The Impact of Clinical Pathway Implementation on Cost Effectiveness in Health Care Service: A Bibliometric Analysis

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ABSTRACT

Clinical pathways play a strategic role in mitigating fraud risk by reducing unnecessary variability in clinical practice. Implementing clinical pathways in hospital healthcare services has a positive impact on cost-effectiveness. To determine research trends related to the impact of clinical pathway implementation on cost-effectiveness in healthcare systems worldwide. This study used a bibliometric analysis approach. Data analysis techniques employed VOSviewer. VOSviewer tools were used for network, overlay, and density visualization. The bibliometric analysis in this study was conducted using VOSviewer software, employing a co-authorship analysis approach at the author level. This analysis identified 80 authors, with 18 authors showing the largest number of links. Implementing clinical pathways is an effective strategy for improving cost efficiency and the quality of healthcare services in hospitals. Clinical pathways need to be developed and implemented consistently to enhance cost-effectiveness, service quality, and the efficiency of the healthcare system, particularly in developing countries.

INTRODUCTION

A clinical pathway is a detailed plan for each service provided by a healthcare professional using evidence-based medical guidelines, tailored to the service needs of the healthcare facility, from assessment, intervention, treatment, outcomes, and patient care plans from admission to discharge, based on predetermined timelines. Clinical pathways are developed for the diagnosis or treatment of patients with high-volume, high-risk, and high-cost characteristics (Galea 2025; Muhammad 2022; Rachmawaty et al. 2025). The benefits of clinical pathways include supporting the implementation of evidence-based standard procedures, enhancing multidisciplinary collaboration in patient planning, narrowing gaps in patient care variation, and improving service quality (Jaya, Sunarto, & Sukmawan, 2025).

The implementation of clinical pathways in hospital healthcare services has a positive impact on cost-effectiveness. Several studies have shown that implementing clinical pathways can reduce the length of stay (LOS), reduce inpatient costs, and help reduce the burden on medical resources and national insurance (Septiana, 2025). Clinical pathway implementation is also used as a guide for submitting health insurance claims. Clinical pathways, as an instrument for standardizing evidence-based clinical practice, play a strategic role in mitigating fraud risk by reducing unnecessary variability in clinical practice, increasing service transparency, and providing a baseline for anomaly detection (Rachmawaty, Wahyudin, & Bukhari, 2025). Variations in healthcare services are expected to impact variable and even excessive costs. Clinical pathways, as written guidelines, are expected to reduce this cost variation while maintaining high-quality healthcare (Gustafsson et al. 2019; McLawhorn et al. 2017; Yabroff et al. 2019).

A study conducted by Fan Y, Yang Q, Chen C, et al. (2025) used path analysis to identify factors influencing length of stay (LOS) and inpatient costs in oral cancer patients in China. Several factors, such as optimizing surgical protocols, were found to offer opportunities to reduce treatment costs and improve cost-effectiveness. These insights provide actionable targets for reducing financial burden and improving patient outcomes.

In a scoping review journal reported by Dermont et al. (2025), it was stated that best practice care models using the Discharge Pathway Protocol, Care Pathway-Based Approach, and the Psychological Treatment Pathway can reduce length of stay, facilitate timely discharge, and improve care outcomes for patients with intellectual disabilities. Implementing clinical pathways in patient care procedures and monitoring clinical progress will significantly reduce the average length of stay (LOS), improve patient turnover, increase patient admission capacity, and improve patient outcomes.

A research study by Corrao et al. (2024) conducted an assessment of the quality of services and costs of care for heart failure patients treated in hospitals using several indicators developed by a working group of experts from the Italian Ministry of Health. This study validated these indicators through their relationship to measurable clinical outcomes and healthcare costs, supported by the Italian National Health System. The results of this study indicate that adherence to recommended clinical guidelines for heart failure care pathways improves patient prognosis and reduces healthcare costs after discharge. Therefore, close monitoring of patients with heart failure through routine clinical examinations and drug therapy should be considered a cornerstone of national guidelines and audits. The results of this study also support the implementation of performance indicators based on adherence to these recommendations for the management of outpatient heart failure patients into a national monitoring and evaluation system (Buja et al. 2016; Miranda et al. 2024; Shanbhag et al. 2018).

