

## ORIGINAL RESEARCH

# Research Trends in the Field of Emergency Medicine; A Comparative Bibliometric Analysis on Publications Across Journal Quartiles

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**Abstract:** **Introduction:** Quantitative and qualitative evaluations of the publication trends and architecture can be useful for guiding future research agendas of both researchers and journals. This study aimed to investigate the bibliometric characteristics of emergency medicine (EM) researches across different journal quartiles. **Methods:** A systematic search was conducted in the Scopus database to retrieve published documents from journals in Q1 to Q4 categories (based on Scimago Journal Ranking) from inception to April 2024. The bibliometric analyses were carried out using the Visualization of Similarities viewer (VOSviewer) software. **Results:** Based on author keywords analysis, we identified 7 (96 nodes), 7 (110 nodes), 6 (89 nodes), and 7 (110 nodes) clusters for Q1 to Q4 categories, respectively. The most frequent author keywords in Q1 to Q4 categories were resuscitation, trauma, COVID-19, and pediatric, respectively. Among the top 10 author keywords in Q1 to Q4 categories, cardiac arrest, disaster, burn, and trauma with average of 19.58, 9.56, 4.92, and 1.61 citations were the most cited topics. **Conclusion:** This bibliometric analysis highlights that main focus of research in EM researches varies across different journal quartiles. The most commonly studied topics in EM journal categories are resuscitation, trauma, COVID-19, and pediatric.

**Keywords:** Bibliometrics; Emergency medicine; Publications; Publishing

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## 1. Introduction

With significant developments in scientific research and science, Emergency Medicine (EM) as a relatively young independent specialty was officially introduced by the American Board of Medical Specialties in 1979 (1, 2). Since the introduction of EM as an emerging specialty, there has been a significant increase in the number of published documents in the EM literature (3, 4). Previous reports indicated that as of January 2022, approximately a total of 141000 documents were indexed in the EM category of Web of Science, with about 80% indexed in the last two decades (2, 5). As the literature in the field of EM has grown, both quantitative and qualitative evaluations of the historical evolutions, publication trends, and architecture of the literature can be invaluable for guiding future agendas of both researchers and jour-

nals (6).

Considering the global growth of publication to massive proportions, analysis of the current literature architecture can be challenging (7).

Furthermore, bibliometric analysis on journals with different rankings, may show different findings particularly with respect to the citation analysis. Separate analyses of journals within each quartile can provide valuable insights for the journals of other quartiles to consider more prevalent topics and the most-cited subjects for their future decisions. Although the use of bibliometric analysis to quantify scholarly performance of academic journals has been growing in different fields of medicine (8, 9), few studies have focused on bibliometric analysis of EM literature. Therefore, in this study, we aimed to investigate the bibliometric characteristics of EM researches across different journal quartiles in the field.

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## 2. Methods

### 2.1. Study design and setting

In this systematic bibliometric review, EM journals in Q1 to Q4 categories were identified using the Scimago Journal Rank (SJR) indicator, which was reported based on data from the Scopus database in 2023. The bibliometric characteristics of published materials in the EM field were analyzed and reported using the Visualization of Similarities viewer (VOSviewer) software.

Scimago generates a list of journals ranked by SJR, which is a measure of journal's impact, influence, or prestige. SJR expresses the mean number of weighted citations received in the selected year by the studies published in the journal in the three previous years.

Since this study is a bibliometric analysis, it does not involve human participants, clinical trials, or personal data collection. Therefore, ethical approval was not required. The data used in this analysis were obtained from Scimago, which is a publicly available source.

### 2.2. Evaluated journals

The list of journals in the journal rankings menu from the Scimago website (link: <https://www.scimagojr.com/journal-rank.php>) was filtered by (1) All Subject Areas: "Medicine" and (2) All Subject Categories: "Emergency Medicine". After generating our selected list of EM journals using the above-mentioned filters, we then extracted SOURCE-ID for each journal from the source section of Scopus.

### 2.3. Search strategy

A systematic search was conducted in the Scopus database to retrieve published documents from journals in Q1 to Q4 categories from inception to April 2024. The systematic search formula was finally set as follows: SRCID() OR SRCID() and this search string was continued to include source ID of all journals in each category. SRCID is a term used in the advanced search of Scopus, referring to the Source ID, a unique identifier assigned to each journal or other sources indexed in Scopus. Therefore, we conducted this systematic search four times to retrieve published documents for each quartile, separately.

### 2.4. Data analysis

The Excel software was used to extract bibliometric data such as authors, titles, affiliations, abstracts, author keywords, index keywords, references, and type of documents. The bibliometric analyses were performed using the Visualization of Similarities viewer (VOSviewer) software (Version 1.6.20). In this study, we provided four thesauruses for four bibliometric analyses. In these thesaurus files, we consolidated terms with similar concepts or singular and plurals keywords. Network visualization and density visualization of bibliometric characteristics were carried out using co-occurrence of author keywords, index keywords, average citations, and year of

publication. Moreover, some keywords that were more general and related to the key concept of emergency were excluded, such as emergency department, emergency medical services, emergency medicine, emergency, EMS, emergency service, emergency care, emergency departments, and emergency care systems.

## 3. Results

### 3.1. Distribution of journals and published documents

In this bibliometric study, we included the data from published documents by all emergency medicine journals (n=110), with 27 journals in the Q1 category, 27 journals in the Q2 category, 26 journals in the Q3 category, and 30 journals in the Q4 category. A total of 102844 documents were indexed in Scopus from inception to April 2024 by the EM journals included in this bibliometric analysis. Of these, 50158 (48.7%) documents were published by Q1 journals, 29579 (28.7%) by Q2 journals, 11085 (10.7%) by Q3 journals, and 12022 (11.6%) by Q4 journals.

### 3.2. Most productive countries, institutes, and authors

In Q1 to Q3 categories, United States was the most productive country, while in the Q4 category, France was the most productive country.

Analysis of organizations revealed that Rush University Medical Center, Denver Health Medical Center, Faculty of Medicine Universitas Indonesia-cipto Mangunkusumo Hospital, and Federal State Budgetary Institution were the most productive institutes in the Q1 to Q4 journal categories, respectively. Gottlieb M with 315 documents, Gottlieb M with 132 documents, Szarpak L with 51 documents, and Bazin JE with 63 documents were the most productive authors in the Q1 to Q4 journal categories, respectively.

Co-occurrence analysis was conducted to identify high-frequency keywords, which shows hot topics in each EM journal category. We performed two separate co-occurrence analyses for each category with respect to the author keywords and index keywords. In all four categories, most author keywords represented the main topics of the documents, while most index keywords indicated the study settings.

Based on the analysis of author keywords, we identified 7 (96), 7 (110), 6 (89), and 7 (110) clusters(nodes) for Q1 to Q4 categories, respectively. Co-occurrence analysis using index keywords showed 6 (99), 5 (110), 5 (113), and 5 (115) clusters (nodes) for the Q1 to Q4 categories, respectively.

