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Assessing Factors Related to the Pharmacologic Management of Laryngeal Diseases and Disorders

Seth M. Cohen, MD, MPH^{a,*}, Jaewhan Kim, PhD^b, Nelson Roy, PhD, CCC-SLP^c, and Mark Courey, MD^d

^aDuke Voice Care Center, Division of Otolaryngology – Head & Neck Surgery, Duke University Medical Center, Durham, NC

^bDivision of Public Health & Study Design and Biostatistics Center, University of Utah, Salt Lake City, UT

^cDepartment of Communication Sciences and Disorders, Division of Otolaryngology-Head & Neck Surgery (Adjunct), University of Utah, Salt Lake City, UT

^dDepartment of Otolaryngology – Head & Neck Surgery, University of California - San Francisco

Abstract

Objective—To examine how age, gender, comorbidity, geography, provider type, and laryngeal pathology influence the use of pharmacological treatment in managing patients with laryngeal disorders.

Study Design—Retrospective analysis of data from a large, nationally representative administrative U.S. claims database.

Methods—Patients with a laryngeal disorder based on ICD-9-CM codes from January 1, 2004 to December 31, 2008, seen as an outpatient by a primary care physician (PCP), otolaryngologist, or both, and continuously enrolled for 12 months were included. Data regarding pharmacy claims, age, gender, geographic location, comorbid conditions, provider type, and laryngeal diagnosis were collected. To identify factors that influenced whether a patient received a medication or not, a logistic regression was performed.

Results—Of almost 55 million individuals in the database, 258,705 had a laryngeal diagnosis, 12 months post-index date follow-up, and an outpatient encounter with a PCP, otolaryngologist, or both. 135,973 (52.6%) unique patients, mean age 47.4 years (22.2 SD) with 61.9% female, received a medication, and 122,732 (47.4%), mean age 47.4 (19.8 SD) with 65.8% female, did not. Higher odds ratios (ORs) for medication treatment were associated with PCPs versus otolaryngologists, acute laryngitis, the south region, and patients with comorbid conditions. Variable prescription patterns were also observed for age and gender.

Conclusion—Multiple factors are associated with the use of medical treatment for laryngeal disorders.

Keywords

laryngeal disorders; dysphonia; treatment; medication; voice

*Corresponding Author: Seth Cohen, MD, MPH, DUMC Box 3805, Durham, NC, 27710, seth.cohen@duke.edu, 919-681-7350 phone, 919-668-6036 fax.

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Introduction

Patients with laryngeal diseases and disorders often present to health care providers with complaints related to their ability to speak or produce voice. Approximately 7.5% of adults in the U.S. currently report having a voice disorder with 5.9% to 22.1% of these dysphonic adults seeking medical attention.^{1, 2} Management strategies for laryngeal disorders may involve behavioral, surgical, and pharmacological therapy. Based upon the above point prevalence and treatment seeking rates, national annual direct cost estimates for the evaluation and treatment of laryngeal disorders range from \$0.7 to \$4.9 billion.^{1, 2, 3} Furthermore, pharmacy claims were a significant component accounting for 20.1% to 33.3% of these overall direct costs.³

Prior investigations have found heterogeneity in how medications are used in treating laryngeal disorders. Among primary care physicians (PCPs), various types of medications are frequently used prior to laryngoscopic examination.⁴ Otolaryngologists also demonstrated variability in prescription patterns for patients with benign vocal fold lesions, suspected reflux-related laryngitis, and with persistent dysphonia.⁵⁻⁷ However, these survey studies did not evaluate potential factors influencing the varied medical treatment of laryngeal disorders. Inconsistent medical treatment may lead to inappropriate prescriptions, disparate patient outcomes, and increased health care costs.

Therefore, examining the variation in medication use is an important aspect of managing patients with laryngeal disorders. The MarketScan[®] database, a large, nationally representative administrative U.S. claims database, provides the means to explore the patterns and variation regarding medication use on a national scale and has been used to examine such issues in diverse patient populations.^{8, 9} While patient age, gender, provider type, comorbid conditions, geographic region, and patient diagnosis may influence medication treatment, a void exists in the literature regarding their impact on prescription patterns in patients with laryngeal disorders.¹⁰ The purpose of this investigation is to examine how these factors influence the use of pharmacological treatment in managing patients with laryngeal disorders.

