Assessing the evolution of publications by Brazilian spine surgeons in the last decade

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Abstract

Purpose To evaluate the scientific contribution of Brazilian Spine Surgeons not only in number of publications but also in their quality between January 2000 to December 2011.

Methods A literature search of publications by Brazilian spinal surgeons on topics concerning the spine or spinal cord was performed using an online database; Pubmed.gov. The results were limited to articles published from January 2000 to December 2011. A total of 1,778 articles were identified after a Medline search. After exclusion criteria, the study comprised 206 articles. The quality of the Journals was assessed with IF and the article quality using the Oxford classification.

Results An increasing number of publications by Brazilian spine surgeons was observed in recent years: 45.1 % of those papers were published during the last 4 years

(2008–2011). Clinical studies and case reports were the most frequent types of article published (37.5 vs 31.1 %). An increasing number of Brazilian publications in non-Brazilian journals has been observed in recent years (linear-by-linear association: 5.449, $P = 0.020$). The Arquivos de Neuro-Psiquiatria was the most frequent journal in which the papers were published ($N = 67$, 32 %). The IF of the publications varied from 0.021 to 8.017. The analysis of quality of the articles using the Oxford classification demonstrated that most of them provided LOE 4 ($N = 113$, 54.9 %) or 5 ($N = 45$, 21.8 %).

Conclusions There have been an increasing number of publications by Brazilian spine surgeons in recent years and the quality of the articles published has improved. Also the number of publications by Brazilians in non-Brazilian journals has increased in recent years.

Keywords Spine surgery · Manuscript preparation · Medical publication · Research · Brazil

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Introduction

Knowledge is an action that is in a continuous state of becoming, rather than in a state of being. Continuing education concerns a field of knowledge guided by a critical analysis of trends of continuity and the emergence of new approaches to education. The only way in which professionals can achieve this permanent education is to keep informed of changes in the state of art. It is understandable that a strong, linear relationship exists between new information/knowledge and improved practice.

The main reason for scientific publication is to share information. The new research studies and articles published about spine pathologies have provided remarkable

developments and refinements in basic sciences, diagnosis and choice of treatments in the last decade. This information is even more important when it comes from the different continents, because it shows that information can be provided and applied by physicians around the world to solve their daily medical problems.

Heldwein et al. [1] reported a rising curve in contributions by Brazilian authors in general surgery articles, with Brazil climbing from the 34th position (0.07 %) in the Seventies to the 13th position in the 2000s (1.47 %). The same trend was seen by Tess et al. [2], with the number of articles published in cardiology by Brazilian authors rising from 77 in 2000 to 109 in 2003.

The purpose of this article is to evaluate the scientific contribution of the Brazilian Spine Surgeons, not only in number of publications but also in their quality during the period from January 2000 to December 2011.

Materials and methods

A literature search of publications by the Brazilian spinal surgeons on spine or spinal cord topics was performed using an online database; Pubmed.gov. The results were limited to articles published from January 2000 to December 2011. The search terms used were Brazil* and (“spine” or “spinal diseases” or “spinal cord” or “spinal cord diseases” or “vertebroplasty” or “arthrodesis” or “discectomy” or “foraminotomy” or “laminectomy” or “denervation” or “back injuries”).

Based on title and abstract we excluded articles that were not published in the delimited period (2000–2011), articles not related to spine surgery, letters to the editor, articles published in Brazilian journals but without Brazilian authors, case reports of Brazilian spine disease patients without Brazilian authors and articles in which we could not find the presence of spinal surgeons among the authors (Fig. 1). The retrieved articles were evaluated by two independent authors. In case of differing classifications, the two reviewers discussed their results according to the classification scheme and found a consensus.

The articles were identified and analyzed the authors’ variables (name, affiliations, state), the journal variables [name, country and impact factor (IF)], and the article variables (Oxford classification, type of publication, the main pathology studied) were evaluated. We considered national journals to be all those published in Brazil, independent of their circulation (national or international), and considered international journals to be those published in other countries.

The quality of the journals was evaluated with the IF of the journal. The IF of the journal was assessed using the classification published in 2010 in the Journal of Citation

Fig. 1 Literature review of publications by the Brazilian spinal surgeons on spine or spinal cord topics using an online database of Pubmed.gov. during the period from January 2000 to December 2011 with the total numbers and the exclusion criteria

Reports (JCR) [3]. The quality or level of evidence (LOE) of the articles published was evaluated using the Oxford classification [4]. Citations of articles were assessed primarily in the web of science and secondarily in SCOPUS, and then the number of citations per year of publication was calculated. The type of article was divided into clinical studies, case reports, experimental studies, case series, reviews, technical reports and meta-analyses.

Statistical analyses were conducted with SPSS 19.0. Categorical variables were presented as number and proportion. Linear-by-linear association tests were conducted to verify improvement in quality of publications during the last decade.

