

*Food Therapy and Health Care***Visual analysis of the research hotspots of Neuman systems model in recent 20 years**Hui-Min Zhang<sup>1</sup>, Wen-Jiao Li<sup>1</sup>, Hong-Mei Ma<sup>2\*</sup>, Yan Li<sup>3\*</sup><sup>1</sup>Graduate College, Tianjin University of Traditional Chinese Medicine, Tianjin, China;<sup>2</sup>Tianjin People's Hospital, Tianjin, China;<sup>3</sup>Tianjin University of Traditional Chinese Medicine, Tianjin, China.**\*Corresponding to:** Hong-Mei Ma. Tianjin People's Hospital, Tianjin, China. Email: hongmeima1031@163.com. Yan Li, Tianjin University of Traditional Chinese Medicine, Tianjin, China. Email: 22019036@qq.com.**Highlights**

Using CiteSpace V software to analyze the relevant literature of Neuman systems model, and analyze the time distribution, research power distribution, research hotspots, research frontier and development trend of Neuman systems model at home and abroad in the past 20 years, in order to provide reference for the future development of related work and research.



## Abstract

**Background:** This paper uses information visualization software to sort out the relevant research of Neuman systems model at home and abroad in the past 20 years, and discusses the research hotspots and development trend in the field of Neuman systems model, so as to provide scientific and reliable reference for the future work and research.

**Methods:** By using CiteSpace V software, this paper analyzes the literatures about the Neuman systems model collected in the core web of science database and CNKI database from 2001 to 2020, and analyzes the time distribution, research power distribution, research hotspots, research frontier and development trend of the Neuman systems model at home and abroad in the past 20 years.

**Results:** The development trend of research in this field in foreign countries is relatively stable. The core strength of research is mainly in the United States, and the research hotspots are health, quality of life, caregivers, spirituality, etc; the research in this field in China is gradually on the rise, and there is no obvious research force, and the research hotspots are mainly quality of life, complications, anxiety, stressors, perioperative period, hypertension, etc.

**Conclusions:** It has been proved that the model has a certain guiding effect on the development of nursing discipline in China. In China, there is still room for development in the research of this model. It is suggested that Chinese scholars can learn from foreign leading research forces to carry out in-depth research and expand its application scope.

**Keywords:** Neuman systems model, Research hotspots, At home and abroad, Visual analysis

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## Abbreviations:

NSM, Neuman Systems Model; WoS, Web of Science; CNKI, China National Knowledge Infrastructure.

## Competing interests:

The authors declare that they have no conflict of interest.

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## Introduction

The Neuman systems model (NSM) was put forward by Betty Neuman in the 1970s. Guided by holism and systematology, this model explores the interaction between stressors and individual systems, as well as the nursing model of individual system's regulatory response and reconstruction of system balance ability [1]. In the field of modern nursing, which emphasizes holistic nursing and health promotion, this model is widely used in clinical nursing, nursing education, nursing research and other fields in the world because of its comprehensiveness and flexibility [2]. With the development of Neuman systems model, this model was first applied in the nursing procedure by Chinese scholars in 2001 [3]. The application is conducive to the comprehensiveness and depth of nursing, and has high practical value. In order to better grasp the research direction in this field, this research will use visualization technology to analyze the current domestic and foreign Neuman systems model related literature, and have a clearer and more intuitive understanding of the research hotspots and development trends of the Neuman systems model at home and abroad. Provide reference for related work and research in the future.

## Materials and methods

### Data sources

This study selects Web of Science core collection database (WoS) and CNKI database as data retrieval sources. Web of Science core collection database as the most authoritative citation database in the world, including the most influential journals in various fields. As the main domestic knowledge source, CNKI database covers a wide range of comprehensive literature resources. The Chinese search terms are "Neuman systems model", "Neuman nursing model", "Neuman theory" and "Neuman model". The English search terms are "Neuman systems model", "Neuman model", "Betty Neuman model" and "Neuman theory".

The search time is from January 1, 2001 to June 2, 2020. A total of 469 documents were retrieved, and 336 documents were finally included after the exclusion of those with inconsistent themes, including 252 Chinese documents and 84 English documents.