It should be noted that in each co-occurrence analysis, we set a different limit for the minimum number of occurrences of a keyword to achieve approximately 100 nodes in a thematic map. The most frequent author keywords in Q1 to Q4 categories were "Resuscitation", "trauma", "COVID-19", and "pediatric", respectively. Furthermore, these keywords with the

highest values of total link strength (TLS) were the main focus of research in each category.

In terms of the index keywords, “human” had the highest frequency of occurrence across all categories (Table 1). The top 10 author and index keywords of each category, ranked by frequency of occurrences are summarized in table 1. The thematic maps of document production by EM journals in Q1 to Q4 categories, based on the co-occurrences analysis of author and index keywords are shown in Figures 1-8.

### 3.3. The most cited and up-to-date subjects

Among the top 10 author keywords of Q1 to Q4 categories, “cardiac arrest”, “disaster”, “burn”, and “trauma” with averages of 19.58, 9.56, 4.92, and 1.61 citations were the most cited nodes, respectively (Table 1 and Figures 9-12). Furthermore, “COVID-19” was the most up-to-date topic among the top 10 author keywords of Q1 and Q2 categories with average publication years of 2021.55 and 2021.35, respectively. Among the top 10 author keywords of Q3 and Q4 categories, “case report” with average publication years of 2021.95 and 2022.31 was the most up-to-date topic (Table 1 and Figures 13-16).

## 4. Discussion

This study was carried out to investigate the bibliometric characteristics of EM published researches in journals with different quartiles on Scimago. Our bibliometric analysis revealed that the most frequent author keywords in Q1 to Q4 categories were “Resuscitation”, “trauma”, “COVID-19”, and “pediatric”, respectively. Furthermore, these keywords with the highest TLS values, were the main focus of research in each category. Based on the index keywords, “human” had the highest frequency of occurrence in all categories. Moreover, among the top 10 author keywords of Q1 to Q4 categories, “cardiac arrest”, “disaster”, “burn”, and “trauma” were the most cited nodes. Additionally, “COVID-19” was the most up-to-date topic among the top 10 author keywords of Q1 and Q2 categories, while in Q3 and Q4 categories, “case report” was the most up-to-date topic.

In a similar study by Golfiruzi et al. (6), a bibliometric study was conducted on the published documents in the subject area of EM indexed in Web of Science from inception to 2023. They included studies based on searches in the SCI-EXPANDED and SSCI collections using terms such as Wound\*, Trauma\*, Injury\*, and Emergency Care\*. The data extracted from 54256 published documents were analyzed using VOSviewer software. Their findings showed that “traumatic brain injury” was the most frequent topic. However, “traumatic brain injury” did not appear among our top 10 authors or index keywords. This inconsistency can be explained by the fact that they included published papers based on a search strategy mainly consisting of keywords related to trauma. Thus, their final findings represent the terms used in their systematic search.

Since we did not employ a search strategy based on a specific

group of keywords, all published documents from EM journals were included in our analysis regardless of their main keywords. They also reported that “recurrent concussion” was the most cited node in their analysis, while we found that “cardiac arrest”, “disaster”, “burn”, and “trauma” were the most cited nodes. Similarly, the term “recurrent concussion” is related to the keywords used in their search strategy, which cannot be considered as the most cited term among all documents published in the field of EM. Their results indicated that “neuroinflammation” was the most up-to-date topic, while we found that COVID-19 was the most up-to-date topic. The aforementioned reasons can also clarify this discrepancy.

Another bibliometric analysis by Cetin et al. (2) was performed on publications from the last 10 years in EM. Similar to the study of Golfiruzi et al., they used Web of Science database to extract data of publications. In contrast to the study of Golfiruzi et al., they included all documents in the EM category and then limited their search to the years 2010 to 2019. Their findings showed that “cardiovascular emergencies”, “resuscitation”, and “mortality” were the most frequent topics. These findings are in line with our results from the Q1 category, where “resuscitation” and “cardiac arrest” were the most frequent topics. They did not report the most cited and up-to-date topics. However, their analysis of the most productive countries in the field of EM showed that USA was the most productive country, which is consistent with our findings and those of Golfiruzi et al. These consistencies between our findings and the results of the study conducted by Cetin et al. are mainly due to similar methodology, as both studies included all documents in the field of EM.

It should be noted that a bibliometric study on research productivity of EM was also performed restricted to a single country. This type of bibliometric study was carried out using indexed documents in Web of Science, PubMed, and Embase by researchers affiliated to South Korea (10). Consistent with our finding, they found that “resuscitation” was the most commonly studied topic with 110 articles. Another bibliometric analysis was carried out on a wider area including published papers from China-Mainland, Taiwan, and Hong Kong (11). They reported that “trauma” was the most frequent topic in the field of emergency, accounting for about 25% of the documents. Similarly, we found that “trauma” was the most frequent topic in the Q2 and Q3 categories.

It seems that, research studies focusing on resuscitation, cardiac arrest, and trauma may have a higher chance of publication in high-ranked journals and citation in other documents. These results provide insights into the current trends and scientific agendas for both EM researchers and journals within each category.

## 5. Strength and limitations

Since we compared the bibliometric characteristics of Q1 to Q4 EM journals, our study is unique, and therefore, comprehensive comparison of our results with the findings of

previous studies is not possible. However, our study had some limitations. First, although Scopus is considered a reliable database for bibliometric analyses, retrieving data only from this database may result in missing some studies, which could affect generalization of findings. Second, we only included documents published by the EM journals, but some documents in the field of EM published by non-EM journals may be still missed. In this study, we did not have language restrictions for the inclusion of published articles; therefore, our findings may not be completely in line with the current trends of journals that only publish articles in English.

## 6. Conclusions

This bibliometric analysis highlights that the main focus of research of EM journals varies across different quartiles of Scimago. The most commonly studied topics in the Q1 to Q4 categories of EM journals were “resuscitation”, “trauma”, “COVID-19”, and “pediatric”. “Cardiac arrest”, “disaster”, “burn”, and “trauma” were the most cited topics. It seems that, research studies on “resuscitation”, “cardiac arrest”, and “trauma” may increase the chance of being published in high-ranked journals and also being cited in other documents.

## 7. Declarations

### 7.1. Acknowledgments

The authors thank all those who contributed to this study. The authors would like to express their sincere gratitude to the Clinical Research Development Center, Imam Hosseini Educational Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran, for their invaluable support and guidance in conducting this study.

### 7.2. Author Contribution

All authors contributed to study design, data collection, and writing the draft of the study.

### 7.3. Funding/Support

None.

### 7.4. Conflict of interest

None.

### 7.5. Data Availability

Not applicable.

### 7.6. Using Artificial Intelligence Chatbots

None.