Methods

The Duke University Medical Center Institutional Review Board approved the study. A retrospective analysis of data from a large, nationally representative administrative U.S. claims database, the MarketScan[®] Commercial Claims and Encounters dataset and Medicare Supplemental and Coordination of Benefits dataset for January 1, 2004 to December 31, 2008, was performed. As previously described, the MarketScan[®] databases (Thomson Reuters Healthcare, Ann Arbor, MI) contain the annual health care claims of approximately 55 million individuals including employees < 65 years of age, Medicare beneficiaries 65 years of age, and their dependents integrated from all care providers and connected to health care utilization and cost records at the patient level.¹¹

Patients who received a primary or non-primary diagnosis of at least one of the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) codes (Table 1) at an outpatient visit with either a PCP or an otolaryngologist and who were continuously enrolled for at least 12 months after the day of first laryngeal diagnosis (i.e. the index date) during January 1, 2004 to December 31, 2008 were included. The codes 438.10 and 438.19 refer to late effects of cerebrovascular disease resulting in speech and language deficits and were included as patients with a brainstem stroke could potentially have a disordered voice from nucleus ambiguus involvement. An outpatient encounter was determined by the Evaluation and Management (E & M) Current Procedural Terminology (CPT) codes of

99201, 99202, 99203, 99204, 99205, 99211, 99212, 99213, 99214, 99215, 99241, 99242, 99243, 99244, 99245, 99354, 99355 and internal MarketScan® database codes for an outpatient encounter. Patients with less than 12 months of post-index date data, who were not seen as an outpatient, or who saw a provider other than a PCP or otolaryngologist were excluded.

Age, gender, geographic region (divided into four census regions: northeast, north central, south, and west), employment status, comorbid conditions, medication status (received a medication or not), and provider type were determined. *Otolaryngologists* were classified as otolaryngology, pediatric otolaryngology, or head & neck surgery; *PCPs* as urgent care, medical doctor (not elsewhere classified), osteopathic medicine, internal medicine, multispecialty group, emergency medicine, hospitalist, family practice, geriatric medicine, preventive medicine, pediatrician, nurse practitioner, or physician assistant based on the MarketScan® database dictionary. Patients were grouped as seeing PCP only, otolaryngologist, or both providers (i.e., PCP first and secondarily an otolaryngologist). Because the otolaryngologist would likely be the primary treating provider for patients who saw a PCP and otolaryngologist on the same day or otolaryngologist first and later their PCP, they were classified with patients who only saw an otolaryngologist as the otolaryngologist group. Patients were also classified as being in a metropolitan statistical area (MSA) based upon employment location and to determine urban versus rural status. To control for the impact of comorbid conditions on prescription patterns, specific comorbidities were assessed: sinusitis (461.x, 473.x), asthma (493.x), chronic obstructive pulmonary disease (490, 491.xx, 492), gastro-esophageal reflux (530.81), acute pharyngitis (462), acute bronchitis (466.xx), acute upper respiratory illness (465.x), pneumonia (481, 482.xx, 483.x, 486), and allergic rhinitis (477.x). Patients with a single medical encounter with more than one laryngeal diagnosis and those with more than one laryngeal diagnosis on separate encounters were categorized as multiple diagnoses.

Each pharmacy claim occurring within 2 weeks after an outpatient encounter (new or return) with a PCP or an otolaryngologist for a laryngeal diagnosis, and the claim was not present in the 3 months prior to the visit date, was tabulated over the 12 month post-index date period. Patients who saw more than one provider for a related diagnosis were counted as one patient but data regarding pharmacy claims were tabulated for each provider. To identify medications that could be related to treating a laryngeal disorder, a combination of the therapeutic drug classes and generic identification numbers according to the MarketScan® database dictionary was used. The medication classes, anti-histamine, antibiotic, histamine 2 antagonist, proton pump inhibitors (PPIs), and oral and inhaled steroids were selected as they accounted for 84.1% of pharmacy claim costs.³

All MarketScan® database management and statistical analyses were performed with Stata Version 11.1 (Stata Corp., TX, USA). Summary statistics were tabulated. To identify factors that influenced whether a patient received one of the medications or not, a logistic regression was performed to consider the binary outcome (with and without prescription drugs). *A priori* variables included age, gender, geographic region, MSA status, number of comorbid conditions, laryngeal diagnosis, and provider category (PCP only, otolaryngologist only, or both providers). The Wald statistic was used to compare the impact of different laryngeal diagnoses on medication use.

