

**MAPPING HUMAN RESOURCE INDICATORS IN HOSPITAL RESEARCH :
A BIBLIOMETRIC PERSPECTIVE****Pemetaan Indikator Sumber Daya Manusia pada Penelitian Rumah Sakit :
Perspektif Bibliometrik****Solichati Fatonah*, Qurratul Aini**Master in Hospital Administration, Universitas Muhammadiyah Yogyakarta, 2nd Floor Postgraduate Building, UMY Integrated Campus, Kasihan, Bantul, Yogyakarta, Indonesia*Email: 5lica.dr@gmail.com**ABSTRACT**

Human resource indicators are important determinants of hospital service quality because workforce management directly affects patient care and organizational performance. However, the literature on hospital human resource management remains fragmented, particularly regarding its relationship with service quality and performance outcomes. This study aimed to map the research landscape on human resource indicators in hospitals from a bibliometric perspective. A bibliometric analysis was conducted using the Scopus database for articles published between 2015 and 2025. Of 3,995 records initially identified, 1,985 articles met the eligibility criteria and were included in the final analysis. Bibliometric mapping was performed using VOSviewer. The results showed a clear increase in publication output over time, especially in 2024–2025, indicating growing scholarly interest in hospital human resource indicators. The keyword health care quality had the highest total link strength, showing that the literature is strongly oriented toward quality assessment, organizational performance, and service improvement. Overall, the findings demonstrate that research on hospital human resource indicators is closely linked to hospital quality, management, and patient safety, while several workforce-related themes remain underexplored.

Keywords: *Bibliometrics, HRSC, Human resource indicators, Human resource management, Hospital***ABSTRAK**

Indikator sumber daya manusia merupakan penentu penting mutu pelayanan rumah sakit karena pengelolaan tenaga kerja secara langsung memengaruhi pelayanan pasien dan kinerja organisasi. Namun, literatur mengenai manajemen sumber daya manusia rumah sakit masih terfragmentasi, terutama dalam kaitannya dengan mutu pelayanan dan luaran kinerja. Penelitian ini bertujuan untuk memetakan lanskap penelitian mengenai indikator sumber daya manusia di rumah sakit dari perspektif bibliometrik. Analisis bibliometrik dilakukan menggunakan basis data Scopus terhadap artikel yang diterbitkan pada periode 2015–2025. Dari 3.995 dokumen yang teridentifikasi pada tahap awal, sebanyak 1.985 artikel memenuhi kriteria dan dianalisis lebih lanjut. Pemetaan bibliometrik dilakukan menggunakan VOSviewer. Hasil menunjukkan adanya peningkatan publikasi yang jelas dari waktu ke waktu, terutama pada 2024–2025, yang menandakan meningkatnya perhatian akademik terhadap indikator sumber daya manusia rumah sakit. Kata kunci health care quality memiliki total link strength tertinggi, yang menunjukkan bahwa literatur sangat berorientasi pada penilaian mutu, kinerja organisasi, dan peningkatan layanan. Secara keseluruhan, temuan ini menunjukkan bahwa penelitian tentang indikator sumber daya manusia rumah sakit berkaitan erat dengan mutu

rumah sakit, manajemen, dan keselamatan pasien, meskipun beberapa tema terkait tenaga kerja masih belum banyak diteliti.

Kata kunci : *Bibliometrik, HRSC, Indikator SDM, Manajemen SDM, Rumah sakit*

INTRODUCTION

Human resources are a strategic component of hospital performance because hospitals rely heavily on the capacity, stability, and effectiveness of their workforce to deliver safe and high-quality care. In this study, human resource indicators refer to measurable workforce-related variables that reflect the condition and management of hospital personnel, including workload, job satisfaction, motivation, staff attitudes, competence, retention, and turnover-related outcomes. These indicators are important because they influence not only staff well-being, but also service efficiency, continuity of care, and overall hospital quality (Adha & Aini, 2023; Gaspar et al., 2023; Hadian et al., 2024; Iqbal et al., 2022; Palijama, 2023; Wang et al., 2024). Prior studies have shown that workload, job satisfaction, and motivation are closely associated with the performance of health professionals and the quality-of-service delivery (Alzoubi et al., 2024; Handayani et al., 2025; Kurniawan et al., 2024; Muhammad et al., 2024; Rotea et al., 2023). In addition, wider hospital workforce research has emphasized retention, turnover, and manpower management as key concerns in maintaining service quality and organizational sustainability (Darzi et al., 2023; Komashie et al., 2021; Nafari & Rezaei, 2022; Nyawira et al., 2022; Wang et al., 2024).