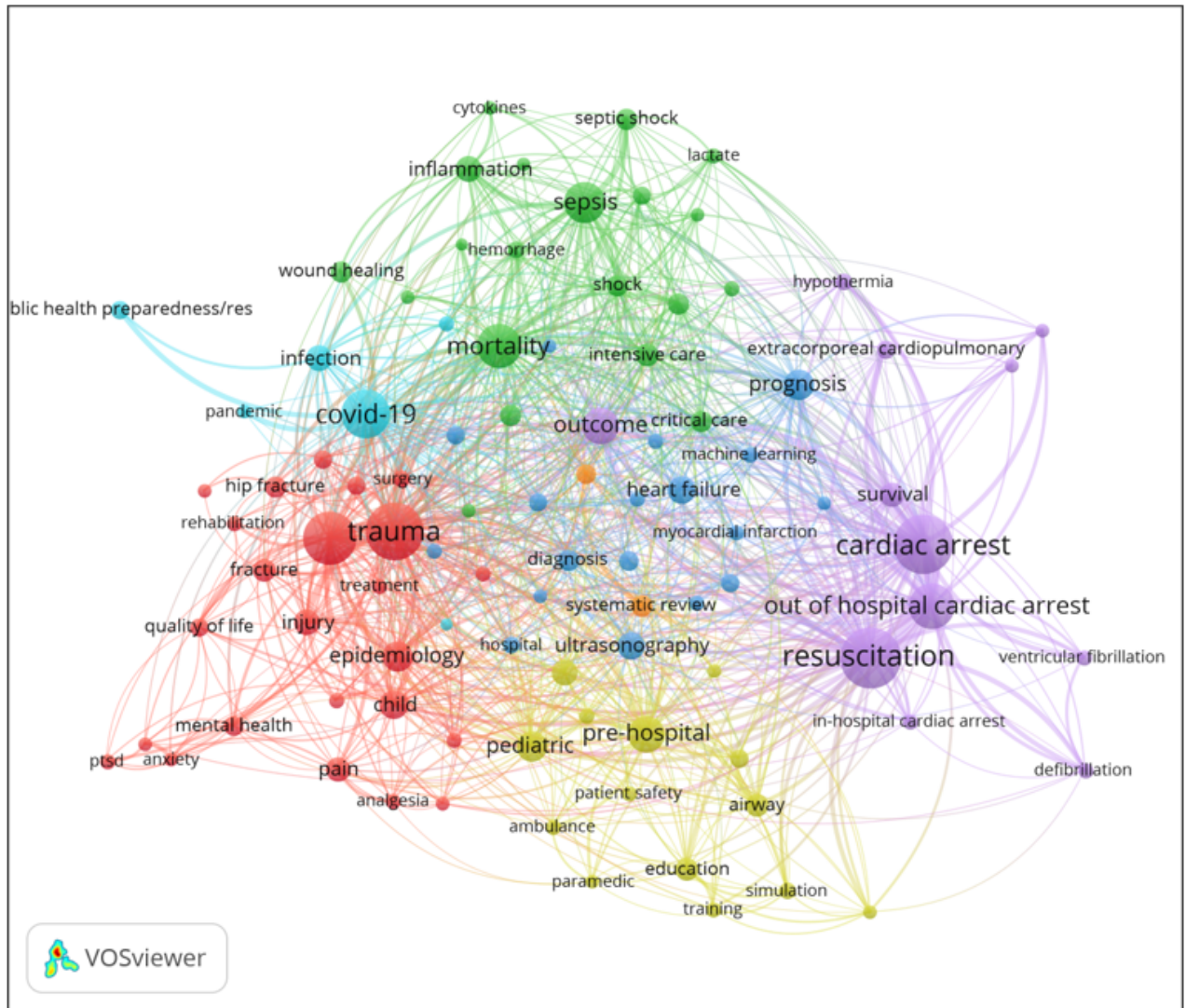
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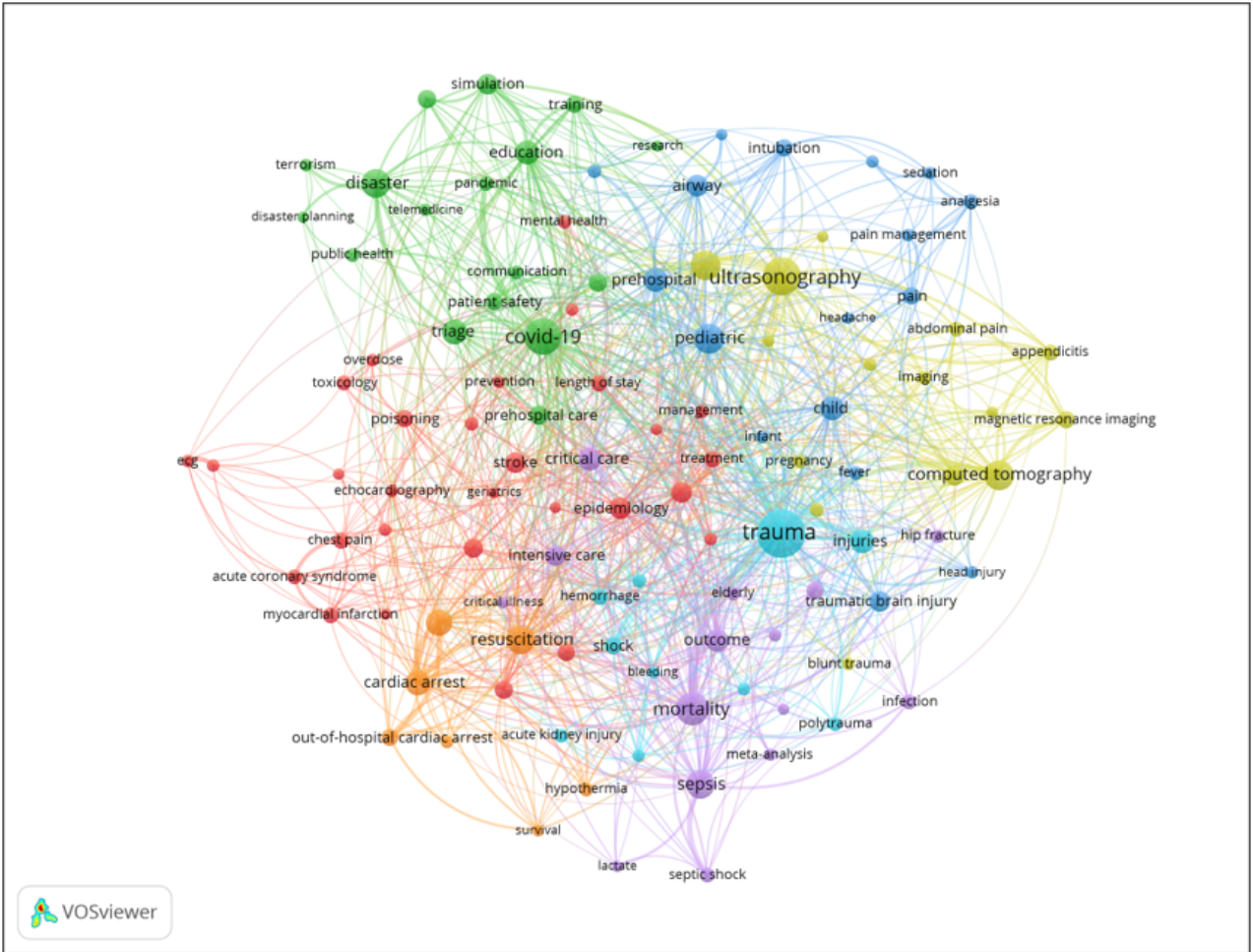
**Table 1:** Scimago categories and detailed data on the nodes based on the documents indexed in Scopus