Research by Cole, S., et al. (2024) used STAR (Support and Treatment After Replacement) as a care pathway for patients undergoing TKR (Total Knee Replacement). This research was motivated by the condition of post-TKR patients who experienced persistent chronic pain after undergoing surgery. Persistent chronic pain after surgery is classified as pain that persists for three months or more after surgery. The STAR care pathway consists of a clinical assessment by a healthcare professional trained by an orthopedic specialist. This STAR care pathway is designed to reduce the severity of pain experienced by individuals (Moore et al. 2023; Wylde et al. 2018, 2022). Based on this assessment, the STAR care pathway is able to provide care tailored to individual needs. The results of this study indicate cost-effectiveness. Interventions using the STAR care pathway are not only effective in reducing post-operative pain but also can save care costs for up to the first five years after TKR surgery.

In another research study, Barbosa, Szrek, Ferreira, Cruz, & Firmino-Machado (2024) aimed to determine the most cost-effective stroke rehabilitation care pathway during the first 12 months after a first stroke. This study provides a 1-year cost-effectiveness analysis of various stroke rehabilitation care pathways. The results of this study provide evidence for policymakers to establish pathway 3 (short-term inpatient care units and community clinics) as the new standard care pathway for stroke rehabilitation as the most efficient and effective. Given the complexity of stroke clinical heterogeneity, other pathways can be considered, which are still cost-effective in the final decision model. This allows for the planning and organization of a comprehensive, integrated, and efficient system tailored to different stroke profiles.

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The purpose of this study is to determine research trends regarding the impact of clinical pathway implementation on cost-effectiveness in healthcare systems worldwide.

METHOD

This study uses a quantitative approach with a descriptive research design. The aim of this research is to describe the existing phenomena and identify patterns and relationships between the variables studied. The population of this study includes all hospitals implementing clinical pathways in Indonesia, focusing on general hospitals and those utilizing health insurance systems. The sample taken consists of 10 hospitals that have systematically implemented clinical pathways and have been operational for over five years. The sampling technique used is purposive sampling, which involves selecting samples based on specific criteria, namely hospitals that have implemented clinical pathways and have data related to treatment costs and patient service outcomes.

The instrument used in this study is a questionnaire developed based on indicators relevant to the implementation of clinical pathways and their impact on cost-effectiveness and healthcare service quality. The validity of the instrument is tested using content validity, by having experts in hospital management evaluate the relevance of the indicators in the questionnaire to the concepts being studied. To test reliability, Cronbach's Alpha is used, with a value expected to be greater than 0.7 to indicate that the instrument can be used consistently. Data is collected through surveys distributed to hospital personnel, including hospital managers and medical staff directly involved in the implementation of clinical pathways.

The research procedure starts with sending the questionnaires to the selected hospitals. The collected data is then analyzed using SPSS version 25 for descriptive statistics and linear regression analysis to examine the relationship between the implementation of clinical pathways and the cost-effectiveness of healthcare services. This analysis aims to identify the impact of clinical pathway implementation on variables such as treatment costs, length of stay, and patient satisfaction. Additionally, data visualization analysis using VOSviewer is also used to analyze research collaboration patterns in relevant literature, providing further understanding of research trends in the field of clinical pathways.

RESULT AND DISCUSSION

The bibliometric analysis in this study was conducted using VOSviewer software, using a co-authorship analysis approach at the author level. The purpose of this analysis was to identify collaboration patterns, productivity levels, and key actors in the development of research related to the topic under study. This analysis yielded 80 authors, with 18 authors showing the largest number of links.
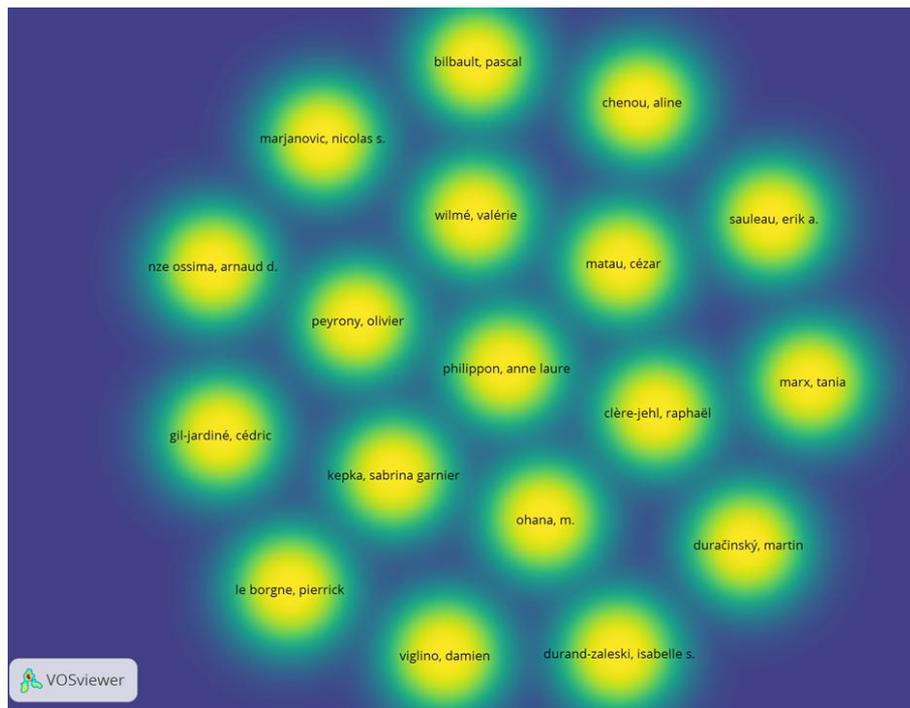
Figure 1. Visualization of Co-authorship Density

