

# Bibliometric Analysis of Health Services Research in Otolaryngology Journals

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## Abstract

**Objective.** Determine current health services research (HSR) publication trends in major general otolaryngology journals.

**Study Design.** Bibliometric analysis.

**Methods.** All main issues of 8 high-impact general-interest otolaryngology journals published worldwide in 2002, 2005, 2008, and 2011 were searched for HSR-related publications. To qualify as HSR, the abstract of the article must discuss access to care, cost, delivery of care, financing, health organizational or system issues, quality of care, resource utilization, and/or health outcomes. Otolaryngology topics were classified as general, pediatrics, oncology, otology and neurotology, sleep disorders, sinonasal disease, facial plastics, and/or laryngology. Other key measures included study authorship and external sponsorship or mechanism of support.

**Results.** Of 5958 total articles, 449 (7.5%) qualified as HSR. There was a statistically significant increase in the number of HSR publications across all journals from 2002 to 2011 ( $P < .001$ ). Outcomes research (337, 75.1%) was the most common type of HSR being published. The most common subject was oncology (112, 24.9%), whereas the least represented was trauma and facial plastics (4, 0.9%). First and corresponding authors were based in 31 countries, although the United States was the predominant country of origin. Nearly 95% of HSR articles in the current sample demonstrated multidisciplinary authorship. An estimated 22.9% of first authors and 17.8% of corresponding authors were female. Two-thirds of HSR publications reported no external sponsor, whereas the remainder was supported most commonly by philanthropy and hospital-based sources.

**Conclusion.** Health services research is an international, multidisciplinary field of inquiry with an increasing presence in major otolaryngology journals.

## Keywords

health services research, health policy, health reform, bibliometric, publication trends, gender disparities, otolaryngology—head and neck surgery, surgical subspecialty, outcomes, access, cost

In 1995, the Institute of Medicine (IOM) defined health services research (HSR) as “a multidisciplinary field of inquiry, both basic and applied, that examines the use, costs, quality, accessibility, delivery, organization, financing, and outcomes of health care services to increase knowledge and understanding of the structure, process, and effects of health services for individuals and populations.”<sup>1</sup> With rapidly rising health care costs and the future of health reform in the United States at stake, HSR is more relevant than ever in answering policy-relevant questions about the state of US medicine.<sup>2,3</sup>

Like all medical and surgical specialties, otolaryngology faces important questions about the quality and quantity of health care being delivered. In 1994, Piccirillo<sup>4</sup> discussed the relevance of outcomes research (one type of HSR) to many diseases within otolaryngology, suggesting that such studies can be used to assess appropriateness of care. Nearly 2 decades later, it is unclear to what extent HSR and its many subtypes have become integrated into the greater otolaryngology literature. Evidence also suggests that there is persistent confusion about the underlying principles of HSR. For example, Kezirian and Yueh<sup>5</sup> found frequently inappropriate or inconsistent usage of commonly accepted terminology in economic analyses of otolaryngologic disorders.

One method of measuring professional or academic interest in health services and policy is bibliometric analysis of publications pertaining to HSR. Bibliometric analyses have been used previously to estimate the impact of qualitative research on health services and policy, the impact of federal

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**Table 1.** Major Categories of Health Services Research

Health Services Research Categories	Definition
Access to care <sup>29</sup>	“The timely use of personal health services to achieve the best possible health outcomes”
Charges and costs <sup>30</sup>	Charges: prices of medical goods and services as billed to patients and payers Costs: actual monetary measurement of resource consumption by providers and hospitals
Delivery of care <sup>31</sup>	The macro-level components of a health care system, the process enabling patients to receive care, and the individual acts of providing health services to patients
Financing <sup>32</sup>	The economic infrastructure of health care systems, primarily including public and private insurance programs, government-based taxes, and out-of-pocket payments
Health organizations and systems <sup>33</sup>	The interactions among health governance and policy, human resources, finance, information systems, service infrastructure, and medical products in a greater sociopolitical context
Outcomes <sup>34</sup>	“Clinical measures of disease progression, patient-reported health status or functional status, satisfaction with health status or quality of life, satisfaction with services, and the costs of health services” <sup>a</sup>
Quality of care <sup>35</sup>	“The extent to which health services provided to individuals and patient populations improve desired health outcomes and are consistent with current professional knowledge”
Resource utilization	The use of health care resources, such as hospital infrastructure, physician services, and medical products, by patients, providers, and other stakeholders

