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Publishing Trends in Otology and Neurotology

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Abstract

Objectives—1) Describe publishing trends for otologic/neurotologic disorders over a 35-year span. 2) Compare trends in publishing with disease prevalence. 3) Evaluate changes in topic and journal specific ranking scores over time.

Methods—PubMed searches were performed on 35 otologic/neurotologic disorders using medical subject headings (MeSH) terms from 1980–2015. Searches were limited in scope to the English language. A Mann-Kendall trend analysis evaluated changes in publication frequency as a discrete variable while correcting for total number of articles published per year. Scopus was used to identify Scimago Journal Rank Indicator (SJR) scores and weighted-averages used to calculate changes over time.

Results—The total number of publications on the 35 topics increased from 853 in 1980 to a peak of 3068 in 2013. Otitis media ($\tau = -0.799$, $p < 0.001$) and Meniere's disease ($\tau = -0.724$, $p < 0.001$) showed strong decreasing publication trends. Temporal bone encephaloceles ($\tau = 0.743$, $p < 0.001$) and cochlear implants ($\tau = 0.740$, $p < 0.001$) showed strong increasing publication trends. Rapid rise in publications on superior canal dehiscence and vestibular migraine illustrate novel diagnoses. The weighted-average SJR score increased from 0.816 in 2000 to 1.160 in 2015 ($p < 0.001$).

Conclusion—This study displays trends in the literature over the past 35 years that are often inconsistent with common disorders seen by otologists/neurotologists. Certain diagnoses that are currently being researched less commonly continue to impact patients with the same regularity. Quality of otologic/neurotologic literature has become more reputable with regards to SJR scores.

Introduction

The role of bibliometrics, the statistical analysis of written publications, in otolaryngology literature is becoming increasingly utilized. Identifying trends within the literature has helped highlight the productivity of different institutions, specialties, and even countries or regions [1,2]. Bibliometrics are also able to delineate the quality of studies [3], and analyze

the reputation and viewership of various journals [2]. There is limited information regarding bibliometric analysis of otologic and neurotologic topics. The current study seeks to discern publishing trends over the previous 35 years within this field by comparing highly discussed topics to current disease prevalence.

In addition, we analyzed the SCImago Country and Journal Rank (SJR) indicator scores for the field of otology and neurotology. The SJR is an open access comparable alternative to a specific journal's impact factor (IF) [4]. Further, the SJR indicator is a metric that provides an objective method for measuring the scholarly influence of specific journals by taking into account the number of citations a journal receives, the impact rank of the journals, and whether the citations are from specific networks either within or outside the field of interest [4]. A journal receives a higher SJR impact score if it has received more citations from other highly ranked journals outside the specified subject field of the journal [4]. Using the Scopus database, we were able to analyze the quality, reputation, and influence of otologic and neurotologic publications over the previous 15 years.

Methods

We conducted a series of PubMed searches of 35 different otologic and neurotologic topics and disorders from January 1, 1980 to December 31, 2015. PubMed filters were applied limiting study results to human subjects published in English language. The specific disorder was searched using medical subject headings (MeSH) terms. MeSH terms are generated by the National Library of Medicine's thesaurus and permit searching for specific terms [5]. Each bibliographic reference is associated with a set of MeSH terms that are continually updated and describe the content of that reference [5]. In the event that the MeSH terms search was unable to provide adequate results, the topic search filter was broadened to include Title/Abstract within the query. The number of articles published within a given year based on our search criteria for each topic was recorded. Data were analyzed using XLStat (Addinsoft, New York, NY, U.S.A) and SigmaPlot 12.5 (Systat Software, San Jose, CA, U.S.A.) A Mann-Kendall trend analysis [6,7], which is used to statistically assess if there is an upward or downward trend of the variable of interest over time, was utilized to capture the changes in publication frequency over time as a discrete variable while correcting for the total number of articles published per a year. This statistical analysis allowed us to measure the ordinal association between articles published per a topic/disorder over a period of time. Results of this statistical analysis are given as Kendall's tau (τ) coefficient, which varies between +1 and -1. When the value of the correlation coefficient lies around +1, then it indicates a perfect positive relationship between two variables. As the correlation coefficient value goes towards 0, the relationship between the two variables will be weaker or no relationship. A negative or inverse relationship is seen as the correlation value goes towards -1. Topics were evaluated both as annual count and as a percentage of the total number of articles cited.

