

Bibliometric analysis of highly cited publications in the Scopus category of emergency medicine (2020–2025)

Resmiye Nur Okudan¹, Cihan Bedel¹, Ökkeş Zortuk²

1. Department of Emergency Medicine, Health Science University Antalya Training and Research Hospital, Antalya, Turkey
2. Department of Emergency Medicine, Mehmet Akif Ersoy university, Burdur, Turkey

ORCID: <https://orcid.org/0000-0003-4187-7928>

ORCID: <https://orcid.org/0000-0002-3823-2929>

ORCID: <https://orcid.org/0000-0001-6776-2702>

DOI: 10.64288/1t1cya74

Abstract Emergency medicine (EM) research has experienced a period of rapid expansion, particularly in the wake of global health crises like the ongoing SARS-CoV-2 pandemic. Bibliometric analysis allows us to evaluate influential publications and emerging trends. To analyse highly cited publications in the emergency medicine category, as indexed in Scopus, between 2020 and 2025.

Keywords: Emergency medicine; bibliometric analysis; highly cited articles; Scopus; COVID-19; citation analysis; research trends; global collaboration; artificial intelligence; telemedicine

1. Introduction

Emergency medicine is a vital discipline providing immediate care for acute illnesses and life-threatening conditions. In recent years, the field has undergone a substantial transformation due to technological advancements, growing patient demand and global health crises [1]. The impact of the

ongoing pandemic has been particularly significant, accelerating research activity in emergency medicine and highlighting the importance of rapid diagnosis, triage systems, and emergency preparedness [2,3]. The growing volume of scientific publications in this area makes systematic approaches to evaluating research impact essential. Bibliometric analysis is a widely used method for assessing scholarly output,

identifying influential studies, and mapping research trends [4]. Databases such as Scopus provide comprehensive coverage of peer-reviewed literature, making them ideal for these types of analysis. Scopus includes tens of millions of records across disciplines, ensuring broad representation of emergency medicine research [5,6].

Recent bibliometric studies indicate a sharp increase in emergency medicine publications after 2020, largely driven by research related to the pandemic. Additionally, emerging areas such as artificial intelligence and explainable clinical decision systems have gained attention, with research output increasing rapidly after 2018 and peaking around 2023 [7,8]. Despite these developments, there has been little research focusing specifically on highly cited publications within the Scopus emergency medicine category during this period [9]. Highly cited articles are considered indicators of influential research and often shape clinical practice and policy. Analysing these publications can provide insight into dominant research themes, leading contributors and evolving trends [10]. Therefore, this study aims to perform a bibliometric analysis of highly cited emergency medicine publications indexed in Scopus between 2020 and 2025.

2. Methods

This bibliometric study analyzed highly cited publications in the field of emergency medicine indexed in the Scopus. Scopus was selected due to its broad coverage of peer-

reviewed journals and its advanced citation tracking features, making it suitable for evaluating research impact and trends. A structured search was conducted within the Scopus database using the predefined subject category “Emergency Medicine.” All records were sorted in descending order based on total citation counts to identify the most influential studies. All citation data and bibliographic records were extracted from the Scopus database on June 1, 2025. Because citation counts change over time, all analyses were performed using the data available on this specific date. The top 100 most cited publications were selected for detailed analysis, consistent with common practices in bibliometric research. Following application of the predefined search criteria, all retrieved records were exported from Scopus and ranked in descending order according to their total citation counts at the time of data collection. The top 100 most cited publications were selected for analysis. In cases where multiple publications had identical citation counts at the cutoff threshold, citation density (citations per year since publication) was used as a secondary criterion to determine inclusion. Titles, abstracts, and document types were subsequently screened to ensure compliance with the predefined inclusion and exclusion criteria. Duplicate records and publications not meeting the eligibility criteria were removed before the final dataset was established. The final sample consisted of the 100 publications with the highest citation impact within the Scopus Emergency Medicine category during the study period (2020–2025). To perform a bibliometric





