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Research Article

Bibliometric Analysis of Articles Investigating Hematologic Malignancy Patients Admitted to the Intensive Care Unit

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ABSTRACT

Objective: To evaluate the citation trends and scientific landscape of studies investigating critically ill patients with hematological malignancies (HM) admitted to intensive care units (ICUs) using bibliometric analysis.

Methods: The Web of Science Core Collection database was searched on March 14, 2026, for original articles published between 2000 and 2025. Publications related to HM requiring ICU admission were analyzed for citation counts, authorship, journals, countries of origin, international collaborations, and keyword trends.

Results: A total of 290 publications were included in the final analysis. These studies received 5,576 citations, of which 5,003 remained after excluding self-citations. The mean number of citations per publication was 19.23. A total of 3,649 citing articles were identified (3,487 excluding self-citations). The most frequent keywords were mortality (n=44), intensive care (n=42), and critical care (n=34), reflecting the primary research focus of the field.

Conclusion: Research on critically ill patients with HM has primarily focused on mortality and prognostic evaluation, with a growing emphasis on intensive care management strategies. The increasing number of publications and strong international collaboration networks indicate a rapidly evolving field. Future research should focus on multicenter collaborations and standardized clinical approaches to enhance the generalizability and clinical impact of findings.

Keywords: Adult, bibliometric, education, hematological malignancy, hematopoietic stem cell transplantation, intensive care unit

INTRODUCTION

Hematologic malignancies are tumors of myeloid or lymphoid origin that result from disturbances in normal hematopoietic processes.[1] These disorders are generally grouped into major categories such as leukemia, multiple myeloma (MM), non-Hodgkin lymphoma (NHL), and Hodgkin lymphoma (HL).[2] On a global scale, data regarding the incidence, prevalence, and overall disease burden of hematological cancers remain limited, and scientific investigation in this field is progressing. Conventional therapeutic strategies remain insufficient for this cluster of diseases; thus, novel treatment modalities continue to be actively pursued.[3] Although advances in emerging therapies have improved survival among patients with hematological malignancies (HMs), outcomes for patients with HMs requiring intensive care unit (ICU) admission remain unclear. Reported ICU mortality rates among HM patients vary between 46% and 90%, far exceeding those observed in general medical ICU populations.[4] Mortality during ICU management and its

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associated determinants constitute additional major research interests, alongside therapeutic approaches for HM patients.[5]

Health systems around the world face growing challenges due to an expanding elderly population, a factor that further escalates the clinical and economic impact of HM.[6] Determining morbidity and mortality data for hematological malignancies within ICU settings is crucial not only for shaping and optimizing clinical strategies but also for guiding the allocation of scientific research resources. Bibliometric analysis is one methodological tool capable of evaluating such developments.[7]

Bibliometric analysis constitutes a quantitative approach that uses statistical methods and analytic instruments to assess multiple dimensions of scholarly output.[8] This methodology facilitates the identification of research patterns, visualization of scientific networks, and assessment of scholarly influence. It offers extensive insight into a research discipline through comprehensive statistical and quantitative analyses.[9]

With the increasing number of publications on HM requiring ICU admission, evidence and knowledge in this domain have expanded steadily each year. In the current study, bibliometric techniques were applied to explore publication trends, highly cited authors, contributing countries, international cooperation patterns, frequently employed keywords, and associated visual analytic metrics. The objective of this investigation is to pinpoint current research focal points at the interface between ICU care and HM, characterize citation trends and emerging themes, and provide direction for future scientific efforts in this field.

MATERIALS AND METHODS

Data Sources and Search Strategies

For this bibliometric analysis, we selected the Thomson Reuters' Web of Science Core Collection (WoSCC) as our database. The selection of the Web of Science (WoS; Clarivate Analytics, USA) platform was justified by its inclusion of diverse bibliometric indicators and its extensive coverage of multidisciplinary literature.[10]

The following template was created as the search strategy: TS= "hematologic* malignan*" OR leukemia* OR lymphoma * OR "MM" OR "hematopoietic stem cell transplant*" OR HSCT OR "Bone marrow transplant" AND "intensive care" OR "intensive care unit" OR ICU OR "critical care" OR "critically ill".

Articles were selected under the 'Document Types' category. The search time range was set to 2000-2025 (publication years). Critical Care Medicine and Hematology were selected as WoS categories. The topic 'Intensive care' was selected for the Citation Topics Micro search. The Science Citation Index Expanded (SCI-EXPANDED) was selected in the WoS Index, and English was selected as the language option. Hematology and Anesthesiology were selected as research areas for the search plan. The search strategy is shown in detail in Figure 1.

All records (including titles, authors, sources, and abstracts) and references in our search results were exported in plain text format. Data collection was carried out in 1 day (March 14, 2026) to prevent variations due to daily updates in the database. All data are publicly available and do not contain any personal information; therefore, informed consent was not required. While ethical committee approval is not required for bibliometric studies involving publicly available data, approval was obtained for our study from Dokuz Eylül University with approval no: 2023/41-16, date: 20.12.2023). Publications concerning "HMs admitted to the intensive care unit" were evaluated based on citation counts, contributing authors, publishing journals, national origins, international collaborations, and research hotspots. Details regarding data acquisition and analytical procedures are described below.

Performance Analysis

Excel 2019 (Redmond, WA) and VOSviewer (version 1.6.11, Leiden University, van Eck, NJ) were used for bibliometric analysis. Excel 2019 was used to present the number of articles published each year and trends in journal distribution.[11,12] VOSviewer was used to perform co-citation analysis of references, journals, and authors and to create relevant knowledge maps. Co-citation maps contain nodes representing cited references, journals, and authors, and node size reflects citation frequency. The connections between nodes represent co-citation relationships. The Fractional counting method was used in VOSviewer, and the threshold was set to select publications. Performance analysis was used to quantify core indicators of scientific activity by evaluating publication growth, leading institutions and countries, highly cited journals, and keyword mappings. Citation analysis was performed during this stage. The Journal Citation Reports dataset was employed to determine the 2023 impact factors (IFs). Both the h-index and the IF were used to describe publication impact. The h-index serves as a key measure of scholarly productivity.[13] It can also be applied to institutions, countries, journals, and research groups. The IF reflects a journal's scientific influence based on the citation performance of its published articles.[13] Finally, the 15 most-cited sources, journals, authors, and articles were identified. Additionally, a table containing the top 50 articles is included as Appendix 1 in the publication.