Results

54,600,465 unique patients were enrolled in the MarketScan® databases during January 1, 2004 to December 31, 2008 with 536,943 (1%) unique patients having a laryngeal diagnosis. Among the unique patients with a laryngeal disorder, 405,766 (75.2%) were seen as an

outpatient. 258,705 (48.2%) had 12 months post-index date follow-up and an outpatient encounter with a PCP, otolaryngologist, or both and are the focus of this investigation.

The mean number of outpatient visits for a laryngeal diagnosis was 1.6 (2.1 standard deviation (SD)) with 136,240 (52.7%) unique patients seeing a PCP, 109,870 (42.4%) seeing an otolaryngologist, and 12,595 (4.9%) seeing a PCP and subsequently an otolaryngologist (Table 2). During outpatient treatment for a laryngeal diagnosis, 135,973 (52.6%) unique patients received a medication and 122,732 (47.4%) did not (Table 3). In the medication group, the mean age was 47.4 years (22.2 SD) with 61.9% female, and in the non-medication group, the mean age was 47.4 (19.8 SD) with 65.8% female. Additional characteristics of the medicated and non-medicated group are displayed in Table 4.

To determine how provider type, age, gender, geographic region, urban status, comorbidity, and type of laryngeal disorder influenced the use of medications, a multiple logistic regression was performed. The adjusted odds ratios (ORs) for each variable (i.e., adjusting for the remaining variables in the model) are shown in Table 5. As compared to patients who saw a PCP only, those receiving care from an otolaryngologist had an 8% lower odds of receiving a medication, and those seeing both providers a 29% higher odds of medication treatment. As compared to patients 65 years of age, those < 18 years of age had a 32% lower odds of medication treatment, and those 36 to 64 years of age had a 20% higher odds of receiving a medication. Females had slightly higher odds of receiving a medication compared to males. Geographic variation was noted in medication use for laryngeal disorders with the highest odds occurring in the south region and an 8% lower odds in urban compared to rural locations. A dose-response relationship was noted for the influence of comorbidity with an increase in the OR for increasing number of comorbid conditions.

The type of laryngeal pathology impacted medication use. Pairwise comparisons of ORs of medication use across laryngeal pathology were computed using the Wald test. Patients with acute laryngitis and multiple diagnoses had higher odds of medication use than chronic laryngitis ($p < 0.001$, Wald test). Patients with chronic laryngitis had higher odds of medication use than laryngeal cancer ($p < 0.001$, Wald test) and vocal fold paralysis ($p < 0.001$, Wald test).

Discussion

Medication use is prevalent in the treatment of laryngeal disorders. Roughly half of our patients seeking care in an outpatient setting received a medication as at least part of their treatment. Medications were prescribed across all diagnostic categories with over 30% of patients within almost every laryngeal diagnosis receiving a medication (Table 2). A prior study using National Ambulatory Medical Care Survey (NAMCS) data evaluated treatment patterns of patients with voice complaints and found that medical treatment was common among PCPs and otolaryngologists.¹² However, this study was limited in its evaluation of the variation in prescription patterns.

The specific laryngeal pathology influenced the use of pharmacologic treatment. Because the NAMCS study broadly categorized diagnoses in groups such as laryngeal, infectious, and gastrointestinal, examining the influence of different laryngeal diagnoses on pharmacologic treatment was not possible.¹² The current investigation found that acute laryngitis had the highest odds for medication use (Table 5). Acute laryngitis has accounted for 68.1% and 51.4% of laryngeal diagnoses for which antibiotics and oral steroids were prescribed, respectively.³ Due to its self-limited nature, the potential for excessive prescriptions in acute laryngitis cases exist as symptoms may resolve without treatment.¹³ While the current study could not address the issue of specific medication overuse in cases

of acute laryngitis, this remains an important unknown with public health implications due to potential side effects and costs. In contrast, unilateral vocal fold paralysis and laryngeal cancer had lower odds for medication use likely reflecting the need for surgical intervention in these conditions (Table 4). While the prescription patterns varied depending upon laryngeal diagnosis, the specific medication trials for each diagnosis, appropriateness, and reasons for the prescription, such as managing concomitant and related medical problems, requires investigation. Further study examining the ultimate diagnosis among patients with different laryngeal disorders treated with specific medications may uncover areas of overuse and lead to improved patient care.