| Q              | Nodes (Terms)  | Author Keywords |         |         |                | Nodes (Terms)    | Index Keywords |         |         |           |
|----------------|----------------|-----------------|---------|---------|----------------|------------------|----------------|---------|---------|-----------|
|                |                | Weight          |         | Score   |                |                  | Weight         |         | Score   |           |
|                |                | Number1         | TLS     | Year    | Citations      |                  | Number         | TLS     | Year    | Citations |
| Q1             | Resuscitation  | 2009            | 3095    | 2019.16 | 19.57          | Human            | 44891          | 461277  | 2018.81 | 10.98     |
|                | Cardiac Arrest | 1928            | 2881    | 2019.16 | 19.58          | Male             | 25755          | 347019  | 2018.64 | 12.32     |
|                | Trauma         | 1803            | 1950    | 2019.29 | 13.05          | Article          | 25746          | 330349  | 2018.88 | 13.12     |
|                | Burn           | 1538            | 1234    | 2018.76 | 14.06          | Female           | 24433          | 336467  | 2018.66 | 12.47     |
|                | COVID-19       | 1276            | 1217    | 2021.55 | 15.52          | Adolescent       | 22217          | 303158  | 2018.84 | 12.23     |
|                | OHCA           | 1149            | 1588    | 2020.06 | 16.33          | Priority Journal | 20266          | 237378  | 2017.26 | 13.86     |
|                | Mortality      | 1078            | 1549    | 2019.59 | 15.31          | Clinical Study   | 13906          | 219493  | 2018.91 | 13.25     |
|                | Sepsis         | 965             | 1985    | 2019.34 | 18.01          | Age              | 12878          | 195338  | 2018.7  | 14.13     |
|                | Outcome        | 759             | 1192    | 2019.01 | 15.7           | Middle Aged      | 12442          | 191329  | 2018.19 | 15.24     |
| Pre-hospital   | 720            | 1116            | 2019.42 | 12.43   | CS             | 12131            | 166822         | 2019.37 | 11.66   |           |
| Q2             | Trauma         | 1032            | 1120    | 2019.4  | 7.43           | Human            | 25490          | 237515  | 2019.01 | 6         |
|                | US             | 627             | 701     | 2018.89 | 7.83           | Article          | 14629          | 167972  | 2018.96 | 6.11      |
|                | COVID-19       | 596             | 586     | 2021.35 | 8.22           | Male             | 12884          | 161921  | 2018.85 | 6.48      |
|                | Mortality      | 482             | 650     | 2020.01 | 7.52           | Female           | 11898          | 151837  | 2018.92 | 6.72      |
|                | Pediatric      | 407             | 530     | 2019    | 7.2            | Adult            | 10407          | 128135  | 2018.99 | 6.24      |
|                | CT scan        | 402             | 392     | 2018.65 | 7.4            | Clinical Study   | 5692           | 83961   | 2019.29 | 7.06      |
|                | POCUS          | 382             | 347     | 2019.97 | 4.79           | RS               | 5549           | 72545   | 2019.73 | 6.07      |
|                | Sepsis         | 367             | 456     | 2018.98 | 9.37           | Priority Journal | 5369           | 63583   | 2017.16 | 7.94      |
|                | Resuscitation  | 355             | 475     | 2019.32 | 7.05           | Case Report      | 5330           | 57613   | 2018.36 | 3.04      |
| Disaster       | 350            | 271             | 2018.79 | 9.56    | EMS            | 4909             | 64091          | 2018.92 | 7.36    |           |
| Q3             | COVID-19       | 606             | 494     | 2021.85 | 1.86           | Human            | 5343           | 45466   | 2019.22 | 2.7       |
|                | Trauma         | 375             | 260     | 2019.59 | 2.47           | Article          | 3773           | 39412   | 2019.64 | 2.36      |
|                | Burn           | 373             | 259     | 2019.54 | 4.92           | Male             | 3038           | 34610   | 2019.54 | 2.76      |
|                | Pediatric      | 295             | 301     | 2019.16 | 2.44           | Adult            | 2710           | 30973   | 2019.61 | 2.64      |
|                | Mortality      | 212             | 257     | 2020.53 | 3.88           | Female           | 2521           | 29069   | 2019.29 | 3.03      |
|                | Sepsis         | 135             | 126     | 2019.69 | 2.94           | Case Report      | 1626           | 16197   | 2019.6  | 1.42      |
|                | Intensive Care | 124             | 160     | 2020.83 | 2.45           | Clinical Article | 1397           | 15942   | 2020.74 | 1.51      |
|                | Case Report    | 122             | 52      | 2021.95 | 0.46           | Middle Aged      | 1209           | 14883   | 2018.93 | 3.5       |
|                | Complication   | 85              | 59      | 2020.08 | 4.71           | CAT              | 1107           | 13930   | 2019.92 | 1.81      |
| Q4             | Injury         | 85              | 87      | 2019.25 | 2.91           | Aged             | 1078           | 14099   | 2019.47 | 3.26      |
|                | Pediatric      | 421             | 310     | 2020.48 | 0.48           | Human            | 4135           | 23647   | 2019.33 | 1.48      |
|                | COVID-19       | 379             | 275     | 2021.54 | 1.46           | Article          | 3322           | 18775   | 2019.05 | 1.56      |
|                | POCUS          | 260             | 176     | 2020.77 | 0.13           | Adult            | 1146           | 11060   | 2019.95 | 2.06      |
|                | US             | 242             | 196     | 2020.39 | 0.67           | Male             | 1062           | 10558   | 2019.79 | 2.09      |
|                | Trauma         | 231             | 172     | 2019.24 | 1.61           | Female           | 1050           | 10515   | 2019.89 | 2.06      |
|                | Sepsis         | 221             | 193     | 2019.14 | 0.65           | CS               | 650            | 6302    | 2020.35 | 2.21      |
|                | Case Report    | 172             | 102     | 2022.31 | 0.45           | Clinical Study   | 641            | 6754    | 2020.18 | 2.32      |
|                | Prognosis      | 168             | 179     | 2018.78 | 0.67           | Clinical Article | 542            | 4667    | 2020.55 | 0.91      |
| Anaesthesia    | 151            | 106             | 2019.46 | 0.83    | Intensive Care | 504              | 3626           | 2019.32 | 1.59    |           |
| Intensive Care | 150            | 133             | 2019.49 | 0.76    | Case Report    | 456              | 3370           | 2019.19 | 0.71    |           |

