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A bibliometric study on the publication errors in emergency medicine journals from 2000 to 2020

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ABSTRACT

Background: The literature on scientific publication errors in medical research is limited, and no studies on emergency medicine publications have been conducted yet. This study aimed to investigate the characteristics of the publication errors in emergency medicine literature.
Methods: This bibliometric study reviewed intervened publication errors in the manuscripts of seven high-impact emergency medicine journals from 2000 to 2020, covering twenty years, and evaluated the corrections in the forms of an erratum, corrigendum, addendum, and retracted papers. The detected publication error rate and the trend, error severity, and error types were calculated.
Results: We detected 257 intervened scientific papers consisting of 251 corrections due to one or more publication errors and six retractions. Authors were the primary source of the errors (93.2%). Most of the errors were in the author attribution section (40.5%). The published errors of 7.2% had an impact on the paper's conclusion. Simple typographic errors were the most common error type (62.5%). The corrected publication error rate was 1.3%, with a steady trend over the twenty years.
Conclusions: Publications errors are inevitable, but it is possible to minimize them. The number of corrections in emergency medicine literature is at a low rate and show many similarities with the previous literature.
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1. Introduction

The development of evidence-based medicine requires the scientific reports of researchers worldwide, and so does emergency medicine. The number of publications has been expanding with easier access to literature, the faster online publication process, and the increasing number of journals during the last decades. However, readers should be aware that not every article is error-free [1]. The errors noticed after publication need corrections, but in some cases, the paper needs to be withdrawn entirely due to uncorrectable or unjustifiable errors. The crucial point is that these processes should occur as quickly as possible so that readers can easily access information about the intervention to prevent the dissemination of wrong or unreliable information [2]. In the era of online publication, error correction actions are expected to be much faster and easier. However, there is no standard execution of the error presentation and connection links in medical databases, publishers, or journal websites [3]. Ideally, once a reader reaches an article from any official source, they must encounter any correction or retraction action on the paper and be able to get the updated version of the original work.

There is a wide range of terminology for publication errors, generally based on the responsible party or the action. While erratum (plural; errata) stands for author originated error, corrigendum (plural; corrigenda) describes the publisher originated one. On the other hand, the addendum (plural; addenda) addresses the later added information to the paper. Lately, the term "correction" has been preferred to reveal the detected errors and state the accurate version of incorrect content instead of erratum and corrigendum classification.

A limited number of studies focus on publication errors in medicine [1,2,4-8]. Most of them have reviewed publications in specific journals or some subfields of medicine, but no study has assessed emergency medicine (EM) in terms of publication errors [4-8]. Accordingly, we aimed to investigate the characteristics of the publication errors in EM between 2000 and 2020 across seven high-impact EM journals.

2. Methods

The ethics approval was nonapplicable since the study was conducted as a bibliometric study on online archives of EM journals and

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did not include any patient data. We selected journals from the Journal Citation Reports of the ISI Web of Science 2021 with the criteria of the primary focus on EM, the highest impact factors, and having 20-year online archives. The resultant seven journals were Academic Emergency Medicine (AEM), American Journal of Emergency Medicine (AJEM), Annals of Emergency Medicine (AnnEM), BMC Emergency Medicine (BMC), Emergency Medicine Australasia (EMA), Emergency Medicine Journal (EMJ), and European Journal of Emergency Medicine (EJEM) in alphabetic order. During the article selection process, two independent reviewers searched for the keywords *erratum*, *errata*, *corrigendum*, *corrigenda*, *addendum*, *addenda*, *correction*, *corrected*, *error*, *retraction*, *retracted*, and *withdrawal*, respectively, in the title of the articles covering 20 years from January 1, 2000, to December 31, 2019. Among them, we included papers in the forms of original articles, review articles, case reports, letters to the editor, and editorials and excluded the congress abstracts.

We reviewed all the corrected and retracted papers published on the Medline database and journal websites during the study period. Firstly, two reviewers identified the articles independently. After that, they discussed their assessments and reached a consensus on excluding outputs with word similarity results unrelated to publication errors to reduce misclassification. In the third step of the adjudication process, they investigated the intervention type (correction or retraction), availability of the online links from the original work to the correction and vice versa, and the content. The intervention features (i.e., error severity, error number, location of the error in the manuscript, responsible party, date of publication, date of intervention, free electronic access of the original work and the intervention), as well as the characteristics of the first and corresponding authors (i.e., gender, country, and continent) and the papers (multidisciplinary nature of the article and the number of the authors) were recorded. The publication error rate was calculated by dividing the number of corrected papers x 100 by the sum of articles published in 20 years in each journal and in total and expressed as %.

