

## RESEARCH ARTICLE

## A retrospective analysis of reported errata in five leading medical journals in 2012

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**Background:** Although medical publications are frequently used as the source of information, the prevalence of errata remains unclear. The objective of this study was to examine peer-review and publication processes of medical journals as well as to determine the occurrence of reported errata in medical journals and timeliness in identifying and correcting errata.

**Methods:** Five medical journals, *New England Journal of Medicine*, *Annals of Internal Medicine*, *British Medical Journal*, *Journal of American Medical Association*, and *Lancet*, were evaluated. The characteristics of these journals were obtained from editors' survey. All these journals report errata noted in their prior publications. We retrospectively analyzed all errata reported from January 1, 2012, to December 31, 2012. The mean number of reported errata per issue, the most common errata, and the mean time to report errata were calculated.

**Results:** The journals had high impact factors (14–51), received 3,200 to more than 15,000 submissions in 2012, and utilized two or more external reviewers and usually two or more editors for any accepted articles. All the journals edited the accepted articles, including references, figures, and tables for style. A mean of 1.3 articles with  $\geq 1$  errata was reported per issue (a total of 306 articles with errata in 226 issues). Errata in author's information, numeric errata, and errata in the figures and tables were the most common errata. The mean time to report the errata was 122 days.

**Conclusion:** The high-impact journals, with extensive pre-publication review, reported relatively few errata per issue. The delay in reporting errata needs further exploration.

Keywords: *medicine; publications; journals; errata*

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Health care professionals seek medical journals for authentic and up to date information. It is a common observation that medical trainees frequently utilize journal articles for their education. Many publications in reputed medical journals are covered by leading newspapers. Therefore, such articles may have a potential to immensely influence on health care professionals' knowledge and clinical practices. For instance, the *New England Journal of Medicine*, which publishes every week, has almost 200,000 paying subscribers and the online version is read by 300,000–400,000 readers each week (1). Such effect requires that the publications be free

of errors as much as possible, and errors be recognized and corrected as early as possible.

Several studies have assessed the scientific publications for accuracy, publication standards, and other issues. These prior studies have shown that the medical journals have multiple citation errata (2–4), high prevalence of articles with ghost and honorary authors (5, 6), unclear and inconsistent guidelines on the authorship (7), and inadequate and heterogeneous authors' instructions with regards to methodologic, statistical, and ethical issues (8, 9). Several statistical problems have been documented in the reporting of clinical trials, including analysis of

multiple end points and tendency to emphasize statistically significant end points rather than emphasis on the magnitude of the treatment differences (10). This is important since perceived quality of clinical trials can influence adoption of the study findings (11). Despite such importance, only one-third of medical journals reported statistical review for all accepted manuscript in 1998 (12). It is also clear that scientific publications are not free of major errors, which can be serious enough to require retraction (13). The majority of publications retracted have plagiarism, duplicate publication, falsification or fabrication, authors' dispute, and ethical issues as the cause (13, 14). While many of the aforementioned issues have been rigorously studied, there is a paucity of recent studies on reported errata in medical journals (15, 16). Hence, we conducted this study to examine peer-review, editing, and publication processes of five leading medical journals and analyze publication errata reported in 2012. A recent study by Hauptman et al., published after the completion of our study, determined that errata are frequent in medical publications. This study was much larger than our study and determined the 'error severity'. The study demonstrated that 24% of the studied articles had at least one major error, which materially altered data interpretation. However, the study reviewed articles published between July 1, 2009, and December 31, 2010. The study excluded certain categories of articles, categorized errata differently, did not determine the timeliness of errata reporting, and did not assess peer-review, editing, and publication processes of the journals (17).