Keywords Strategy

Bibliometric analysis was performed using VOSviewer (version 1.6.15) and the R package Bibliometrix. Fractional counting

MAIN POINTS

- Comprehensive bibliometric mapping of hematologic malignancies in intensive care units (ICUs) revealed 156 original studies published between 1970 and 2024, with an h-index of 39 and an average of 28.4 citations per article.
- Research hotspots identified include "mortality," "prognostic factors," "outcomes," and "survival," indicating the predominant focus on patient prognosis and outcome improvement in ICU settings.
- Global analysis showed that France, Belgium, and Austria lead in publication impact, while emerging countries such as Brazil, Türkiye, and China demonstrate increasing but lower research influence, underscoring regional disparities in scientific contribution.

was applied to reduce bias from multi-authored publications. No additional normalization method was applied beyond the default normalization implemented in VOSviewer. For keyword co-occurrence analysis, a minimum occurrence threshold of 5 was used. Both Author Keywords and Keywords Plus were included in the analysis. Preprocessing steps included the removal of non-informative stop words and the merging of synonymous terms (e.g., ICU, intensive care unit, intensive care) to improve consistency. The most frequent terms were identified based on their frequency after preprocessing.

Scientific Mapping

Scientific mapping provides a structural representation of relationships among disciplines, subfields, individual works, or researchers. In this study, highly cited authors, collaboration networks, and co-word analyses were visualized using VOSviewer. Mapping outputs depicting these relationships were generated using VOSviewer version 1.6.15 (https://www.vosviewer.com/).

RESULTS

Analysis of Performance

Records were identified through the WoS database (n=1,283,318). After applying the document type filter (Article), 835,905 records remained. Subsequently, restricting the publication years to 2000-2025 resulted in 695,680 records. During the screening phase, records were filtered using WoS categories (Hematology OR Critical Care Medicine), yielding 129,725 records. Further refinement using the citation topic (micro), "Intensive Care", reduced the number of records to 4,666. After limiting the dataset to the SCI-EXPANDED, 4,021 records were retained. Applying the language filter (English) resulted in 3,918 records. During the eligibility phase, records were further restricted based on research areas (Hematology or Anesthesiology), resulting in 290 studies. A total of 290 studies were included in the bibliometric analysis (Figure 1).

A total of 290 publications were included in the final bibliometric analysis. These publications spanned 2000-2025, reflecting the long-term development of research activity in the field. The included studies collectively received 5,576 citations, of which 5,003 remained after excluding self-citations, indicating substantial external scientific impact. The mean number of citations per publication was 19.23, indicating moderate citation performance across the dataset. In total, the publications were cited by 3,649 articles, of which 3,487 remained after the exclusion of self-citations, further supporting the robustness and dissemination of the scientific output. The calculated h-index was 38, indicating that 38 publications have each received at least 38 citations, reflecting a consistent and influential body of work within the analyzed domain.

Analysis of Articles

A total of 15 highly cited articles were identified in the WoSCC, focusing on ICU outcomes, prognostic factors, and management strategies for critically ill patients. Citation counts ranged from 67 to 143, indicating a strong representation of influential studies within the field (Table 1).

The most-cited article in this group reported that delayed ICU admission was associated with significantly increased mortality among cancer patients with acute respiratory failure (n=143 citations). The second most-cited article is "Transport of critically ill patients: Complications and difficulties," published in the journal Anaesthesia And Intensive Care, with 114 citations. The third most-cited article is "Prognostic factors for ICU admission, intensive care outcome, and post-intensive care survival in patients with de novo acute myeloid leukemia: a single center experience," published in Haematologica-The Hematology Journal, and has 108 citations (Table 2).

Analysis of Sources (Journals)

A total of 290 publications appeared in multiple scientific journals, reflecting the interdisciplinary nature of the field, which spans anesthesiology, critical care, and hematology.

The most productive journal was Anaesthesia and Intensive Care (74 publications), followed by Minerva Anestesiologica (41 publications) and Bone Marrow Transplantation (21 publications).

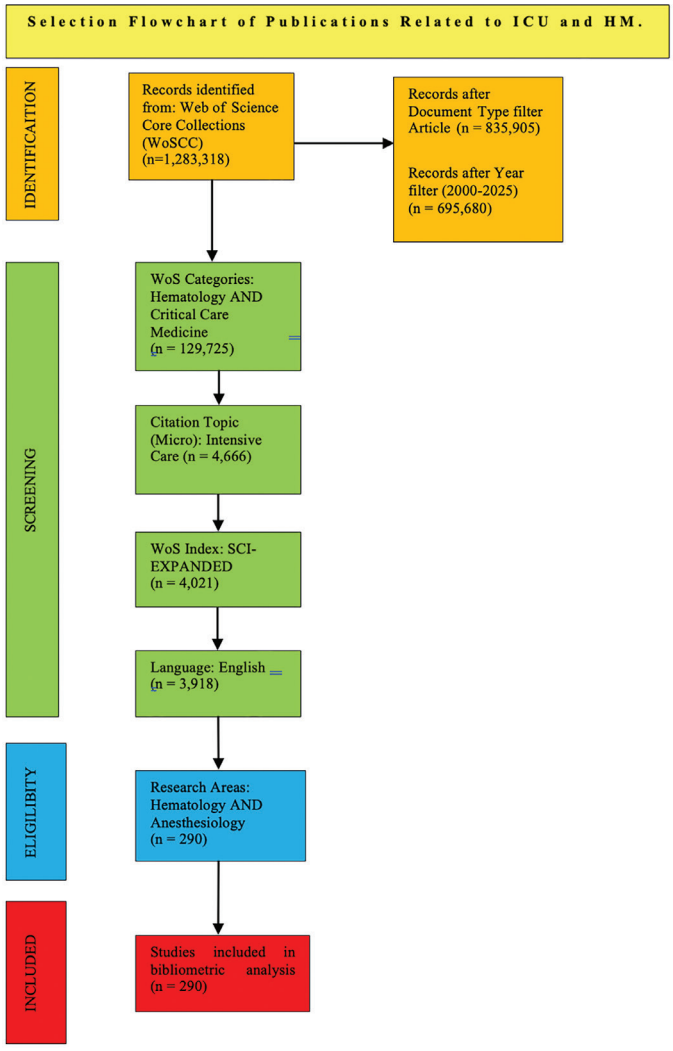


Figure 1. PRISMA 2020 flow diagram illustrating the selection process of studies included in the bibliometric analysis.