Because patient comorbidity may influence prescription patterns, the impact of comorbidity on pharmacologic treatment was investigated. Compared to patients without one of our comorbidities, a step-wise increase in the odds of medical treatment was seen for increasing number of comorbid conditions (Table 5). A systematic review investigating the relationship between multiple chronic conditions and health care utilization, medication use, and costs also found increases in each outcome for each additional chronic condition.¹⁴ Patients with comorbid conditions may be more complicated and require treatment of related conditions such as gastro-esophageal reflux, allergic disease, and pulmonary conditions to improve the laryngeal disorder. Additionally, such comorbid conditions may be risk factors for patients with a disordered voice.^{1, 2} Studies examining how best to treat patients with laryngeal disorders with comorbid conditions may result in improved, interdisciplinary treatment strategies.

Prescription patterns for laryngeal disorders varied according to geographic region. The southern region had the highest odds of medication prescriptions with the northeast and west regions in particular having significantly reduced odds of a pharmacy claim for a laryngeal disorder (Table 5). Geographic differences in pharmacotherapy have also been demonstrated for patients with dementia, diabetes, and in antibiotic use.^{10, 15, 16} Regional differences also exist in otolaryngology practice, including the use of esophagoscopy and bronchoscopy in head and neck cancer.¹⁷ While the reasons for geographic variation in medication use for laryngeal disorders may reflect training, physician experience and preference, and demographics of the regional population, the variability warrants further investigation in to the causes and suggests there are opportunities for improving prescription patterns in patients with laryngeal disorders.

Demographic features, such as gender and age, had an impact on prescription patterns for laryngeal disorders. A small but statistically significant increased odds of a medication trial was identified in females (Table 5). Previous studies have found that females have higher rates of illness and are more likely to see medical care.¹⁸ Additionally, in 2007, females filled more prescriptions per capita than males.¹⁹ Age also influenced the use of pharmacologic treatment with patients less than 18 having the lowest odds and those 36 to 64 years the highest odds with the > 65 year group in between (Table 5). Similar findings of the role of age in medication trends have been identified in other conditions such as arthritis treatment.²⁰ The concern for side effects, drug interactions, and family concerns could explain the age-related trends in patients with laryngeal disorders and is worthy of investigation.

The type of provider, PCP versus otolaryngologist, was a determining factor in the use of pharmacologic treatment. Because PCPs and otolaryngologists were the most common specialties involved in caring for patients with laryngeal disorders, examining the practice patterns in these two specialties is important.³ If a patient had a PCP involved in their care, they had higher odds of receiving a medication compared to if they were only treated by an otolaryngologist (Table 5). This may be secondary to the reality that the average PCP does

not examine the larynx. This may lead to an increased reliance on a shotgun approach of medications. While treatment by an otolaryngologist may be more costly than a PCP, due in part to the more chronic and complex laryngeal disorders treated, laryngeal examination by an otolaryngologist is essential for diagnosing the specific laryngeal pathology and instituting appropriate treatment.²¹ This enhanced diagnostic precision justifies otolaryngology evaluation as it may improve the ability to determine the need for behavioral, medical, or surgical intervention, as evidenced by the lowered odds of pharmacologic treatment by otolaryngologists compared to PCPs. As previously discussed, significant variability regarding the type of medication use is also noted among PCPs and otolaryngologists.^{4–7, 22} Thus, further study is needed to examine the practice patterns related to specific medication trials between and within these treating specialties to uncover areas for improved care.

Certain methodological issues must be addressed. Potential sources of bias are present in administrative claims data. The type of laryngeal pathology was based on the ICD-9 codes, the accuracy of which could not be determined. Although disease severity and ethnicity may impact prescription patterns, such data were not available. Because the study was interested in the use of prescription medications, the pharmacy claims data do not include the use of over-the-counter medications that may have been employed to treat the laryngeal disorder. Although precisely determining that a medication was used for a specific laryngeal disorder is difficult, a priori definitions of medication linkage to a diagnosis were made. Furthermore, comorbid conditions for which the medications of interest could have been prescribed were assessed and controlled in the regression analysis. Lastly, since our patient population was covered by Medicare or employer-sponsored health insurance plans, results may not be generalizable to the Medicaid population. Despite these limitations inherent in database research, the MarketScan[®] database, as previously mentioned, has been widely used with similar methodology to evaluate medication use in patients with various diseases.^{8, 9} This large national population-based study provides initial insights regarding factors that influence the use of pharmacologic trials in patients with laryngeal disorders.