Although the literature on hospital quality and workforce management has grown substantially, the evidence remains fragmented across separate themes and professional contexts. Existing studies often examine individual dimensions of human resource management or service quality in isolation, rather than showing how workforce indicators are positioned within the broader hospital performance literature (Agustina et al., 2025; Mamatha et al., 2023; Oktaviani et al., 2024; Warui Mwangi et al., 2022). This fragmentation makes it difficult

to identify the dominant indicators, conceptual relationships, and emerging trends that shape research on hospital human resources. A bibliometric approach is therefore appropriate because it is designed to map publication patterns, thematic structures, keyword relationships, and research networks across a broad body of literature, which differs from systematic reviews or meta-analyses that are usually intended to synthesize evidence for narrower and more comparable questions (Kokol et al., 2021). Accordingly, this study aims to map human resource indicators in hospital research and examine how these indicators are linked to service quality and efficiency. In this sense, the study offers a relatively novel bibliometric perspective on human resource indicators in hospitals by providing a structured overview of research trends, thematic linkages, and indicator clusters that may inform future research as well as hospital management and policy.

MATERIALS AND METHOD

This study employed a bibliometric design to map the literature on human resource indicators in hospital settings. Data were retrieved from the Scopus database on January 5, 2026, using the search query applied to the title, abstract, and keywords fields: (TITLE-ABS-KEY (human AND resources AND indicator) OR TITLE-ABS-KEY (hrsc) AND TITLE-ABS-KEY (hospital)), with additional filters for publication year (2015–2025), document type (article), subject area, language (English), and source type (journal). The 2015–2025 period was selected to capture recent developments in hospital human resource research while maintaining sufficient publication volume for trend analysis. The initial search yielded 3,995 records, of which 1,985 were included after screening. The record identification and screening process is presented in Figure 1.

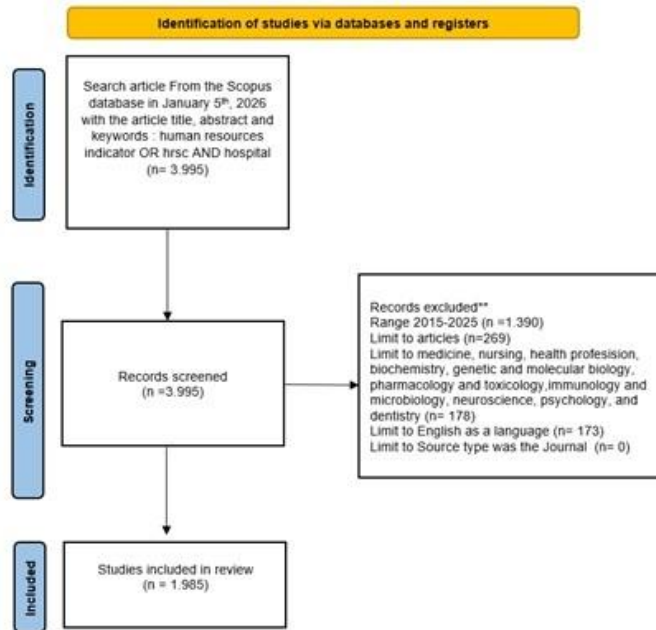


Figure 1. PRISMA 2020 flow diagram of database search, screening, and final record inclusion

Screening and eligibility assessment were conducted by one reviewer using pre-defined inclusion and exclusion criteria; therefore, inter-rater reliability was not calculated. All records were exported in CSV format and checked before analysis, and no duplicate records were identified. Bibliometric analysis was performed using Scopus analytical tools and VOSviewer version 1.6.20. The main technique applied was keyword co-occurrence analysis to identify

dominant themes and conceptual relationships in the literature. The minimum keyword occurrence threshold was set at 5, and the threshold was checked iteratively using the “Create Map” feature in VOSviewer to ensure a meaningful network structure. Association strength was used as the normalization method, and the resulting keyword network was visualized in clusters based on the strength of co-occurrence among terms.