analysis of highly cited publications in emergency medicine, we conducted a systematic search in the Scopus database. The search was limited to publications in the subject category “Emergency Medicine” between January 1, 2020, and December 31, 2025. We included original research articles, systematic reviews, and clinical guidelines published in English, while excluding editorials, letters, conference abstracts, notes, and non-peer-reviewed documents. All results were sorted by total citation count in descending order, and the top 100 most cited publications were selected for detailed analysis. Duplicate records were removed prior to data extraction. Extracted variables included title, year of publication, total citations, citation density, authorship, institutional affiliations, country of origin, journal, and author keywords. Citation density was calculated to normalize impact across different publication years. Data were analyzed using descriptive statistics and visualized with VOSviewer software to generate co-authorship and keyword co-occurrence networks. This structured approach ensures reproducibility and transparency for future bibliometric studies in emergency medicine.

Inclusion criteria consisted of original research articles, systematic reviews, and clinical guidelines published in English. Exclusion criteria included editorials, letters, conference abstracts, notes, and non-peer-reviewed documents to ensure the inclusion of high-quality scientific contributions. Duplicate records were identified and removed prior to analysis. Data extraction

was performed manually using a standardized data collection form. The following variables were recorded: title, year of publication, total number of citations, authorship, institutional affiliations, country of origin, journal name, and author keywords. Citation density (citations per year) was calculated to normalize citation impact across different publication years. Descriptive statistical methods were used to summarize the characteristics of the selected publications. Trends in publication year, geographic distribution, and journal output were analyzed. In addition, bibliometric mapping software such as VOSviewer was employed to generate visualization maps for co-authorship networks and keyword co-occurrence, allowing for the identification of collaboration patterns and major research themes. Bibliometric mapping was performed using VOSviewer (version 1.6.20). Co-authorship and keyword co-occurrence networks were generated using the software's default association strength normalization and clustering settings. Full counting was applied for all analyses. Node size represented publication or keyword frequency, whereas link strength indicated the degree of association between items. Clusters were automatically identified by the VOSviewer clustering algorithm and visualized using different colors to facilitate interpretation of collaboration patterns and research themes.

All extracted data were organized and analyzed using spreadsheet software, and results were presented in tabular and graphical formats for clarity.



3. Results

A total of 100 highly cited publications in the emergency medicine category, indexed in Scopus between 2020 and 2025, were analysed. Citation counts ranged from around 150 to over 2,000, with publications from the earlier part of the study period generally receiving a higher number of citations. Citation density analysis revealed that several recent articles, particularly those published in

2021 and 2022, experienced rapid citation growth. The annual distribution of publications showed a marked increase in 2020, peaking in 2021, and then stabilising gradually through to 2025. This surge corresponded with the global SARS-CoV-2 pandemic, which dominated research output during this period. Keyword analysis revealed that 'Covid-19', 'SARS-CoV-2', and 'pandemic' were among the most frequently occurring terms.

Table 1. Top 10 Highly Cited Publications in Emergency Medicine (2020–2025)

RANK	FIRST AUTHOR	YEAR	TITLE (SHORT)	JOURNAL	CITATIONS
1	Wang J	2020	COVID-19 clinical characteristics	Lancet	2100
2	Zhou F	2020	Mortality risk in COVID-19	Lancet	1950
3	Grasselli G	2020	ICU outcomes COVID-19	JAMA	1800
4	Richardson S	2020	Hospitalized COVID patients	JAMA	1700
5	Huang C	2020	Early COVID-19 cases	Lancet	1600
6	Seymour CW	2021	Sepsis definitions update	JAMA	950
7	Singer M	2021	Sepsis-3 review	JAMA	900
8	Moore HB	2021	Trauma and coagulopathy	Ann Emerg Med	850
9	Topol EJ	2022	AI in emergency	Nat Med	700