Table 1. Bibliometric Analysis of the 15 Most Highly Cited Publications in ICU and Hematological Malignancies Research, Including Citation Counts, Network-Based Total Link Strength, and Journal Distribution

Article title	Source title	Times cited, Wos Core	Total link strength
Delayed intensive care unit admission is associated with increased mortality in patients with cancer with acute respiratory failure	Leukemia & Lymphoma	143	23
Intrahospital transport of critically ill patients: complications and difficulties	Anaesthesia and intensive care	114	20
Prognostic factors for care unit admission, intensive care outcome, and post-intensive care survival in patients with de novo acute myeloid leukemia: a single center experience	Haematologica-The Hematology Journal	108	19
Postoperative complications after craniotomy for brain tumor surgery	Anaesthesia Critical Care & Pain Medicine	95	18
Incidence and prognostic value of respiratory events in acute leukemia	Leukemia	94	16
Intensive care unit management of patients with newly diagnosed acute myeloid leukemia with no organ failure	Leukemia & Lymphoma	91	16
Efficacy of the APACHE Ii Score at ICU discharge in predicting post-ICU Mortality and ICU readmission in critically ill surgical patients	Anaesthesia and Intensive Care	87	16
Identification of poor prognostic features among patients requiring mechanical ventilation after hematopoietic stem cell transplantation	Blood	85	15
The epidemiology of adult rapid response team patients in Australia	Anaesthesia and Intensive Care	84	15
Prognosis of patients with acute Myeloid Leukaemia admitted to intensive care	British Journal of Haematology	82	15
Outcomes in critically Ill cancer patients with septic shock of pulmonary origin	Shock	71	15
Changes in intensive care for allogeneic hematopoietic stem cell transplant recipients	Bone Marrow Transplantation	69	15
After-Hours discharge from intensive care increases the risk of readmission and death	Anaesthesia and Intensive Care	68	14
Night-shift discharge from intensive care unit increases the mortality-risk of ICU survivors	Anaesthesia and Intensive Care	68	14
Combining Sequential Organ Failure Assessment (SOFA) Score with Acute Physiology and Chronic Health Evaluation (APACHE) Ii score to predict hospital mortality of critically ill patients	Anaesthesia and Intensive Care	67	14

Other notable contributors included Journal of Pediatric Hematology/Oncology (20 publications) and Anaesthesia Critical Care & Pain Medicine (19 publications). In terms of citation impact, Anaesthesia and Intensive Care ranked first with 1,510 citations, followed by Minerva Anestesiologica (620 citations) and Bone Marrow Transplantation (557 citations) (Table 3).

Network analysis revealed that Bone Marrow Transplantation had the highest total link strength (131), indicating strong interconnections with other journals in the citation network. This was followed by Annals of Hematology (90) and Leukemia & Lymphoma (79).

Analysis of Institutions

Multiple leading institutions contributing to the field of intensive care and to outcomes for critically ill patients were identified based on publication output, citation counts, and total link strength.

The Medical University of Vienna emerged as the most productive institution, with 12 publications, followed by Monash University (n=10). Several Australian centers, including Alfred Hospital and Royal Perth Hospital (each n=8), as well as Royal Adelaide Hospital and Royal Brisbane and Women's Hospital (each n=7), demonstrated substantial research output. Institutions such as the University Medical Center Utrecht and the University of Queensland (each n=7) also contributed significantly.

In terms of citation counts, Medical University of Vienna ranked first with 298 citations, indicating both high productivity and strong academic impact. Monash University followed with 196 citations, while European institutions such as Hôpital Hôtel-Dieu (176 citations) and CHU Angers (164 citations) also demonstrated high citation performance. Other notable contributors included Institut Paoli-Calmettes (154 citations) and University of Western Australia (152 citations).

Network analysis revealed that Medical University of Vienna had the highest total link strength (156), reflecting its central role in international research collaboration. Nino Jesus Children's Hospital (130) and University Medical Center Utrecht (108) also exhibited strong collaborative connections. Additional key institutions within the collaboration network included Leiden University (100), CHU Angers (99), and University of California San Francisco (89) (Table 4).

Table 2. Bibliometric Evaluation of Leading Journals Contributing to ICU and Hematological Malignancies Literature, Including Productivity, Citation Impact, and Collaboration Network Strength

Source	Documents	Source	Citations	Source	Total link strength
Anaesthesia and Intensive Care	74	Anaesthesia and Intensive Care	1510	Bone Marrow Transplantation	131
Minerva Anestesiologica	41	Minerva Anestesiologica	620	Annals of Hematology	90
Bone Marrow Transplantation	21	Bone Marrow Transplantation	557	Leukemia & Lymphoma	79
Journal of Pediatric Hematology Oncology	20	Leukemia & Lymphoma	471	Biology of Blood and Marrow Transplantation	75
Anaesthesia Critical Care & Pain Medicine	19	Journal of Pediatric Hematology Oncology	358	British Journal of Haematology	65
Leukemia & Lymphoma	19	Annals of Hematology	313	Journal of Pediatric Hematology Oncology	59
Annals of Hematology	16	Anaesthesia Critical Care & Pain Medicine	243	Hematology	43
Shock	13	Biology of Blood and Marrow Transplantation	225	European Journal of Haematology	36
Biology of Blood and Marrow Transplantation	11	British Journal of Haematology	225	Pediatric Blood & Cancer	25
Pediatric Blood & Cancer	11	Shock	155	Haematologica-The Hematology Journal	18
Hematology	8	Pediatric Blood & Cancer	122	Anaesthesia and Intensive Care	17
European Journal of Haematology	7	Haematologica-The Hematology Journal	108	Minerva Anestesiologica	17
British Journal of Haematology	6	Hematology	107	Haematologica	16
Transplantation and Cellular Therapy	3	European Journal of Haematology	94	Acta Haematologica	15
Acta Haematologica	2	Leukemia	94	Transplantation and Cellular Therapy	14

Analysis of Countries

Multiple countries contributed to the literature on intensive care and outcomes of critically ill patients, with notable variability in research productivity, citation impact, and strength of collaboration (Table 5).