The error severity classification was performed based on three categories due to its impact on methodology, reporting, interpretation, or conclusion: minor, moderate, and severe. Among them, minor errors represented the simple typographic, transpositional, and mislabeling errors in the authors' information text, tables, or figures with no impact on the manuscript; moderate errors represented errors potentially altering the interpretation but not the conclusion. Errors causing significant alterations in both interpretations of data in text, figures, or tables and conclusions were classified as severe errors.

We used IBM SPSS Statistics for Windows, Version 25.0. (Armonk, NY: IBM Corp.) for the statistical analysis. The descriptive results were presented as median ± interquartile range (IQR) with minimum and maximum values. We used Spearman rank correlation coefficients (rho) for the correlation between the number of authors and the number of corrections.

3. Results

We detected a total of 257 intervened scientific papers consisting of 251 corrections due to one or more publication errors and six retractions in seven emergency medicine journals between 2000 and 2020 (Table 1). The error rate was 1.3% due to 239 intervened papers among 18250 publications. Authors were the primary responsible party of an error/errors requiring correction ($n = 234$, 93.2%). Only a small portion of errors impacted the conclusion, which we classified as severe ($n = 18$, 7.2%). In contrast, almost two out of three publications consisted of minor errors with no impact on interpretation or conclusion ($n = 158$, 62.9%). For 247 publications, we were able to identify the location of the error in the corrected papers. In contrast, four papers had been corrected due to duplication, doi error, or publication in the wrong journal section. The author information part was the major error field ($n = 100$, 40.5%). Fig. 1 represents the number of correction notifications due to publication errors in EM journals and the trend between 2000 and 2020 for 238 correction notifications. The trend line shows that the average correction notification number per year was

Table 1
The distribution of intervened publication errors among emergency medicine journals.

Journals	AEM	AJEM	AnnEM	BMC	EJEM	EMA	EMJ	Total
Intervention metrics								
• Total interventions (n)	50	47	71	6	11	29	43	257
• Total retractions (n)	0	2	1	1	1	0	1	6
• Total corrections (n)	50	45	70	5	10	29	42	251
• Total corrected papers (n)	46	44	70	6	10	23	41	239
• Total publications (n)	3326	4569	3572	522	1420	1606	3235	18250
• Correction rate between 2000 and 2020 (%)	1.4	1.0	2.0	1.1	0.7	1.4	1.3	1.3
Responsible party (n, %) ($N = 251$)								
• Author/s	45 (90)	40 (88.9)	66 (94,3)	5 (100)	10 (100)	28 (96.6)	40 (95.2)	234 (93.2)
• Publisher	5 (10)	5 (11.1)	4 (5.7)	0 (0)	0 (0)	1 (3.4)	2 (4.8)	17 (6.8)
The severity of error ($N = 251$)								
• Minor	34 (68)	35 (77.8)	37 (52.9)	3 (60)	10 (100)	15 (51.7)	24 (57.1)	158 (62.9)
• Moderate	13 (26)	9 (20)	27 (38.6)	1 (20)	0 (0)	9 (31)	16 (38.1)	75 (29.9)
• Severe	3 (6)	1 (2.2)	6 (8.6)	1 (20)	0 (0)	5 (17.2)	2 (4.8)	18 (7.2)
The location of the correction (n, %) ($N = 247$)								
• Title	0	2	3	0	1	3	3	12 (4.9)
• Author attributions	25	30	11	3	9	4	18	100 (40.5)
• Abstract	1	0	3	0	0	0	1	5 (2)
• Introduction	2	0	4	0	0	1	2	9 (3.6)
• Materials and methods	2	2	8	0	0	8	4	24 (9.7)
• Results	4	1	9	0	0	3	3	20 (8.1)
• Discussion/Conclusion	2	0	4	0	0	2	0	8 (3.2)
• Conflict of interest	2	2	5	0	0	2	2	13 (5.3)
• Funding	0	0	1	0	0	0	0	1 (0.4)
• References/Citations	2	1	8	0	0	4	1	16 (6.5)
• Table	7	3	11	2	0	1	2	26 (10.5)
• Figures	2	3	2	0	0	1	5	13 (5.3)

AEM; Academic Emergency Medicine, AJEM; American Journal of Emergency Medicine, AnnEM; Annals of Emergency, BMC; BMC Emergency Medicine, EJEM; European Journal of Emergency Medicine, EMA; Emergency Medicine Australasia, EMJ; Emergency Medicine Journal.