RESULTS AND DISCUSSION

Result Publication Trends

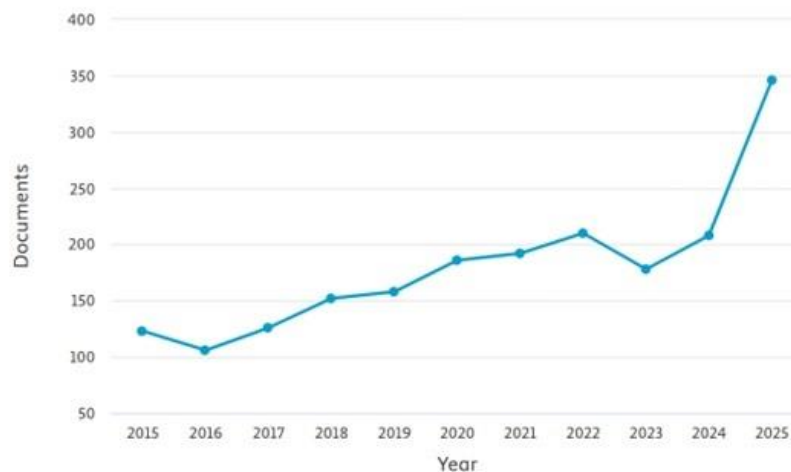


Figure 2. The number of documents by year. *Source: Scopus Database*

A total of 1,985 documents were retrieved from the Scopus database, showing an overall upward trend in publication output during 2015–2025 (Figure 2). In the earlier period (2015–2020), annual publication volume increased gradually from approximately 120 to nearly 190 documents, indicating steady but moderate scholarly interest. Publication output continued to rise in 2021 and reached a local peak in 2022, followed by a temporary decline in 2023. However, the number of publications recovered in 2024 and increased sharply in 2025, reaching the highest level of the study period at approximately 345 documents.

This pattern suggests that research on hospital human resource indicators has gained substantial momentum in recent years. The sharp rise in the final years may reflect increasing global concern regarding workforce resilience, staffing shortages, service quality, and organizational performance in hospitals following major healthcare system pressures. Overall, the trend indicates that hospital human resource indicators are becoming an increasingly important topic within health services and management research.

Top Countries

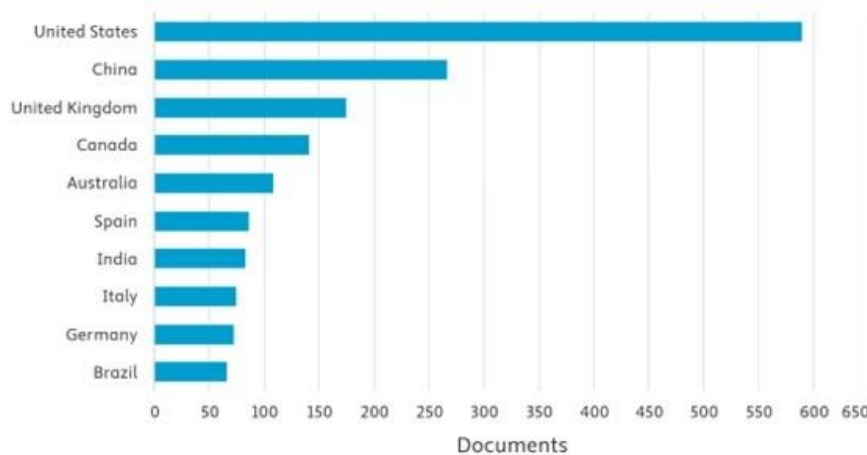


Figure 3. The top 10 countries contributed to the research. *Source: Scopus database*

The United States was the most productive contributor in this field, with more than 550 documents, substantially exceeding all other countries. China ranked second with more than 250 publications, followed by the United Kingdom and Canada, each contributing more than 200 documents. Australia, Spain, India, Italy, Germany, and Brazil also appeared among the top 10 contributing countries, although at lower publication volumes (Figure 3).

