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Original article

A bibliometric analysis of research on nursing models in countries other than China<sup>☆</sup>Shi-Fan Han<sup>a,\*</sup>, Rui-Fang Zhu<sup>a,b</sup>, Lin Chen<sup>c</sup><sup>a</sup> First Hospital of Shanxi Medical University, Taiyuan, Shanxi 030001, China<sup>b</sup> College of Nursing, Shanxi Medical University, Taiyuan, Shanxi 030001, China<sup>c</sup> Shanxi Medical University, Taiyuan, Shanxi 030001, China

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## ABSTRACT

**Objectives:** To deepen our understanding of the status quo and to identify the hot topics and developmental trends of research on nursing models in countries other than China in the most recent decade.**Methods:** The study subjects were the publications retrieved from the PubMed database using the MeSH terms of “Models, Nursing”. Bibliographic item co-occurrence mining system (BICOMS) software was used for conventional bibliometric analysis of publications during two time periods, 2005–2009 and 2010–2014. The number of published journal articles, journal distribution, authors of publications, country of origin of journals, and language of publications were analyzed to establish a high-frequency keyword profile and co-occurrence matrix. Graphical clustering toolkit (gCLUTO) software was applied for two-way clustering analysis and visualized analysis.**Results:** A total of 1472 journal articles with a key theme of nursing models were retrieved for final analysis, including 771 published during 2005–2009 and 701 during 2010–2014. The bibliometric analysis revealed that publications other than China concerning nursing models were mostly concentrated in the United States and the United Kingdom and that the number of relevant publications has been continuously decreasing. The two-way clustering analysis showed that there were mainly four types of research themes in the relevant publications in countries other than China during 2005–2009, i.e., nursing education and theoretical research, clinical nursing and psychological care, nursing administration, and models of nursing education, whereas there were five types during 2010–2014, i.e., nursing theories and clinical nursing practice, nursing administration models and assessments of nurses' knowledge and skills, community nursing administration models, nursing human resource management, and nursing education models and approaches.**Conclusions:** Research on nursing models in countries other than China is relatively mature and stable with a broader view, but it has shown a declining trend in recent years. It emphasizes both theory and practice, with research content tending to be structured into four modules, i.e., nursing education, administration, clinical practice, and theoretical research. Community nursing models may become a key research direction in the international research on nursing models in the future.© 2017 Shanxi Medical Periodical Press. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## 1. Introduction

Nursing models, the early form of nursing theories and products resulting from history, are developed under the impact of

contemporary medical models and evolve along with social, political, and economic changes. Moreover, the models vary among different cultures.<sup>1</sup> In 1977, Engel proposed a biopsychosocial (BPS) model and claimed that “to provide a basis for understanding the determinants of disease and arriving at rational treatments and patterns of health care, a medical model must also take into account the patient, the social context in which he/she lives, and the complementary system devised by society to deal with the disruptive effects of illness, that is, the physician role and health care system”.<sup>2</sup> This proposal has provided a reference for the theoretical

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construction of nursing models. Model formation in a disciplinary field symbolizes the maturing of this field. Therefore, exploring the past, present, and future developmental trend of nursing models under a modern nursing context is of great theoretical and practical significance. In addition, deepening our understanding of the development and research history of nursing models in countries other than China and updating our nursing concepts will enable us to learn from advanced foreign models and concepts, thus illuminating nursing theoretical research and promoting the development of nursing care in China. From the bibliometric perspective, this paper presents the results from two-way clustering analyses of publications concerning nursing models in countries other than China during the 2005–2014 period, aiming to identify the developmental trends and hot topics in this research field in countries other than China in the most recent decade.

## 2. Materials and methods

### 2.1. Data sources

The literature-related data of countries other than China were retrieved from the PubMed database. The MeSH terms used for searching were “Models, Nursing”. Only the articles published during 2005–2014 were included, and they were retrieved on November 25, 2015. The final results were derived from three repeated searches.

