Impact factor and study design: the Academic Value of Published Research (AVaRes) score

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ABSTRACT

INTRODUCTION To compare the citation indices of original articles and case reports in otolaryngology journals and thereby determine whether case reports are of less interest and possibly of academically inferior value to original articles.

MATERIALS AND METHODS All articles in two reputable UK otolaryngology journals (*Clinical Otolaryngology and Journal of Laryngology and Otology*) for 2000 and 2001 were identified. Citation indices were obtained from ISI Web of Knowledge and compared. Statistical analysis was performed using Microsoft® Office Excel 2003.

RESULTS Review articles were cited most frequently with a mean of 5.21 followed by original articles with 4.28 citations and case reports with 2.40 citations. The difference in citing between original articles and case reports was statistically significant ($P < 0.0001$). There was no statistically significant difference in citations between review articles and original articles.

CONCLUSIONS As case reports are clearly of lesser academic value than original and review articles, we suggest a scoring system incorporating journal impact factor and a scoring multiple taking into account study design. This facilitates easier comparison and recognition of publications in *curricula vitae* during job application.

KEYWORDS

Academic value – Research – Publications – Impact factor – Citation

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In the last 20 years there have been major changes in the configuration of ENT training. With the introduction of the Calman reforms in 1996, it has become more difficult for trainees to participate in dedicated periods of research. Nevertheless, emphasis is still placed on publications in reputable journals in all application forms for higher training.¹

We wanted to identify whether we could incorporate the level of study design of the publication (*i.e.* case report, original article, randomised controlled trial) and the impact factor of the journal in determining the merit of a particular publication. This would provide a unique multiple which could be awarded a certain score. Trainees could then be compared with regard to their publicised work, by taking into consideration the study design and journal impact factor.

It is well recognised that various study designs can be ranked into different 'levels of evidence'.² The hierarchy of the levels of evidence is dependent on the relative reliability and reproducibility of the individual study designs. Expert opinions and non-systematic reviews are considered to provide the least dependable information. Controlled studies take up higher positions in hierarchies whilst meta-analyses or systematic reviews are the gold standard

of scientific research. Case reports, although at the lower end of the hierarchy, still provide valuable information that may, influence clinical practice and decision making.

Journal impact factors are, amongst other indicators, a measure of their relative importance in the academic world. Articles that are published in high impact journals are deemed to be more important. It is, therefore, plausible to incorporate the impact factor in commending a publication.

The citation index is an important measure of academic merit, by which authors can keep track of articles that cite their work in different academic journals. The first citation index was established in the early 1960s in social sciences and has since migrated across all faculties.⁵ However, the citation index of an article is a dynamic measure which will be static or increase over a given time period. The individual citation index of any given article will, therefore, be dependent on many variables, including time. By establishing a multiple which can be applied to all articles in order to recognise their average merit, articles can be more reasonably compared in a methodical fashion.

The aim of this study was to compare the citation indices of case reports and original articles in the UK otolaryngology

literature. We also wanted to produce a unique scoring system incorporating study design and impact factor of the respective journals to compare publications easily and systematically. Trainees would thus benefit by receiving proportionate merit for research that they have conducted.

Materials and Methods

The citations of all articles in two otolaryngology journals were compared. Articles from *Clinical Otolaryngology* 2000 and 2001 were compared to articles in the *Journal of Laryngology and Otology* 2000. Articles were separated into clinically based original articles, laboratory based original articles, review articles and case reports. Randomised controlled trials were included in clinically based original articles. Data were retrieved from ISI Web of Knowledge,⁵ collated in spreadsheets and statistical analysis was performed in Microsoft® Office Excel 2003. The data appeared non-parametric and the samples were all independent. Hence, descriptive statistics and the Mann-Whitney U-test were utilised.

Results

Clinical Otolaryngology published 67 original articles in both 2000 and 2001. The *Journal of Laryngology and Otology* published 87 original articles in 2000. There were 144 case reports published in *Journal of Laryngology and Otology* and no case reports were published in *Clinical Otolaryngology*. In 2000, *Clinical Otolaryngology* published 12 review articles, 60 clinically based original articles and 7 laboratory based original articles. In 2001 *Clinical Otolaryngology* published 13 review articles, 54 clinically based original articles and 15 laboratory based original articles. *Journal of Laryngology and Otology* published 4 review articles, 75 clinically based original articles and 12 laboratory based original articles. Review articles had a

mean citing of 5.21, overall original articles had a mean citing of 4.28 and case reports had a mean citing of 2.67 (Table 1). The difference in citing between original articles and case reports was statistically significant ($P < 0.0001$; $z = 4.38$). There was no statistical significant difference between the citing of laboratory and clinically based original articles ($P = 0.28$; $z = 0.58$). There was, furthermore, no statistical significant difference between citing of original articles and review articles ($P = 0.37$; $z = -0.32$).

Of the 144 case reports, 38 had not been cited at all (26.38%) and 40 (18.09%) of the 221 original articles had not been cited at all. Eight (27.58%) of the 29 review articles were not cited at all. The mathematical mode of citations of all articles except laboratory based research was zero indicating that many articles published are not cited at all. The median citation of original articles was 3 and 4 for laboratory based research, while case reports had a median of 2 citations. We did not exclude or assess self-citations, and there is, therefore, a risk that these may skew data.

For the year 2000, the journals *Clinical Otolaryngology* and *Journal of Laryngology and Otology* had impact factors of 0.839 and 0.482,⁴ respectively.