### Research method

This study uses information visualization technology, based on network knowledge map, to present the structure, rule and distribution of subject knowledge. CiteSpace V software, with its distinctive network knowledge map, intuitively displays the key path and important turning point in the field of scientific research, and gradually becomes one of the international mainstream visual analysis tools. In this study, we use the software to analyze the time, author, institution, country, keywords and other information of the imported literatures visually, and discuss the research hotspots and development trends in this field.

## Results

### Time distribution of document quantity

Import the retrieved data into excel, and generate a histogram with the year as the abscissa and the annual document quantity as the ordinate. The dotted line in the graph represents the trend of document quantity at home and abroad, as shown in Figure 1. It can be seen from Figure 1 that the number of domestic publications has been on the rise since 2001, with a small number from 2001 to 2007 and a slow growth trend from 2008 to 2019, with a maximum of 43 publications in 2019. However, the total number of foreign publications is small and the development trend is relatively stable, with a maximum of 20 publications in 2012. It shows that although the research on the Neuman systems model started late in China, it has a high degree of concern. From the overall development trend, the research on the Neuman systems model in China is on the rise, which reflects that the Chinese scholars pay more attention to the study and research of nursing theory.

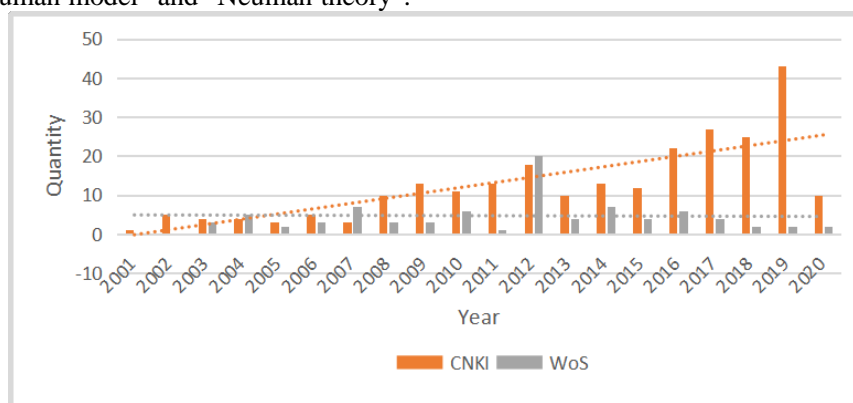


Figure 1 Time sequence of relevant papers on Neuman systems model

**Research power analysis**

Through the research of the authors, institutions, and countries, we can understand the main scholars in this field, know which institutions they are located in and which country they belong to, so as to provide references for the introduction of academic resources, cooperation and academic achievement evaluation [4].

*Author cooperative network analysis*

Set parameters: time partition is 2001-2020, time slice is 5 years, node type is "Author", select Cosine algorithm, data threshold is set to top30, no clipping. There are 27 nodes in the domestic map, among which Wang Li, Fan Yuying, and Li Qiujie appear more frequently. There are 5 nodes in foreign maps, among which Jacqueline Fawcett and Eileen Gigliotti appear more frequently, with the highest occurrence frequency reaching seven times.

*Institution cooperation network analysis*

The parameter setting is the same as above, and the node type is "Institution". There are seven high-frequency nodes in the domestic map, including two medical schools and five hospitals. They are the Nursing College of Hebei University, Hangzhou Normal University School of Medicine, the First Affiliated Hospital of Wenzhou Medical University, Wuxi Fifth People's Hospital, Union Hospital of Tongji Medical College of Huazhong University of Science and Technology, Shenzhen Longhua District People's Hospital, and Zhaoqing First People's Hospital hospital. The foreign maps also identified seven high-frequency nodes, including five universities, and the most frequently occurring nodes are Dokuz Eylul University and University of Massachusetts Boston.

*Country Cooperation Network Analysis*

The parameter settings are the same as above, and the node type is "Country". In the analysis of foreign data sources, it is found that the United States is the largest node in the atlas, with the frequency of 45 times, accounting for more than 50% of foreign data, followed by Turkey. The above fully reflects that the United States has a certain leading position in research in this field, followed by Turkey. However, there are very few related articles published in SCI journals in my country. However, from the perspective of domestic trends, Chinese scholars have a certain degree of recognition and attention to this model. It is suggested that Chinese scholars can strengthen cooperation with leading foreign forces to promote the in-depth development of the Neuman systems model in China.

