Improvement in the accuracy of references in the journal *Emergency Medicine Australasia*

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**Abstract**

**Objective:** To study any change in reference accuracy in the Australasian emergency medicine journal (now known as *Emergency Medicine Australasia*), in the 10 years since a previous analysis was undertaken.

**Method:** A sample of 100 randomly selected references was compared with the results from the previous analysis.

**Results:** There was a significant reduction in the number of citations with errors and in the total number of errors.

**Conclusion:** This paper demonstrates a significant improvement in the accuracy of references in the journal *Emergency Medicine Australasia* over the past decade. This paper did not identify the reasons for this improvement, but potential causes might include the introduction of a web-based peer review and manuscript submission process, as well as improved reference bibliography systems by authors. In addition, an increase in the overall standard of paper submitted to the journal might have contributed to this improvement.

**Key words:** accuracy, citations, error, reference.

**Introduction**

The accuracy of the references cited in medical journals has been a problem for journal editors and readers for many years. Studies looking at this issue have quoted an error rate of up to 49%.1–5 Australasian journals are not immune from this problem.5 A study by this author looking at the accuracy rate of citations in the journal *Emergency Medicine* (the predecessor of *Emergency Medicine Australasia*) showed an error rate of 35%, which was in the mid-range of reference accuracy for emergency medicine journals at that time.

Improvements in the accuracy of journal references have been found to be achievable, with some studies showing an improvement of up to 26% when there is a concerted effort on the part of the receiving journal to improve citation accuracy.6

In the decade since the index study, there have been a number of changes in the administration of the journal
Emergency Medicine Australasia, and also a general improvement in the standard of paper submitted, and these changes would be expected to improve the accuracy of citations in published articles.

The aim of this study was to see if there has been any change in the accuracy of references cited by articles published in Emergency Medicine Australasia in the 10 years since the index study of Volume 12 of the Journal, in 2000.

**Method**

All references in Volume 22 of Emergency Medicine Australasia were listed and numbered consecutively. A sample of 100 references was then selected using the random number generator feature of Microsoft Excel 2000 (Office 2000: Microsoft Corporation, Seattle, WA, USA). This method was chosen to allow a direct comparison of the results of this analysis with an identical analysis of the references in Volume 12 of the journal (then known as Emergency Medicine). The sample size was chosen to match the review of Volume 12. This previous review found that 35% of citations had errors. Sampling an additional 100 references would provide 90% power to detect a 10% absolute reduction in errors with alpha of 0.05.

In keeping with the previous study, references were excluded when the reference generated was not a medical journal (such as a book, college report or government report) or not in English. Where a citation was excluded, a further random reference was examined.

The first author checked the accuracy of all of the references. Each reference was then searched for on Medline®, Pre-Medline® or the Cumulative Index to Nursing & Allied Health Literature (CINAHL)®. When the article in question was not referenced on these databases, the original article was sourced as a first-line check. If the reference sourced was identical to that quoted in the article, it was deemed to be correct. Where a discrepancy was noted between the two references, the original article was retrieved. The original article was used as the gold standard against which the original reference was judged. If there was any error in the reference, it was deemed to be incorrect.

Each error found was listed and categorised. This was done according to six chosen bibliographic headings (article title, author name, journal name, year of publication, volume or pages) and also type of error (incorrect spelling, punctuation, numerical inaccuracy, inaccurate wording and incomplete/missing information). The grouping of incomplete/missing information in the citation included those citations that had incomplete titles or author lists, and where it was not indicated that the article was in abstract form only or was in a supplement to the journal.

The results of the analysis of the citations in Volumes 12 and 22 were compared, and analysed using Fisher’s exact test and a two-tailed P-value was calculated.

**Results**

A total of 1108 citations from Volume 22 were included in the study. A random selection of 100 of these citations was analysed. Nine of these were excluded (six book references, three government reports), and another nine random references were subsequently analysed. All referenced articles were able to be retrieved.

Thirteen citations had one error, and two citations had two errors. Thus, there were 15 citations with errors (15%, 95% CI 9.3–23.3%) with a total of 17 errors within the 100 citations analysed (17%, 95% CI 10.9–25.5%). Table 1 shows the total number of errors compared with Volume 12.

An analysis of each error and comparison with Volume 12 is tabulated in Tables 2 and 3.