The visualization used in this analysis is a density visualization (Figure 1), which illustrates the density of publication activity and collaboration between authors. On the density map, yellow indicates areas with high density, while green and blue indicate medium to low density. Based on the visualization, almost all authors are found in the yellow to light green areas. This indicates that most authors in this research field have relatively high levels of productivity and collaboration. There were no areas with a dominant dark blue color, which would indicate low research activity. Thus, it can be concluded that this research field has developed well and is supported by a fairly strong collaborative network. Several key authors exhibiting high co-author density include Wilmé, Valérie; Philippon, Anne Laure; Chenou, Aline; Marx, Tania; Sauleau, Erik A.; and Bilbault, Pascal. These authors can be categorized as key authors, or key actors in the development of science in this field. The high density of these names indicates that they have made significant contributions to producing scientific publications and building collaborative networks with other researchers. Furthermore, the relatively even distribution of nodes indicates that collaboration is not centralized by a single individual or institution. The research network is inclusive and open, enabling a broad exchange of knowledge among researchers. This supports the development of more comprehensive and multidisciplinary research. The absence of significant network fragmentation indicates that the research community in this field has established a stable research ecosystem. This collaboration not only improves the quality of publications but also accelerates the dissemination of innovation and scientific findings.

Overall, the results of the co-authorship analysis using the density visualization approach indicate that research in this field is supported by a solid collaborative network, high author productivity, and the involvement of key actors who play a crucial role in scientific development. These findings strengthen the research field's position as an established and growing area of study.
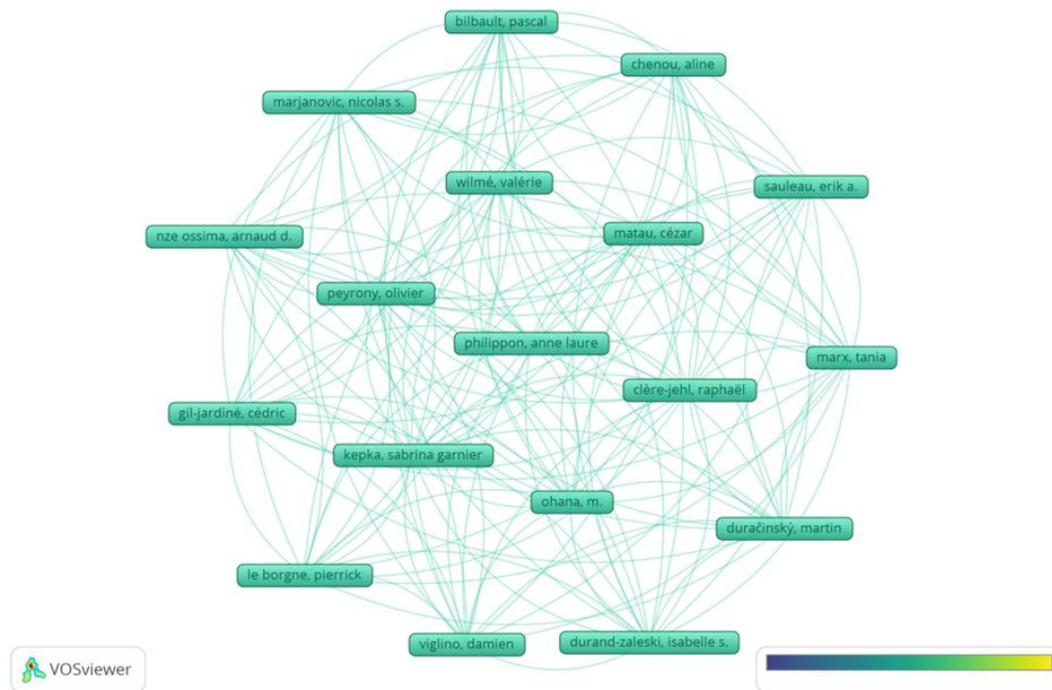
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Figure 2: Visualization of Co-authorship Overlay

The Co-authorship Overlay Visualization (Figure 2) analysis was conducted to identify the temporal development of collaboration between authors in the research field under study. This visualization displays relationships between authors coded by the average year of publication. In the overlay map, blue indicates older publications, while green to yellow represent more recent publications. Based on the visualization, most authors fall within the green to light green color spectrum, indicating sustained research activity in the mid- to recent period.