**Research hotspots analysis**

Keywords often contain important information such as the research object, research content, and research methods of the literature. They are the condensed content of the research field. The word frequency often represents the research hotspots in the research field. The evolution process of high-frequency keywords can reveal the evolution process of the research hotspot in this field [4,5]. Reset the parameters. The time slice is set to 1 year. The node type is keyword. Other parameters remain unchanged. After running the software, the keyword co-occurrence network map of Neuman systems model is obtained, including 53 nodes and 103 connections in China, and 8 nodes and 4 connections in foreign countries, as shown in Figures 2 and 3. The larger the nodes in the figure, the higher the



**Figure 2 Analysis of co-occurring keywords in CNKI**



Figure 3 Analysis of co-occurring keywords in WoS

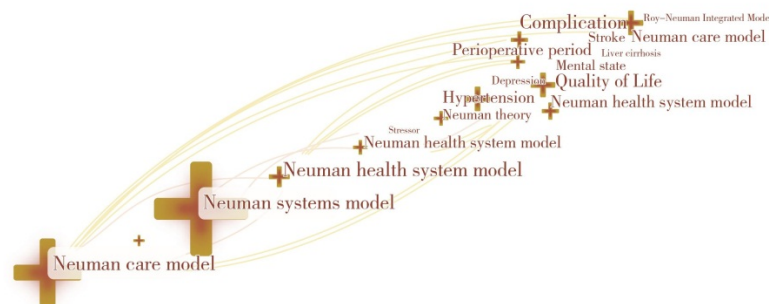


Figure 4 Analysis of Time Zone keywords in CNKI

frequency. The keywords with higher frequency in China are Neuman systems model, nursing, quality of life, hypertension, anxiety, complications, stressors, nursing intervention, perioperative period, etc. The keywords with higher frequency in foreign countries are Neuman systems model, nursing, health, nursing theory, quality of life, caregiver, spirituality. Intermediary centrality is an important indicator to measure the importance of nodes in the network. Highly intermediary documents are usually the key hub connecting two different fields. The higher the intermediary, the greater the importance of the node [4]. In the domestic map, the keywords with Intermediary centrality greater than 0.1 are quality of life (0.26), nursing (0.20), Neuman health system model (0.17), complications (0.16), Neuman nursing model (0.13), hypertension (0.12), perioperative period (0.11).

In order to more clearly and intuitively show the path evolution of research and development in this field, this study uses the "Time Zone View" function. The time interval of keywords is the first occurrence time, and the node and label size represent the frequency of occurrence, as shown in Figure 4 and

Figure 5. According to Figure 4, the research process of Neuman systems model in China can be divided into three stages.

Stage 1: From 2001 to 2007, the keywords of high-frequency are the Neuman systems model and nursing, so the research hotspots mainly focus on the application of the Neuman systems model in nursing. Because the Neuman systems model focuses on maintaining the balance of the individual system through three-level preventive nursing measures, its integrity and systematization are conducive to the individual reconstruction of health, so the model is considered as an effective theoretical framework and is applied in gradually applied in the field of nursing [6]. In 2001, Yuan AH first published the application of Neuman systems model in nursing procedures in China. Through the evaluation of the dynamic of five variables, three defense mechanisms, internal and external environment and pressure sources, the nursing objectives and measures were determined, and the effectiveness of nursing outcomes was evaluated [3]. In 2003, Jian P applied the Neuman systems model to the nursing of patients with chronic hepatitis B. The results of randomized controlled trials show that the