**Discussion**

This study demonstrates that the frequency of errors in citations published in Emergency Medicine Australasia

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Table 1. Total errors found

| Type of error            | Volume 12 (n = 100) | Volume 22 (n = 100) | Difference (95% CI of difference) |
|--------------------------|---------------------|---------------------|-----------------------------------|
| Number of citations with errors (%) | 35                   | 15                   | 20% (8.0–31.3%)                   |
| Total number of errors (%)     | 41                   | 17                   | 24% (11.5–35.5%)                   |
had fallen significantly over the past 10 years. The previously published error rate of 35% in Volume 12 of the journal has fallen to 15% of citations containing errors in Volume 22. This rate is at the lower end of previously published studies of this topic concerning other medical journals.

This study was not designed to identify the reasons why the accuracy of referencing was improved. However, there are a number of possible explanations. In the intervening decade from the index study, there have been a number of changes to the management of papers submitted to *Emergency Medicine Australasia*. The most significant of these was in 2005, with the adoption of a web-based peer review and online manuscript submission process (Manuscript Central™). This system, by ScholarOne (Charlottesville, VA, USA), hugely improved the process of submission, peer review, annotation and formatting of papers submitted to the journal. The previous process followed by the journal, which was dependant on files being sent by email and by post on disks, and which was recognised as being extremely inefficient. The new system was fully in place by September 2005, and was the exclusive means for submitting and reviewing papers from Volume 18 onwards. With the move to the more streamlined, user-friendly submission process, it might be that one of the benefits would be that the accuracy of the citations would be improved.

Along with the changes in administration, the journal has also achieved its first impact factor in 2009. This impact factor of 0.901 ranked the journal as the 11th out of the 19 journals in the 2009 ISI Journal Citation Reports Emergency Medicine Category. This reflects the high quality of papers being published in the journal, one measure of this quality being the accuracy of citations within it. This current study examines changes in reference accuracy in the Australasian emergency medicine journal (now known as *Emergency Medicine Australasia*), in the 10 years since the last analysis was undertaken.

It is also true that the intervening decade has seen an exponential increase in the usage of reference bibliography systems, such as EndNote® and Reference Manager®. This might have contributed to the quality improvement seen.

There is reason to question as to whether accurate referencing in scientific journals is important or not. Previous studies have pointed to a high retrievability of articles even with a high error rate. Also, even if a reference is accurate, it is impossible to say, without sourcing the original article, whether it is appropriate in the context of the paper in which it is being quoted, or if indeed it addresses the point being made in that paper. Quotation inaccuracies might also have the potential for more serious consequences regarding treatment and patient management by providing misleading information.

However, it is known that inaccurate references might affect the computerised citation databases, such as Science Citation Index Expanded®, Web of Science®.

### Table 2. Bibliographic errors

| Type of error       | Volume 12 (n = 100) | Volume 22 (n = 100) | Difference (95% CI of difference) |
|---------------------|---------------------|---------------------|-----------------------------------|
| Title (%)           | 25                  | 9                   | 16% (5.6–26.2%)                   |
| Author name (%)     | 5                   | 5                   | 0% (–6.8–6.8%)                    |
| Journal name (%)    | 1                   | 0                   | 1% (–2.8–5.4%)                    |
| Year of publication (%) | 0                  | 0                   | 0% (–3.7–3.7%)                    |
| Volume (%)          | 0                   | 0                   | 0% (–3.7–3.7%)                    |
| Pages (%)           | 10                  | 3                   | 7% (–0.01–14.7%)                  |

### Table 3. Type of errors found

| Type of error                  | Volume 12 (n = 100) | Volume 22 (n = 100) | Difference (95% CI of difference) |
|-------------------------------|---------------------|---------------------|-----------------------------------|
| Spelling (%)                  | 6                   | 3                   | 3% (–3.3–9.8%)                    |
| Punctuation (%)               | 11                  | 5                   | 6% (–1.8–14.1%)                   |
| Numerical inaccuracy (%)      | 5                   | 3                   | 2% (–4.2–8.5%)                    |
| Wording (%)                   | 10                  | 2                   | 8% (1.3–15.6%)                    |
| Missing/incomplete documentation (%) | 9                  | 4                   | 5% (–2.2–12.6%)                   |
and Journal Citation Reports®, which are the source of a journal’s impact factor. It is also true that the citation rate for individual authors and their subsequent metrics like the H-Index might be affected by inaccurate referencing.

Conclusion

This paper demonstrates a significant improvement in the accuracy of references in the journal *Emergency Medicine Australasia* over the past decade. This paper did not identify the reasons for this improvement, but potential causes might include the introduction of a web-based peer review and manuscript submission process, as well as improved reference bibliography systems by authors. In addition, an increase in the overall standard of paper submitted to the journal might have contributed to this improvement.

Competing interests

None declared.

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