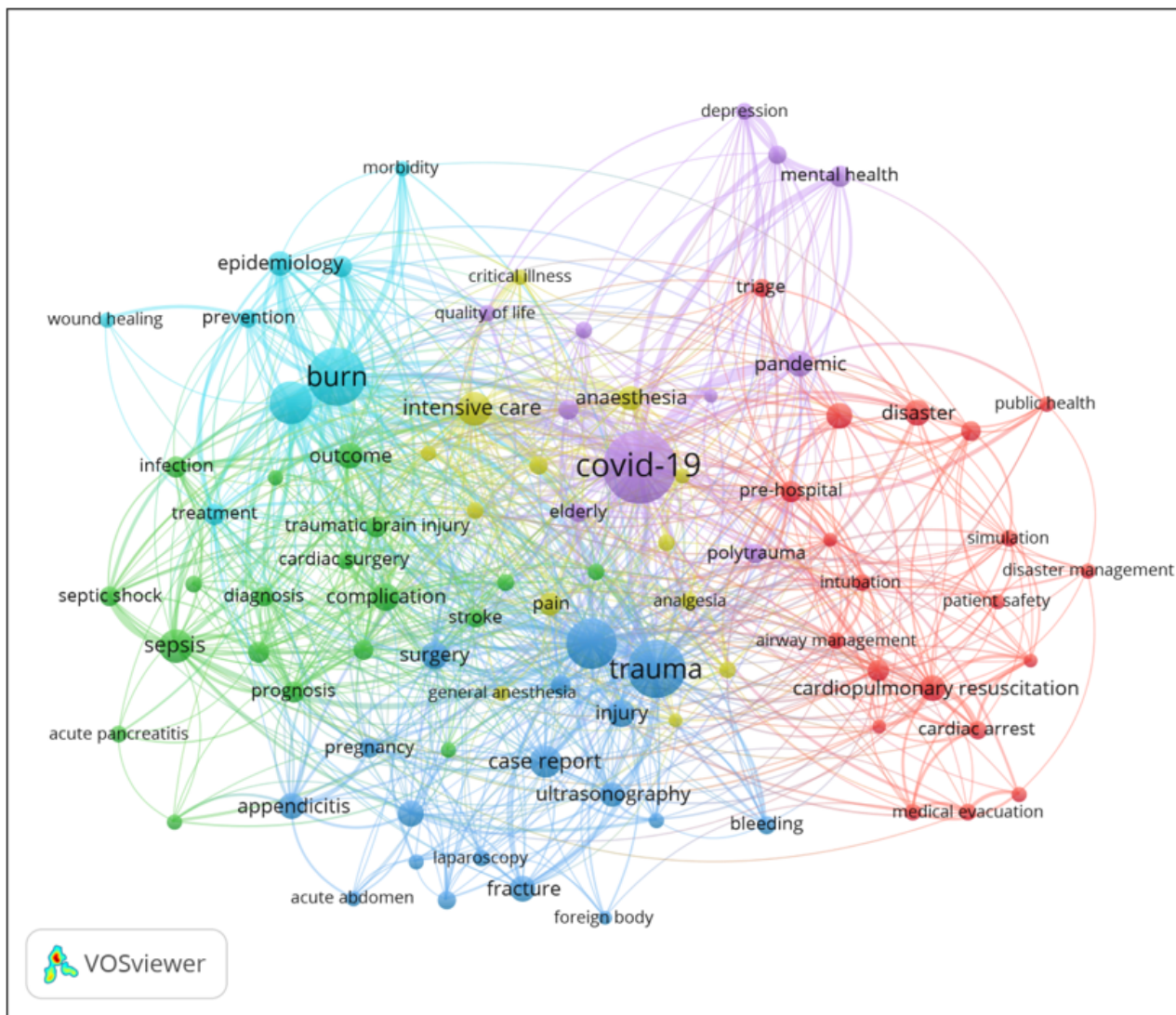
I: number of occurrences. TLS: Total link strength; OHCA: Out of Hospital Cardiac Arrest; EMS: Emergency Service, Hospital; CAT: Computer Assisted Tomography; CT: Computed Tomography; US: Ultrasonography; RS: Retrospective Studies; POCUS: Point of Care Ultrasound; CS: Controlled Study; Q: quartile of ranking based on Scimago journal ranking method.



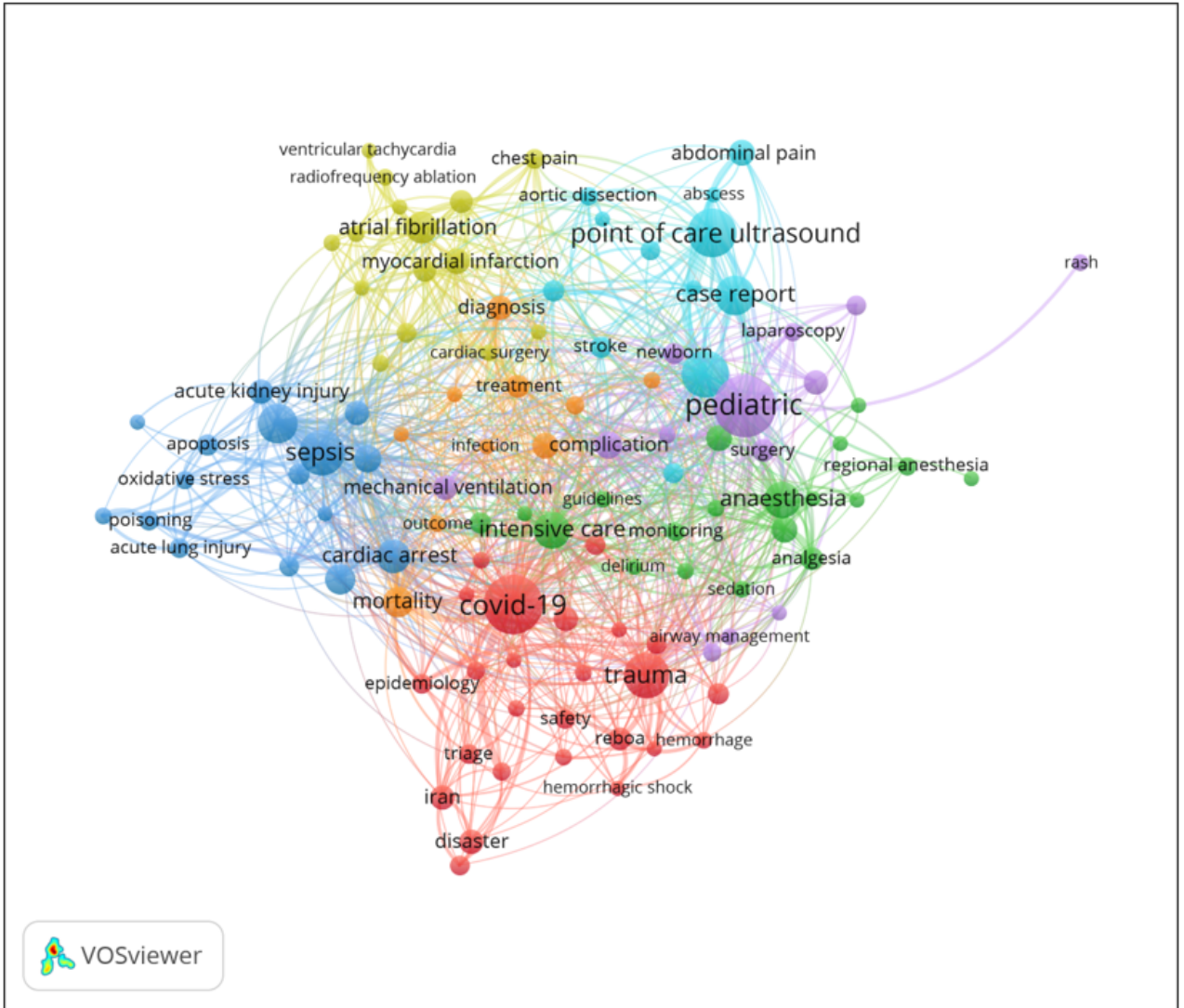
**Figure 1:** The thematic map of document production by Q1 category of emergency medicine journals based on the co-occurrences analysis of author keywords.