Conclusion

Multiple variables were associated with the use of pharmacologic treatment in patients with laryngeal disorders. Patients' health, such as the specific laryngeal pathology and number of comorbidities, affected the prescription patterns. Variability in medication trials were also noted for gender, age, and geographic region. Compared to patients seen by PCPs, those treated by otolaryngologists had lower odds of receiving a medication. Future investigations are necessary to uncover the prescription patterns related to specific medication classes, how specific prescriptions change over time, and examine the determinants of prescribing one medication class versus another. Examining the ultimate diagnosis of patients initially treated with a given medication class may help identify areas of inappropriate use and lead to interventions aimed at reducing excess care and maximizing patient outcomes.

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References

1. Roy N, Merrill RM, Gray SD, Smith EM. Voice disorders in the general population: prevalence, risk factors, and occupational impact. *Laryngoscope*. 2005; 115:1988–1995. [PubMed: 16319611]
2. Cohen SM. Self-reported impact of dysphonia in a primary care population: an epidemiological study. *Laryngoscope*. 2010; 120:2022–2032. [PubMed: 20830762]

3. Cohen SM, Kim J, Roy N, Asche C, Courey M. Direct health care costs of laryngeal diseases and disorders. *Laryngoscope*. 2012; 122:1582–1588. [PubMed: 22544473]
4. Turley R, Cohen S. Primary care approach to dysphonia. *Otolaryngol Head Neck Surg*. 2010; 142:310–314. [PubMed: 20172372]
5. Sulica L, Behrman A. Management of benign vocal fold lesions: a survey of current opinion and practice. *Ann Otol Rhinol Laryngol*. 2003; 112:827–833. [PubMed: 14587971]
6. Cohen SM, Pitman MJ, Noordzij JP, Courey M. Management of dysphonic patients by otolaryngologists. *Otolaryngol Head Neck Surg*. 2012; 147:289–294. [PubMed: 22368039]
7. Ahmed TF, Khandwala F, Abelson TI, et al. Chronic laryngitis associated with gastroesophageal reflux: prospective assessment of differences in practice patterns between gastroenterologists and ENT physicians. *Am J Gastroenterol*. 2006; 101:470–478. [PubMed: 16542282]
8. Hanselin MR, Saseen JJ, Allen RR, Marrs JC, Nair KV. Description of antihypertensive use in patients with resistant hypertension prescribed four or more agents. *Hypertension*. 2001; 58:1008–1013. [PubMed: 22042809]
9. Harpaz-Roten I, Rosenheck RA. Prescribing practices of psychiatrists and primary care physicians caring for children with mental illness. *Child Care Health Dev*. 2006; 32:225–237. [PubMed: 16441857]
10. Steinman MA, Landefeld CS, Gonzales R. Predictors of broad-spectrum antibiotic prescribing for acute respiratory tract infections in adult primary care. *JAMA*. 2003; 289:719–725. [PubMed: 12585950]
11. Cohen SM, Kim J, Roy N, Asche C, Courey M. Prevalence and causes of dysphonia in a large treatment-seeking population. *Laryngoscope*. 2012; 122:343–348. [PubMed: 22271658]
12. Best SR, Fakhry C. The prevalence, diagnosis, and management of voice disorders in a National Ambulatory Medical Care Survey (NAMCS) cohort. *Laryngoscope*. 2011; 121:150–157. [PubMed: 21120835]
13. Schalen L, Eliasson I, Kamme C, Schalen C. Erythromycin acute laryngitis in adults. *Ann Otol Rhinol Laryngol*. 1993; 102:209–214. [PubMed: 8457123]
14. Lehnert T, Heider D, Leicht H, et al. Review: health care utilization and costs of elderly persons with multiple chronic conditions. *Med Care Res Rev*. 2011; 68:387–420. [PubMed: 21813576]
15. Fortinsky RH, Zlateva I, Delaney C, Kleppinger A. Primary care physicians' dementia care practices: evidence of geographic variation. *Gerontologist*. 2010; 50:179–191. [PubMed: 19597058]
16. Sargen MR, Hoffstad OJ, Wiebe DJ, Margolis DJ. Geographic variation in pharmacotherapy decision for U.S. Medicare enrollees with diabetes. *J Diabetes Complications*. 2012; 26:301–307. [PubMed: 22658408]
17. Deleyiannis FW, Weymuller EA, Garcia I, Potosky AL. Geographic variation in the utilization of esophagoscopy and bronchoscopy in head and neck cancer. *Arch Otolaryngol Head Neck Surg*. 1997; 123:1023–1010.
18. Bird C, Fremont A. Gender, time use, and health. *J Health Soc Behav*. 1991; 32:114–129. [PubMed: 1861048]
19. Retail Prescription Drugs Filled at Pharmacies (Annual per Capita by Gender). Kaiser Family Foundation; 2011. Available at: <http://www.statehealthfacts.org/comparetable.jsp?ind=269&cat=5&sort=a&gsa=2>. [Accessed October 18, 2012]
20. Desai RJ, Agarwal SJ, Aparasu RR. Drug use trends for arthritis and other rheumatic conditions and effect of patient's age on treatment choice. *NC Med J*. 2011; 72:432–438.
21. Cohen SM, Kim J, Roy N, Asche C, Courey M. Factors influencing the health care expenditures of patients with laryngeal disorders. *Otolaryngol Head Neck Surg*. 2012; 147:1099–1107. [PubMed: 22820973]
22. Altman KW, Prufer N, Vaezi MF. The challenge of protocols for reflux disease: a review and development of a critical pathway. *Otolaryngol Head Neck Surg*. 2011; 145:7–14. [PubMed: 21493264]