The dominance of the United States is important to interpret beyond simple ranking. One possible explanation is the scale of research funding available for health services research, hospital quality, patient

safety, and workforce-related studies. Another likely factor is the complexity of the U.S. healthcare system, which is characterized by extensive quality reporting, accreditation requirements, multiple financing structures, and persistent workforce challenges. These conditions may generate strong institutional demand for research on staffing, performance measurement, and quality improvement. Thus, the large contribution from the United States may reflect not only higher research capacity, but also a healthcare environment in which hospital human resource indicators are particularly salient for policy, management, and service evaluation.

Top Journal

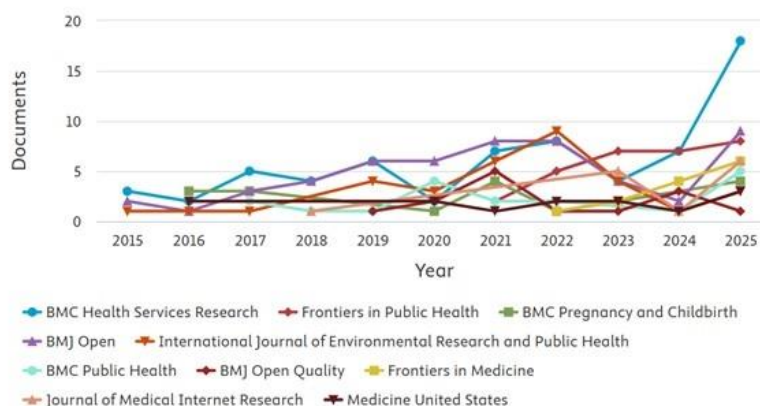


Figure 4. The top 10 number of documents by the source
Source: Scopus database

The distribution of publications by source showed that BMC Health Services Research recorded the strongest growth over time, with output peaking at nearly 20 publications in 2025. Other sources, including Frontiers in Public Health and BMC Pregnancy and Childbirth, also contributed steadily, although with more moderate fluctuation across years (Figure 4).

This pattern suggests that the topic is being published predominantly in journals concerned with health services, public health, and quality improvement. In turn, this reinforces the observation that hospital human resource indicators are often discussed in relation to service delivery, organizational performance, and patient outcomes, rather than solely within the narrower domain of human resource administration.

Top Affiliation

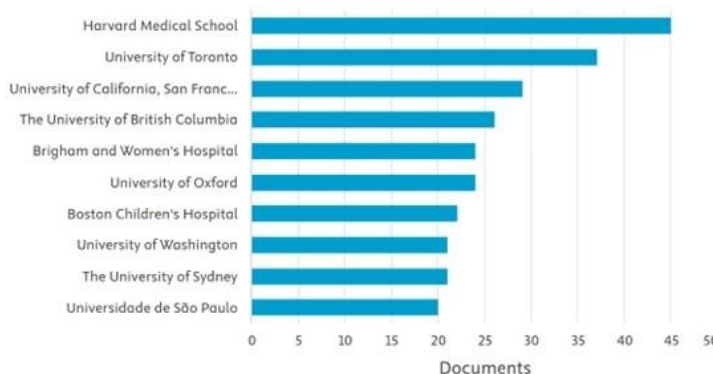


Figure 5. The top 10 number of documents by affiliation
Source: Scopus database

At the institutional level, Harvard Medical School emerged as the most productive affiliation, contributing approximately 45 documents, followed by the University of Toronto with around 37 publications. The next highest contributors were the University of California, San Francisco, The University of British Columbia, and Brigham and Women's Hospital (Figure 5). Other institutions within the top 10 included the University of Oxford, Boston Children's Hospital,

University of Washington, The University of Sydney, and Universidade de São Paulo.

The concentration of leading affiliations among internationally recognized academic medical centers and research-intensive universities suggests that scholarship on hospital human resource indicators is strongly driven by institutions with advanced healthcare systems, robust research infrastructure, and close integration between clinical services and academic inquiry.

