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## ORIGINAL ARTICLE

## A cross-sectional description of open access publication costs, policies and impact in emergency medicine and critical care journals

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## ABSTRACT

**Introduction:** Finding journal open access information alongside its global impact requires access to multiple databases. We describe a single, searchable database of all emergency medicine and critical care journals that include their open access policies, publication costs, and impact metrics.

**Methods:** A list of emergency medicine and critical care journals (including citation metrics) was created using Scopus (Citescore) and the Web of Science (Impact Factor). Cost of gold/hybrid open access and article process charges (open access fees) were collected from journal websites. Self-archiving policies were collected from the Sherpa/RoMEO database. Relative cost of access in different regions were calculated using the World Bank Purchasing Power Parity index for authors from the United States, Germany, Turkey, China, Brazil, South Africa and Australia.

**Results:** We identified 78 emergency medicine and 82 critical care journals. Median Citescore for emergency medicine was 0.73 (interquartile range, IQR 0.32–1.27). Median impact factor was 1.68 (IQR 1.00–2.39). Median Citescore for critical care was 0.95 (IQR 0.25–2.06). Median impact factor was 2.18 (IQR 1.73–3.50). Mean article process charge for emergency medicine was \$2243.04, SD = \$1136.16 and for critical care \$2201.64, SD = \$1174.38. Article process charges were 2.24, 1.75, 2.28 and 1.56 times more expensive for South African, Chinese, Turkish and Brazilian authors respectively than United States authors, but neutral for German and Australian authors (1.02 and 0.81 respectively). The database can be accessed here: <http://www.emct.info/publication-search.html>.

**Conclusions:** We present a single database that captures emergency medicine and critical care journal impact rankings alongside its respective open access cost and green open access policies.

## African relevance

- Limited access to global research restricts knowledge translation and reduces the potential downstream benefits to patients.
- This paper provides a single database that includes impact metrics and detailed open access publishing information for emergency medicine and critical care journals.
- This database may facilitate informed decision making when selecting a journal for open access publication in emergency medicine or critical care.

## Introduction

Although high-income countries make up just 17% of the global population, they account for nearly 60% of all emergency care research [1,2]. Accordingly, research from low- and middle-income countries (LMICs) is relatively underrepresented globally [3]. Since LMICs generate less research of their own, they rely on knowledge translation of research performed elsewhere. However, limited access to global research as well as publishing accessibly (specifically in LMICs) restricts knowledge translation and reduces the potential downstream benefits to patients.

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With better publication access, many researchers from high income countries are simply unaware of the limitations of access to their work in the wider global population. Perhaps because of this, there is a notable discrepancy between the proportion of research originating from high income countries published open access, relative to low income countries. Between 2012 and 2017 only a third of the global top 500 cited emergency medicine articles were freely accessible compared to 60% of African emergency medicine research [4,5]. Given the barriers to access faced by LMIC researchers, it is easy to understand why SciHub (a successful academic shadow library) originated in a middle-income country (Kazakhstan). Although SciHub user data demonstrates substantial utilization from high-income countries, its use is disproportionately more in LMICs – where access is most challenging [6,7]. In essence, research generated in LMICs is not accessible within the settings it was generated in [5,6,7].

Open access publication has grown substantially over the last decade. Currently, open access publication options include gold (or full open access), hybrid (or an option to publish open access in a standard subscription journal), and green (or self-archiving of publications) [8,9]. Green open access provides a reasonably simple solution for researchers to provide access to their own research outputs without incurring the potentially prohibitive costs of gold or hybrid open access. One limitation is that self-archiving is dependent on the author and not the publisher as with gold or hybrid open access. In addition, the rules and regulations of the various publishers that governs self-archiving are often unclear and opaque and the cost of publishing open access can be limiting [10].

Selecting an appropriate journal with access for a global audience is not simple. Platforms like the Directory of Open Access Journals (<https://doaj.org/>) and the Sherpa/RoMEO database (<http://www.sherpa.ac.uk/romeo/search.php>) provide information on open access journals, but cannot easily sort them based on their field, open access status, publication cost, and impact metrics. Finding this information on open access journals requires access to at least two databases. As a researcher's success is often quantified by the publication of their research in high impact journals, this is a meaningful limitation and it is understandable why many researchers simply do not bother.

