

Current Status and Trends in Health Informatics Research: A Bibliometric Analysis by Health Technology and Informatics

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Abstract

The aim of this study was to understand status and trends in health/medical informatics research. We used the Scopus database to extract all papers published in *Studies in Health Technology and Informatics* from 2008 to 2017. This study presented the key bibliometric indicators such as annual publications, top 10 authors, institutions, countries, and co-occurrence of keywords. These findings can be used to enhance our understanding of health/medical informatics research.

Keywords:

Health informatics, Medical informatics, Research, Bibliometrics

Introduction

The *Studies in Health Technology and Informatics* is a book series published by IOS Press. “This book series was started in 1990 to promote research conducted under the auspices of the EC programmes’ Advanced Informatics in Medicine (AIM) and Biomedical and Health Research (BHR) bioengineering branch” [1]. It presents the proceedings of many international health/medical informatics conferences (e.g. MedInfo). The book series “has developed into a highly visible global platform for the dissemination of original research in this field, containing more than 250 volumes of high-quality works from all over the world” [2]. Our study aimed to provide a macroscopic overview of the main characteristics of the book series based on a bibliometric analysis and visualization map. It will bring a panoramic view of health/medical informatics research to scholars and help them to identify suitable researching orientation as well.

Methods

A literature search was conducted in Scopus for publications from January 1, 2008 to December 31, 2017, and used the following publication name: “*Studies in Health Technology and Informatics*”. All data were collected by two authors and downloaded in text format.

After that, the records including all essential information (such as paper title, abstract, keywords, authors’ names, affiliations, and references) were compiled for further analysis. Data extraction and analysis were performed using Microsoft Excel 2016. VOSviewer (Leiden University, Netherlands), a software tool for constructing and visualizing bibliometric networks, was used to construct a knowledge map of all keywords relations.

Results

Of the 8129 articles retrieved, the majority were conference papers (n = 7227, 88.90%), articles (n = 682, 8.39%), editorials (n=123, 1.51%), reviews (n = 59, 0.73%) and conference reviews (n=38, 0.47%). They were all published in English. Subject areas included medicine (33.4%), engineering (33.3%) and health professions (33.3%). Figure 1 shows the annual distribution of publications from 2008-2017.

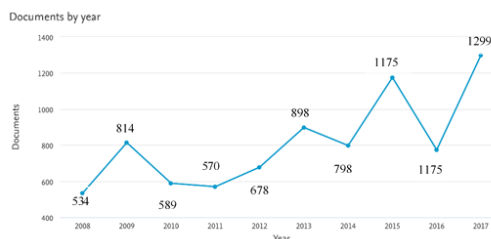


Figure 1 Annual distribution of publications

Institutions and Countries

The publications of *Studies in Health Technology and Informatics* originate from 111 different countries/regions and 14374 institutions/organizations. The top 10 productive institutions and countries are shown in Table 1. The greatest amount of research activity contribution in countries was from the United States (n=1592, 19.6%), followed by Germany (n = 818, 10.1%) and Canada (n = 660, 8.1%). The University of Victoria was the most productive institution (n = 284, 3.5%), followed by Inserm (n = 215, 2.6%), and Aalborg University (n= 155, 1.9%).

Contributing Authors

17476 authors contributed the 8129 papers. The top 10 most prolific authors in the book series, with their number of publications, are shown in Table 2. Borycki EM clearly obtains the first position with 95 (1.17%) articles.

Co-occurrence of author keywords analysis

The period ranging from 2008 to 2017 included 13438 keywords from 8129 articles, 1047 keywords appeared 5 or more times. The term maps show 500 keywords having the greatest total link strength (Fig 2a, 2b). It grouped 12 clusters. The most common keywords are “electronic health record/records”, “virtual reality”, “telemedicine”, “ehealth” and “patient safety”.