## Methodology

We included the following five leading medical journals in our study: *New England Journal of Medicine* (NEJM), *Annals of Internal Medicine* (Annals), *British Medical Journal* (BMJ), *Journal of American Medical Association* (JAMA), and *Lancet*. We visited the journals' website, and emailed a questionnaire to the editorial team to

gather information about the journal, peer-review, editing, and publication processes (Supplementary file). The response to our questionnaire was voluntary and implied informed consent. Reported errata were defined by any errata, regardless of their nature or cause, which occurred in a prior issue of the journal, and were reported in a subsequent issue. All the journals report errata noted in their prior publications under the following categories: 'correction' in *NEJM*, *BMJ*, and *JAMA*, 'corrections' in *Annals* and 'department of error' in *Lancet*. Two authors (VRB and MRA) reviewed online version of all such errata reported from January 1, 2012, to December 31, 2012. The same authors also reviewed the online and print versions of the full text of pertinent articles in corrected and erroneous versions, as needed, to categorize the errata into different types (Table 1). During this process, we observed a high number of errata involving authors' information, numeric data, figures, tables, or legends. Hence, we also specifically calculated the total number of errata involving these areas.

The difference between the date when the erratum was first reported (online or in print version) and the initial publication date (online or in print version, whichever was first) was used as the time taken to report the errata. Errata in publication involving only the supplementary online material, errors in reporting errata, and clarification of published statements for better understanding (in the absence of any error) were excluded from this analysis. Data were collected in an excel sheet and analyzed using Microsoft Office Excel 2010. The study was approved by the institutional review board at the University of Nebraska Medical Center.

## Results

The journals included in the study are among the oldest medical journals with some of the highest impact factors (Table 2). In 2012, the five journals received approximately 3,200 to more than 15,000 submissions, and published 24–52 issues. All the journals required electronic submission,

**Table 1.** Categorization of publication errata reported in the journals

Types of errata	Description of errata	Hierarchy of errata
Errata in the fact or data	Errata in the data, e.g., errata in reported efficacy or safety of a drug or intervention, incidence or prevalence of a condition; errata in fact, e.g., incorrect recommendations, nomenclature or terminology. These errata may or may not create significant difference in conclusion.	1st
Citation errata	Citation error, e.g., wrong or missing information in a reference.	2nd
Errata in the use of language	For example, spelling error, typo, grammar errors, changes in writing style.	3rd
Errata in the authors' information and miscellaneous	Authors' name, title, affiliation, correspondence, disclosure, funding information, copyright, acknowledgment and miscellaneous.	4th

For articles with multiple errata, the errata were categorized based on the following hierarchy: errata in the data or fact, citation errata, errata in the use of language, and errata in author's information.

Table 2. Characteristics of the medical journals<sup>a</sup>

Journal	<i>NEJM</i>	<i>Annals</i>	<i>BMJ</i>	<i>JAMA</i>	<i>Lancet</i>
Established year	1,812	1,927	1,840	1,883	1,823
Impact factor (Thomson Reuters)	51.658	14.0	17.215	29.978	39.06
Issues in 2012	52	24	52	48	50
Submissions received in 2012	15,737	>3,200	6,288	>8,000	9,223
Average number of external reviewers per published manuscript	2–3	3	2–3	3	4–5
Average number of editors assigned to original research article	4 (including editor-in-chief and statistical consultant)	4 (including statistical editor and production editor)	2	1 (other editors are involved if the paper is likely to be accepted)	3
Time provided for proofreading	1–5 days <sup>b</sup>	2 days	3 days <sup>c</sup>	1–2 days	2 days
Median time from submission to decision <sup>d</sup>	6 days (fast track); 28 days (regular track)	8 weeks	9 days for first decision	7 days for first decision <sup>e</sup>	41 days
Median time from acceptance to publication of research manuscript	71 days in 2012	Range from 1 week to 3 months	44 days in 2012	35 days (all articles); 18 days (Online First articles)	113 days

<sup>a</sup>The figures are based on the data from the year 2012.

<sup>b</sup>*NEJM* has two rounds of author proofreading. On the regular track, the author has 4–5 days on round 1 and 3 days for round two. On the fast track, the author has <1 day on the first round, and depending on the speed, 0–1 day on the second round.

