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Bibliometric Analysis of Erectile Dysfunction Publications in Urology and Sexual Medicine Journals

Michael E. Rezaee, MD, MPH,[1] Heather A. Johnson, MLIS,[2] Ricardo M. Munarriz, MD,[3] and Martin S. Gross, MD[1]

ABSTRACT

Introduction: Scientific literature has experienced a significant growth in the number of authors per publication each year. Erectile dysfunction (ED) is one of the most common urologic conditions, accounting for over 2.9 million outpatient visits per year. Given the prevalence of ED and the large literature base available on this condition, bibliometric analysis of the ED literature could provide urologists and sexual medicine specialists with a better understanding of publication trends in this topic area.

Aim: The purpose of this study was to investigate trends in authorship, citations, and impact score for ED original and review articles published in urology and sexual medicine journals.

Methods: We analyzed ED original research and review articles indexed in MEDLINE between January 1, 2006, and December 31, 2016. Descriptive statistics were used to evaluate the mean number of authors for articles by journal type and time period (2006 vs 2016). Linear regression was used to examine the relationship between number of authors, number of citations, and relative citation ratio (RCR).

Main Outcome Measure: The primary outcomes of interest included mean number of authors, citations, and RCR per manuscript by journal type and time period.

Results: A total of 3,516 articles were analyzed, 2,938 (83.6%) original and 578 (16.4%) review articles. The mean number of authors among ED publications increased from 4.8 in 2006 to 6.4 in 2016, a 34.4% increase. Original articles had a greater mean number of authors compared to review articles (6.0 vs 4.3, $P < .001$). The mean number of authors for original articles significantly increased from 5.0 in 2006 to 7.0 in 2016 ($P < .001$), an increase of 38.9%. A positive linear relationship was observed between mean number of authors and number of citations per manuscript ($r = 0.015$, $P < .01$) as well as RCR ($r = 0.37$, $P < .0001$). The largest authorship increases were observed in *European Urology* (78.8%), *BJU International* (78.6%), and *Journal of Sexual Medicine* (58.1%).

Clinical Implications: Authorship trends should be taken into consideration when urologists and sexual medicine experts review ED articles for the purpose of informing patient care.

Strength and Limitations: Primary strengths include a large literature base spanning multiple years for analysis and a systematic literature search to identify relevant ED literature. Findings are limited to ED literature published in the urology and sexual medicine journals analyzed.

Conclusion: The number of authors per ED manuscript has significantly increased over time, most notably among original research articles. Increasing authorship was associated with more citations and higher RCR in the ED literature.
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Key Words: Erectile Dysfunction; Men's Health; Trend Analysis; Bibliometric Analysis; Authorship

INTRODUCTION

Erectile dysfunction (ED) is one of the most common urologic conditions, accounting for over 2.9 million outpatient visits per year.[1] The enormity of this disease has been well represented in the academic literature. The Feldman et al[2] 1994 study on the relationship between ED and psychosocial factors is the most cited urology publication to date.[3] 3 of the top-11 most cited urology publications pertain to ED.[3] Despite the importance of this disease

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[1]Section of Urology, Department of Surgery, Dartmouth-Hitchcock Medical Center, Lebanon, NH, USA;

[2]Mathews-Fuller Library, Dartmouth College, Lebanon, NH, USA;

[3]Department of Urology, Boston University Medical Center, Boston, MA, USA

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to both the fields of urology and sexual medicine, little research has been conducted to examine publication trends in the ED literature.