<sup>a</sup>Costs (and charges) are sufficiently different from other common patient-based outcomes to warrant a separate category.

sponsorship on cost-effectiveness research, the prevalence of HSR in individual journals, and HSR productivity at the researcher, institution, and national levels.<sup>6-13</sup> Herein, I conducted a bibliometric analysis of the general otolaryngology literature to describe the quantity, authorship, content, and sources of sponsorship of the present body of HSR and predict future research priorities pertaining to otolaryngology-related health services and policy. I hypothesized that HSR would demonstrate an increasing presence in the otolaryngology literature over the past decade, consistent with the growing recognition of HSR within the greater medical community.

## Methods

The ISI Web of Knowledge Journal Citation Reports (Thomson Reuters, New York, New York) annually rank peer-reviewed journals by impact factor (IF), a well-known measure of citation frequency. The top 20 otolaryngology journals, based on 2010 IF, were examined, and the 8 journals that were not specifically dedicated to the allied sciences or a subspecialty of otolaryngology and primarily published unsolicited manuscripts were selected for analysis: *The Laryngoscope*, *Archives of Otolaryngology—Head and Neck Surgery*, *Otolaryngology—Head and Neck Surgery*, *Clinical Otolaryngology* (known as *Clinical Otolaryngology & Allied Sciences* before 2005), *Annals of Otolaryngology, Rhinology & Laryngology*, *European Archives of Otorhinolaryngology*, *Acta Otolaryngologica*, and *American Journal of Otolaryngology*. These journals reflect general-interest, high-impact topical content and an international stewardship.

Next, the main issues for each journal for the years 2002, 2005, 2008, and 2011 were acquired and all articles were reviewed. Special themed issues or supplements (eg, symposium

reports) were excluded. Special journal features, such as general, radiology, or pathology-based “Case of the Month” articles, clinical notes, and photographs; “How I Do It” features; general-interest articles (eg, historical articles and book reviews); descriptions of drugs, devices, or instruments; invitation-only manuscripts; editorials and commentaries; letters to the editor; and errata were also excluded, as previously described elsewhere.<sup>14,15</sup>

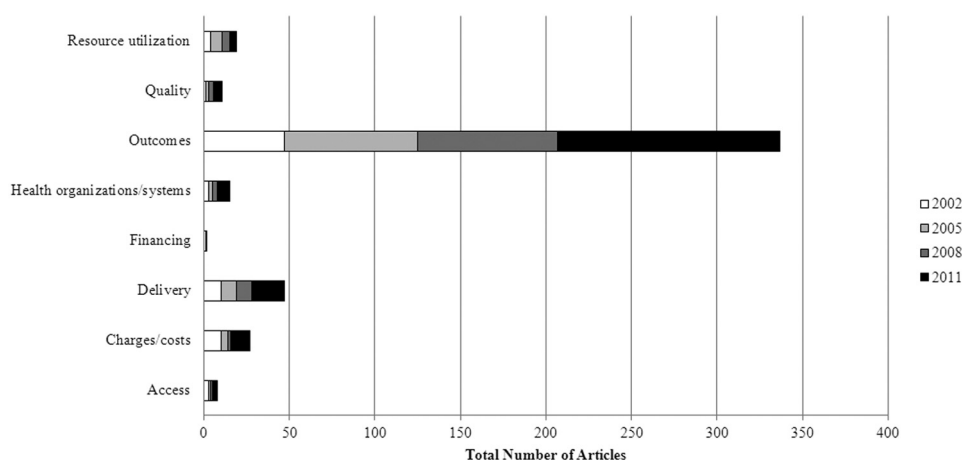
To qualify as HSR, the article was required to evaluate at least 1 of the following topics: access to care, charges and costs, delivery of care, financing, health organizations and systems, outcomes, quality of care, and resource utilization (**Table 1**). This information was extracted directly from the abstract and the Methods section of the article being reviewed. I used study designs proposed by Piccirillo<sup>4</sup> in determining which articles constituted true outcomes research and which were clinical or laboratory research. For the purposes of the current study, qualified outcomes-based studies included the following: prospective observational cohort studies, epidemiologic cohort studies based on computerized administrative or financial databases, and systematic reviews with or without meta-analyses of diagnostic and therapeutic interventions. Outcomes research not using any of the above methodologies must contain an expanded set of patient outcomes to qualify: clear diagnostic criteria for the disease being studied; a clinical-severity index for prognostic stratification; measurement of comorbidities; traditional measures of mortality, morbidity, and physical impairments; patient-based subjective assessments of symptoms, health and functional status, quality of life, and satisfaction with care; and financial impact of care.