We sought to describe the current state of open access publishing in emergency medicine and critical care by outlining the open access policies, publication costs, and impact metrics of a broad selection of emergency medicine and critical care journals. In an effort to facilitate the journal selection process, we amalgamated this data into a single, searchable online database.

## Methods

We describe the relationship between open access journals and impact metrics in this emergency medicine and critical care as well as the creation of a database of emergency medicine and critical care journals. The study received ethical approval through the University of Cape Town.

A list of emergency medicine and critical care journals was created using the specialty categories from Scopus (Elsevier, New York City, NY, USA) and the Web of Science (Clarivate Analytics, Philadelphia, PA, USA). Impact metrics included the Citescore and Impact Factor for each journal and were collected from Scopus and Web of Science respectively. We included Citescore as its calculation is very similar to the Impact factor, but accessible for a much larger journal cohort [12]. The costs of, and policies surrounding gold/hybrid open access publication for each journal were recorded from their publisher's webpage. Green open access policies were gathered from the Sherpa/RoMEO database and this information was crosschecked with information provided on the respective publisher's webpage. Green open access policies were classified in one of two categories: self-archiving of the preprint (the version of the manuscript prior to peer-review can be posted) and the postprint (the version of the manuscript following peer-review and

corrections can be posted). Journals that did not adequately characterize their open access policies online were excluded.

Data was summarised and analyzed using Microsoft Excel (Microsoft, Redmond, WA, USA). This process allowed filtering and ranking of journals depending on the desired open access model, cost or journal quality while providing information regarding waivers and discounts, as well as links to specific self-archiving information. The data was then uploaded into a Caspio database (Caspio, Santa Clara, CA, USA) to create a searchable web interface. Article process charges (or open access fees) were described in United States dollar. Where costs were provided in a different currency the values were converted to the United States dollar using the exchange rates for 15 August 2017 to allow comparison.

Descriptive data were presented in a flowchart and expressed in numbers (n) and proportions (%). The embargo periods of green open access data were described using numbers and proportions. Impact metrics (Citescore and Impact Factor) were described using the median and interquartile range (IQR) and article process charges were described using the mean and standard deviation (SD) for the emergency medicine and critical care cohorts respectively. The top ranked journal for each cohort was provided along with its impact metrics. The Pearson correlation coefficient (r) was used to correlate the Citescore (as the more consistently used impact metric) with the article process charge and green open access embargo periods respectively.

To provide a perspective of the relative cost of access in different global publishing regions, article process charges were corrected using the World Bank's Purchasing Power Parity index to reflect the relative difference in cost for researchers from different income regions [11]. Purchasing power parity is based on the hypothesis that similar items cost the same, irrespective of currency differences, no matter where bought in the world. The index describes the deviation from this hypothetical parity using the United States dollar as its baseline. We provided the relative difference of this corrected article process charge between the United States of America (USA) in North America, and Germany in Europe, Turkey in the Middle East, China in Asia, Brazil in South America, South Africa in Africa and Australia in the Pacific region. These were selected by identifying the largest emergency medicine publication output countries as reported in SciVal, for each respective region.

## Results

As outlined in Fig. 1, we identified 78 emergency medicine and 82 critical care journals from the Scopus and Web of Science databases. Of these, 15 (19%) emergency medicine journals and 25 (30%) critical care journals provided inadequate open access policy information and were excluded (data supplement – appendix A). Also, 15 journals were dual registered as emergency medicine and critical care journals. As a result, we included a sample of 105 journals.

For emergency medicine journals, the median Citescore was 0.73 (IQR 0.32–1.27) and the median impact factor was 1.68 (IQR 1.00–2.39). The top ranked journal was Resuscitation with a Citescore of 3.26 and an impact factor of 5.23. For critical care journals, the median Citescore was 0.95 (IQR 0.25–2.06) and the median impact factor was 2.18 (IQR 1.73–3.50). The top ranked journal was Annals of Intensive Care with a Citescore of 4.23 and an impact factor of 3.66. A number of highly ranked Citescore journals did not have an Impact Factor. The correlation between Citescore and journal article process charge was poor ( $r = 0.23$ ).