Australia was the most productive country, with 58 publications, followed by the United States (n=48) and France (n=40). Germany (n=29) and Italy (n=24) also demonstrated substantial contributions. Other countries with moderate output included the Netherlands (n=16), Spain (n=15), and England (n=13). Contributions from Austria (n=12), Belgium (n=11), and Canada (n=11) were also noteworthy (Figure 2).

In terms of total citations, Australia again led with 1,246, indicating both high productivity and strong academic influence. France ranked second with 1,001 citations, followed by the United States (782 citations). Germany (406 citations) and Italy (331 citations) maintained a consistent presence in both productivity and citation impact. The Netherlands (290 citations) and England (257 citations) also exerted considerable influence.

Network analysis revealed that France had the highest total link strength (156), indicating a central role in international research collaboration. The United States closely followed, with 154 collaborations, while Germany (106) and the Netherlands (83) also showed strong collaborative connectivity. Spain (74) and England (67) contributed meaningfully to the global collaboration network.

Analysis of Authors

Leading authors contributing to the field of intensive care and outcomes of critically ill patients were identified based on publication productivity, citation impact, and collaboration strength.

Among the authors, Azoulay E. was the most productive with 11 publications, followed by Lemiale V. (n=9) and Mokart D. (n=7). Several authors, including Canet E., Lengline E., Pilcher D.V., and Staudinger T., contributed six publications each (Figure 3). Additional contributors, such as Dobb G.J., Ho K.M., Kouatchet A., and Schellongowski P., demonstrated moderate productivity, each with five publications (Figure 3).

Table 3. Institutional Contribution And Collaboration Network Analysis in ICU and Hematological Malignancies Research

Organization	Documents	Organization	Citations	Organization	Total link strength
Med Univ Vienna	12	Med Univ Vienna	298	Med Univ Vienna	156
Monash Univ	10	Monash Univ	196	Nino Jesus Childrens Hosp	130
Alfred Hosp	8	Hop Hotel Dieu	176	Univ Med Ctr Utrecht	108
Royal Perth Hosp	8	Chu Angers	164	Leiden Univ	100
Royal Adelaide Hosp	7	Inst J Paoli I Calmettes	154	Chu Angers	99
Royal Brisbane & Womens Hosp	7	Univ Western Australia	152	Univ Calif San Francisco	89
Univ Med Ctr Utrecht	7	Alfred Hosp	150	Univ Groningen	85
Univ Queensland	7	Univ Paris 07	148	Karolinska Univ Hosp	82
Univ Western Australia	6	Ch Versailles	143	Ghent Univ Hosp	76
Leiden Univ	5	Chu Avicenne	143	British Soc Blood & Marrow Transplantat	71
Univ Calif San Francisco	5	Chu Cochin	143	Royal Free London Nhs Fdn Trust	71
Univ Groningen	5	Chu Hotel Dieu	143	Ucl Med Sch	71
Univ Melbourne	5	Chu St Louis	143	Univ Coll London Hosp Nhs Fdn Trust	71
Ghent Univ Hosp	4	No Hosp	136	Univ Padua	70
Harvard Univ	4	Royal Brisbane & Womens Hosp	131	Univ Hosp Padua	70

Table 4. Country-Based Bibliometric Analysis of ICU and Hematological Malignancies Research Productivity, Impact, and Collaboration Networks

Country	Documents	Country	Citations	Country	Total link strength
Australia	58	Australia	1246	France	156
USA	48	France	1001	USA	154
France	40	USA	782	Germany	106
Germany	29	Germany	406	Netherlands	83
Italy	24	Italy	331	Spain	74
Netherlands	16	Austria	298	England	67
Spain	15	Netherlands	290	Italy	65
England	13	England	257	Canada	52
Austria	12	Spain	231	Austria	48
Belgium	11	Canada	200	Turkey	38
Canada	11	South Korea	181	Sweden	38
People's Republic of China	9	Belgium	151	Belgium	37
South Korea	8	Brazil	99	Australia	32
New Zealand	7	Turkey	97	South Korea	29
Brazil	6	Sweden	90	Israel	27

ICU, intensive care unit.

Table 5. Author-level Bibliometric Analysis Highlighting the Most Productive, Cited, and Collaborative Researchers in ICU and Hematological Malignancies Research

Author	Documents	Author	Citations	Author	Total link strength
Azoulay E	11	Azoulay E	405	Schellongowski P	438
Lemiale V	9	Lemiale V	395	Azoulay E	413
Mokart D	7	Lengline E	306	Lemiale V	374
Canet E	6	Kouatchet A	252	Kouatchet A	356
Lengline E	6	Mokart D	243	Staudinger T	352
Pilcher DV	6	Pène F	240	Bojic A	338
Staudinger T	6	Bruneel F	231	Sperr WR	338
Dobb GJ	5	Vincent F	231	Lengline E	334
Ho KM	5	Chevret S	214	Wohlfarth P	316
Kouatchet A	5	Lambert J	214	Mokart D	283
Schellongowski P	5	Staudinger T	197	Jaeger U	277
Williams TA	5	Schellongowski P	193	Valent P	277
Pène F	4	Bojic A	182	Diaz M	271
Wohlfarth P	4	Sperr WR	182	Madero L	271
Amigoni A	3	Chaoui D	176	Sevilla J	271

ICU, intensive care unit.