In general, scientific literature has experienced significant growth in the number of authors per publication each year.[4] This phenomenon is also occurring in the urology literature.[5,6] A study by An et al[5] recently reported a 46.1% increase in the number of authors for original and review articles for all urology topics over the last decade. It is unclear what may be driving this growth. Potential explanations include an increase in study complexity, size, and number of research sites, greater student and resident involvement, and unwarranted authorship inflation to enhance article reach and impact.[7,8] Bibliometric analysis can be used to study the implications of this trend.[5]

Bibliometric analysis is an evaluation methodology that characterizes the quality and impact of scientific articles in a given field.[9] It can be used to help guide publishers and authors in comparing articles and determine which manuscripts may drive improvements in patient care. Additionally, factors associated with manuscript impact can be elucidated and subsequently taken under consideration by readers. Given the prevalence of ED and the large literature base available on this condition, bibliometric analysis of the ED literature could provide urologists and sexual medicine specialists with a better understanding of publication trends in this topic area. The purpose of this study was to investigate trends in authorship, citations, and impact score for ED original and review manuscripts published in 11 urology and sexual medicine journals over the last 11 years.

METHODS

PubMed was queried for ED original research and review articles published and indexed in MEDLINE between January 1, 2006, and December 31, 2016. The query was limited to relevant, high-impact urology and sexual medicine journals, including *Andrology*, *Asian Journal of Urology*, *BJU International* (BJUI), *European Urology* (EU), *International Journal of Impotence Research*, *Journal of Sexual Medicine* (JSM), *Sexual Medicine*, *Sexual Medicine Reviews*, *Journal of Urology* (JU), *Translational Andrology and Urology*, and *Urology*. Journals were selected based on the authorship teams' review of all available urology and sexual medicine journals. Journals that were indexed in PubMed and considered to have historically published significant contributions to the ED literature base were included. See Table 1 for included journals and 2016 Journal Citation Reports impact factors. Original research included journal articles, clinical trials, and observational studies, while reviews included systematic reviews, literature reviews, and meta-analyses. Case reports, letters to the editor, guideline statements, editorials, and errata were excluded. The query period was structured to account for:

1) a policy limiting the number of authors applied to certain articles in PubMed that ended in 2005.[10]
2) the time required to retrospectively index published articles in MEDLINE for the year 2016.[10]

Table 1. Urology and sexual medicine journals

Journal	Abbreviation	JCR impact factor*
Andrology	Andro	2.4
Asian Journal of Urology	Asian J	2.9
BJU International	BJUI	4.4
European Urology	EU	16.3
International Journal of Impotence Research	IJI	1.3
Journal of Sexual Medicine	JSM	2.9
Journal of Urology	JU	5.2
Sexual Medicine	SM	1.7
Sexual Medicine Reviews	SMR	0.9†
Translational Andrology and Urology	TAU	0.6‡
Urology	U	2.3

JCR = Journal Citation Reports.
*JCR impact factors are from 2016.
†Source normalized impact factor.
‡Research Gate impact factor.

Specific search strategy terms are available upon request.

Unique article PubMed Identifiers (PMID) from our PubMed search were inputted into the National Institutes of Health iCite web-based portfolio analysis platform to obtain bibliometric information for each article, including citation rate, relative citation ratio (RCR), and author information. RCR is a novel, field-normalized metric developed by *PLoS Biology* to measure the influence of an article based upon a co-citation network.[11] Publications with a top-20 ED author in terms of the number of published articles in the query were also flagged for analysis. Authorship was recognized when an author's name appeared in any author position (ie, first through last) within a manuscript's title.

Descriptive statistics were used to evaluate the mean number of authors for ED articles by journal type and time period (2006 vs 2016). Linear regression was used to examine the relationship among number of authors, number of citations, and RCR. Multiple logistic regression was utilized to examine the relationship between an article's top-20 author status and number of citations and RCR. Descriptive statistics and logistic regression were used to evaluate authorship by journal impact factor category, defined as impact factor less than or greater than or equal to 3.[12] Linear regression was also used to assess the relationship between number of authors and journal volume, defined as the number of issues per journal per year.[12] Statistical significance was defined as $P < .05$. Institutional review board approval was not necessary for this study of publicly available bibliometric data.

RESULTS

The literature search resulted in 3,516 articles for analysis, 2,938 (83.6%) original and 578 (16.4%) review articles. Overall, the mean number of authors among ED publications increased from 4.8 in 2006 to 6.4 in 2016, a 34.4% increase. Original