These organizations are more likely to possess large hospital datasets, multidisciplinary expertise, and sustained funding for studies related to workforce management, service quality, and patient safety.

Notably, several of the top institutions are teaching hospitals or university-affiliated health systems, indicating that hospital HRM research is closely linked to environments

where workforce performance, quality improvement, and evidence-based management are strategic priorities. This institutional pattern also suggests that the dominant literature may largely reflect the experiences of well-resourced settings, while perspectives from low- and middle-resource institutions may remain comparatively underrepresented.

Top Subject Area

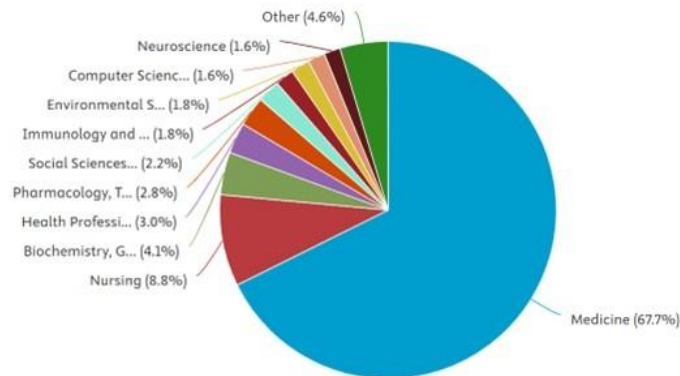


Figure 6. The top 10 number of documents by subject area
 Source: Scopus database

Medicine accounted for 67.7% of all publications, making it by far the dominant subject area in the dataset. Nursing contributed 8.8%, while Biochemistry, Genetics and Molecular Biology, Health Professions, Pharmacology, and Social Sciences each represented smaller proportions. Immunology and Microbiology, Environmental Science, Computer Science, and Neuroscience contributed less than 2% each (Figure 6).

The dominance of Medicine suggests that research on hospital human resource indicators is largely driven by clinical priorities and service-delivery concerns. This pattern is understandable because hospitals are primarily healthcare institutions, and workforce issues are often examined in relation to patient outcomes, service effectiveness, quality assurance, and safety improvement. In this context, human resource indicators are more likely to be framed around staffing adequacy, workload, professional performance, and their consequences for care delivery. As a result, the literature tends to position HRM as a supporting mechanism for clinical quality rather than as a broader strategic management function.

This disciplinary concentration has important implications for the HRM approach reflected in the literature. On the one hand, the strong medical orientation makes the field highly relevant to hospital practice because it connects workforce management directly to quality of care and patient safety. On the other hand, it may narrow the analytical scope of HRM by emphasizing operational and clinically measurable outcomes while giving less attention to strategic and organizational dimensions such as leadership development, employee engagement, retention systems, digital HR transformation, workforce governance, and institutional culture. The relatively limited contribution of social sciences, computer science, and other interdisciplinary fields therefore indicates that hospital HRM research is still more clinically oriented than managerially integrated. This suggests a need for future studies that combine medical, organizational, and technological perspectives so that hospital human resource indicators can be understood not only as determinants of clinical performance, but also as part of a broader strategy for institutional sustainability and workforce development.

Keyword and Cluster Analysis

Table 1. List of top 10 keywords based on total link strength

Rank	Keyword	Total Link strength
1	Health care quality	12314
2	Quality indicators, health care	7327
3	Hospital	6832
4	Organization and management	5726
5	Total quality management	5631
6	Quality improvement	4582
7	Standards	3976
8	Health care personnel	3845
9	Health service	3474
10	Quality of health care	3059

Table 1 presents the top 10 keywords in the literature on hospital human resource indicators based on total link strength, which reflects the extent to which a keyword is connected to other keywords in the bibliometric network. A higher total link strength indicates that a term is not only frequently used, but also strongly associated with multiple themes across the dataset.

The analysis shows that health care quality was the most strongly connected keyword, with a total link strength of 12,314, indicating that it occupies a central position in the research network. This was followed by quality indicators, health care (7,327) and hospital (6,832), suggesting that the literature is primarily organized around the measurement of quality within hospital settings.