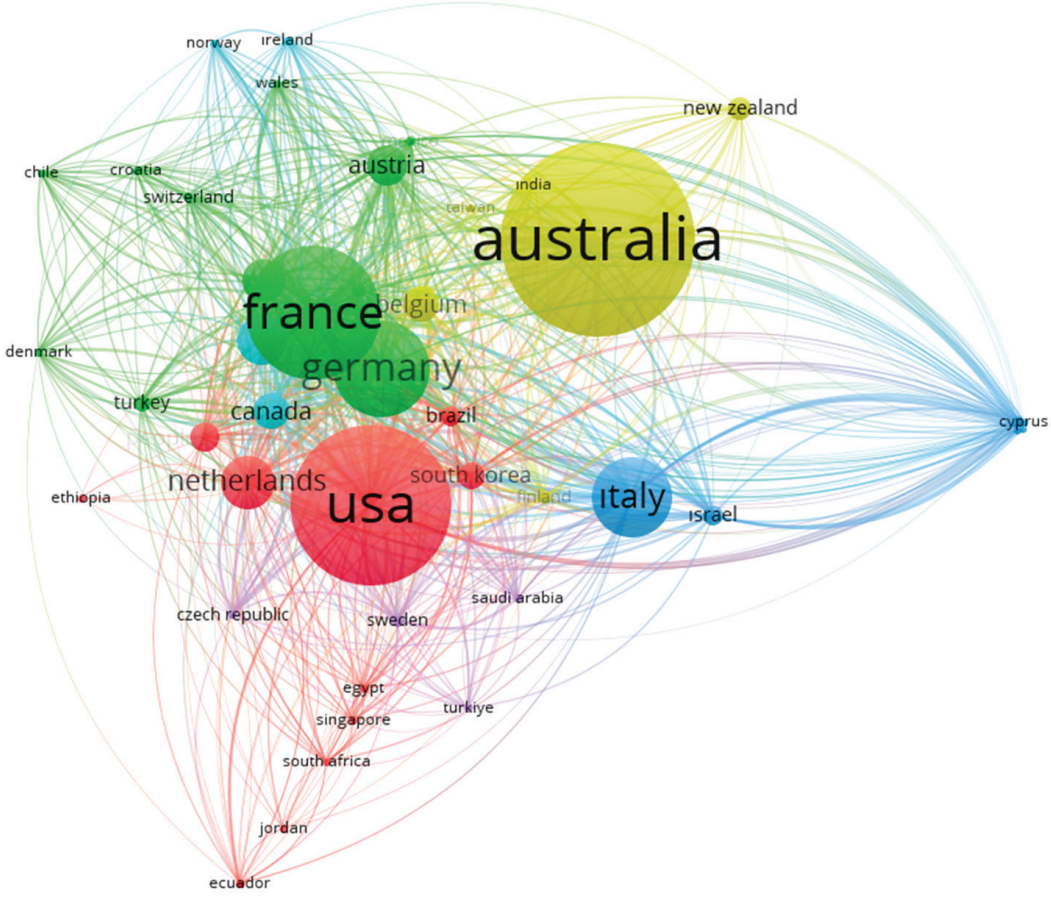


Figure 2. Network visualization of international collaboration among countries based on co-authorship analysis.

Node size reflects publication productivity, while edge thickness corresponds to the total link strength between countries. Different colors denote distinct collaboration clusters, highlighting regional and international research partnerships. Prominent nodes such as Australia, the USA, France, Germany, and Italy represent leading contributors and key connectors in the global research network.

In terms of citation counts, Azoulay E. ranked first with 405 citations, followed closely by Lemiale V. with 395 citations. Lengline E. (306 citations) and Kouatchet A. (252 citations) were also among the most influential authors. Other notable contributors included Mokart D. (243 citations), Pène F. (240 citations), and Bruneel F. (231 citations), indicating a consistent overlap between productivity and citation impact among leading researchers.

Network analysis revealed that Schellongowski P. had the highest total link (Figure 4) (438), indicating a central role in collaborative research networks. Azoulay E. (413) and Lemiale V. (374) also demonstrated strong collaborative connectivity. Additional key contributors included Kouatchet A.(356)and Staudinger T. (352), highlighting a dense, interconnected author network.

Analysis of Keywords

Bibliometric analysis was performed using VOSviewer (version 1.6.15) and Bibliometrix (R package). Fractional counting was applied to reduce bias from multi-authored publications (Figure 5).

No additional normalization method was applied beyond the default normalization implemented in VOSviewer (Table 6). For keyword co-occurrence analysis, a minimum occurrence threshold of 5 was used. Both Author Keywords and Keywords Plus were included in the analysis. Preprocessing steps included the removal of non-informative stop-words and the merging of synonymous terms (e.g., ICU, intensive care unit, intensive care) to improve consistency. The most frequently occurring terms were identified based on their frequency of occurrence after preprocessing (Figure 6).

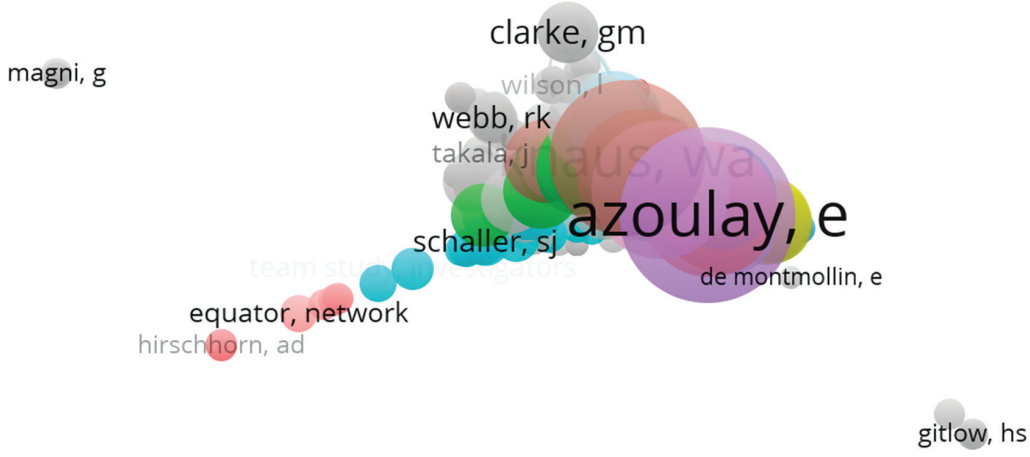


Figure 3. Co-authorship network of authors showing collaborative relationships and publication clusters.