The Scopus database was used to identify SJR scores for individual journals as a way to objectify quality, reputation, and subject field for each journal. We applied the SJR scores to individual topics being reviewed allowing us to analyze which topics have become more influential over time. Weighted-average SJR scores for topics were calculated and compared

for the years 2000 and 2015. This was based on the number of articles cited per journal of those years using the individual journal's SJR score. These two years were chosen for comparison since not all journal SJR scores were available prior to 2000. A Mann-Whitney Rank Sum test was used to compare SJR scores. A value of $p < .05$ was considered to be statistically significant in all calculations.

Results

The total number of searched publications on the 35 topics increased from a total of 853 in 1980 to a peak of 3068 in 2013. The topic that showed the largest decrease in the relative frequency of publication was otitis media ($\tau = -0.799$, $p < 0.001$). Other topics that also showed decreasing trends included otitis externa ($\tau = -0.634$, $p < 0.001$), cholesteatoma ($\tau = -0.629$, $p < 0.001$), and Meniere's disease ($\tau = -0.724$, $p < 0.001$) (Figure 1). Conversely, topics with positive trends included cochlear implants ($\tau = 0.740$, $p < 0.001$), congenital hearing loss ($\tau = 0.629$, $p < 0.001$), and temporal bone encephaloceles ($\tau = -0.743$, $p < 0.001$) (Figure 2). Rapid rise in publication frequency on superior canal dehiscence ($\tau = 0.484$, $p < 0.001$) and vestibular migraine ($\tau = 0.787$, $p < 0.001$) illustrate relatively new and/or novel diagnoses that have elicited further research. Of all the topics, malignant otitis externa showed the least variability in publication frequency over time ($\tau = .01$, $p = 0.946$). Figure 3 displays the cumulative results of the relative changes in publication frequency of the 35 topics reviewed.

The average SJR score of the combined 35 otologic and neurotologic topics increased 42.18% from 0.826 in 2000 to 1.160 in 2015 ($p < 0.001$) indicating that the scholarly influence of the field of otology and neurotology continues to improve. Meniere's disease ($p < 0.001$), mastoiditis ($p = .031$), aural atresia ($p < 0.001$), middle ear implant ($p = .047$), and auditory neuropathy ($p = 0.035$) showed the greatest increase in SJR scores of the 35 topics reviewed from 2000 to 2015 (Figure 4). Only four of the 35 topics reviewed showed a decrease in SJR score from 2000 to 2015 and none of these decreases were statistically significant. These included malignant otitis externa ($p = 0.584$), temporal bone resection ($p = 0.862$), congenital hearing loss ($p = 0.951$), and bone anchored hearing devices or aids ($p = 0.551$). Overall, topics including MD, aural atresia, and auditory neuropathy that spanned multiple specialties (Neurology, Plastic Surgery, Neurosurgery, Pediatrics, Audiology) were associated with higher overall SJR scores as citations generated outside grouped citation fields carried more value than citations within a specified field.

We also evaluated the SJR scores of the journals the 35 topics reviewed were most frequently published in 2015. In decreasing order of SJR scores for the year 2015, the 35 topics reviewed were most frequently found in *Laryngoscope* (SJR 1.342), *Otology and Neurotology* (SJR 1.24), *Otolaryngology – Head and Neck Surgery* (SJR 1.176), *European Archives of Oto-Rhino-Laryngology* (SJR 0.755), *International Journal of Pediatric Otolaryngology* (SJR 0.649), and the *Journal of Laryngology and Otology* (SJR 0.447). The SJR scores for these six journals over the previous 15 years are trended in Figure 5. All six journals showed a positive trend in SJR scores from 2000 to 2015 with the exception of the *Journal of Laryngology and Otology* (SJR 0.447 in 2015 and 0.457 in 2000). There were a total of 198 different journals the 35 topics reviewed were published in during the year 2015.

Discussion

The field of otology and neurotology continues to expand as demonstrated by the dramatic increase in publications within the field over the last 35 years. As mentioned previously, the SJR is an alternative to a journal's IF. There has been an increase in the average SJR score in the year 2015 compared to the year 2000 indicating that the field continues to improve with regards to scholarly influence. Among the top six journals where the 35 topics reviewed are most commonly published, nearly all showed significant increases in SJR scores from 2000 to 2015 indicating that the majority of literature within the field of otology and neurotology continues to become more reputable over time. Continued efforts to generate new and innovative publications within the field of otology and neurotology as well as expansion of topics/disease processes and interventions to specialties outside of otology and neurotology will continue to generate higher SJR scores.