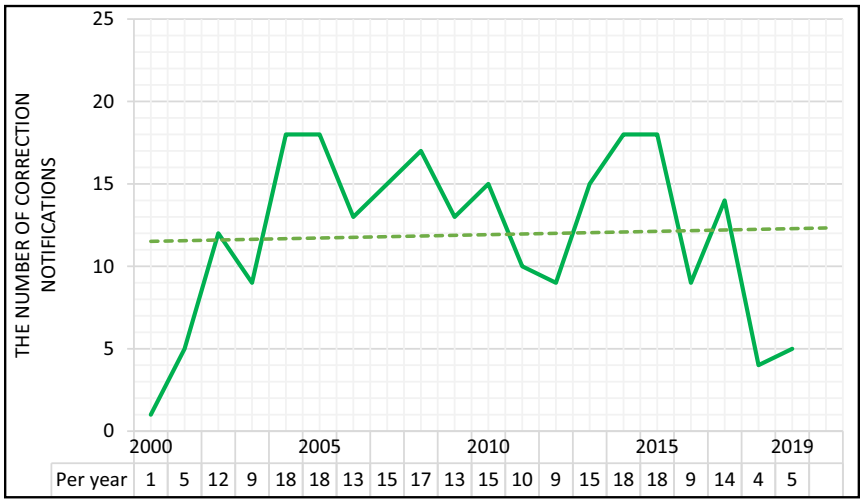


Fig. 1. The number of correction notifications due to publication errors in emergency medicine journals per year and the trend between 2000 and 2020.

10–15, with a mean of 11.9. For 13 notifications (5.2%), we could not find the date of release information.

Most corrections were due to simple typographic errors ($n = 146$, 62.5%) among the 248 papers (Table 2). The simple typographic errors that needed correction were less likely to be in the text ($n = 46$, 31.5%). The publications errors were mostly seen in original articles ($n = 151$, 60.2%), case reports/case series ($n = 37$, 14.7%), and review articles ($n = 16$, 6.4%). Ten papers (4%) contained more than one separate notification, whereas 42 papers (16.7%) had more than one publication error with or without the same intervention notification. The maximum number of errors in a corrected paper was six, which was detected in only one paper. The hyperlink availability analysis showed that the connection was possible from correction to the original work in 79.7% and from the original to the correction in 77.3%. Although the correction notifications generally included a statement of apology for the inconvenience by the publisher (74.1%), they did not clearly identify the major responsible party for the error/s (36.7%). Access to the full version of the original paper from the erratum was not possible in 38.2% of the study sample. The median time between the original publication date of the paper and the published erratum was 6.0 ± 10.9 months (min: 0.1, max: 204.4).

The median number of authors per paper was 4.0 ± 2.7, ranging between 1 and 17. The increase in the number of authors was not correlated with the increase in errors ($p = 0.361$). The male/female ratio for the first and corresponding authorship position was 189/62 (75.3 vs. 24.7%) and 196/55 (78.1 vs. 21.9%) out of 251 papers, respectively. The error rates for male vs. female authors in the first and corresponding authorship position were 1.0% vs. 0.3% and 1.1% vs. 0.3%, respectively. The first and corresponding authors were from the USA in 121 (48.2%) and 122 (48.6%), respectively. America was the dominant continent in authorship, with 132 (52.6%) first authors and 130 (51.8%) corresponding authors. Almost half of the papers were multidisciplinary ($n = 122$, 48.6%). The multicenter collaboration was detected in 152 (60.6%). Only 17 papers included authors from different countries (6.8%).

Table 2
The characteristic of corrected publication errors in emergency medicine.

Type of error ($n = 248$)	(n, %)
Simple typographic errors	146 (62.5)
• Author informatics	100 (44.0)
▪ The names/surnames of the authors	58 (23.4)
▪ The affiliation/s of the authors	17 (6.9)
▪ The order of the author in the author list	13 (5.2)
▪ The included authors in the author list	5 (2)
▪ The contribution/s of the authors	7 (2.8)
▪ Acknowledgments	9 (3.6)
• Simple typographic errors in the text	46 (18.5)
Transposition	21 (8.5)
Dosage/formula error	11 (4.4)
Reference/citation	15 (6)
Result error	13 (5.2)
Statistical error	10 (4)
Ethical	7 (2.8)
Insufficient literature contribution	3 (1.2)
Figure error	4 (1.6)
Data error	9 (3.6)
Number of errors in each correction notification	
1	206 (83.3)
2	24 (9.6)
3	13 (5.2)
4	4 (1.6)
5	0
6	1 (0.4)
Article type ($n = 251$)	
Original	151 (60.2)
Review	16 (6.4)
Meta-analyses	2 (0.8)
Case reports/case series	37 (14.7)
Others (letter, editorial, comment, opinion, book review)	45 (17.9)
Total	251(100)
Access to original paper	
Free of any charge	155 (61.8)
Charge is required	96 (38.2)
Hyperlink Availability	
Available from correction to original	200 (79.7)
Available from original to correction	194 (77.3)
Correction availability on the journal website	206 (82.1)
Available apology statement	186 (74.1)
Available responsible party identification	92 (36.7)
Duration (Median ± IQR) (months)	
Submission-publication of the original paper	5.6 ± 4.7
Publication-correction notification	6.0 ± 10.9