Other highly connected terms, such as organization and management, total quality management, and quality improvement, point to a strong managerial and performance-oriented orientation in the field. In contrast, keywords such as health care personnel, health service, and standards indicate that workforce and operational dimensions are also present, although they appear less dominant than quality-related themes. Overall, these findings suggest that research on hospital human resource indicators is largely framed through the lens of quality assessment, organizational performance, and continuous improvement, rather than through broader strategic human resource management perspectives.

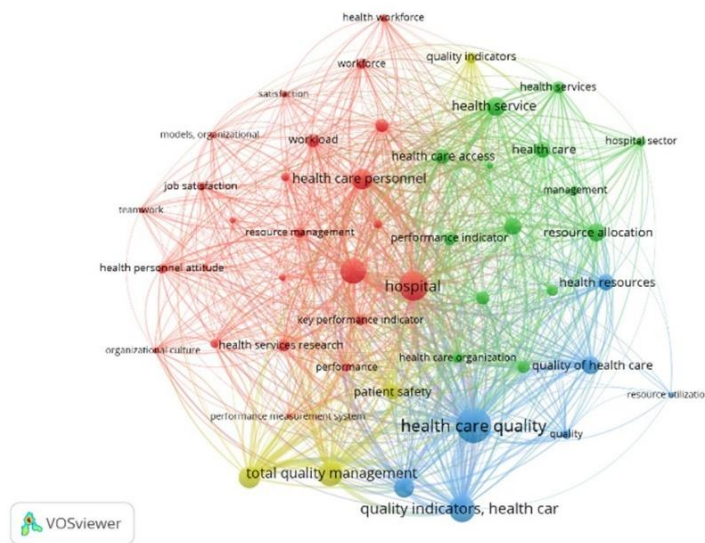


Figure 7. Mapping visualization networking
 Source: Scopus database

Figure 7 represents 49 keywords that are categorized into four distinct clusters.

Colors indicate distinct clusters, while point size reflects the frequency of keyword occurrence. Each point is connected by a line, which signifies the co-occurrence of both keywords within the same article.

Clustering refers to the bibliometric grouping of keywords, whereas mapping provides a comprehensive visualization of the network structure. Mapping is used to acquire a comprehensive network image. A detailed description of each cluster and its associated items is provided in Table 2.

Table 2. The clusters of bibliometric analysis

Cluster	Keywords	Color
Cluster 1 (23 items)	Health care personnel, health personnel attitude, health services research, health workforce, hospital, human resource management, job satisfaction, key performance indicator, motivation, organizational, organization, organization and management, organizational culture, patient satisfaction, performance, performance measurement, productivity, resource management, satisfaction, teamwork, workflow, workforce, workload	Red
Cluster 2 (14 items)	Clinical indicator, health care, health care access, health care management, health care organization, health care system, health service, health services, hospital management, hospital sector, management, performance indicator, quality control, resource allocation	Green
Cluster 3 (7 items)	Health care quality, health resources, quality, quality of health care, resource utilization, standards, quality indicator	Blue
Cluster 4 (3 items)	Patient safety, quality improvement, total quality management	Yellow

The keyword co-occurrence analysis identified four thematic clusters representing the conceptual structure of research on hospital human resource indicators. Cluster 1 (red) is the largest cluster and focuses on workforce and organizational performance. Keywords such as human resource management, job satisfaction, motivation, organizational culture, performance, teamwork, workflow, and workload indicate that this stream of research examines how employee-related factors shape hospital productivity and service outcomes. This cluster reflects the operational core of HRM in hospital settings.

Cluster 2 (green) emphasizes healthcare systems and managerial processes. Terms such as health care management, hospital management, resource allocation, clinical indicator, and quality control suggest a systems-level perspective in which hospital performance depends on governance structures, resource distribution, and service coordination.

Cluster 3 (blue) centers on healthcare quality and resource efficiency, containing

terms such as health care quality, quality indicator, resource utilization, standards, and health resources. Although these topics are conceptually important, the blue coloration in density visualization indicates lower concentration compared with dominant yellow areas. This suggests that the detailed mechanisms linking quality measurement, resource use, and workforce indicators may remain relatively underdeveloped and represent promising areas for future research.