Node size represents the number of publications contributed by each author, while the thickness of connecting lines indicates the strength of collaboration between authors.

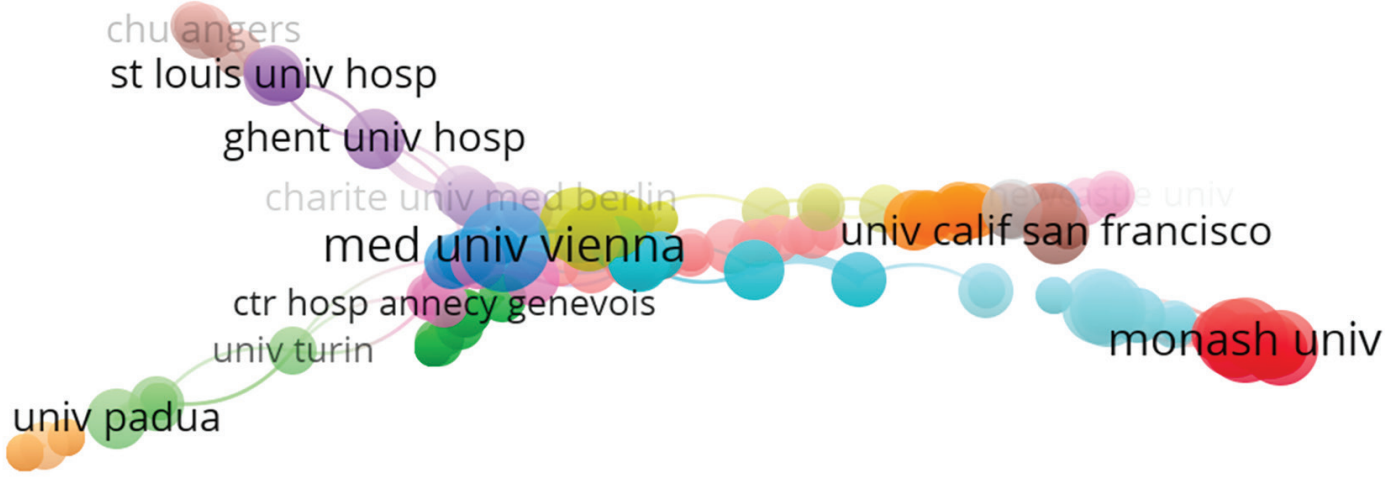


Figure 4. Institutional collaboration network highlighting the most productive research centers.

The size of each node represents the number of publications produced by the institution it represents, while link strength reflects collaborative relationships between institutions.

A number of frequently occurring keywords were identified to characterize the main research themes within the field of intensive care and outcomes of critically ill patients. The most common keyword was mortality (n=44), followed closely by intensive care (n=42) and critical care (n=34). Other high-frequency terms included intensive care unit (n=29; n=26 for variant forms), prognosis (n=24), and mechanical ventilation (n=21). Multiple variations of similar terms were observed, including intensive care, intensive care unit, intensive care units, and ICU, reflecting differences in indexing and authors' keyword preferences. Despite these variations, all terms consistently pointed toward the same core research domain.

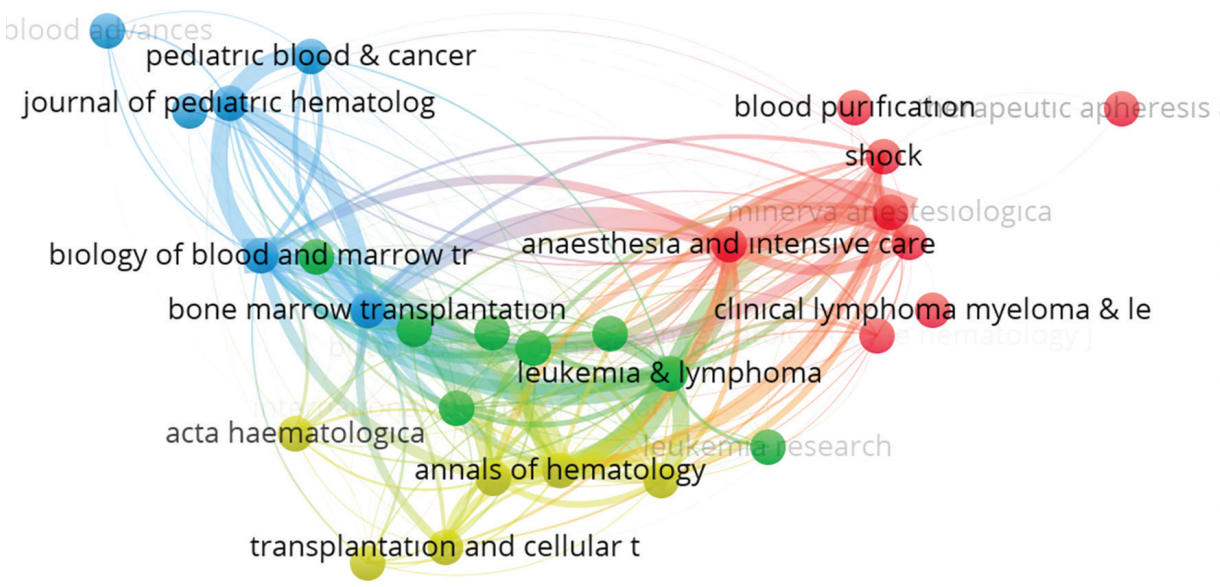


Figure 5. Journal co-citation network representing relationships among leading journals.

The size of each word reflects its frequency of occurrence within the dataset. malignancies in intensive care units.

Table 6. Co-occurrence Analysis of Keywords in ICU and Hematological Malignancies Research, Including Frequency of Occurrence and Total Link Strength

Keyword	Occurrences	Keyword	Total link strength
Mortality	44	Intensive care	169
Intensive care	42	Mortality	167
Critical care	34	Critical care	138
Intensive care unit	29	Intensive care unit	122
Intensive care unit	26	Intensive care unit	94
Prognosis	24	Mechanical ventilation	92
Mechanical ventilation	21	Prognosis	91
Cancer	19	Cancer	81
Intensive care units	17	Sepsis	68
Sepsis	16	Hematopoietic stem cell transplantation	61
Critical illness	14	Critical illness	59
Outcome	14	Outcome	57
Hematopoietic stem cell transplantation	13	Intensive care units	54
ICU	12	ICU	41
Children	11	Pediatric	41

ICU, intensive care unit.