Otolaryngologic topics were classified as follows: general, pediatrics, oncology, trauma and facial plastics, sleep

**Table 2.** Distribution of Health Services Research (HSR)–Related Publications in 8 Major Otolaryngology Journals

Journal	2002 HSR/Total Articles	2005 HSR/Total Articles	2008 HSR/Total Articles	2011 HSR/Total Articles	P Value
All journals	73/1325 (5.5)	99/1579 (6.3)	100/1519 (6.6)	177/1535 (11.5)	<.001
A	17/356 (4.8)	30/386 (7.8)	23/369 (6.2)	51/394 (12.9)	<.001
B	15/227 (6.6)	32/363 (8.8)	33/274 (12)	55/336 (16.4)	.001
C	10/93 (10.8)	9/191 (4.7)	12/248 (4.8)	20/253 (7.9)	NS
D	1/136 (0.7)	11/207 (5.3)	7/223 (3.1)	9/180 (5)	NS
E	3/181 (1.7)	0/158 (0)	2/146 (1.4)	9/127 (7.1)	.001
F	0/79 (0)	2/91 (2.2)	0/83 (0)	2/117 (1.7)	NS
G	19/156 (12.2)	8/128 (6.3)	15/147 (10.2)	18/90 (20)	.017
H	8/97 (8.2)	7/55 (12.7)	8/29 (27.6)	13/38 (34.2)	.001

Values are presented as No. (%). Abbreviation: NS, not significant.

**Figure 1.** Number of health services research articles by health services research category and year of publication.

disorders, sinonasal disease (including allergy), otology and neurotology (including audiology), or laryngology (including voice and speech pathology). Other key abstracted data included the sex (male, female, and unknown), country and continent of origin, and otolaryngology affiliation of the first and corresponding authors, multidisciplinary status (determined by examining affiliation data on all authors in each study), and source of external sponsorship or support (government, industry, other, or none).

Data were entered into Stata 12.1 (StataCorp LP, College Station, Texas) for descriptive and statistical analysis. Comparisons between categorical variables in this study were analyzed with  $\chi^2$  tests. Statistical significance was defined as  $P < .05$ .

