum number of published papers in 2021 reached 35. Figure 1

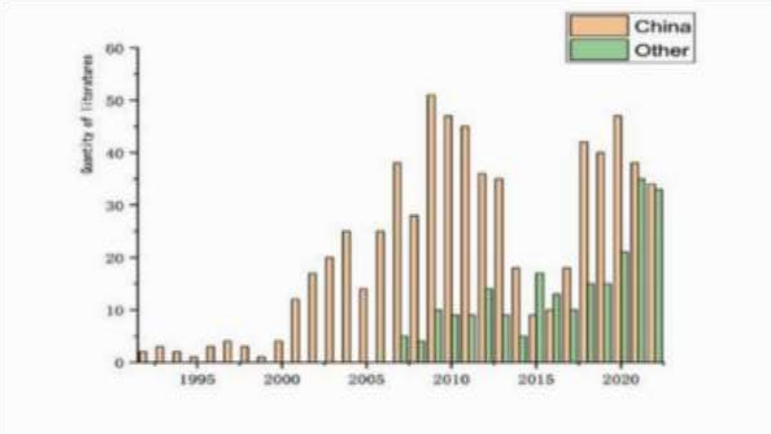

Figure 1: Total number of publications

3.2 Author cooperation network distribution

From 1992 to 2022, a total of 1,692 authors published relevant literature in China. In the author's collinear network knowledge graph, the number of network nodes is 1166, the number of connections is 2009, and the density is 0.003. Ma Yufen (18 articles), Xu Yuan (17 articles) and Wang Xiaojie (17 articles) are the top three authors in terms of published variables in China. Among them, Ma Yufen, a scholar from Peking Union Medical College Hospital of Chinese Academy of Medical Sciences, who published the most articles, mainly focuses on VTE, DVT, risk assessment, risk factors and current investigation of pulmonary embolism and other research fields [5-7].

A total of 570 authors have published relevant literature worldwide. In the author's collinear network knowledge graph, the number of network nodes is 411, the number of connections is 737, and the density is 0.0087 (Figure 2). Ashrani (5 papers), Holzmueller (3 papers) and Heit (3 papers) are the most published foreign authors. Among them, Ashrani's research direction is mainly related to the relationship between diabetes, progesterone, cancer and DVT and the independent risk factors of DVT
[8-10]. Figure 2.

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Figure 2: Analysis diagram of author cooperation network
84-89,

3.3 Analysis of national/regional and institutional cooperation networks

A total of 435 research institutions were retrieved in China from 1992 to 2022, and the top institutions with the number of published papers were Shandong Provincial Hospital (11 papers), Union Hospital Affiliated to Tongji Medical College of Huazhong University of Science and Technology (5 papers), and the First Affiliated Hospital of Wenzhou Medical College (4 papers), but there was no connection between the institutions. It shows that there is no cooperation among Chinese hospitals in the study of DVT, and the number of publications has not seen the difference between regions. From 2007 to 2022, a total of 195 articles were retrieved from the international community, and 302 articles were co-located. China (81 articles) ranked first in the number of DVT nursing papers, followed by the United States (66 articles), the United Kingdom (13 articles), Australia (12 articles) and Canada (12 articles).

3.4 Analysis of research hotspots

3.4.1 High-frequency keyword analysis

High-frequency keywords can reflect the hot issues in the research field [11]. The Chinese time period was 1992-2022, and the foreign time period was 2007-2022. The time slice was set to 1 year, the database algorithm was set to top 50, and the top 10 high-frequency keywords were used for statistical analysis. See Table 1. (Deep vein thrombosis, venous thrombosis, thrombosis, pulmonary embolism, nursing and other key terms in this field were not included in the analysis).

Table1. DVT nursing research high frequency words

Number	Count	Keyword
1	67	prevention
2	46	risk factor
3	34	risk
4	26	management
5	23	guideline
6	20	disease
7	16	Meta-analysis
8	16	diagnosis

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9	15	complication
10	14	surgery

Keywords	Year	Strength	Begin	End	2007-2022
post-thrombotic syndrome	2007	2.28	2009	2011	
d-dimer	2007	1.48	2009	2013	
dalteparin	2007	1.97	2011	2014	
intensive care unit	2007	2.13	2012	2014	
molecular weight heparin	2007	1.72	2012	2017	
critical care	2007	1.6	2012	2014	
metaanalysis	2007	2.13	2013	2018	
critically ill patient	2007	1.83	2013	2014	
antithrombotic therapy	2007	1.52	2015	2017	
epidemiology	2007	1.79	2016	2018	
intermittent pneumatic compression	2007	2.37	2017	2018	
thrombosis	2007	2.69	2018	2022	
risk	2007	2.44	2018	2020	
stroke	2007	1.5	2018	2022	
mortality	2007	1.44	2020	2022	

