



## Bibliometric Analysis of Hospital Bed Management Study

Dian Norma Damawati<sup>1\*)</sup>, Mahendro Prasetyo Kusumo<sup>2</sup>

<sup>1\*),2</sup> Master of Hospital Administration, Yogyakarta Muhammadiyah University

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#### \*) corresponding author

dr. Dian Norma Damawati

Postgraduate Study Program in Hospital  
Administration, Yogyakarta Muhammadiyah  
University, Indonesia

Email: diandamawati@gmail.com

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### ABSTRACT

Healthcare and hospital services continue to evolve. This has led to hospital managers being faced with high demand for health services, shortages of hospital beds resulting in delayed inpatient admissions in emergency rooms, improper use of beds, and failure of transfer flows among care units that could reduce the quality of health care. This study aims to provide information on hospital bed management in the bibliometric data. Bibliometric analysis is used to look at research trends, including the most-published journals, the most-cited publishers, author agencies, and collaborations among authors, in visualization using the VOSViewer application. A total of nine English-language articles obtained from the Scopus database from 2018 to 2022 were used in the bibliometric analysis of hospital bed management. The most cited publisher's journal is the Journal of General Internal Medicine, with 12 citations. The results show that studies related to hospital bed management have not been done much but show an increasing trend from year to year. The author's contributions are dominated by developed countries such as the United States and Canada. Studies on hospital bed management are still needed as decision support tools to help professionals develop more assertive hospital bed management planning.

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### INTRODUCTION

Hospital beds are one of the most needed resources in hospitals. The importance of good planning and management of these beds is highly needed because it is reflected well in the quality of services provided (La Regina et al., 2019). The demand for effective healthcare in hospital services continues to increase with the times. This has led hospital managers to be faced with high demand for health services and a shortage of hospital beds that risks delayed inpatient admissions. In the emergency room, cancellation of elective surgery, improper use of bedding, and failure of transfers among care units cause repercussions in the intensive care unit (ICU). These problems have also resulted in an increase in hospital stays, a decrease in bed changes, and an increase in the number of surgical procedures that can harm the quality of health care (Maldonado et al., 2021).

Healthcare institutions have invested in implementing patient flow management systems, which allow demands to be met by increasing efficiency in the use of hospital beds, reducing waiting times for hospitalizations, and optimizing surgical scheduling. This has the benefit of monitoring and planning hospital work, allowing optimization of the admission process from admission to discharge (Grübler et al., 2018). A decision support system is needed to help professionals develop a more assertive hospital bed management plan. In recent years, studies of bed management have been promoted with different approaches and different study outputs (Adlington et al., 2018).

A bibliometric analysis of hospital bed management was conducted to see if the study was interesting to do. Information on the study of the management of hospital beds is presented in the bibliometric data. Bibliometric mapping is beneficial for both the scientific community and the public in general because it can help turn publication metadata into

maps or visualizations, which are easier to manage and process for useful insights, such as visualizing keywords to identify research themes or clusters in specific disciplines, mapping author affiliations of specific journals to identify geographic coverage of journals, and mapping institutional collaboration and international collaboration as part of a framework for identifying emerging technologies (Tanudjaja and Kow, 2018; Sidiq, 2019). Bibliometric applications range from studying publications to patterns of collaboration and exploring the structure of research areas that can manifest as journals. Bibliometric methodologies are applied to provide a retrospective overview of journals (Donthu et al., 2021).

**METHODS**

**Tools and materials**

The VOSViewer application (1.6.18) is used to perform bibliometric analysis. Study data obtained from the Scopus database was downloaded on January 13, 2023. Databases are taken from Scopus because databases from PubMed often show fewer search results. In addition, in bibliometric analysis using VOSViewer on PubMed, there are some limitations (Perwitasari et al., 2022).