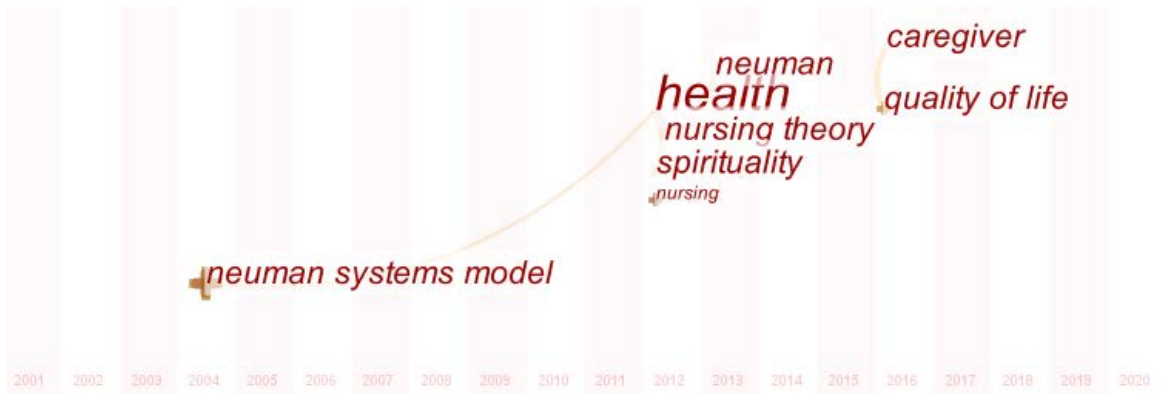


Figure 5 Analysis of Time Zone keywords in WoS

Neuman systems model has a guiding role in improving patients' lifestyle and psychological stress, and enhancing patients' beliefs about hepatitis-related knowledge and health care capabilities [7].

Stage 2: From 2008 to 2015, the high-frequency keywords are stressors, hypertension, anxiety and depression. In this stage, researchers have made more in-depth research on the basic core concepts of Neuman systems model. Meanwhile, hypertension and improving the negative emotions of patients have gradually become the research hotspots of scholars. In 2012, Zhang XY used Cooper's 5-step literature review method to analyze the related researches on stressors at home and abroad, and answered the questions about what are the main research topics related to stressors, what methods and evaluation tools are used to confirm stressors, what are the theme words of stressors, and whether there are common stressors, so as to provide rationale for Chinese scholars to better use this model on the basis [8]. In 2012, Yao AJ used a randomized controlled trial to explore the application effect of Neuman systems model in patients with hypertension. Compared with the relevant literature at the same time, this literature has a higher amount of downloads and citations, indicating that this literature has a certain guiding role [9].

Stage 3: From 2016 to 2020, the relevant research and development of Neuman systems model gradually matured, the application scope of the model was expanded, the research types were more extensive and the research content was more abundant, and some scholars tried to combine the model with other theoretical models to make the use of the model more flexible. As can be seen from Figure 5, Neuman systems model mainly focuses on health, nursing, spirituality, quality of life and caregivers. Among them, "spirituality" has been widely concerned by many scholars. In 1989, Neuman further improved the system model and defined the spiritual variable as the fifth variable of the individual system. The spirit is the source of the individual's internal strength and the

significance of individual survival, and its role is higher than that of psychological nursing [10]. Foreign scholars applied mental variables in Neuman systems model as a theoretical framework to HIV patients, through mental assessment and nursing to help patients regain hope, improve the immune function of patients, reduce HIV related symptoms [11]. Based on the Neuman systems model, Bennett V believes that mental nursing is becoming more and more important in the patient-centered nursing model. Strengthening the mental nursing education of nursing students, meeting the mental needs of patients, and promoting holistic nursing should become an important part of nursing teaching [12]. In addition, some scholars have developed assessment tools based on the mental variables of Neuman systems model, such as spiritual care scale [13].

#### Research frontier and development trend analysis

This study uses the strongest citation bursts keywords detection technology in CiteSpaceV software to generate the strongest citation bursts keywords map of Neuman systems model field in 2002-2020, observe its dynamic change characteristics, and understand the research frontier and development trend in this field [4]. On the basis of keyword co-occurrence network analysis, the strongest citation bursts keywords are analyzed. Five strongest citation bursts keywords are generated in domestic database, as shown in Figure 6. "Neuman systems model" has the highest intensity of burst in the strongest citation bursts keywords, and the beginning and ending time of burst is 2009-2014, which indicates that the research of Neuman systems model is the most significant in these six years, laying a good foundation for the rapid development of the third stage. The keyword for the longest duration of burst is "nursing", and its mutation intensity is in the second place, which shows that Neuman systems model has been better applied in the domestic nursing field. Neuman believes that nursing should focus on the response of five variables of stressor and individual

### Top 5 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2001-2020
Nursing	2001	5.5471	2003	2014	
Stressor	2001	3.9274	2008	2012	
Neuman System Model	2001	6.2185	2009	2014	
Neuman theory	2001	3.6171	2013	2016	
Hypertension	2001	4.2663	2014	2017	