All but one journal allowed preprint self-archiving. There were 33 (52%) emergency medicine journals that allowed immediate self-archiving of the postprint publication on the author's personal website or institutional repository while the remainder imposed a 6–12-month embargo. There were 29 (51%) critical care journals that allowed immediate self-archiving of the postprint on publication on the authors personal website or institutional repository while the remainder

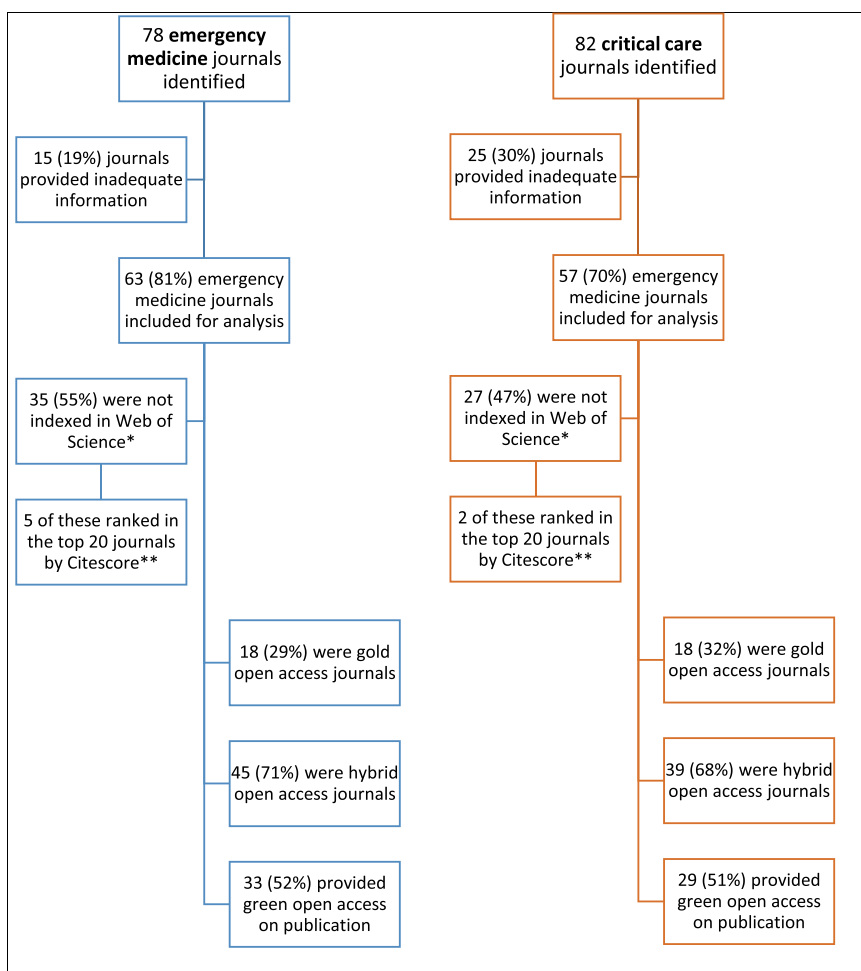


Fig. 1. Data collection flow chart for both the emergency medicine and critical care journals.

\*, The Impact factor is compiled from journals indexed in the Web of Science

\*\* , The Citescore is compiled from journals indexed in Scopus

imposed a 12-month embargo. No journals allowed self-archiving of the published version of an article. The correlation between Citescore and journal green access embargo period was poor ( $r = 0.29$ ).

The mean article process charge for emergency medicine journals was \$2243.04 (standard deviation \$1136.16). The mean article process charge for critical care journals was \$2201.64 (standard deviation \$1174.38). There were 18 (17%) journals that did not levy an article process charge for open access publication. Also, 17 (27%) emergency medicine and 11 (19%) critical care journals that provided waivers and discounts to authors from lower-middle, and low-income countries.

When Purchasing Power Parity was considered, compared to United States authors, article process charges were shown to be 2.24 times more expensive for South African authors, 1.75 times more for Chinese authors, 2.28 times more for Turkish authors and 1.56 times more for Brazilian authors. In contrast, the ratio for German authors was more balanced (1.02 times) and it was less expensive for Australian authors (0.81 times).

The data are available as an open access, searchable database that can be accessed here: <http://www.emct.info/publication-search.html>. Figs. 2 and 3 provide screenshot of the gold and green open access journal search engines respectively.

## Discussion

This study describes emergency medicine and critical care journal impact rankings, open access article processing costs, and green open

access policies. This data, which previously had to be obtained from at least two separate databases as well as the publisher's website, was published in a searchable, openly accessible online repository.