**Research procedure**

The keywords used in searching for publications related to hospital bed management during the period 2018–2022 are as follows:

REF ( " bed management" AND "hospital" ) AND ( LIMIT-TO ( SUBJAREA , "MEDI" ) OR LIMIT-TO ( SUBJAREA , "NURS" ) OR LIMIT-TO ( SUBJAREA , "HEAL" ) AND ( LIMIT-TO ( PUBYEAR , 2022 ) OR LIMIT-TO ( PUBYEAR , 2021 ) OR LIMIT-TO ( PUBYEAR , 2020 ) OR LIMIT-TO ( PUBYEAR , 2019 ) OR LIMIT-TO ( PUBYEAR , 2018 ) AND ( LIMIT-TO ( DOCTYPE , "ar" ) OR LIMIT-TO ( DOCTYPE , "re" ) AND ( LIMIT-TO ( LANGUAGE , "English" ) ) )

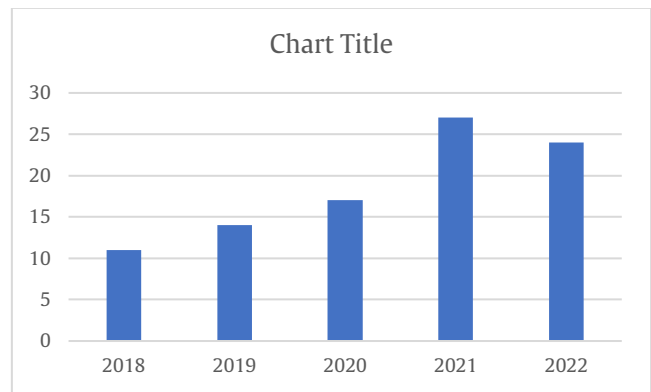
Study data relating to hospital bed management was taken from the Scopus database between 2018 and 2022. The data was obtained and then analyzed using the VOSViewer application. VOSViewer software (1.6.18) is used to map writings, total number of publications, and number of publications cited in CSV format. VOSViewer is open-source software developed by Nees Jan van Eck and Ludo Waltman at

the Centre for Science and Technology (CWTS) at Leiden University of the Netherlands. VOSViewer is designed to build and visualize bibliometric maps such as author, co-authorship, co-occurrence, and citation-based maps. VOSViewer can receive data from bibliometric databases and be integrated with other tools. VOSViewer is used to visualize collaborating institutions and a map of institutions cited (Tanudjaja and Kow, 2018; N. Priya et al., 2019; Van Eck NJ and Waltman L., 2019).

**Data analysis**

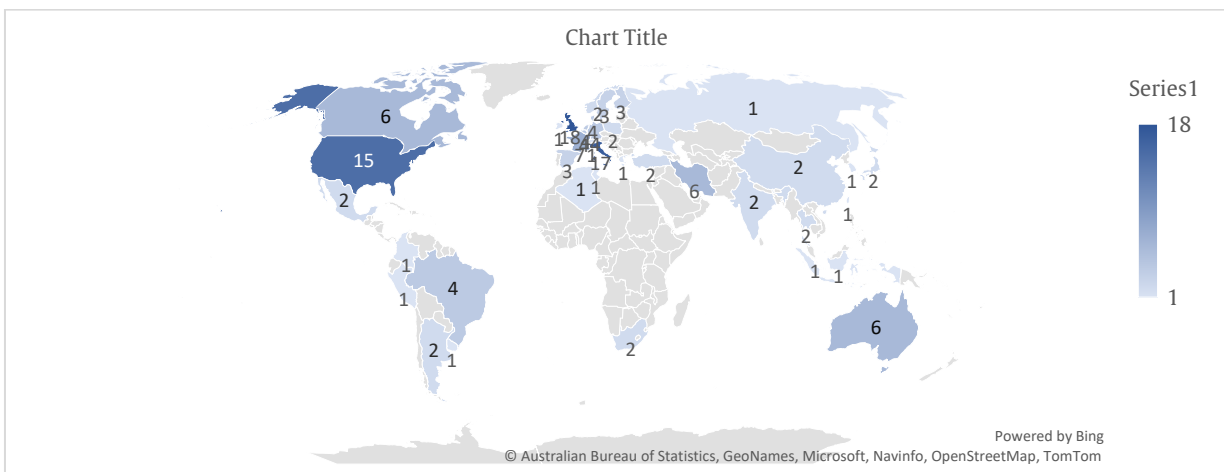
The study data was obtained from the Scopus database, downloaded on January 13, 2023. The search words used are bed management with hospital, bed management, and bed hospital, with a search time of 2018 to 2022. A search of the Scopus database obtained the results of 93 study documents in English. The data search strategy in this study can be seen in the figures below.