Cluster 4 (yellow) includes patient safety, quality improvement, and total quality management. Despite containing fewer keywords, this cluster is strategically important because it reflects practical efforts to improve care processes and reduce risks in hospital services. The yellow density indicates that these topics are highly connected and currently receive substantial scholarly attention.

Taken together, the clusters indicate that the literature is structured around four interrelated domains: workforce management, health system organization, quality evaluation, and patient safety improvement.

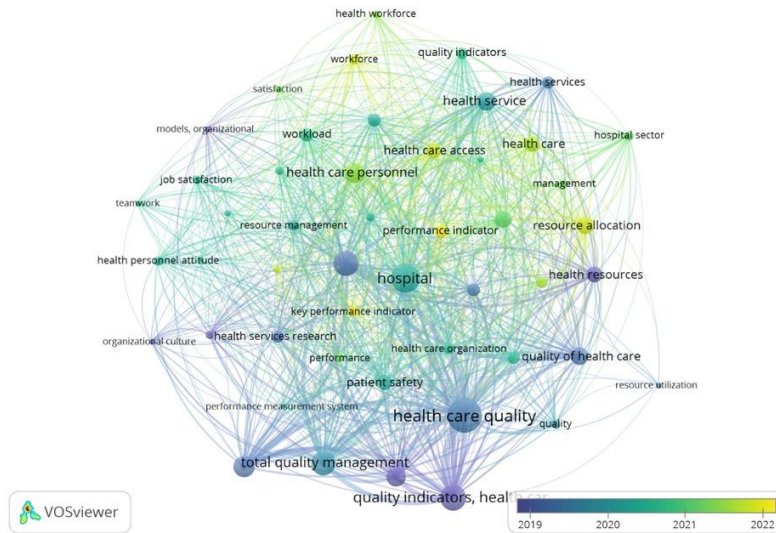


Figure 8. Overlay visualization of keyword co-occurrence by average publication year

Figure 8 presents the overlay visualization of keyword co-occurrence based on average publication year. The colour gradient indicates temporal development, with blue or purple nodes representing earlier topics and green to yellow nodes representing more recent topics. Earlier themes were concentrated around total quality management, quality indicators, health care, quality of health care, and patient safety, suggesting that the literature initially emphasized quality assurance, standards, and safety monitoring. In contrast, more recent topics are represented by keywords such as

resource allocation, performance indicator, workforce, and health care access. This shift suggests that research has moved from traditional quality-control approaches toward broader concerns related to workforce planning, service efficiency, and resource distribution in hospital settings. The position of health care quality in the network indicates that it remains an important theme, but the overlay map suggests that newer studies increasingly connect this topic with performance measurement and workforce-related issues.