Table 1 Top 10 most productive institution and countries

No.	Institution	Record	Country	Record
1	Univ of Victoria (Canada)	284 3.5%	USA	1592 19.6%
2	Inserm (France)	215 2.6%	Germany	818 10.1%
3	Aalborg Univ (Denmark)	155 1.9%	Canada	660 8.1%
4	Univ of Athens (Greece)	110 1.4%	UK	560 6.9%
5	UiT The Arctic Univ of Norway (Norway)	83 1.0%	Australia	490 6.0%
6	Acad Med Cent, Univ of Amsterdam (Netherlands)	81 1.0%	France	448 5.5%
7	Univ Cattolica del Sacro Cuore (Italy)	79 1.0%	Italy	367 4.5%
8	Univ of Amsterdam (Netherlands)	77 0.9%	Japan	325 4.0%
9	Karolinska Institutet (Sweden)	75 0.9%	Norway	295 3.6%
10	Univ of Tasmania (Australia)	74 0.9%	Austria	294 3.6%

Table 2 Top 10 of most productive authors

Authors	Record	Institution	Country
Borycki EM	95	Univ of Victoria	Canada
Kushniruk, AW	86	Univ of Victoria	Canada
Blobel B	83	Univ of Regensburg	Germany
Riva G	75	Univ Cattolica del Sacro Cuore	Italy
Househ M	56	Kin Saud Bin Abdulaziz Univ for health	Saudi Arabia
Mantas, J	52	Sci National and Kapodis-trian Univ of Athens	Greece
Lovis C	49	Univ Hosp of Geneva	Switzerland
Kushniruk A	44	Univ of Victoria	Canada
Nøhr, C	43	Aalborg Univ	Denmark
Saranto, K	43	Univ of Eastern Finland	Finland

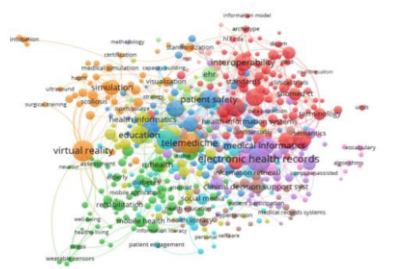


Figure 2a Network visual keywords analysis

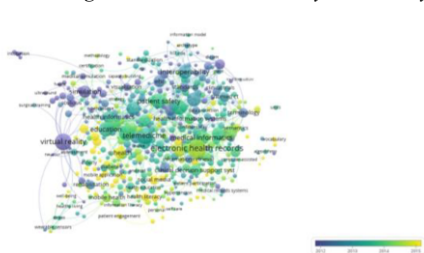


Figure 2b Overlay visualization keyword analysis

Discussion

The number of articles produced annually has obviously increased over this period (2008-2017). The number of publications has been considered a measure of scientific productivity and interest in health informatics research.

A co-occurrence analysis of authors keywords of the publications can provide insight into the main topics and research trends in health/medical informatics. In co-occurrence, the relatedness of terms is determined based on the number of publications in which two terms occur together. The result of the terms analysis is presented in Figure 2a-2b. The size of the circles represents the occurrence of a term (the bigger the circle, the higher the occurrence of a term in the author keywords). The overall distance between terms offers information on their relatedness. The shorter the distance between two terms, the stronger their relation. The relatedness of terms is determined by counting the number of times that terms occur together in the keywords [3]. The colors are used to distinguish between different clusters. The term map of overlay visualization is the timeline view of the network (Figure 2b). The color of a term indicates the term’s average publication year (the terms with yellow show the times with more recent publication year). It shows chronologically the most applied keywords which are “big data”, “universal design”, “mhealth”, “social media”, “health literacy”, and “vocabulary”. This transformation shows researchers are increasingly interested in these research themes.

Conclusions

These outcomes help us perceive the evolution of research in the field of health/medical informatics over a 10 year period. The study also shows Studies in Health Technology and Informatics is an important global conference proceeding in digital health and health/medical informatics.

Acknowledgements

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