Although many authors (when selecting a journal) consider prioritising access of their work to the most relevant audience (dissemination), academia often prioritises prestige or impact of the journal. We believe that this is inappropriate because global impact does not necessarily translate into impact in every global region, especially when it comes to clinical research [2]. Lamanna and colleagues demonstrated that emergency medicine journal rankings differ substantially between different global regions [2]. While journal prestige based on a global impact assessment may be beneficial for the author's institution, open access provides publication provides unhindered global dissemination and research accessibility. This gives authors from high-income countries (which produces the bulk of emergency medicine and critical research) a distinct opportunity to impact knowledge translation and aid the growth of knowledge economies in LMICs [2,13]. As a bonus, open access publications are also associated with higher citations [14]. Selecting the right journal while considering all of these factors can be confusing. However, we believe that balancing access and prestige in journal selection can be eased if all the information are available at the same time.

As previously described, article process costs are not straight forward when considered globally [4,5]. When article processing costs were considered as a function of the cost-of-living within a particular country, authors from lower income countries (e.g. South Africa, China,



## Going for gold: I would like to publish open access

### Terminology

- A **gold open access journal** is a journal in which all of the articles are open access. This status typically requires the payment of a publication fee (also called an article processing charge or APC) to the publisher.
- A **hybrid open access journal** is a subscription journal in which some of the articles are open access. This status typically requires the payment of a publication fee (also called an article processing charge or APC) to the publisher.

### When should I use this tool?

- Use this tool if you want to publish your work open access.
- Some journals charge a fee for publishing your work open access. If you do not have a study budget you can enter 0 in the budget box to reveal the journals that do not charge an open access processing fee.
- Alternatively you could enter the maximum processing charge (US\$4000) and then select the waiver option to see if a waiver applies to you. Waivers can either be full waivers or discounts.

### Notes

- The costs provided in the results are correct for September 2017. It may vary slightly depending on when accessed. It is updated annually.

### Enter your search criteria below

Fig. 2. Screenshot of gold open access journal search engine.

Turkey, and Brazil) required a larger proportion of their available income to publish open access. In contrast the difference for high-income countries (USA, Germany and Australia) was fairly small. Publishers provide poor compensation, with only around a quarter of journals from our sample providing waivers or discounts. Interestingly, none of the countries we included would have qualified for these, irrespective of the relative cost-impact for authors from poorer settings. It is therefore disappointing to see that only around half of journals allowed immediate self-archiving, as the impetus to self-archive likely wanes during a protracted embargo period. Given their lack of access to these journals, it is not surprising that authors from the lower-ranked universities in LMICs are less likely to publish in open access journals [10].

A number of journals ranked highly by Citescore lacked an Impact Factor. As the calculation for Citescore and Impact Factor (citations divided by publications) are fairly similar, this finding questions how Impact Factor is assigned to journals. Both scores are calculated using the number of citations (over a set period) and dividing this by a number of predefined publications over the same period. For Citescore the period is three years and for Impact Factor it is two. Citescore includes all publications published within the three years, and Impact Factor only includes publications likely to be cited – the details of what a citable publication is, is not explicitly defined. Impact Factor's publisher instead cites Bradford's law (described in 1934) which states that a relatively small number of journals publish the majority of significant scholarly results. Of course Bradford's law is a retrospective observation from a very different era; and given its perceived academic value, assigning an Impact Factor to any journal is likely to substantially contribute to. Naturally both publishers justify the merits of their calculations. However, since authors take their lead from publishers' impact

metrics, it is important to note that highly ranked journals in one metric may be omitted in another despite metric similarities. In any event, citations are a controversial variable to use for impact calculations. Limited to describing the article cited or who cited the article (Citescore and Impact Factor only describe the former) are less granular than metrics of disseminative impact such as article views (the number of times an article has been viewed or downloaded) and other Altmetrics [15,16]. Further, alternative (non-impact factor) metrics can often be pinpointed geographically to provide regional information about the audience that views the journal. As research must be read (but not necessarily cited) to have real-world impact article views are an interesting variable for use in impact calculations. At the other end, current attempts by authors to funnel their research through the small proportion of journals supporting an Impact Factor are more likely to stifle dissemination.