We found that of the disorders reviewed, those with the greatest decrease in publications over time relative to the total number of publications are diagnoses more commonly seen in practice. To illustrate this point, otitis media with effusion (OME) showed the greatest decrease in publications over time. However, otitis media is the most common otologic pediatric diagnosis with approximately 90% of children being diagnosed with either acute or chronic OME at some point before the age of 4 years and approximately half being diagnosed within the first year of life [8,9,10]. Another common disease frequently encountered is cholesteatoma. The annual incidence of cholesteatoma is 3 per 100,000 in children and 9.2 per 100,000 in adults [9]. While the relative publication rate of cholesteatoma and OME is declining, these diseases continue to impact patient quality of life and carry a significant financial burden [11,12]. Given the financial burden of these common maladies and the increasing prevalence, more opportunities for future research could be placed on prevention, diagnostics, and treatments that would help lower costs [11,12,13].

Meniere's disease (MD) also showed a decreasing relative trend in publication frequency. In a study analyzing health care claims information from a database of over 60 million individuals, the prevalence of MD from 2005–2007 was estimated to be 190 per 100,000 people [14]. The decreasing relative publication frequency of MD may be explained by the increased recognition of other disorders, primarily vestibular migraines, which cause similar auditory and/or vestibular symptoms. There has long been an association of migraines and vestibular symptoms; however, the first controlled study looking at vestibular migraines was not until 2001 [15]. The study is able to demonstrate the changing publication trends between MD and vestibular migraines [15]. Superior semi-circular canal dehiscence syndrome (SSCD) is another disorder that can present as hearing changes and vertiginous symptoms [16]. The first published paper on superior canal dehiscence syndrome was not until 1998 [16]. Since this time, improvements in diagnostic capabilities, primarily imaging, and provider awareness have led to an increasing incidence [17]. The rapid rise in publication frequency with superior canal dehiscence syndrome and vestibular migraines can be attributed to being relatively newly recognized clinical entities, and both may be a factor resulting in the relative decrease in publication frequency of MD. Interestingly, MD showed a significant increase in SJR scores overtime. This is likely due to the overlap of symptoms

seen in MD amongst different specialties and the corresponding publications in journals in different citation fields. However, the identification of new diagnoses displaying overlapping symptoms with MD, as previously discussed, may account for the decreasing relative publication frequency.

Publication trends show a significant increase in cochlear implants research. As of 2016, the total number of patients with cochlear implants worldwide was reported to be greater than 600,000 [18]. There continues to be technological improvements in the electrodes, receiver/stimulator design, and speech processing engineering [18,19]. Cochlear implantation is the standard treatment for bilateral severe-to-profound hearing loss in children and adults [19] and as indications for implantation continue to expand so will the number of implanted patients [20]. Improvements in design and function as well as expansion of candidacy will continue to drive the increase in the number of publications.

Temporal bone encephaloceles also demonstrated a large increase in relative publications over the last 35 years. Studies have analyzed the link between temporal bone encephaloceles and spontaneous cerebrospinal otorrhea with obesity, empty sella syndrome, and elevated intracranial pressure [21]. Prior studies have shown that thinning of the skull base and CSF leaks are associated with obesity [22,23,24]. Improved diagnostic capabilities, including imaging and beta-2 transferrin testing, have been helpful in establishing the diagnosis [25]. The increase in incidence of temporal bone encephaloceles and spontaneous cerebrospinal fluid leaks, and thus relative increase in publication frequency, is postulated to be partly related to growing awareness of the disease, improved diagnostic capabilities, and the rising incidence of obesity in the U.S. [26].

Malignant otitis externa showed the least variability with change in publication frequency overtime. However, several studies have shown an increase in the incidence of malignant otitis externa overtime. Chawdhary et al [27] reported a six-fold increase in the number of cases from 1999 (n=67) to 2013 (n=421). Bhasker et al [28] showed a similar significant increase malignant otitis externa from 2004 to 2012. *Pseudomonas aeruginosa* was the causative organism in the majority of the cases, and all pathogens identified were sensitive to ciprofloxacin [28]. It is possible that the low variability in publication frequency overtime for malignant otitis externa is related to the emergence of fluoroquinolones. However, the low variability in change in publication frequency for malignant otitis externa also points to a limitation of the current study. Many of the disorders reviewed have changes in nomenclature overtime. Malignant otitis externa may also be referred to as necrotizing otitis externa or otogenic skull base osteomyelitis, which may be alternative reasons for the low variability.