4. Discussion

Publication error metrics are not intensely scrutinized compared to other journal or publication metrics in the literature. The present study evaluated the intervened publication errors in EM journals between 2000 and 2020 and presented a summary of corrected errors after publication. The results showed that authors were the primary

source of the errors. Most of the errors were simple typographic ones that generally did not compromise the conclusion in the author attribution section, with an average of 1.3 corrections per 100 publications in EM journals.

The previous studies addressed that the responsible party for the publication errors was generally authors rather than publishers [2,4,5]. It is more commonly seen in the case of moderate or severe errors, which has the potential to alter the interpretation of the conclusion [4]. The severe error rate in EM in the study was very similar to general medical, imaging-related, and neurosurgery journals [1,2,4,5]. However, it was very low compared to some studies, one of which reported that the errata occurrence rate per journal ranged between 0 and 18.8% in the top ten peer-reviewed journals in general medicine and cardiovascular medicine, and another found 14% in oncology journals [1,6]. We believe the main reason behind the variation might be that the most adopted error severity classifications include a grading system based on three ordinal components, which can be highly subjective. Hauptman and colleagues also found that almost half of the errors were seen in research articles, which was in line with our results (47.9 vs. 60.2%) [1]. We found the publication error rate in EM as 1.3%, ranging between 0.7% and 2.0% among the high-impact EM journals included in this study. Although a high-impact factor journal is expected to have a more robust review process and experienced editorial and reviewer staff that prevent many errors before publication, it would probably have more readers and more cited papers, which make the publications more visible to the scientific community and make the error/s to be more detectable and vice versa.

The analysis of demographic characteristics of the authors related to publication errors showed that the increase in the number of authors was not correlated with the increase in the number of errors. The gender of the first and corresponding author, i.e., the male dominancy, was consistent with the existing gender distribution of authors in EM journals [9]. Lastly, almost half of the errors were seen in studies conducted in the USA, which was in line with a previous report [5].

The publication error trend over time is one of the crucial aspects of this topic. Akhaddar et al. evaluated 441 published errata in 28 leading neurosurgical journals between 1990 and 2019 and found a dramatic increase over the last six years [5]. The authors also argued that the global expansion of division and increased volume of publications were the potential reasons behind this increase. Besides those, we believe that online access to scientific papers via institutional and personal computers with the internet could be the most influential cause. The publication errors have been more visible and detectable compared to the past, with the easier accessibility of the publications to the increased readership. Although their arguments related to the dramatic increase in publication errors also apply to EM, our results did not show such a dramatic increase. On the contrary, it was in the form of a stable trend which can be related to our relatively shorter study duration, fewer reviewed journals, and difference in the impact factor range.

Not every mistake is immediately noticeable. The detection, correction, and updating of an existing publication still is a slow process. We found the median duration of the corrections as 6.0 $\pm$ 10.9 months, which can be interpreted as a similar period of achieving a paper published. However, our results also showed that the maximum duration could be very long, like 17 years in some cases. Therefore, minimizing the potential publication errors should be the primary goal for all parties.

We detected a high rate of apology statements by the publishers (approximately 75%), which is considered a courtesy in the correction notification. However, many of the statements (63.3%) did not address the responsible party for the error. For most of these cases, reviewers 1 and 2 had to discuss to reach a consensus on who the responsible party was according to the error style. Another issue we evaluated during the study was the accessibility of the correction and the original paper on the journal's website. Because some of the journals being assessed in the study were hybrid, some had a completely open access publication policy, and some required subscription, we could not freely reach 39.5% of original papers. The number of free-of-charge paper rates would be lower considering the finished embargo period of the some publication. We did not include the page position of the online presentation of corrections. However, some previous studies also pointed to inter-journal variability and stated their concern about the online pages' positioning [3,6]. The absence of hyperlinks will contribute to the spread of misinformation. Also, journals should develop strategies to detect errors faster and more comprehensively. Reporting an error anonymously by a reader may be simplified by adding an online link below any published paper on a journal's website, as Molckovsky et al. suggested [6]. Therefore, adding the link to the sidebar would be convenient for easier accessibility. As the authors stated, checking the corrected and retracted references can be an extra barrier during the submission process of a manuscript [6].