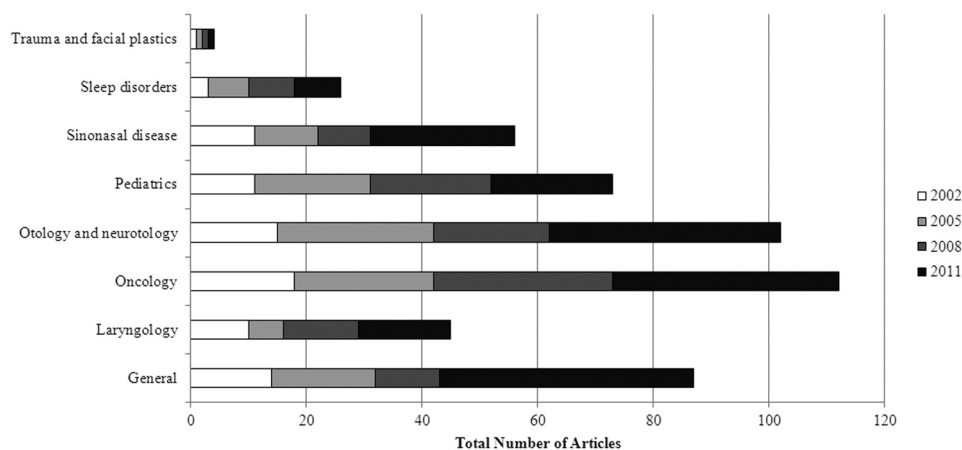
## Results

A total of 5958 articles were reviewed, and 449 (7.5%) were classified as HSR. The number of HSR publications gradually increased from 73 of 1325 (5.5%) in 2002 to 177 of 1535 (11.5%) in 2011, a statistically significant change ( $P < .001$ ) (Table 2). The journal with the largest HSR

output published a total of 219 articles in the study sample, 36 (16.4%) of which were HSR related. Conversely, the journal with the smallest HSR output published 370 articles, of which only 4 (1.1%) were HSR related.

Outcomes research (337, 75.1%) was the most common HSR category studied in all years individually and combined, comprising approximately 64% to 82% of all HSR publications per year studied (Figure 1). Seventeen articles investigated multiple disciplines of HSR. Oncology (112, 24.9%) was the most commonly researched otolaryngology topic in HSR overall, followed closely by otology and neurotology (102, 22.7%) and general topics (87, 19.4%) (Figure 2). Fifty-six articles investigated more than one otolaryngology topic. The most frequent combination was pediatrics and otology/neurotology (28, 6.2%). These articles examined topics as varied as newborn hearing screening protocols and disparities in access to cochlear implantation for deaf children of lower socioeconomic status.

All first and corresponding authors hailed from 31 different nations. One article had 2 corresponding authors from



**Figure 2.** Number of health services research articles by otolaryngology topic and year of publication.

**Table 3.** Authorship of Otolaryngology Health Services Research by Continent of Origin

Continent of Origin	First Author (n = 449)	Corresponding Author (n = 450)
North America	230 (51.2)	234 (52.0)
Europe	176 (39.2)	174 (38.7)
Asia	31 (6.9)	30 (6.7)
Australia	10 (2.2)	10 (2.2)
Africa	2 (0.5)	2 (4.4)
South America	0	0

Values are presented as No. (%).

separate countries (and continents). The 5 most highly represented countries in decreasing order were the United States (220/449 or 49% for first authors, 222/450 or 49.3% for corresponding authors), the United Kingdom (51), Germany (23), the Netherlands (20), and Finland (18). Authorship by continent of origin is displayed in **Table 3**. There were no first or corresponding authors from South America in the study sample.

The sex of first and corresponding authors for all articles is reported in **Table 4**. The proportion of female first authors increased from 10 of 73 (13.7%) in 2002 to 51 of 177 (28.8%) in 2011, whereas female corresponding authors increased from 10 of 73 (13.7%) to 37 of 178 (20.8%) during the same timeframe. Neither trend reached statistical significance. Female first authors were most common in access (3/8, 37.5%) and outcomes (88/337, 26.1%) research, as well as in articles on pediatrics (21/73, 28.8%), otology and neurotology (28/102, 27.5%), and oncology (28/112, 25%). Similarly, female corresponding authors were most frequently identified in access (2/8, 25%) and outcomes research (68/338, 20.1%), in addition to articles on pediatrics (21/74, 28.4%), otology and neurotology (25/102, 24.5%), and oncology (22/112,

**Table 4.** Authorship of Otolaryngology Health Services Research by Sex

Sex	First Author (n = 449)	Corresponding Author (n = 450)
Male	299 (66.6)	332 (73.8)
Female	103 (22.9)	80 (17.8)
Unknown	47 (10.5)	38 (8.5)

Values are presented as No. (%).

19.6%). No women were first or corresponding authors on articles featuring multiple HSR topics.