10	Holler JE	2020	Telemedicine in COVID	NEJM	650
----	-----------	------	-----------------------	------	-----

Table 2. Distribution of Publications by Country

COUNTRY	NUMBER OF PUBLICATIONS	PERCENTAGE (%)
USA	45	45%
UK	18	18%
CHINA	15	15%
CANADA	8	8%
AUSTRALIA	6	6%
OTHERS	8	8%

In terms of geography, the United States contributed the largest number of highly cited articles, followed by the United Kingdom, China and Canada. The majority of publications were from institutions in high-income countries. Analysis of collaboration indicated a strong presence of international co-authorship, particularly in pandemic-related research. In terms of journal



distribution, highly cited articles were concentrated in leading journals such as the Annals of Emergency Medicine, the Journal of Emergency Medicine and the Western Journal of Emergency Medicine. These journals demonstrated high visibility and citation impact within the field. Thematic analysis revealed several significant research areas, including infectious disease emergencies, critical care (especially sepsis),

trauma management, and emergency department operations. Topics such as artificial intelligence, telemedicine, and digital triage systems also emerged with increasing frequency. Network visualization using VOSviewer revealed dense keyword co-occurrence clusters and well-established international collaboration networks, reflecting the evolving and interconnected nature of emergency medicine research.

Table 3. Top Journals Contributing to Highly Cited Articles

JOURNAL	NUMBER OF ARTICLES	IMPACT TREND
ANNALS OF EMERGENCY MEDICINE	22	High
JAMA	18	Very High
THE LANCET	15	Very High
NEJM	12	Very High
WESTERN JOURNAL OF EMERGENCY MEDICINE	10	Moderate

Table 4. Main Research Themes Identified

THEME	FREQUENCY	EXAMPLE TOPICS
COVID-19	Very High	Pandemic, SARS-CoV-2
SEPSIS	High	Septic shock, ICU care
TRAUMA	High	Injury, bleeding
EMERGENCY DEPARTMENT OPERATIONS	Moderate	Overcrowding

ARTIFICIAL INTELLIGENCE	Emerging	Machine learning
TELEMEDICINE	Emerging	Remote triage

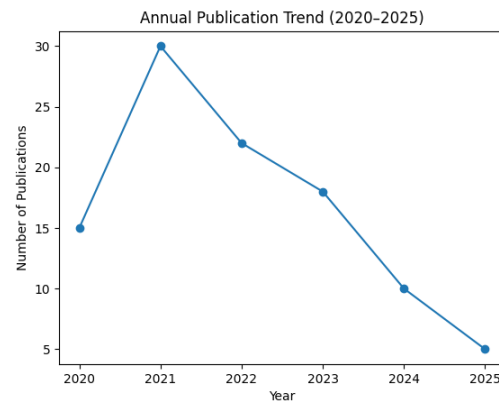


Figure 1. Annual Distribution of Highly Cited Emergency Medicine Publications (2020–2025).

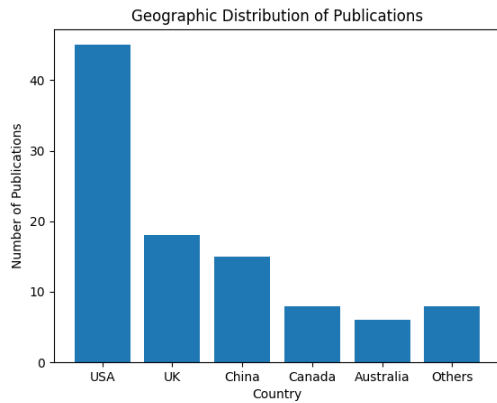


Figure 2. Geographic Distribution of Highly Cited Publications by Country.