There were several limitations to this study. Although mentioned in the discussion, we were unable to provide a measure of regional impact. It is generally acknowledged that measuring regional impact would benefit authors, institutions and academic libraries, however, no universally agreed impact metric that incorporate regional differences have been developed. The addition of a regional variable to this database would undoubtedly guide journal selection. Our database was created de novo using information obtained from several sources. Specifically, we used the Scopus and Web of Science databases to derive our journal cohort. It is possible that other emergency medicine and critical care text exist that is not included in these databases. As we were keen to include a measure of impact, including journals without similar impact metrics would complicate ranking. The impact metrics, article processing costs, and self-archiving presented in our database



## Geared for green: I am unable to publish open access and would like a journal that allows self-archiving

### Terminology

- **Self-archiving**, also known as green open access, refers to the practice of depositing articles in an open access repository, this can be a personal website, an institutional, or commercial repository.
- **Embargo**, some green open access journal publishers enforce an embargo period before self-archiving is allowed.
- A **preprint** is a version of a scholarly or scientific paper that precedes publication in a peer-reviewed scholarly or scientific journal.
- A **post-print** is a version of a scholarly or scientific paper that has been through the peer-review process. It is the final version of the paper before it is sent off the the journal for publication.

### When should I use this tool?

- Use this tool if you cannot afford an open access charge.
- Use this tool if you cannot find an appropriate open access journal.

### Notes

- Embargo periods provided by this tool relates to *self-archiving on the author's personal website or an institutional repository* such as OpenUCT. It does not apply to commercial repositories such as ResearchGate, Mendeley, Academia.edu, etc.
- None of the journals below allows self-archiving of the final published version. All except one allows self-archiving of the preprint version.
- It is important to note that it is the author's responsibility to self-archive their work; this will not automatically occur. You can find more on this topic, as well as how to [present your postprint, here](#).
- The self-archiving detail provided in the results are correct for September 2017. It may vary slightly depending on when accessed. It is updated annually.

### Enter your search criteria below

Select specialty	<input type="radio"/> Emergency medicine <input type="radio"/> Critical care
Postprint embargo period	<input type="radio"/> 0 months <input type="radio"/> 6 months <input type="radio"/> 12 months
Show only journals that allows archiving of preprint (optional)	<input type="checkbox"/>
<input type="button" value="SEARCH"/>	

Fig. 3. Screenshot of green open access journal search engine.

were manually updated by the study team and may slightly lag the most current values. Similarly, as currencies and disposable income fluctuate over time, the proportional difference in out-of-pocket expense towards article processing costs will also fluctuate. Although this is unavoidable when working with absolute numbers, the relative differences between these variables will likely remain small in most instances. Although not a strict limitation, it is important to note that some publishers currently provide impact metrics alongside various bits of open access information, but that these are strictly for journals included in their collection. For example, Elsevier's journal finder (<https://journalfinder.elsevier.com/>) comes closest to providing a similar cohort of variables to ours but fails to provide detailed information or include titles from other publishers. Expanding the cohort of journals to include other specialties would widen the utility of the database. Lobbying industry to provide this information more consistently and for a larger cohort of journals would take the burden off academia to collate information that is readily available to publishers. If a standard for measuring regional impact is developed and accepted it would be useful to include it in the database. Finally, we only evaluated the journals for emergency medicine and critical care. Although we did not include medical journals from other specialties, we have no doubt that findings will likely be very similar. It is also very likely that other specialties will benefit from a similar database to aid in their selection of high impact, accessible journals.

## Conclusions

Authors should take due care when selecting a journal for publication. Although important, impact metrics such as Citescore and Impact factor should seldom be the only variables considered. Dissemination options should be strongly considered, specifically access options following publication. Authors from higher income countries have a unique opportunity to use their relative position of privilege to improve the plight for those lower down the rankings. The database described here can be used as a guide to navigate the various open access options with due consideration of journal impact at the same time.

## Dissemination of results

The findings were presented at the Emergency Medicine Society of South Africa's biennial conference in Sun City, South Africa in November 2017.

## Conflicts of interest

Prof Stevan Bruijns is an editor of the African Journal of Emergency Medicine. Prof Bruijns was not involved in the editorial workflow for this manuscript. The African Journal of Emergency Medicine applies a double blinded process for all manuscript peer reviews. The authors

declared no further conflict of interest.

### Author contribution

Authors contributed as follows to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: CD contributed 30%; TMC, BT and DR contributed 15% each; and SRB contributed 25%. All authors approved the version to be published and agreed to be accountable for all aspects of the work.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.afjem.2019.01.015>.

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