Results

A total of 1,778 articles were identified after a Medline search (Fig. 1). Most of them were excluded based on the information provided in the title or abstract. Of 690 potentially eligible publications, the majority were excluded because they were not related to spine surgery or none of the authors was a Brazilian spine surgeon. The study comprised 206 articles published at Medline with at least one author who is a spinal surgeon.

An increasing number of publications by Brazilian spine surgeons was observed in recent years: 45.1 % of those papers were published during the last 4 years (2008–2011), 39.3 % between 2004 and 2007, and only 15.5 % between 2000 and 2003 (Fig. 2).

It was observed that much of spine research in Brazil is concentrated in the Southeast region. Most papers were

Fig. 2 Number of articles included after Medline search during the elapsed time of 2000–2011 ($N = 206$)

provided by authors from that region (71.4 %), followed by the South (18.4 %), the Northeast (5.3 %) and the Midwest (4.9 %). No articles were found by authors from the North of Brazil.

Of the 206 articles included in the study, 6 (2.9 %) were performed with the participation of foreign authors, 3 (1.5 %) of them North American, 1 (0.5 %) German, 1 (0.5 %) Italian, 1 (0.5 %) Canadian, and 1 (0.5 %) French.

Of the 87 institutions listed in the articles, only 6 (6.9 %) had graduate programs in Neurosurgery and Orthopedics. Despite this, of the 206 papers included, 74 (36.8 %) were connected to one of these institutions.

Clinical studies and case reports were the most frequent types of article (37.4 vs 31.1 %) of all published articles. Other types were less frequent: experimental studies ($N = 22$; 10.7 %), case series ($N = 16$; 7.8 %), narrative reviews ($N = 14$; 6.8 %), technical reports ($N = 10$; 4.9 %), and meta-analyses ($N = 3$; 1.5 %).

Initially most of the indexed articles were published in Brazilian journals ($N = 82$; 39.8 %). However, an increasing number of Brazilian publications in non-Brazilian journals has been observed in recent years (Fig. 3, linear-by-linear association: 5.449, $P = 0.020$). The most common journal in which the articles were published ($N = 67$, 32 %) was a Brazilian Journal named *Arquivos de Neuro-Psiquiatria* (Arq Neuropsiquiatr) (Fig. 4). Journals which published less than 3 articles were included in the category “others”: *Pediatric Neurosurgery* (1), *Revista do Colégio Brasileiro de Cirurgiões* (1), *Physiotherapy* (1), *International Orthopedics* (2), *Journal of Neurosurgical Science* (2), *Stereotactic and Functional Neurosurgery* (2), *Acta Neurochirurgica Supplement* (2), *Journal of Spinal Disorders and Techniques* (1), *Surgical Neurology International* (1), *International Journal of General Medicine* (1), *BMC Emergency Medicine* (1), *Neurosurgical Focus* (2), *Pediatric Neurology* (2), *Neurology* (1), *Revista da Associação Médica Brasileira* (1),

Fig. 3 Trends of publication in Brazilian and non-Brazilian journals during the period (linear-by-linear association: 5.449, $P = 0.020$)

Journal of Neurosurgery Pediatrics (2), *São Paulo Medical Journal* (2), *Neurology India* (1), *Journal of Clinical Neuroscience* (1), *Journal of Trauma* (1), *Transplantation Procedures* (2), *Indian Journal of Orthopedics* (1), *Brazilian Journal of Medical and Biological Research* (2), *Journal of Craniomaxillofacial Surgery* (1), *Neurosurgical Review* (2), *Scandinavian Journal of Infectious Disease* (1), *Journal of Neuroscience Methods* (1), *The American Journal of Medical Sciences* (1), *Tropical Doctor* (1), *Fetal Diagnosis and Therapy* (1), *Revista do Hospital de Clínicas da Faculdade de Medicina de São Paulo* (1), *Neuroscience Letters* (1), *Artificial Organs* (1), *British Journal of Sports Medicine* (1), *Digestive Diseases and Science* (1), *Revista Brasileira de Anestesiologia* (1), *International Journal of Neuroscience* (1), *Revista da Sociedade Brasileira de Medicina Tropical* (1), *Revista Brasileira de Fisioterapia* (1), *Journal of Neuroimaging* (1), *Journal of the American Veterinary Medical Association* (1), and *Journal of Children's Orthopedics* (1).

The IF of the publications varied from 0.021 to 8.017. Most of the articles were published in journals with an IF of less than 1 (54.0 %), 32.3 % between 1 and 2, and 13.6 % greater than 3. There was a non-statistically significant tendency, to an increasing number of publications with a greater IF in the last 4 years (Fig. 5, Chi square: 6.115, $P = 0.191$).