Figure 3: The top 15 emergent words cited in foreign literature

4. Discussion

4.1 The number of publications on deep vein thrombosis care is on the rise, and more and more attention has been paid to it worldwide

DVT prevention guidelines have been issued at home and abroad, emphasizing that nurses play an important role in preventing DVT [12]. Analysis of the number of published papers: The overall number of domestic DVT published shows an upward trend, indicating that the domestic research on DVT is always in a high heat state. After 2007, the number of foreign DVT publications showed a spiral upward trend, indicating that more and more international nursing scholars pay attention to the study of DVT.

4.2 Strengthen research cooperation among institutions to promote the development of deep vein thrombosis research

According to the author cooperation network diagram, there are connections among some high-producing author nodes in China, which indicates that there is a certain cooperative research relationship among high-producing authors. However, the overall network density is low, suggesting that cooperation between high-yield authors needs to be improved in future studies to jointly promote the development of DVT nursing research. According to the national/institutional cooperation network map, although China is leading in the field of DVT nursing research, compared with other countries, there is no connection between institutions in China, indicating the lack of research cooperation between institutions, which is not conducive to academic research, and also restricts the development of this field to a certain extent. Cooperation between high-yield institutions and other institutions should be strengthened to promote the flow and sharing of knowledge in this field and promote the further development of the entire research field.

4.3 Frontier analysis of research hotspots

The research hotspots of high-frequency keywords and cluster analysis results can be summarized into the following three categories, research objects, research content and research direction.

4.3.1 Research object

Research objects at home and abroad include orthopedic patients, gynecological tumor patients, stroke patients, critically ill patients, ICU patients, children, etc. In recent years, with the promulgation of relevant guidelines in China,

the research on DVT in China has gradually deepened, but in the future, comprehensive and in-depth research on key DVT populations for nursing staff is still needed to reduce the incidence of DVT [13-14]

4.3.2 Research content

Compared with the development level of foreign DVT risk assessment tools, China is relatively backward. According to domestic guidelines, the Caprini scale is recommended and has been used in surgical patients, patients with severe diseases and patients with malignant tumors. However, a meta-analysis shows that the specificity of this scale is low, and laboratory examination items may underestimate the DVT risk of some patients in the assessment [15-16]. In addition, the evaluation effect of Padua scale, Autar scale and RAPT scale has also been confirmed, but their effectiveness needs to be further verified in China due to differences in race, physique and lifestyle [17]. At present, relevant scales suitable for different fields in China have been developed, but further research is needed to develop accurate scales for DVT risk factors in different populations.

The research on nursing intervention of DVT is concentrated at home and abroad. Early warning management is the key to prevent DVT. Domestic scholars proposed nursing risk early warning management in 2008 [18]. At present, the clinical intervention measures for DVT mainly include mechanical prevention, basic prevention, drug prevention and the establishment of an effective early-warning nursing platform [19]. First, mechanical prevention includes gradient pressure elastic socks, intermittent inflatable pressure devices and plantar arteriovenous pumps. It is mainly used for patients at high risk of DVT with active bleeding or massive bleeding risk, and especially serious bleeding consequences. Second, basic prevention includes active or passive lower limb activity as early as possible, strengthening health education, etc. Third, clinical anticoagulant drugs mainly prevent thrombosis by changing the hypercoagulable state of blood, but at the same time, there will be complications such as bleeding. DVT early warning management system realizes comprehensive intelligent management of patients and standardizes nursing work [20]. However, China's DVT early warning intervention lacks high-quality original research, and the source, reliability and validity of the measurement tools used are not clear enough, so further research is needed.

4.3.3 Research direction

In China, the combination of evidence-based nursing and rehabilitation nursing in DVT prevention pays more attention to the research on patients' psychology, nursing experience, health education and other routine nursing [21-23], while in foreign countries, there are more studies on drug prevention and physical prevention [24].

5. Summary

Based on the visualization analysis of CiteSpace software, this study objectively summarized the research hotspots and development of DVT nursing prevention at home and abroad in the past 30 years. This study also has some limitations. The literature data only comes from the core collection of CNKI and Web of Science, and the number of documents is small, which cannot cover all the studies in this field and lacks certain completeness and accuracy. The total amount of literature will be expanded in the future, so as to provide a more comprehensive reference for the research on DVT nursing in our country.

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