**RESULTS**



**Figure 1. Publication Trends from 2018 to 2022**

Figure 1 shows publication trends on hospital bed management during the period 2018–2022, from Scopus. The trend of study publications from year to year looks to be increasing, with the sharpest increase in 2021, followed by 2022. The growing trend of publications illustrates that research on hospital bed management is still interesting to discuss.



**Figure 2. Publications by country**

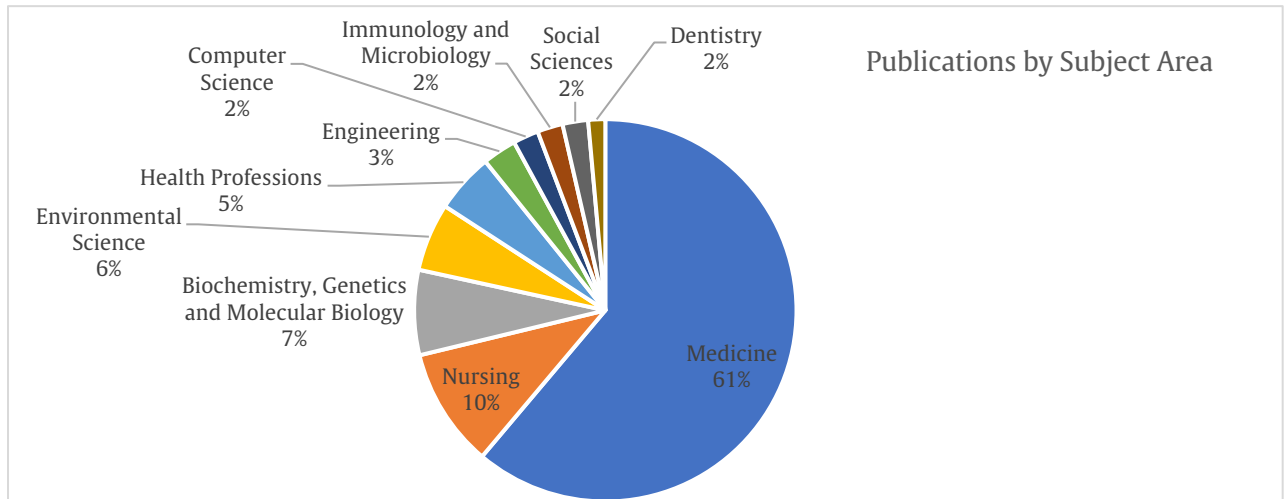


Figure 3. Publications by Subject Area

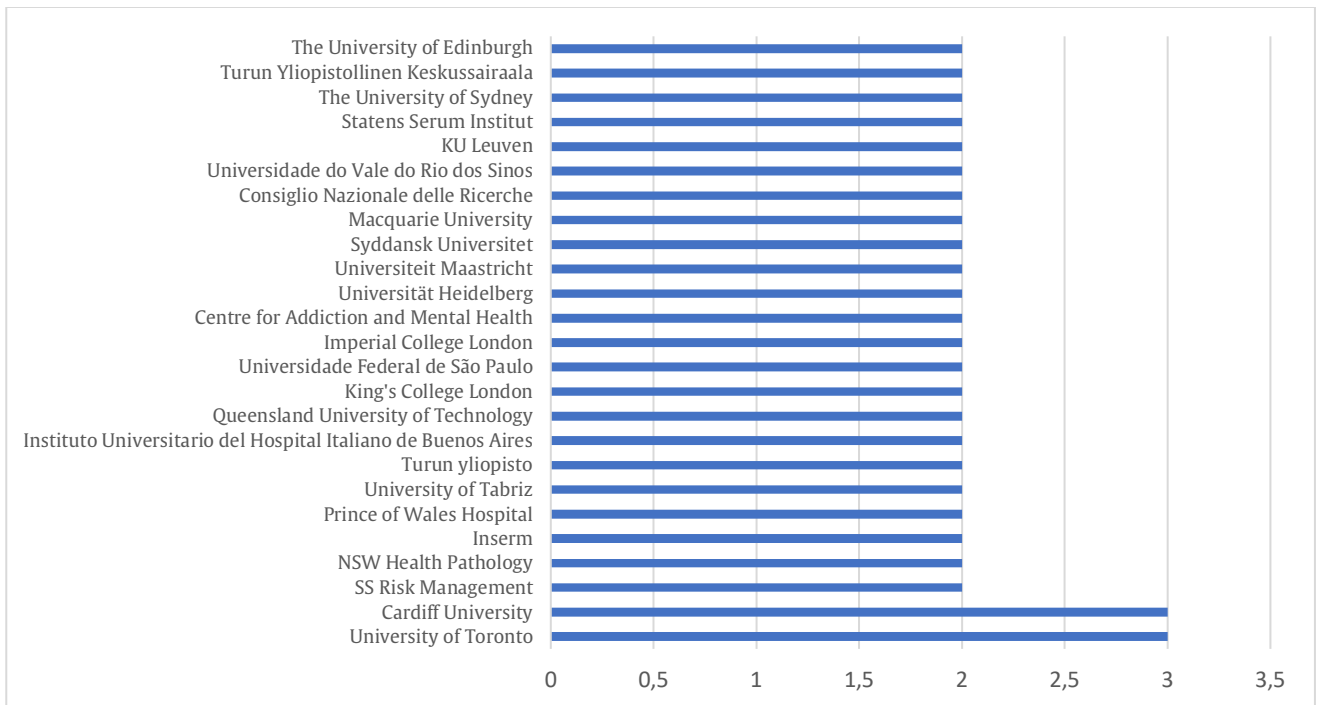


Figure 4. Author affiliation on hospital bed management publications

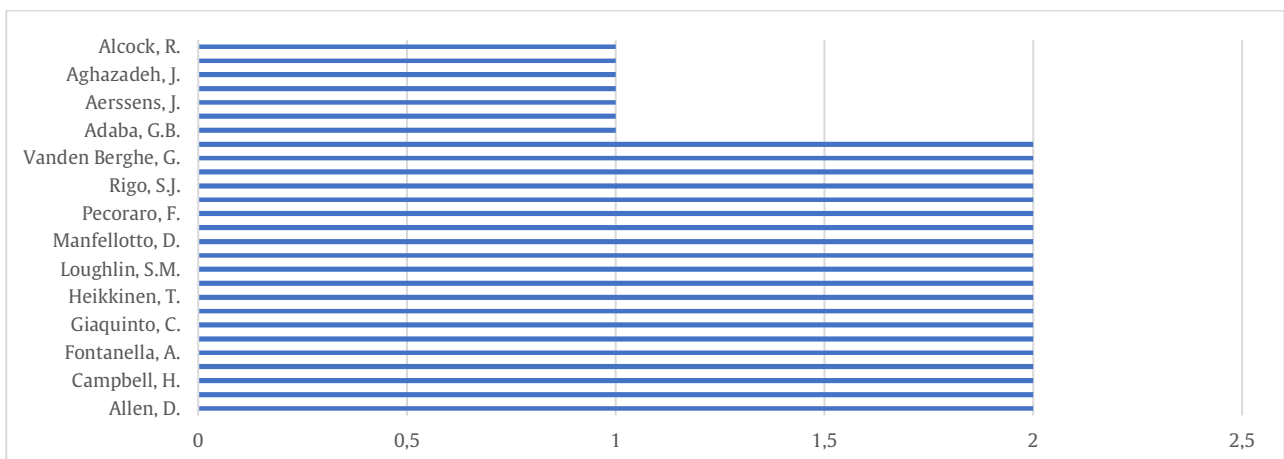


Figure 5. Publications by Author



**Figure 6. Analyze topics based on the keywords the author uses**

Figure 2 shows authors by country. There are nine countries out of 93 authors. The most authored origins are from the United States, followed by Canada, Australia, and Brazil. Indonesia has never published an international journal related to the management of beds in hospitals.

Figure 3 shows publications based on focus sources. Where publications related to hospital bed management are found, they are in publications whose focus area is medicine, followed by nursing, biochemistry, genetics, and molecular biology. For other focus areas, there are not many publications related to bed management in hospitals.

The most numerous 10 authors are from the University of Toronto, with 3 authors. Furthermore, from the SS Risk Management of the United States with 2 authors, Tabriz University of Iran with 2 authors, Instituto Universitario del Hospital Italiano Italy with 2 authors, King University of England with 2 authors, Imperial University England with 2 authors, University of Heidelberg Germany with 2 authors, University of Syddansk Denmark with 2 authors, University of Sydney Australia with 2 authors, and University of Edinburgh UK with 2 authors. Figure 4 shows the top 10 agencies of the study authors for hospital bed management.