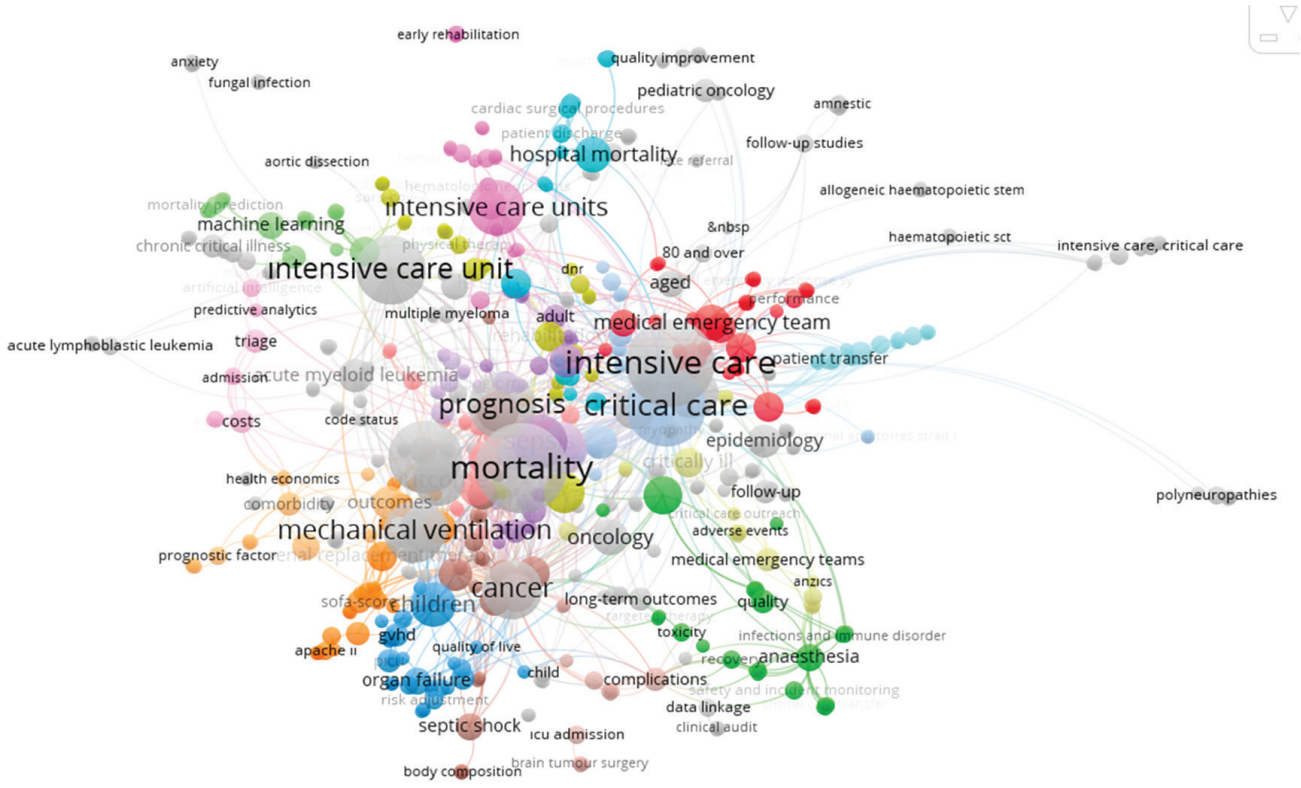


Figure 6. Keyword co-occurrence network illustrating major research themes and their interconnections.

Node size indicates keyword frequency, while link strength represents co-occurrence relationships between terms.

DISCUSSION

This bibliometric analysis provides a comprehensive overview of the scientific landscape concerning critically ill patients with HMs admitted to ICUs. A total of 290 publications were included in the final bibliometric analysis. These publications spanned a broad temporal range from 2000 to 2025, reflecting the long-term development of research activity in the field. The included studies collectively received 5,576 citations, of which 5,003 citations remained after excluding self-citations, indicating a substantial level of external scientific impact. The overall average number of citations per publication was 19.23, demonstrating a moderate citation performance across the dataset. In total, the publications were cited by 3,649 citing articles, with 3,487 citing articles remaining after the exclusion of self-citations, further supporting the robustness and dissemination of the scientific output.

Globally, 1.28 million newly diagnosed hematological malignancy cases were reported in 2020 (7.6%), accompanied by 711,840 cancer-related deaths (7.1%).[14] Despite recent improvements in survival associated with targeted therapies and innovative treatment modalities, a considerable proportion of patients with unfavorable prognoses continue to experience relapse and resistance to therapy.[15] Assessing the quality of care provided to this patient population is a crucial performance measure that assists policymakers and healthcare providers in monitoring clinical processes and enhancing the standards of care.[16] Quality indicators offer insight into areas of strong performance as well as deficiencies, thereby informing future research directions.[16] Bibliometric approaches designed for such purposes enable both qualitative and quantitative characterization of knowledge structures and the identification of evolving trends within specific research domains through mathematical and statistical analyses.[17,18] This methodological strategy enables comparison of contributions and collaborative interactions among authors, countries, and journals.[19] A total of frequently occurring keywords were identified to characterize the main research themes within the field of intensive care and critically ill patient outcomes.

Within this review, the article receiving the highest number of citations was "Delayed intensive care unit admission is associated with increased mortality in patients with cancer with acute respiratory failure''.[20] The analysis of highly cited articles underscores the clinical orientation of the field. The most influential studies addressed critical issues, including delayed ICU admission, prognostic determinants, and the application of severity scoring systems (e.g., APACHE II and SOFA). Notably, delayed ICU admission was consistently associated with increased mortality, highlighting the importance of timely critical care intervention in this vulnerable patient population. The second most cited article, "Intrahospital transport of critically ill patients:complications and difficulties", was published in Anaesthesia and Intensive Care Medicine. Similarly, studies focusing on mechanical ventilation, post-transplant complications, and septic shock in oncologic patients further emphasize the complexity and severity of clinical presentations

encountered in this setting.[21] These findings indicate that the literature is strongly aligned with real-world clinical challenges and decision-making processes.