Studies with authors having affiliations in multiple disciplines (ie, otolaryngology and other medical and nonmedical specialties) were very common (425, 94.7%). Otolaryngologists were the most common first (390/449, 86.9%) or corresponding authors (390/450, 86.7%) for all HSR research in this study. Fourteen (3.1%) articles were written by a single otolaryngologist. Conversely, 52 (11.6%) articles featured no otolaryngologist authors at all. These latter studies were overwhelmingly outcomes research (38/52, 73.1%) and featured predominately otology and neurotology (20/52, 38.5%) or oncology (13/52, 25%) subject matter.

The most common study sponsor was “other” sources such as philanthropy or hospital departmental support (84, 18.7%), followed by government (62, 13.8%) and industry (50, 11.1%). Thirty-six articles reported multiple categories of support, including 5 studies drawing support from government, industry, and other sources concurrently. Two hundred ninety-four (65.5%) either had no formal sponsor or did not report sponsorship data. No sponsorship type was significantly associated with the category of HSR being studied.

## Discussion

Applying the IOM definition of HSR, it is evident that major otolaryngology journals have published HSR articles



at increasingly higher frequencies over the past decade, with oncology and otology/neurotology being particularly well-represented topics. Outcomes research is clearly the most dominant aspect of HSR being studied, which can be explained by at least 2 reasons. First, researchers likely have become more familiar with quantitative research techniques and the analysis of epidemiological databases, which is a key component of many postgraduate medical education curricula and research fellowship coursework. Adapting existing research models to incorporate quality of life and other patient-based measures also requires only a modest investment of resources in the clinical and translational setting. Second, HSR is characterized by a number of qualitative methodologies such as implementation research and focus groups, which generally require substantial infrastructure, coordination, and financial resources to complete. Qualitative research has had an impressive history within the social sciences but is relatively new to the medical disciplines, familiar only to a select few journals partial to qualitative methodology.<sup>16,17</sup> Qualitative study designs are often the only effective method of evaluating conceptual issues such as medical financing and organizational infrastructure, yet to date such research has had very low penetrance even in general medicine and HSR/policy journals. It is speculated that the reason for the low penetration of qualitative research in most areas of medicine is the widespread perception that qualitative research lacks scientific accuracy, the lack of consistent guidelines, and difficulty searching for qualitative research through standard queries in MEDLINE.<sup>8</sup> Nonetheless, as qualitative research techniques and reporting improve, this may represent a possible future source of fruitful collaborative efforts among otolaryngologists and other health care providers. A detailed description of current qualitative research methodology is beyond the scope of this article.

The strength of HSR published in otolaryngology journals is reflected in large part within its authorship. There is a robust international presence, with first and corresponding authors based in more than 30 countries. The multidisciplinary aspect of HSR is also well illustrated, with nearly 95% of articles featuring otolaryngologists and other specialists working in collaboration. About 12% of the HSR-related publications in this study did not have an otolaryngologist as a coauthor, and their content suggests that many specialists in other fields also share clinical and research expertise with otolaryngologists, as well as a common interest in HSR. Very few studies were written by otolaryngologists alone, and even fewer featured a single author.

Other findings suggest room for further collaboration or advancement. Although multiple countries were represented in first or corresponding authorship, nearly half were from the United States. More than 90% of all first and corresponding authors hailed from North America or Europe, whereas Asia, Africa, and South America were underrepresented or absent in the current sample. This study also found that about two-thirds of first authors and three-quarters of corresponding authors were men throughout the

10-year time frame, consistent with a predominance of male authorship in other areas of medicine.<sup>18,19</sup> Still, the “gender gap” in female authorship of otolaryngology-related HSR does appear to be closing gradually, mirroring the upward trend recently reported in the overall otolaryngology literature.<sup>20</sup>

To my knowledge, this is the first attempt to systematically quantify and describe HSR in any surgical specialty. A narrative review by Wang et al<sup>21</sup> summarized landmark comparative effectiveness and outcomes research in urology, noting also that 3 national priorities for comparative effectiveness research as outlined by the IOM pertain to urology. Other investigations have analyzed HSR or outcomes research output in a diverse range of medical topics, including breast cancer and mental health,<sup>22,23</sup> whereas Goldsack et al<sup>24</sup> characterized outcomes research across 535 journals and 12 clinical disciplines, including allergy and sleep disorders. Other key strengths of the current study include a priori utilization of an authoritative definition of HSR to categorize research in a very broad selection of otolaryngology journals, as well as the use of a hypothesis-driven study protocol.