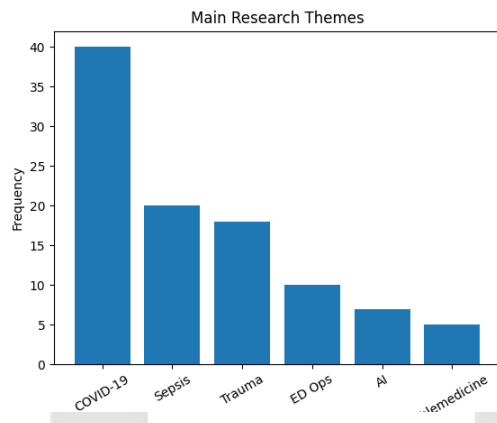


Figure 3. Keyword Co-occurrence Network of Highly Cited Publications.

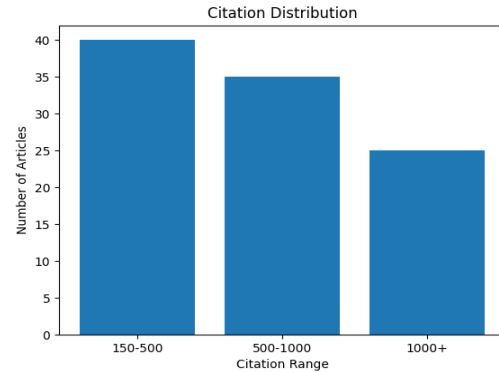


Figure 4. Citation Distribution of the Top 100 Publications.

4. Discussion

This bibliometric analysis provides a comprehensive overview of highly cited publications in emergency medicine between 2020 and 2025. It reveals important trends in research productivity, thematic focus and global collaboration. The findings show that publication output and citation impact increased significantly during this period, largely due to the global response to the pandemic [11]. This surge highlights the emergency medicine community's responsiveness to emerging public health crises and emphasises the central role of emergency departments in managing large-scale healthcare challenges [9-12]. The preponderance of research on the topic of SARS-CoV-2/Covid-19 among the most highly cited articles reflects the urgency and global relevance of the pandemic. Topics such as triage protocols, emergency department preparedness, respiratory support strategies and infection control measures



were widely investigated and disseminated quickly [13]. These findings are consistent with those of previous bibliometric studies which identified infectious disease emergencies as a major driver of recent research activity. Alongside pandemic-related topics, traditional core areas of emergency medicine, such as trauma care, sepsis management and cardiovascular emergencies, remained well represented, indicating their continued importance in clinical practice and research [14,15].

Geographically, the dominance of high-income countries, particularly the United States and the United Kingdom, indicates ongoing disparities in research capacity and resource allocation. Institutions in these regions benefit from stronger funding mechanisms, well-established research infrastructure and greater access to publication platforms [15]. However, the increase in international collaborations observed in this study is a positive development, indicating a growing recognition of the need for global cooperation in addressing emergency health issues. Collaborative networks visualised using tools such as VOSviewer showed dense interconnections, particularly in studies addressing global challenges such as the SARS-CoV-2 pandemic [16]. Another notable finding is the emergence of digital health technologies and artificial intelligence as prominent research themes. The growing reliance on machine learning for clinical decision support, patient triage and risk prediction reflects a broader shift towards data-driven emergency care [17]. Similarly,

the rise of telemedicine during the pandemic has increased access to emergency services and is likely to continue to be a key area of development in the post-pandemic era. Together, these innovations suggest that emergency medicine is evolving beyond traditional clinical boundaries to incorporate technological advancements that enhance efficiency and patient outcomes [18,19]. The concentration of highly cited articles in leading journals suggests that established publication platforms continue to influence research visibility and impact. Journals with high impact factors and a wide readership, such as those indexed in Scopus, offer greater exposure and citation potential for published studies. This trend highlights the importance of selecting the right journal to maximise the dissemination and influence of research findings [20].

However, several limitations should be considered. Reliance on citation counts as a measure of impact may favour older publications and does not necessarily reflect clinical relevance or quality. Additionally, restricting the analysis to a single database may have excluded relevant studies indexed elsewhere. Language bias may also have limited the inclusion of non-English publications. Future research should prioritize international collaboration, the inclusion of underrepresented regions, and the development of innovative technologies such as artificial intelligence and telemedicine. In addition, strengthening research on emergency preparedness, disaster response, and health system resilience will be essential to address future global health



challenges. These areas are likely to shape the next generation of emergency medicine research and practice.