Several key authors, such as Wilmé, Valérie; Philippon, Anne Laure; Bilbault, Pascal; and Chenou, Aline, show bright green, indicating consistency in publication productivity over time. This suggests that these authors play a key role in maintaining the sustainability of scientific development in this field.

The absence of a dominant dark blue color indicates that research activity has not stopped at a specific period but has continued into the relatively recent past. Furthermore, the presence of light green to yellow colors indicates the regeneration of researchers and the involvement of new authors in the collaboration network. Overall, the overlay visualization results demonstrate that this research field is dynamic, ongoing, and remains relevant for further study. The stable temporal pattern reflects the continuity of research that supports systematic scientific development.
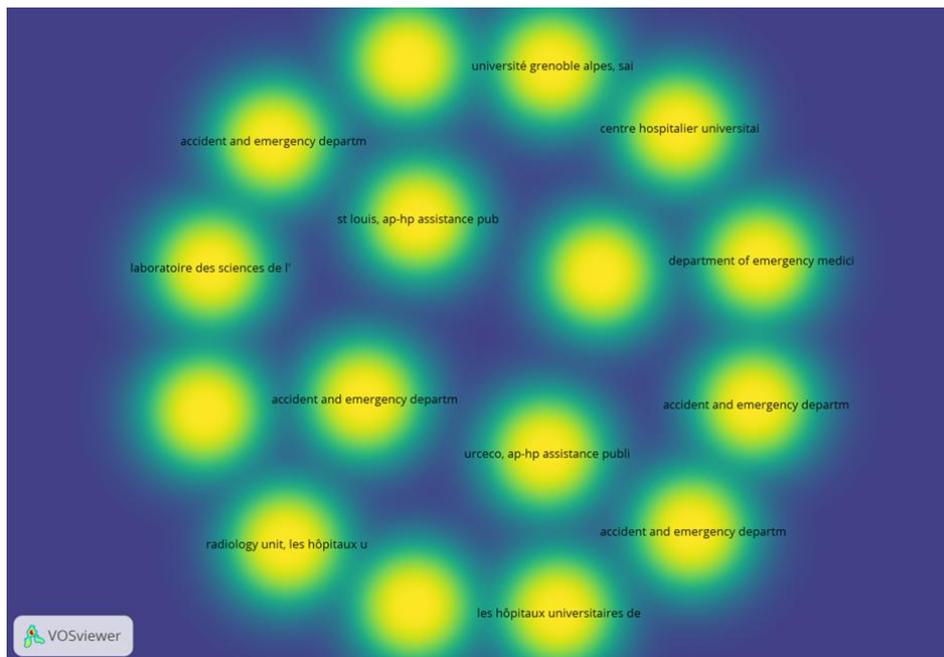
Figure 3: Visualization of Organizational Co-authorship Density

A co-authorship analysis based on organizational affiliation was conducted using VOSviewer to identify the role of institutions in developing research in the field under study. The visualization used was density visualization (Figure 3), which depicts the density of contributions and collaboration between organizations. The visualization results show a predominance of yellow to bright green colors across several institutions, indicating high levels of productivity and collaboration. Key institutions identified include Université Grenoble Alpes, Centre Hospitalier Universitaire, Assistance Publique–Hôpitaux de Paris (AP-HP), and various clinical units such as the Departments of Emergency Medicine and Radiology.

These findings indicate that research in this field is dominated by teaching hospitals and academic institutions integrated with clinical services. The role of referral hospitals and medical education centers is significant in driving the productivity of scientific publications. Furthermore, the limited representation of private hospitals, regional hospitals, and institutions from developing countries indicates a research gap. This suggests that the healthcare context outside the teaching hospital system remains relatively underexplored.

An analysis of co-authorship by organization indicates that research is dominated by teaching hospitals and universities in developed countries. The limited contributions from institutions in developing countries indicate opportunities for contextual research relevant to national healthcare systems.Overall, the results of this analysis indicate that research development is still concentrated in large, university-based institutions, thus opening up opportunities for contextual research on healthcare systems in developing countries, including Indonesia.