Several limitations to this study warrant discussion. First, as a single-authored manuscript, the analyses contained herein may be particularly susceptible to bias and error in determining eligibility and categorization of articles, as well as data abstraction. I attempted to counteract this to a degree by using more objective, formal definitions for each of the HSR categories. Additional sampling bias also is possible as a result of only reviewing studies from every third year and selecting otolaryngology-specific journals that were deemed most likely to be read and cited by the typical otolaryngologist. Although this strategy was used in prior publications,<sup>14,15,25</sup> not all otolaryngology-related HSR articles were captured in this study, and thus the actual volume of HSR is likely higher. A more comprehensive overview of otolaryngology-related HSR would necessitate a systematic review of MEDLINE, EMBASE, and other medical libraries across a longer time frame.

Another possible limitation may involve the definition of HSR used in this study. Distilling the major qualities of HSR into easily summarized points remains a challenge today. The University of Washington School of Public Health website lists 9 separate, complex definitions for HSR provided by the IOM, the Agency for Healthcare Research and Quality, and many others.<sup>26</sup> The 2002 definition provided by AcademyHealth highlights the fact that HSR examines not only individual patients but also families, organizations, and increasingly larger cohorts up to the population level.<sup>27</sup> Ultimately, I chose the 1995 IOM definition for its authoritative, succinct description of the key components of HSR: multidisciplinary outreach, the inclusion of basic and applied research techniques, an emphasis on both individual and population health, and a relatively concrete listing of major topics of inquiry, such as outcomes and quality.

Finally, an increasing rate of HSR publication is not necessarily equivalent to a higher overall quality of research or higher degree of evidence. Just as there are well-designed

pure clinical studies or basic science research, there can also be poorly conceived HSR studies that use flawed methodology or draw inappropriate conclusions. The methodological quality of HSR publications was beyond the scope of the current study. However, prior studies suggest that the overall quality of otolaryngology research has been improving over the past 2 to 3 decades.<sup>14,15</sup> Health services research also uses a number of innovative qualitative and mixed-methods study designs that do not fit cleanly into the 2011 Oxford Levels of Evidence hierarchy.

Future investigations should examine the impact of HSR on specific otolaryngology subspecialties. Trauma/facial plastics and sleep disorders were particularly underrepresented in the current study, and many articles on these subjects were likely published in more focused subspecialty journals such as *Archives of Facial Plastic Surgery* or *Sleep*. Other important articles may have been published in high-circulation, general medical journals such as *JAMA* that were excluded from this review. Barring exceptions such as Megwalu and Piccirillo's recent update on uvulopalatopharyngoplasty research,<sup>28</sup> the actual quality of HSR methodology in otolaryngology has not been studied in depth and also deserves greater attention. Health services research publications must be of the highest caliber to ensure that readers are being accurately informed by this developing discipline and clinicians have the best available evidence when counseling patients on plan of care. Finally, the influence of external sponsors on the results of the HSR publications in this study cannot be readily quantified, given the high proportion of studies that did not explicitly report having a sponsor. Future research to identify undisclosed sources of funding may be worthwhile.

## Conclusion

Health services research is a vibrant multidisciplinary field of inquiry that seeks to illuminate how individuals and populations are affected by current health care processes and systems. Major otolaryngology journals have begun publishing higher numbers of HSR articles from an international authorship base and in practically all major health services categories, although with a predominant focus on outcomes research. The field of otolaryngology demonstrates significant potential for future growth in HSR.

## Author Contributions

**Gordon H. Sun**, substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; drafting the article and revising it critically for important intellectual content; and final approval of the version to be published.

## Disclosures

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