### 2.2. Research methods

Bibliographic item co-occurrence mining system (BICOMS) software<sup>3</sup> was applied to extract and organize the data, including the year of publication, the journals, first author, and keywords. The number of published journal articles, journal distribution, authors of publications, and country of origin of journals were analyzed using bibliometric approaches. High-frequency words were identified from the extracted keywords and used to establish a high-frequency keyword profile and co-occurrence matrix. In addition, the co-existence of any two high-frequency keywords in the same journal article underwent a frequency analysis. Using graphical clustering toolkit (gCLUTO) software, a two-way clustering analysis was conducted to establish a co-occurrence cluster view. Subsequently, in terms to the optimal clustering performance, the semantic relations among different categories of keywords were analyzed, and the descriptive articles in the cluster were interpreted. Combined with the relevant knowledge in the subject area, dual analysis of representative articles and keywords was conducted to identify hot topics in research on nursing models in countries other than China in the most recent decade. To avoid the limitation of high subjectivity that is inherent in the selection of keywords during co-word analysis, the threshold for high-frequency keywords was determined based on the g-index of word frequency.<sup>4</sup>

## 3. Results

### 3.1. Results from conventional bibliometric analysis

#### 3.1.1. Number of journal articles pertaining to research on nursing models in countries other than China

A total of 1472 journal articles with a research theme of nursing models from countries other than China were included in the final analysis in this study, including 771 articles published during 2005–2009 and 701 during 2010–2014. Derek de Solla Price, an American bibliometric expert and information scientist, discovered the exponential growth pattern of scientific literature and plotted

the well-known Price's curve. He proposed that the growth of scientific literature includes four phases, i.e., the initial slow growth, exponential growth, linear growth, and the final slow growth.<sup>5</sup> As shown in Table 1, the number of journal articles pertaining to nursing models remained stable in the range of 111–178 during 2005–2014, generating a changing curve basically parallel to the abscissa axis, even though it tended to slightly decline after 2008. Considering the current research status on nursing models in countries other than China, this result suggests that the relevant subject area was gradually maturing, resulting in the publication of fewer articles.

#### 3.1.2. Distribution of the journals that published articles concerning nursing models in countries other than China

According to the “law of scattering” of publications developed by the bibliometric expert S.C. Bradford,<sup>5</sup> the top 33 journals identified in this study were considered the core journals in the research field of nursing models in countries other than China, as demonstrated by the fact that these journals published 47.24% of the relevant articles and showed a centered distribution. Among them, *Nursing Science Quarterly* published the largest number of articles (80, 5.39%) pertaining to research on nursing models in the PubMed database during 2005–2014, followed by *The Journal of Nursing Administration*, which published 68 relevant articles (4.58%). The articles in the two top journals together accounted for 10% of the total number, significantly more than that in the third journal, *Journal of Advanced Nursing* (36, 2.43%).

#### 3.1.3. First authors of the articles concerning nursing models in countries other than China

During 2005–2014, both Sawatzky and McCormack published seven articles (0.47%) concerning nursing models, thus becoming the authors who published the highest number of relevant articles. According to Price's law, the number of articles from a core author who has the least publications is 0.749-fold that of the core author who has the most publications during the same time period.<sup>5</sup> In this study, because the highest number of publications on nursing models by the same author in countries other than China was seven in 2005–2014, the core authors were then defined as the authors who published more than two articles during this time period according to Price's law. There were 281 authors who published more than two articles, indicating that a core author group in research on nursing models has formed.

#### 3.1.4. Country of origin of journals that published the articles concerning nursing models in countries other than China

The journals that published articles concerning nursing models in 2005–2014 in the PubMed database were mainly from Western developed countries, including the United States, the United Kingdom, and Australia. Journals in the United States published 877

**Table 1**

Numbers of journal articles pertaining to nursing models published in countries other than China, 2005–2014.

No.	Year of publication	Publication quantity	Percentage (%)	Cumulative Percentage (%)
1	2005	138	9.3496	9.3496
2	2006	153	10.3659	19.7155
3	2007	170	11.5176	31.2331
4	2008	178	12.0596	43.2927
5	2009	132	8.9431	52.2358
6	2010	159	10.7724	63.0082
7	2011	155	10.5014	73.5096
8	2012	152	10.2981	83.8077
9	2013	124	8.4011	92.2088
10	2014	111	7.5203	100.0000

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