<sup>c</sup>*BMJ* may provide as less as a few hours for author proofreading for some article types and urgent articles.

<sup>d</sup>Analysis of the median time from submission to decision does not include papers that are not sent for external review.

<sup>e</sup>For *JAMA*, the median time from submission to acceptance (including review and author revision) is 31 days for all articles whereas it is 17 days for articles published online first.

authors' disclosure prior to publication, and allowed change in authorship only upon agreement by all the authors. The published articles were reviewed by two or more external reviewers and usually two or more editors. All the journals had statisticians on the editorial team who reviewed the research articles. All the journals edited the accepted articles for style, reviewed references for style but not necessarily for accuracy, and redesigned figures and tables. All the journals except *Annals* and *JAMA* used anti-plagiarism software. Prior to the publication, all the journals had 100% of articles proofread by the authors, and the time allowed for proofreading ranged from <1 day to 5 days. The median time from submission to decision, excluding the manuscripts which were not sent for external review, as well as the median time from acceptance to publication were variable and depended on whether the manuscript was processed under fast-track or regular-track. The median time from submission to decision was as short as 6 days for fast-track article in *NEJM* to as long as 6–8 weeks in *Lancet* and *Annals*. The median time from acceptance to publication of research article was as short as 18 days for online first articles in *JAMA* to as long as 113 days for *Lancet*.

A total of 314 articles with  $\geq 1$  errata were reported from January 1, 2012, to December 31, 2012, in the five journals, of which 8 were excluded because they involved only the supplementary online material ( $n=6$ ), error in reporting errata ( $n=1$ ), and clarification of published statements ( $n=1$ ) (Table 3). In 2012, the journals altogether published 226 issues. A mean of 1.3 articles with  $\geq 1$  errata was reported per issue. The mean number of days to report the errata was 122 days. Fifty-four percent of the errata were related to the errata in the data or fact reported in the publications. Errata in authors' information such as authors' name, authors' affiliation, and disclosure of conflict of interest, accounted for approximately 28% of the errata. Citation errata constituted relatively small number of errata (3%). When we specifically calculated the errata in author's information, numeric errata and errata in the figures and tables or their legends, we determined that these errata altogether accounted for 71% of all errata.

## Discussion

This study revealed a relatively small number of reported errata per issue in 2012 in five of the most prestigious, oldest, and high-volume medical journals, which may

**Table 3.** Different categories of publication errata in five leading medical journals in 2012<sup>a</sup>

Journal	<i>NEJM</i>	<i>Annals</i>	<i>BMJ</i>	<i>JAMA</i>	<i>Lancet</i>	All five journals
Total number of errata reported in 2012 <sup>b</sup>	85 (27.8%)	21 (6.9%)	101 (33.0%)	42 (13.7%)	57 (18.6%)	306 (100%)
Number of errata per issue	1.6	0.8	1.9	0.8	1.1	1.3
Mean days to report the errata (range)	156.5 (14–980)	105.0 (28–336)	38.1 (1–924)	168.6 (14–1,463)	194.9 (5–2,198)	122.7 (1–2,198)
Errata excluded	2	0	3	0	3	8
Errata in the fact or data	55 (18.0%)	12 (3.8%)	50 (16.3%)	23 (7.5%)	26 (8.4%)	166 (54.2%)
Citation errata	0	0	5 (1.6%)	3 (0.9%)	0	8 (2.6%)
Errata in writing style or use of English	16 (5.2%)	2 (0.6%)	14 (4.6%)	5 (1.6%)	7 (2.3%)	44 (14.4%)
Errata in the authors' information and miscellaneous	14 (4.6%)	7 (2.3%)	32 (10.5%)	11 (3.6%)	24 (7.8%)	88 (28.7%)

<sup>a</sup>The number indicates the absolute number of errata. Percentages are calculated out of the total errata of 306.