Retracted papers in EM journals were reviewed by only one study without including corrected publications [7]. The authors found 28 retractions in 22 EM journals, whereas we found 6 in 7 journals. Another study evaluated the accuracy of text descriptions and labeling of radiological images published in a specific EM journal for an approximately 5-year period [8]. They reported the error rate in articles with images as 40%, and most of the errors potentially affect clinical management, educational value, or both. One study comparing the accuracy of references in an EM journal which was also included in our study showed a significant improvement in the citations and reference list [10]. The authors attributed this improvement to the web-based peer review and online manuscript submission process, the inclusion of the regarding journal in the Journal Citation Reports Emergency Medicine Category, and an increase in the usage of reference bibliography systems.

Although the focus of our study is publication errors in the medical field, readers should keep in mind that we evaluated the publication errors that were detected and intervened. The common point of our and similar studies is that significant errors in error distribution are relatively low. However, the main concern is undetected or unreported errors and their severity which future studies should evaluate. One study by Schroter et al. analyzed the error detection performance of peer reviewers on test papers containing major and minor methodological errors [11]. They found that the reviewers could not detect most errors even after training. Allison et al. emphasized the error-prone nature of science [12]. They shared their experience with substantial or invalidating errors in their field and summarized the common errors and the concerning points leading them. Apart from similar findings to ours, they also mentioned the difficulties in requesting raw data, charging policies for correction letters, and the journals' reluctance to retract. Systematic errors impacting the interpretation of scientific papers in any medical field are likely much higher [12]. Although publication errors are challenging to detect, fixing them is more complicated. Moreover, considering the intentional errors and fraudulent aspects, readers should critically evaluate the literature.

Nevertheless, despite all the efforts, errors are inevitable. The detection of the errors during the post-publication period and the interventions are other qualifying criteria for the journals. As one journal may have a strict policy for errors not considering the high correction rate, another one may neither be so rigorous in enforcing these policies nor face the high numbers of interventions. Therefore, we believe that the correction and retraction rates do not reflect the journal's quality.

4.1. Limitations

Some major limitations in the present study were the subjectivity of the error classification and variability of intervention notifications across the journals and the databases. We noticed that some journals published the corrections separately for each paper, while some preferred to publish them collectively for more than one paper at the end of the editorial sections. Also, some journals prefer to assign unique doi numbers for the notification, while some do not. It was not always

the case that the journal website search engine results matched the database results. Lastly, journals' final actions (i.e., whether they updated the original paper or not) were not always clear. Despite all the limitations, we believe that our study has the potential to give an insight into this topic.

5. Conclusion

The study results show that publication error rate in EM is low and closely resembles the previous literature data. It should not be forgotten that this rate reflects the detected and intervened publication errors. They are inevitable but minimizing them is possible. Prospective authors of scientific papers should be aware of post-publication errors and strive for a less error-oriented approach in writing, submitting their papers, and checking the pre-proofs. At the same time, journals should offer online submission strategies to reduce errors, particularly preventable ones, a uniform intervention template with comprehensive details, and free access to updated papers.

Prior presentation

The preliminary results of the study were presented at the 7th Eurasian Congress of Emergency Medicine 25–28 November 2021, Antalya, Turkey (oral presentation).

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Ethical approval

Not applicable.

Criteria for inclusion in the authors'/contributors' list

The manuscript has been read and approved by all the authors.

Authors' contributions

SV contributed to the manuscript's conception, design, and drafting. HBK contributed to the data collection and data analysis. FC contributed to the recruitment and initial thematic review. SV, HBK, and FC contributed to the conception and design of the study and critical review of the manuscript. SV takes responsibility for the paper as a whole.

CRediT authorship contribution statement

Sevilay Vural: Writing – review & editing, Writing – original draft, Validation, Supervision, Project administration, Methodology, Investigation, Data curation, Conceptualization. **Hasan Burak Kaya:** Methodology, Formal analysis, Data curation. **Figen Çoşkun:** Writing – review & editing, Resources, Methodology, Data curation, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no conflict of interest.

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