Citations could be assessed in 199 articles; the remaining 7 articles were not found either in the web of science or SCOPUS database. A total of 998 citations were retrieved from 199 articles (median citation per article = 3; $P25 = 1$, $P75 = 8$). Number of citations per article varied from zero (23.6 % of articles) to 39 citations (1 article; 0.5 %). The mean number of citations per year of publication was $0.98 (\pm 0.70)$. Linear-by-linear association test

Fig. 4 Number of publications according to journals

Fig. 5 Proportion of papers according to impact factor (Chi square: 6.115, $P = 0.191$)

did not find a difference in the number of citations per year of publication during the last decade (linear-by-linear association: 0.353, $P = 0.552$).

The analysis of quality of the articles using the Oxford classification demonstrated that most of them provided LOE 4 ($N = 113$, 54.9 %) or 5 ($N = 45$, 21.8 %); there were 14 articles with LOE 3b (6.8 %), 6 with 2c (2.9 %), 23 with 2b (11.2 %), 2 with 2a (1.0 %), 2 with 1b (1.0 %) and 1 with 1a (0.5 %). However, an improvement of LOE has been observed in Brazilian publications in the last few years (Fig. 6, linear-by-linear association: 25.429, $P < 0.0001$).

Discussion

More international exchange opportunities, widespread use of the internet and more surgeons dedicated to basic and clinical research could be responsible for the rising curve of publications in recent years [5].

Fig. 6 Trends in level of evidence of the Brazilian articles in the last 12 years using the Oxford classification (Linear-by-linear association: 25.429, $P < 0.0001$)

Arquivos de Neuro-Psiquiatria (Arq Neuropsiquiatr) was the most common Brazilian journal with Medline indexation in which articles were published (32.5 %). This percentage is 39.8 % of the total number of publications in Brazilian journals. The English language can be a barrier, and other types of biases (bias towards nationality) can influence the approval rate [6, 7]. Interestingly, international collaboration and multicenter trials seem to be needed because only 6 (2.9 %) articles have authors from different countries. The United States was the country whose investigators most frequently collaborated with Brazilian authors.

We observed a tendency of clinically oriented publications and case reports. Rothoerl et al. [8] evaluated the quality of the neurosurgical literature according to evidence-based medicine and found similar results. A similar analysis was carried out concerning pediatric surgery journals by Thakur et al. [9]. One may wonder why so many case reports are published in a surgical field. One reason may be that they are cheap, quick, and easy to perform and personal experiences from one institution can thus be disseminated quickly [10]. They could form a basis for defining new diseases or subgroups of others, so case reports can be a starting point for more detailed investigations. Although surgeons are aware of the importance of evidence-based medicine, only (1.5 %) articles were meta-analyses.

The quantitative analysis of scientific production is not sufficient to determine the quality and relevance of the scientific activities performed by spine surgeons. However, this paper shows that despite the quantity, the quality of the publications also increased. The increase of publishing articles in indexed journals, both in international and regional databases, indicated that researchers are concerned with the visibility of their publications. The criteria adopted by the Coordenação de Aperfeiçoamento de Pessoal de Ensino Superior (CAPES) to assess institutional production, which

privileges indexed publications, may also have contributed to this trend [11].

The increased number of graduate programs in orthopedics and neurosurgery in the last 10 years was one of the factors responsible for the increased number of publications, since the most important institutional IF is the number of publications per year. This information was observed in the present work, because of the 206 papers included, 74 (36.8 %) were connected to one of these institutions, and of the 87 institutions listed in the articles, only 6 (6.9 %) had graduate programs in neurosurgery and orthopedics. Funding agencies and institutional committees responsible for deciding on promotions or selection of candidates to academic positions, frequently based their decisions on the number of articles published in prestigious mainstream international journals.

Many factors lead to the promotion of Brazilian scientific production: the growing presence of Brazil in this worldwide ranking of indexations; from the 22nd position in 1998, to 13th in 2008; the input of development resources for research from the federal agencies, especially in recent years, together with funding from the states; growth in the number and size of the federal scholarships, corrected in 2004, and 2008 by 67 % (nominal variation); the increasing number of people with graduate degrees in graduate programs, especially in doctorates, where most of the Brazilian scientific production takes place; demanding better individual performance from the researchers in the evaluation by all development agencies; the demands for course performance in graduate evaluations by CAPES; and the creation of the Qualis Program, which classifies foreign and Brazilian journals to guide the CAPES evaluation.

In conclusion, there have been an increasing number of publications by Brazilian spine surgeons in recent years and the quality of the articles published has improved. Although English is not the native language of Brazil, an increasing number of Brazilian publications in non-Brazilian journals has been observed in recent years. There is

an expectation that along with the greater number of post-graduates in orthopedic and neurosurgery and with more doctors being trained, the number of articles published will increase.

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Conflict of interest None.

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