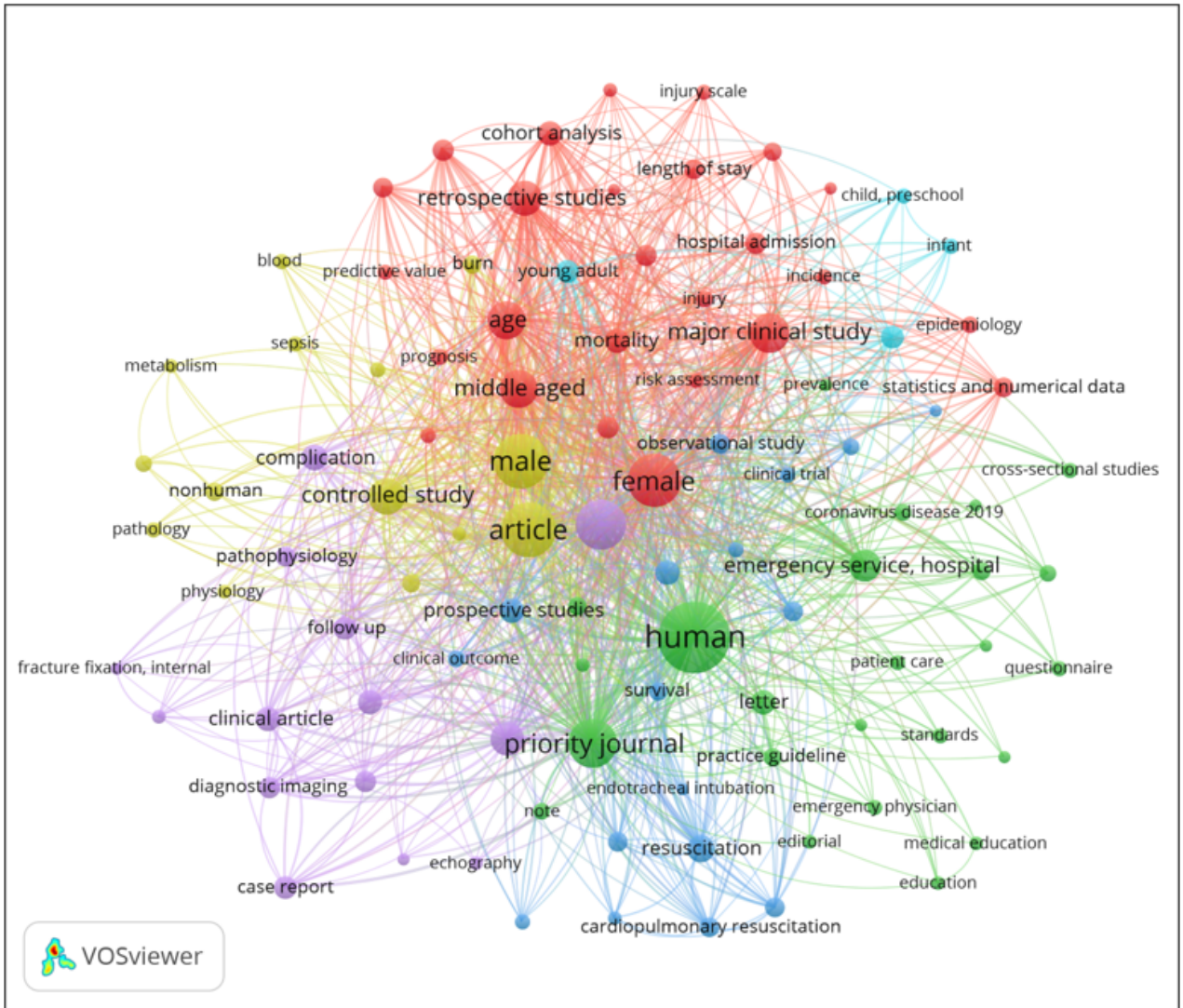
**Figure 2:** The thematic map of document production by Q2 category of emergency medicine journals based on the co-occurrences analysis of author keywords.