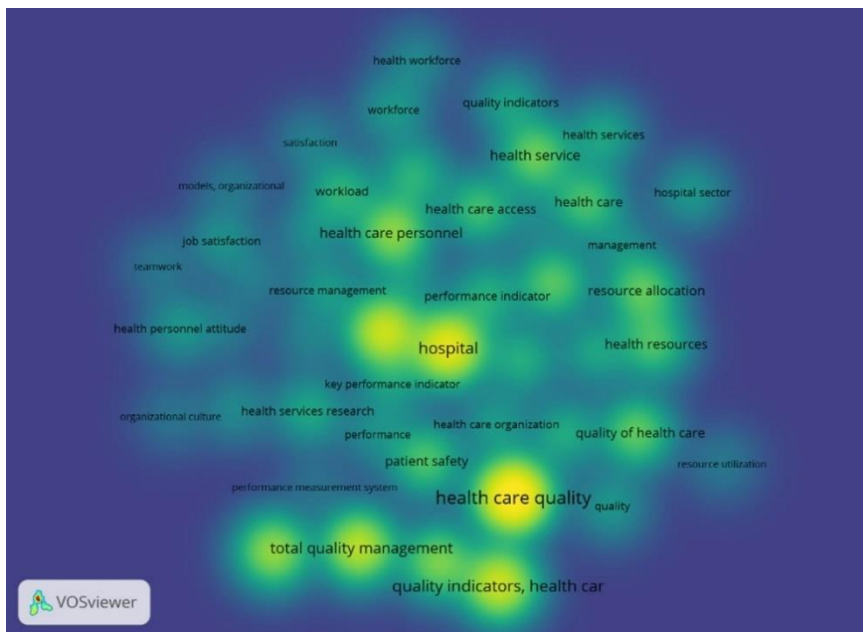


Figure 9. Mapping density
Source: Scopus database

The cooler blue areas in the density visualization represent keywords with lower occurrence frequency and weaker network connectivity. In the present study, these areas mainly relate to quality indicators, resource utilization, health resources, and standards. Although less dominant than central themes such as hospital and health care quality, these topics are important because they may represent under-researched dimensions of hospital HRM. Future studies should examine how resource efficiency, quality measurement systems, and standards interact with workforce management to improve hospital performance.

Discussion

This bibliometric study shows that research on hospital human resource indicators increased substantially during 2015–2025, with the strongest growth occurring in the final years of the period. This trend indicates that hospital HRM is receiving growing attention within health services and management research, particularly in response to concerns about workforce resilience, staffing adequacy, service quality, and organizational performance. The recent rise in publications suggests that HRM is increasingly understood not merely as an administrative function, but as an important determinant of hospital effectiveness and quality of care (Siddique et al., 2025).

The country, affiliation, subject area, and keyword patterns further clarify how this field is being shaped. The dominance of the United States and the prominence of major academic medical centers suggest that the literature is driven largely by well-resourced health systems with strong research infrastructure, extensive quality-reporting mechanisms, and high institutional emphasis on patient safety and performance evaluation. At the same time, Medicine accounted for 67.7% of the publications, indicating that hospital HRM research is still largely framed through a clinical and service-delivery perspective. This orientation is reinforced by the most strongly connected keywords, including health care quality, quality indicators, health care, hospital, organization and management, and total quality management. Together, these findings suggest that the literature is centered more on quality

assessment, performance monitoring, and service improvement than on HRM as a fully developed strategic management domain (Kurniawan et al., 2024; Maulidia et al., 2025).

An important contribution of this study is the identification of under-researched areas. The density visualization indicates that lower-density themes, such as quality indicators, resource utilization, health resources, standards, and several workforce-related topics including motivation, job satisfaction, teamwork, and workflow, remain less developed than the dominant themes of hospital and health care quality. This suggests that the literature has paid greater attention to quality outcomes than to the HRM mechanisms that produce those outcomes. Previous studies have highlighted the relevance of employee satisfaction, motivation, and training for workforce performance and service delivery (Almeida et al., 2023; Wajidi et al., 2023). However, the integration of HRM practices with patient safety and quality improvement strategies remains insufficiently examined (De Ji et al., 2022; El-Gazar & Zoromba, 2021; Tenza et al., 2024). Greater attention is also needed for digital HRM systems and technology-enabled workforce management as healthcare organizations continue to undergo digital transformation (BOLARINWA, 2020; Mohammad, 2019; Roul et al., 2025). Overall, future research should adopt a more integrated perspective linking human resource practices to patient care, service quality, and organizational efficiency in hospitals

CONCLUSION

This bibliometric study mapped the literature on human resource indicators in hospital settings and clarified how these indicators are linked to service quality and organizational performance. Of 3,995 records initially identified in Scopus, 1,985 articles published between 2015 and 2025 met the eligibility criteria for analysis. Publication output increased substantially over time, with the strongest growth occurring in 2024–2025. The United States was the leading contributor, with more than 550 documents, while health care quality emerged as the most strongly connected keyword, with a

total link strength of 12,314. The findings indicate that the field is primarily organized around workforce management, health system organization, quality evaluation, and patient safety improvement. For hospital managers and policymakers, these results highlight the strategic value of workforce indicators for strengthening service quality and safety. Future research should address underdeveloped indicators and adopt more integrated, interdisciplinary, and digitally informed HRM approaches.

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