<sup>b</sup>Does not include the errata excluded for any reason.

have been possible with electronic submission, application of uniform format for authors' disclosure (18), rigorous external and internal peer review including statistical review, and universal proofreading of articles by authors prior to publication. Since several errors may go unnoticed or unreported, there may be more errors than that reported by the journals. Hence, the results of this study may not be generalizable to determine accuracy of publication. The study by Hauptman et al., with a different study design, determined an errata occurrence rate of 7–18% in these five medical journals. For example, the study included only original, meta-analysis and review articles when calculating the errata rate (17). Since these articles are longer and frequently have multiple authors, the errata rate may have been higher than our study. In fact, a positive correlation between the number of authors and errors (except in conclusion) has been demonstrated in Hauptman's study (17).

Although there were a relatively small number of reported errata, there was a substantial delay in reporting such errata. The mean time to retraction of erroneous publications was previously reported to be 26 months (13). Hauptman's study also demonstrated that only half of all errors were corrected; the other half was not corrected or not specified (17). Thus, it appears that there is an urgent need to establish mechanisms to report and correct errata as soon as they are identified. Authorship is important to accurately acknowledge the contribution of researchers and research institutions to medical community. The importance of authorship and authors' disclosure is also highlighted by the fact that several publications are retracted because of authors' dispute (14) and, by a recent study which revealed that physicians were less willing to prescribe drugs based on industry-funded trials (11). Since 2009, International Committee of Medical Journal Editors (ICJME) journals including

the journals reported here have implemented the use of uniform format for disclosure of competing interests (18). Despite this, nearly one-third of the reported errata were related to errata in authors' name, affiliation, and disclosure of conflict of interest. Although previous studies have revealed a high prevalence of citation errata (2–4), this study disclosed relatively few citation errata. This is probably related to our methodology to categorize errata by hierarchy; whether there is also a lack of reporting of citation errata or improvement in citation over last several years remains unclear. In addition to the author's information, the other most common areas for errata included figure or figure legends and numeric data in the text or in the table. These findings are largely consistent with the result of the Hauptman's study (17). Knowledge of the error-prone areas may help in focusing scrutiny during writing, editing and proofreading of an article.

The authors acknowledge that the categorization of errata into different sub-types is challenging.

A hierarchy of errata was utilized in this study based on the perceived importance for the readers. Hauptman et al., categorized the errata into 'trivial', 'minor', and 'major' (17). We had initially attempted to determine 'major errors' (errors that can potentially create a significant difference in meaning or conclusion of the statement, or alter the fact to the extent that it can potentially change the conclusion) (approximately 15% of all errata were felt to represent major errata), but this categorization was discarded because of the difficulty in determining the definition of 'major errors' and a lack of widely accepted definition of a 'major error' in medical literature. The authors believed that, in many cases of 'major errors', if a reader reads the entire manuscript carefully, it may be possible to identify that an error has been made in a certain section. Hence, the real world effect of such 'major

errors' is very difficult to determine. This study was not designed to explore the reasons behind these errata, and to identify whether the authors or the editorial review introduced the errata. A possibility of an association between the time period provided for editing and proof-reading, and the probabilities of errata may exist and needs further exploration.

Only few studies have been conducted to explore the ways to improve the quality of publications. Trials on open peer review have shown mixed results on the impact on quality of review, with one study demonstrating improved quality (19). In some studies, it has been shown that intensive editorial review may correlate to fewer errors in abstracts and references, whereas providing author's instructions may correlate to fewer errors in references and improved reporting of ethics requirements (20). Methodological review of research articles may be expected to improve the quality of published articles. Finally, post-publication peer review may play important role; however, restrictive time and space limitation on submitting correspondence on published articles as well as delay in publication of such correspondence may present a hindrance to successful post-publication peer review (21). Further efforts should be utilized to improve the quality and accuracy of medical publications, upon which we rely for patient care and education.

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James O Armitage reports receiving consulting fees from Ziopharm Oncology, GlaxoSmithKline, Spectrum Pharmaceuticals, Roche and serving on the board of directors for Tesaro bio Inc. Other authors do not have any potential conflict of interest.

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