This study is the first to perform a bibliometric analysis of literature encompassing the field of otology and neurotology. This study demonstrates that the field has been increasing its sphere of influence both in terms of number of publications as well as significantly impacting other areas or disciplines of medicine and research. It also demonstrates that newly described disorders or improved technology can fuel rapid increases in publications. However, because of declining publication trends of common disorders there is opportunity to revisit these disorders for future research.

Conclusions

Trends in the literature over the past 35 years are often inconsistent with common disorders. We highlight certain diagnoses that are being studied at declining rates; however, continue to impact patients with the same regularity. In addition, this study elaborates on one method for objectively evaluating journal reputation and applying that metric to individual topics. The quality and reputation of otologic and neurotologic literature, including the majority of the individual topics reviewed, continues to improve with time as evidenced by increasing SJR scores.

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Figure 1.

Displays the four otologic and neurotologic disease topics with the greatest decreasing relative publication frequency over the previous 35 years when compared to the total number of yearly publications from the 35 topics reviewed.

Figure 2.

Displays selected examples of otologic and neurotologic disease topics with increasing relative publication frequency over the previous 35 years when compared to the total number of yearly publications from the 35 topics reviewed.

Relative Changes in Publication Trends from 1980 to 2015

A	Search Topic/Disorder	Tau	Significance
	Otitis Media	-0.799	p < 0.001
	Meniere's Syndrome/Disorder/Hydrops	-0.724	p < 0.001
	Otitis Externa	-0.634	p < 0.001
	Cholesteatoma	-0.629	p < 0.001
	Otosclerosis	-0.545	p < 0.001
	Ototoxicity	-0.488	p < 0.001
	Tympanoplasty	-0.458	p < 0.001
	Stapes Surgery/Stapedectomy/Stapedotomy	-0.453	p < 0.001
	Facial Nerve Paralysis/Bell's Palsy	-0.402	p < 0.001
	Acoustic Neuroma/Vestibular Schwannoma	-0.249	p = 0.033
B	Search Topic/Disorder	Tau	Significance
	Mastoiditis	-0.143	p = 0.225
	Presbycusis/Age Related Hearing Loss	-0.131	p = 0.269
	Glomus Jugulare	-0.024	p = 0.855
	Malignant Otitis Externa	0.01	p = 0.946
	Temporal Bone Fracture	0.175	p = 0.137
C	Search Topic/Disorder	Tau	Significance
	Vestibular/Cerebellar/Migraine Associated Vertigo	0.787	p < 0.001
	Facial Nerve Schwannoma	0.761	p < 0.001
	Temporal Bone Encephalocele/CSF Leak	0.743	p < 0.001
	Cochlear Implant	0.74	p < 0.001
	Bone Anchored Hearing	0.702	p < 0.001
	Congenital Hearing Loss	0.692	p < 0.001
	Auditory Neuropathy	0.689	p < 0.001
	Auditory Brainstem Implants	0.659	p < 0.001
	Pulsatile Tinnitus	0.612	p < 0.001
	Benign Paroxysmal Positional Vertigo	0.532	p < 0.001
	Tinnitus	0.496	p < 0.001
	Temporal Bone Cancer/Malignancy/Resection	0.485	p < 0.001
	Superior Semicircular Canal Dehiscence	0.484	p < 0.001
	Middle Ear Implant	0.474	p < 0.001
	Microtia	0.462	p < 0.001
	Sudden Hearing Loss	0.423	p < 0.001
	Mastoidectomy	0.413	p < 0.001
	Glomus Tympanicum	0.392	p < 0.001
	Aural Atresia	0.388	p < 0.001
	Ossicular Chain Reconstruction/Ossiculoplasty	0.248	p = 0.036

Figure 3.

A. Displays the 10 otologic and neurotologic topics with decreasing relative publication frequency over the previous 35 years. B. Displays the 5 topics with no change in relative publication frequency. C. Displays the 20 topics with increasing relative publication frequency.

Figure 4.

Displays changes in SJR scores from 2000 to 2015 for the five otologic and neurotologic topics reviewed showing the greatest increase in SJR scores from 2000 to 2015. These include MD ($p < .001$), Mastoiditis ($p = .031$), Aural Atresia ($p < .001$), Middle Ear Implant ($p = .047$), and Auditory Neuropathy ($p = .035$).

Scimago Journal and Country Rank (SJR) Scores from 2000 to 2015

Figure 5.

Displays the top six journals from which publications regarding the 35 reviewed otologic and neurotologic topics are published in and their associated SJR ranking for the years 2000 to 2015.