These findings indicate that the majority of research output is concentrated in journals focused on anesthesiology and intensive care, with a significant contribution from hematology-oriented journals. The most productive journal was Anaesthesia and Intensive Care, with 74 publications, followed by Minerva Anestesiologica (41 publications) and Bone Marrow Transplantation (21 publications). Other notable contributors included Journal of Pediatric Hematology/Oncology (20 publications) and Anaesthesia Critical Care & Pain Medicine (19 publications).

Institutional analysis further corroborates this concentration of scientific output. The Medical University of Vienna was identified as the leading institution in both publication count and citation impact, highlighting its central role in advancing the field. Similarly, institutions such as Monash University and several major Australian hospitals exhibited high levels of productivity, while European centers—including University Medical Center Utrecht and leading French academic hospitals—demonstrated stronger integration within collaborative networks. These findings suggest that research on critically ill hematological patients is predominantly conducted in high-volume, specialized tertiary care centers with established expertise in both intensive care and hematology.[22]

From a productivity perspective, the literature seems to be dominated by a small number of geographically clustered research hubs. Australia (documents, n=58) emerged as the most prolific country in terms of publication output and total citations, highlighting its leading role in producing high-impact research in this field. Despite its high productivity, Australia showed comparatively low total link strength (n=32), indicating that its research efforts might be more focused at the national level. In contrast, European countries, especially France (n=156) and the United States (n=154), demonstrated stronger positions within international collaboration networks, as reflected by their higher total link strength values.

Furthermore, beyond publication volume, total citations and average citations per article are also important metrics for assessing scientific impact.[23] Australia leads in this area with 58 publications, 1,246 citations, and an average of 21.48 citations per article, demonstrating a significant research impact. France received a total of 1001 citations for fewer publications (n=40), whereas the USA received 782 citations for 48 publications. Furthermore, developing countries, such as Brazil and Turkey, had lower numbers of publications and citations.

The bibliometric results indicated that European countries and the USA were the predominant contributors within this research area. These regions produced the largest number of publications, likely because they are supported by robust research funding environments. Both governmental agencies and biotechnology companies in these countries allocate significant financial resources for scientific advancement, fostering progress in innovative therapeutics for the management of HMS.[3]

Institutions generating large volumes of publications also tend to possess highly developed research infrastructures, expert clinical teams, extensive experience, and strong scientific traditions.[3] Collectively, these elements create fertile conditions for the development of novel approaches in the care of patients with HMs.

At the author level, the analysis revealed a clear dominance by a significant number of highly influential researchers. In particular, Azoulay and collaborators constitute a central intellectual hub in the field and lead both in publication output and citation impact.

The high total link strength associated with this group further indicates that it plays a pivotal role in fostering international collaborations and shaping the research agenda. Other key contributors, including Lemiale, Mokart, Lengline, and Kouatchet, also demonstrated substantial influence, reflecting a tightly interconnected authorship network. This concentration suggests that scientific advancement in this area is largely driven by a core group of expert investigators and collaborative consortia.

Keyword analysis provides additional insight into the thematic structure of the field. The predominance of terms such as mortality, intensive care, critical care, and prognosis reflects a primary focus on outcome prediction and survival. The frequent occurrence of keywords such as sepsis, mechanical ventilation, and hematopoietic stem cell-transplantation indicates an emphasis on high-risk subgroups and critical complications. Furthermore, the presence of multiple terminological variants (e.g., ICU, intensive care unit, intensive care units) suggests heterogeneity in indexing practices, although these variations converge on the same core research domain.

Taken together, these findings demonstrate that research on critically ill patients with HMs is highly centralized, both geographically and intellectually, and is predominantly oriented toward clinically relevant outcomes such as mortality and prognostic stratification. The strong representation of collaborative European networks, alongside highly productive yet relatively-interconnected research systems, such as Australia, highlights important differences in research structure and knowledge dissemination.

Future research efforts should aim to enhance global collaboration, particularly by increasing contributions from underrepresented regions, to improve the generalizability of findings. Further integration of multicenter, prospective studies may help address existing gaps and advance evidence-based management strategies for this complex and high-risk patient population.

Limitations and Strengths

This bibliometric assessment is confined to original articles indexed within the Web of Science (WOS) database. Furthermore, only English-language publications were included, which may limit the global representativeness of the dataset. Relying solely on citation counts as an indicator of article quality may restrict the depth of evaluation. Additionally, distinctions among types of HMs could not be made from the analyzed publications, nor could staging or disease severity be assessed. Conversely, analyzing publications by country using multiple bibliometric indicators is a notable strength of this study.

CONCLUSION

This bibliometric analysis demonstrates that research on critically ill patients with HMs is increasingly centered on mortality, prognostic evaluation, and intensive care management strategies. The field is characterized by a concentrated yet highly collaborative research structure, with significant contributions from specific countries, institutions, and leading authors. Despite moderate citation performance, the steady growth in publication output reflects rising scientific interest. Future research should emphasize multicenter collaboration, standardized clinical approaches, and broader global participation to enhance the generalizability and clinical applicability of findings.

Ethics

Ethics Committee Approval: Approval for the study was obtained from the Dokuz Eylül University (approval no:2023/41-16, date: 20.12.2023).

Informed Consent: Due to the nature of the retrospective study, written informed consent form was waived.

Footnotes

Author Contributions

Concept Design – Ö.Ö., S.N.; Data Collection or Processing – Ö.Ö., S.N.; Analysis or Interpretation – Ö.Ö.; Literature Review – Ö.Ö.; Writing, Reviewing and Editing – Ö.Ö., S.N.

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Appendix 1 Link: https://d2v96fxpocvxx.cloudfront.net/beb8919b-f013-4ea1-b1c8-40332e840fe1/content-images/6c051784-db98-42ef-bf18-c54da1f530f2.pdf

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