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Selected	Country	Documents	Citations	Total link strength ⌄
☑	united kingdom	5	3	2
☑	austria	1	0	1
☑	poland	1	0	1
☑	canada	1	0	0
☑	france	1	0	0
☑	germany	1	0	0
☑	netherlands	1	2	0
☑	new zealand	1	0	0

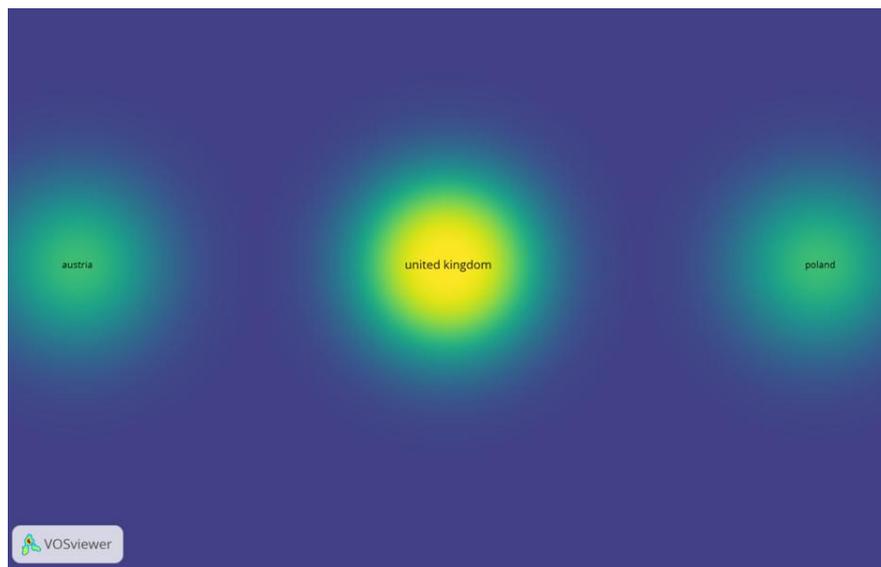**Figure 4:** Countries Contributing to the Research

Figure 5: Co-authorship Density Visualization by Country

A country-based co-authorship analysis was conducted to identify contributions and patterns of international collaboration in the research field under study. The visualization used was density visualization, (Figure 5) which depicts the publication density level based on the author's country of origin. This analysis identified eight countries (Figure 4) with the largest set of connected items consisting of three items. The visualization results show that the United Kingdom has the highest density level, indicated by a bright yellow color, indicating a very dominant publication contribution. Austria and Poland show moderate densities, while other countries have relatively low contributions. This finding indicates that research in this field is still dominated by European countries, particularly developed countries with relatively well-established healthcare systems. The limited representation of developing countries indicates a research gap in the context of different healthcare systems. This suggests that previous research results primarily reflect conditions in developed countries, thus generalizing the findings to developing countries is still limited. The country-based co-authorship analysis shows the dominance of European countries, particularly the UK, in scientific publications. The low contribution of developing countries indicates the need for contextual research to enrich the global perspective.

Research on the impact of clinical pathway implementation on cost-effectiveness in developing countries is still limited, but needs to be expanded, especially in countries that use

health insurance as the provider of health services for their communities. Yingtan, Yaxuan, & Qiuming(2025) standardized clinical pathways can maintain hospital profitability. Hospitals, as insurance providers, must continue to generate profits, in addition to optimizing diagnostic and treatment processes, increasing service efficiency, and reducing operational costs. Standardized clinical pathways can reduce costs per visit, except for patients with complex care. Patients with complex care require complex resources and care. Researchers suggest categorizing high-risk and high-cost groups and implementing financing management according to disease complexity and comorbidity levels, leading to optimized clinical pathway implementation and better health service outcomes.

CONCLUSION

Co-authorship analysis shows that a strong and integrated collaborative network between authors has been established, with a few key authors dominating the research. Research is dominated by academic institutions and teaching hospitals in European countries, particularly the United Kingdom. Contributions from developing countries remain limited, opening up opportunities for contextual research in developing countries to enrich the international literature.

Implementing clinical pathways is an effective strategy for improving cost efficiency and the quality of healthcare services in hospitals. Clinical pathways help standardize service processes, reduce variation in clinical procedures, shorten length of stay (LOS), and optimize resource utilization. Various studies have shown that implementing clinical pathways can reduce care costs, improve patient outcomes, and support hospital operational efficiency, particularly in health insurance-based service systems. Furthermore, clinical pathways also play a role in maintaining hospital financial sustainability by increasing efficiency and controlling service costs. Therefore, clinical pathways need to be developed and implemented consistently to improve cost-effectiveness, service quality, and efficiency of the healthcare system, particularly in developing countries.

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