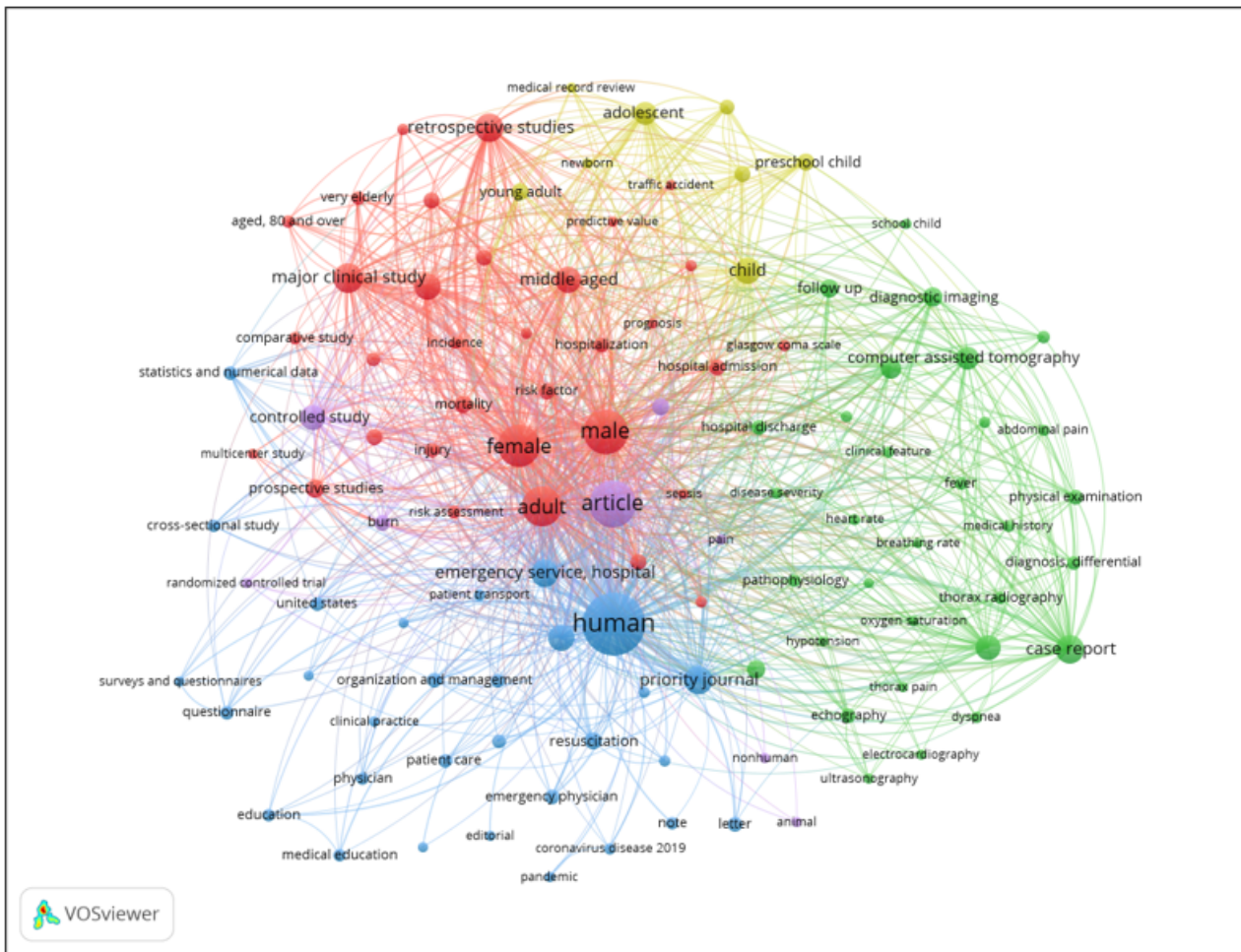
**Figure 3:** The thematic map of document production by Q3 category of emergency medicine journals based on the co-occurrences analysis of author keywords.



**Figure 4:** The thematic map of document production by Q4 category of emergency medicine journals based on the co-occurrences analysis of author keywords.



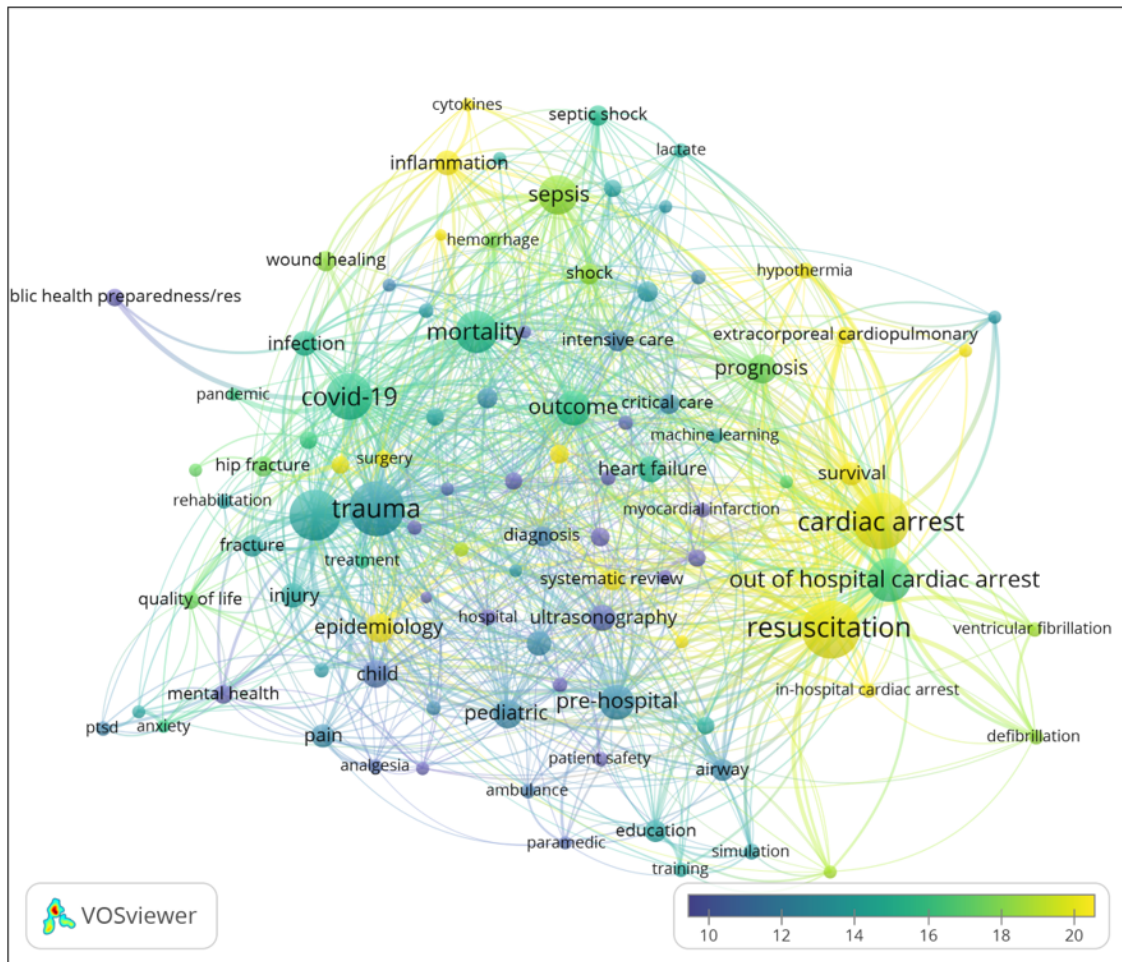
**Figure 5:** The thematic map of document production by Q1 category of emergency medicine journals based on the co-occurrences analysis of index keywords.



**Figure 6:** The thematic map of document production by Q2 category of emergency medicine journals based on the co-occurrences analysis of index keywords.