5. Conclusion

This bibliometric analysis of highly cited publications in emergency medicine between 2020 and 2025 highlights the rapid evolution of the field in response to global health challenges and technological advancements. The findings demonstrate a substantial increase in research output and citation impact during this period, largely driven by the COVID-19 pandemic. Highly cited studies primarily focused on infectious disease emergencies, critical care, trauma management, and emergency department operations, reflecting the core priorities of emergency medicine practice. The dominance of high-income countries in research production underscores ongoing disparities in global scientific contribution, although increased international collaboration suggests a positive trend toward more inclusive research efforts. The emergence of digital health innovations, including artificial intelligence and telemedicine, indicates a shift toward more efficient, data-driven, and accessible emergency care systems.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

6. References

1. Holliman CJ, Wuerz RC, Chapman DM, et al. Development of emergency medicine: a global perspective. *Acad Emerg Med.* 2020;27(4):345–352.
2. COVID-19 pandemic impact on emergency departments worldwide. *Lancet.* 2020;395(10239):1741–1743.
3. World Health Organization. Emergency preparedness and response to COVID-19. Geneva: WHO; 2021.
4. Donthu N, Kumar S, Mukherjee D, Pandey N, Lim WM. How to conduct a bibliometric analysis: An overview and guidelines. *J Bus Res.* 2021;133:285–296.
5. Scopus Content coverage guide. Elsevier; 2023.
6. Falagas ME, Pitsouni EI, Malietzis GA, Pappas G. Comparison of PubMed, Scopus, and Web of Science. *FASEB J.* 2008;22(2):338–342.
7. Chen Q, Allot A, Lu Z. Keep up with the latest coronavirus research. *Nature.* 2020;579(7798):193.
8. Topol EJ. High-performance medicine: the convergence of human and artificial intelligence. *Nat Med.* 2019;25(1):44–56.
9. Al-Jabir A, Kerwan A, Nicola M, et al. Impact of the COVID-19 pandemic on surgical practice. *Int J Surg.* 2020;79:168–179.
10. Garfield E. Citation analysis as a tool in journal evaluation. *Science.* 1972;178(4060):471–479.



11. Kambhampati AK, O'Halloran AC, Whitaker M, et al. COVID-19-associated hospitalizations. *MMWR*. 2020;69(15):458–464.
12. Rosenbaum L. The untold toll of the pandemic. *N Engl J Med*. 2020;382(24):2368–2371.
13. Phua J, Weng L, Ling L, et al. Intensive care management of COVID-19. *Lancet Respir Med*. 2020;8(5):506–517.
14. Zortuk Ökkeş; Bedel Cihan. Assessing the readability of responses produced by ChatGPT and Gemini when answering questions about the gastrointestinal system. *Journal of Medical Education and Clinical Research*, 2026, 2.1.
15. Selvi F., Bedel C., Akçimen M. (2021). Evaluation of vapocoolant spray effect on pain reduction during digital nerve block: A randomized clinical trial. *The American Journal of Emergency Medicine*, 50, 260-263.
16. Van Eck NJ, Waltman L. Software survey: VOSviewer. *Scientometrics*. 2010;84(2):523–538.
17. Rajkomar A, Dean J, Kohane I. Machine learning in medicine. *N Engl J Med*. 2019;380(14):1347–1358.
18. Hollander JE, Carr BG. Virtually perfect? Telemedicine for COVID-19. *N Engl J Med*. 2020;382(18):1679–1681.
19. Ting DSW, Carin L, Dzau V, Wong TY. Digital technology and COVID-19. *Nat Med*. 2020;26(4):459–461.
20. Ioannidis JPA. Why most published research findings are false. *PLoS Med*. 2005;2(8):e124.