Discussion

Although citations have limitations, they may offer vital information on how often scientific data are used and referenced. Our results indicate that review articles are cited most frequently, followed by laboratory based research and clinically based research. Case reports are cited only half as frequently as the original article types under discussion. These data are similar to results shown by Patsopoulos *et al.*⁵ and also relate to current viewpoints on hierarchies of evidence.

High citation rates of articles may not necessarily correlate with importance or usefulness of content; for example, articles may be cited merely to criticise or refute the content.

Table 1 Citation data of articles

Article type	Total	Citations mean (range, $\pm$ SD)	Mode	Median
Review articles	29	5.21 (0–20, $\pm$ 5.45) ^a	0	3
All original articles	221	4.28 (0–24, $\pm$ 4.25)	0	3
Laboratory based	32	4.34 (0–18, $\pm$ 3.82) ^b	2	4
Clinically based	189	4.26 (0–24, $\pm$ 4.33)	0	3
Case reports	144	2.40 (0–13, $\pm$ 2.67) ^c	0	2

^aNo statistically significant difference in citations between review articles compared to original articles ($P = 0.37$).

^bNo statistically significant difference in citations between laboratory based and clinically based articles ($P = 0.28$).

^cStatistically significant difference in citations between original articles and case reports ($P < 0.0001$).

Table 2 AVaRes scoring system

Candidate	Study design	Journal	Impact factor 2005	Multiple	Score
1	Case report	<i>Clinical Otolaryngology</i>	0.983	0.983	1 (multiple 0–1)
2	Original article	<i>Laryngoscope</i>	1.617	3.234	3 (multiple > 2)
3	Case report	<i>Journal of Laryngology and Otolaryngology</i>	0.546	0.546	1 (multiple 0–1)
4	Case report	<i>Laryngoscope</i>	1.449	1.449	2 (multiple 1.1–2)

Indeed, high citations may merely indicate that the article is of interest, but may not be of any clinical or academic importance at all. Nevertheless, the citation index indicates that the article's content is in active debate and reflects the importance of that particular topic in current clinical debate.

Our results confirm that case reports are correctly positioned at the lower end of the hierarchy of evidence. However, whilst our data do suggest a lower academic value to case reports when compared with original and review articles, it does show that not all case reports are without value (as measured by citation index). We also show that not all original and review articles are automatically of greater academic value than a case report, with 73.62% of all case reports having a higher citation index than 18.09% of all original and review articles. Reviews that are not systematic may not reflect current evidence-based medicine; thus, it is important that these articles are peer-reviewed prior to publication (*Journal of Laryngology and Otolaryngology* and *Clinical Otolaryngology* are both peer-reviewed). These articles are otherwise of little more value than an expert opinion case report.

As long as research and journal publications are counted towards a trainee's assessment, we suggest that case reports are weighted half as much as original articles but are included in publication listings. The automatic exclusion of case reports from short-listing criteria is an unscientific approach, and the incorporation of the citation index of all articles and the impact factor of the journal may be a better guide as to the academic usefulness of articles published.

We, therefore, suggest a scoring system using the product of the study design and the impact factor of the respective journal for that year. Based on our results, original and editorial review articles would be allocated a base value of 2 on the study design, whilst case reports would have a base value of 1. The base value would be multiplied by the impact factor of the publishing journal to give the unique scoring multiple. Multiples in the range 0–1 would score 1 point, multiples of > 1–2 would score 2 points and multiples in range of > 2–3 and higher would score 3 points, *etc.* (see Table 2). The scores can then be viewed cumulatively and

trainees may then be compared for the scientific merit of their academic contribution to surgical knowledge. Case reports in journals with higher impact factors would thus score more highly to indicate higher academic value, whilst review and original articles in lower impact journals would be recognised as of lower merit than a similar article in a more meritorious journal. This form of scoring is certainly not limited to UK training and assessment and may be applied internationally. Furthermore, the system may be used across the board in all specialties.

We, therefore, believe that surgical training application forms should request the journal impact factors, and the study type for all articles, to enable such a scoring system to be analysed for each applicant.

Conclusions

Job applications at all levels of the medical hierarchy require information regarding published scientific work. At consultant level, this tends to concentrate more on direction of research interests, while at trainee level it remains largely a numerical exercise.⁶ We believe that all publications in peer-reviewed journals should be given appropriate consideration, based on their academic merit, as assessed in this study. This simple scoring tool should make that numerical assessment more fairly representative of the relative merits of different scientific papers, and more transparently structured.

References

1. Kmietowicz Z. Research and work abroad are discouraged in UK's new training agenda. *BMJ* 2005; **331**: 1426.
2. Phillips B, Ball C, Sackett D, Badenoch D, Straus S, Haynes B *et al.* *Levels of evidence and grades of recommendations*. Oxford: Oxford Centre for Evidence-Based Medicine. <http://www.cebm.net/levels_of_evidence.asp> [Accessed June 2006].
3. Wikipedia. <http://en.wikipedia.org/wiki/Citation_index> [Accessed June 2006].
4. ISI Web of Knowledge. <<http://wok.mimas.ac.uk>> [Accessed May 2006].
5. Patsopoulos NA, Analatos AA, Ioannidis JPA. Relative citation impact of various study designs in the health sciences. *JAMA* 2005; **293**: 2362–6.
6. Doshi J, Anari S. Variations on the application procedures for the specialist registrar posts in otolaryngology. *Clin Otol* 2006; **31**: 75–8.