The result above shows the top 10 authors who published the most articles. Each author published two articles, including Allen, D., Campbell, H., Fontanella, A., Giaquinto, C., Heikkinen, T., Loughlin, S.M., Manfellotto, D., Pecoraro, F., Rigo, S.J., and Vanden Berghe, G. Figure 5 shows the top 10 authors who published the most articles on hospital bed

management studies. Allen, D., wrote articles related to the implementation of bed management strategies. Some other studies conducted by Campbell, H., studied intelligence decisions in support of bed management and hospital planning.

Figure 6 shows an analysis of the topic based on the keywords the authors used in the hospital bed management study. In the cluster, there are several themes grouped by color. The first cluster is red (7 items). The red cluster consists of: bed occupancy, health care facility, hospital, hospital bed utilization, hospital management, nurse, organization, and management. The second cluster is green (5 items). The green cluster consists of: emergency health service, emergency service, hospital, emergency ward, hospital admission, and hospital emergency service. The third cluster is blue (5 items). The blue cluster consists of: health care delivery, health care system, hospitalization, intensive care unit, and length of stay. The fourth cluster is yellow (3 items). The yellow cluster consists of hospital discharge, hospital patient, and patient discharge.

The keywords most used by the author include hospital, organization and management, bed occupancy, and hospital bed utilization. Figure 6 shows the keywords used and their relation to other keywords. The results of bibliometric mapping from the VOSviewer application show that the more often pairs between two keywords occur, the closer the relationship between these keywords is (Sidiq, 2019).

**Table 1  
 Most Cited Journal Sources**

Author	Title	Publication	Cite
(La Regina et al., 2019)	What Quality and Safety of Care for Patients Admitted to Clinically Inappropriate Wards: A Systematic Review	<u>Journal of General Internal Medicine</u>	12
(Kutafina et al., 2019)	Recursive neural networks in hospital bed occupancy forecasting	<u>BMC Medical Informatics and Decision Making</u>	11
(Grübler et al., 2018)	A Hospital Bed Allocation Hybrid Model Based on Situation Awareness	<u>CIN - Computers Informatics Nursing</u>	11

Table 1 shows the top 3 most cited journal sources during the period 2018–2022. The Journal of General Internal Medicine was cited the most (12 times). The journal stated that the progressive reduction of hospital beds may increase the social and medical frailty that hinders hospital discharge, and the inadequate availability of public health services has led to a shortage of hospital beds. As a result, emergency physicians are forced to treat patients in clinically inappropriate wards (La Regina et al., 2019). The Journal of BMC Medical Informatics and Decision Making was cited 11 times. The journal mentioned that hospital occupancy forecasting is a widely understood need for resource optimization in the increasingly competitive medical field. The better predictions we can make, the more efficiently we can plan ahead, and as a result, when resource use is optimized, we can provide the best care for patients (Kutafina et al., 2019). The Journal of Computer Informatics Nursing was cited 11 times. The journal mentioned that bed management is an important planning and control area for hospitals, as it has an important role in maintaining a balance between patients from the emergency department, patients undergoing elective surgery or scheduled treatment, and patients being discharged from the hospital while maintaining a high bed occupancy rate. In this context, this article contributes to the use of situation awareness in bed management using a hybrid system that combines known artificial neural network techniques and multiattribute value theory for decision making by automating the bed allocation process (Grübler et al., 2019). There are still not many journals that publish about hospital bed management. This is an opportunity for the authors to develop the science of effective hospital bed management.

## CONCLUSIONS

The growing trend of publication articles on hospital bed management from 2018 to 2022 illustrates that the theme is increasingly in demand and interesting to discuss. Authors from developed countries such as the United States and Canada contribute the most to writing articles related to hospital bed management. In Indonesia, it is necessary to develop a strategy for regulating hospital beds in order to improve the quality of health care. In addition, the national health insurance inpatient class program, which will soon be implemented, can be studied to determine whether the management of hospital beds can have the maximum impact on hospital services. This is a good opportunity to expand research writings or articles with the aim of exchanging expertise, thoughts, and technology so that they can compete and collaborate with other countries.

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## ETHICAL CONSIDERATIONS

### Funding Statement.

The author does not receive financial support from any party.

## Conflict of Interest Statement

The authors state that they have no disputes with other parties related to this study.

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