Figure 6 The top 5 Keywords with the strongest Citation

system. Nursing behavior should help individual system maintain healthy state through three-level preventive measures [14]. The value of nursing should be reflected in helping patients to rebuild their normal defense line beyond the past range, and the objects of nursing can be individual, family, group, community and social issues [15]. The latest strongest citation bursts keywords in the figure is "hypertension", and the intensity of the burst is in the third place. It shows that in recent years, there are many scholars in China who take hypertension as the research object, which may be related to the fact that hypertension is one of the most common chronic diseases in China, and also the main risk factors for stroke, coronary heart disease and other cardiovascular and cerebrovascular diseases [16]. In the practice of nursing patients with hypertension, Neuman systems model can prevent adverse stress reaction, stabilize individual system and achieve the best health status by assessing the stressors in the environment, applying three-level prevention strategy. The nursing measures of primary prevention are mainly health education. The secondary preventive care measures are based on strict implementation of primary prevention to select appropriate antihypertensive drugs. The third prevention and nursing measures are mainly to control the blood pressure in a reasonable range, investigate the blood pressure monitoring, disease knowledge and bad living habits, and provide effective guidance [17]. In addition, a large number of studies have shown that the combination of Neuman systems model and hypertension nursing practice can effectively reduce the blood pressure level of patients, improve the self-management ability of patients, and then improve the quality of life of patients [18,19].

### Discussion

In this study, CiteSpace V, an information visualization software, is used to analyze the literatures about the Neuman systems model at home and abroad collected in the CNKI and WoS from 2001 to 2020, and summarize the research hotspots and development trend of the Neuman systems model at home and abroad by

quantitative method, so as to provide enlightenment for relevant research and practice.

From abroad, the research development trend in this field is relatively stable, the core strength is mainly the United States, and the research focuses are health, quality of life, caregivers, spirituality, etc. Through the analysis of the research force, it is found that the University of Massachusetts Boston is one of the main research institutions. Through in-depth research on the relevant literature published by the institution, it is found that Aronowitz [15] and DeMarco [20] of the institution have conducted in-depth discussion on the core basic concept of "individual system" in the Neuman systems model. Aronowitz scholars believe that as Neuman put forward, "individual system can be an individual, family or other groups, community and social issues [21]." However, at present, researchers and practitioners who apply the Neuman systems model have considered the impact of social issues on the individual system, and there have been a large number of studies taking individuals, families, other groups or communities as the individual system, but there are few examples of social issues as the individual system [15]. At the 15<sup>th</sup> Neuman systems model seminar in 2015, participants discussed social issues, focusing on distinguishing between the individual systems that are experiencing social problems and the individual systems of social problems themselves. It can be seen that social issues as an individual system have been gradually concerned by foreign scholars, but there is no relevant research published in China. It is suggested that Chinese scholars can track the research trend of foreign leading forces based on this visual research, and conduct in-depth mining for the problems of interest to explore the further application of Neuman systems mode.

From the domestic point of view, the research in this field is gradually on the rise. Colleges and universities or hospitals have a high degree of concern about this model, which has a good application in nursing education, clinical nursing, community nursing, etc. The research focuses are mainly quality of life, complications, anxiety, stressors, perioperative period,

hypertension, etc. According to the domestic time zone map, this study shows that the research frontiers of the domestic Neuman systems model are very different in each period, reflecting that the theory has changed with the background of the times and its application has also changed. In recent years, with the patient-centered overall Nursing models are widely recognized, and mature and complete nursing theories are gradually being needed by nursing researchers, which also promotes the development of theoretical research and practice. With the deepening of research content and the enrichment of research topics, five variables (physiology, psychology, social culture, growth and spirit), three-level prevention, stressors and coping styles of Neuman systems model have been deeply discussed by many scholars. The model has penetrated into various fields of nursing science and promoted the development of nursing science. However, from the perspective of research methods, domestic research on

Neuman systems model is all quantitative research, while foreign countries have applied this model to qualitative research [22]. It is suggested that Chinese scholars can use other research methods to expand the scope of application of this model.

## Conclusions

In the field of nursing, Neuman systems model has been widely used, which not only guides clinical nursing practice, but also provides a reliable theoretical framework for nursing teaching. It is one of the most widely used theoretical models in nursing research. Based on the visualization technology, this study describes the overall appearance of the research and to some extent shows the research status and trend of Neuman system pattern related researches.

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