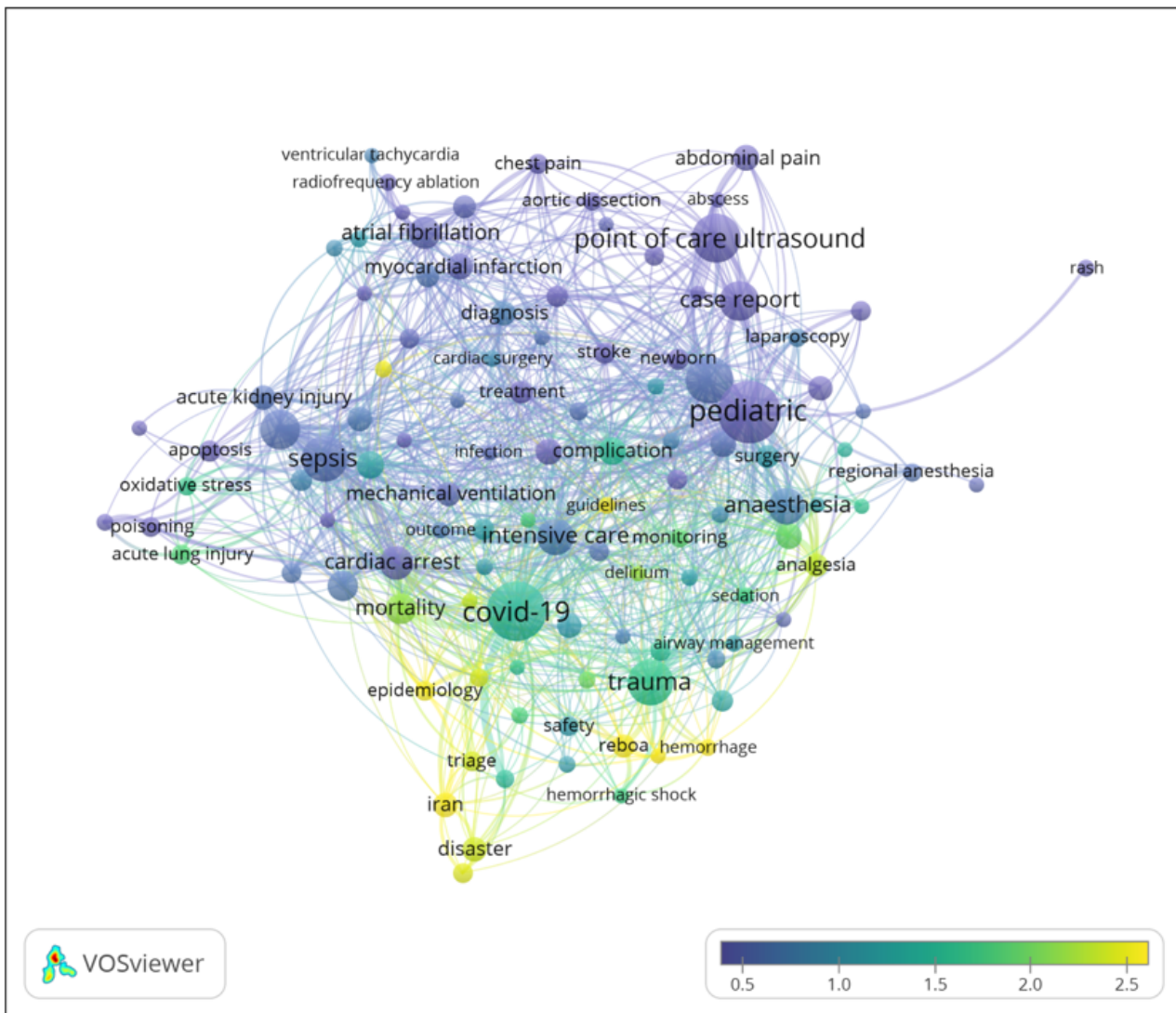




**Figure 9:** The overlay visualization of the most frequent topics of Q1 category based on the average citations.





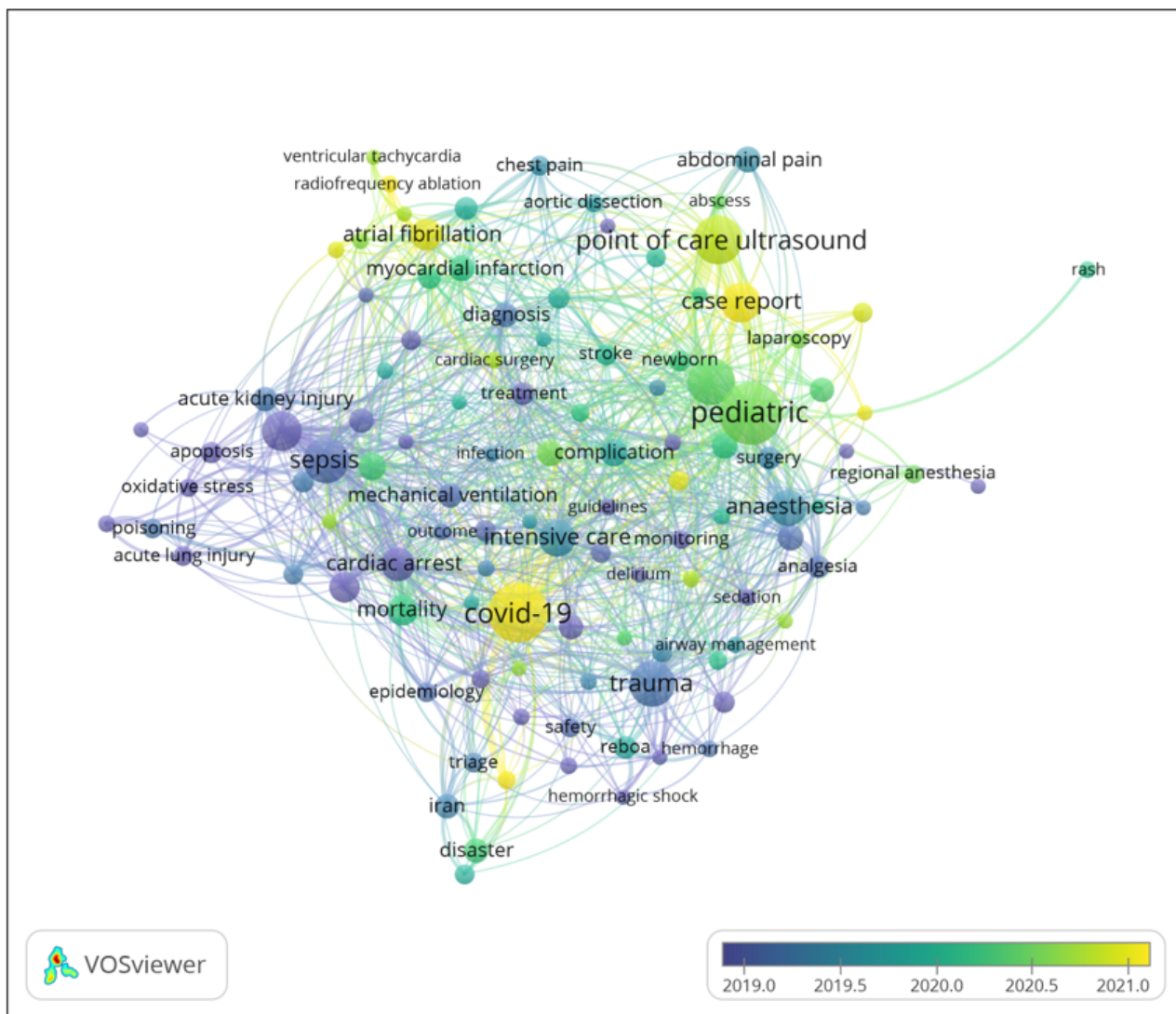


**Figure 12:** The overlay visualization of the most frequent topics of Q4 category based on the average citations.









**Figure 16:** The overlay visualization of the most frequent topics of Q4 category based on the average time of publication.