Table 1

ICD-9 code groupings.

Category	ICD-9 Codes
Vocal fold paralysis	478.30, 478.32
Bilateral vocal fold paralysis	478.34
Vocal fold paresis	478.31, 478.33
Non-specific dysphonia	784.49, 784.42, 784.40, 784.41
Acute laryngitis	464, 464.01, 464.20, 464.21
Benign laryngeal/vocal fold pathology	478.4, 478.5, 478.6, 478.71, 478.79, 212.1
Other larynx/vagus	478.70, 352.3
Chronic laryngitis	476.0, 476.1
Laryngeal cancer	161.0, 161.1, 161.2, 161.3, 161.8, 161.9
Laryngeal spasm	478.75
Late effect cerebrovascular disease, other speech deficits	438.10, 438.19

Table 2

Percent of patients by number of outpatient visits related to a laryngeal disorder.

Number of outpatient visits related to a laryngeal disorder	Number/Percent of patients
1	192,364 (74.4%)
2	35,994 (13.9%)
3	13,640 (5.3%)
4	6,622 (2.6%)
5	10,085 (3.8%)

Table 3

Percent of patient diagnoses for which medication trial was given over 12 months post-index date.

Laryngeal Diagnosis	Received Medication (%)	Did Not Receive Medication (%)
Vocal fold paralysis	31.5	68.5
Bilateral vocal fold paralysis	35.6	64.4
Vocal fold paresis	34.3	65.7
Non-specific dysphonia	40.3	59.7
Acute laryngitis	61.0	39.0
Benign laryngeal/vocal fold pathology	40.6	59.4
Other larynx/vagus	41.8	58.2
Chronic laryngitis	46.2	53.8
Laryngeal cancer	34.4	65.6
Laryngeal spasm	47.3	52.7
Late effect cerebrovascular disease, other speech deficits	14.8	85.2
Multiple diagnoses	64.1	35.9

Table 4

Characteristics of patients with laryngeal disorders receiving a medication and not receiving a medication during an outpatient encounter.

Variable	With Medicine	Without Medicine	p-value
Age at first diagnosis			< 0.001
<18	14.0%	10.2%	
18–35	12.8%	13.9%	
36–64	51.3%	58.6%	
> 65	22.0%	17.0%	
Gender			< 0.001
Male	38.1%	34.3%	
Female	61.9%	65.7%	
Geographic location			< 0.001
Northeast	13.0%	9.8%	
North Central	24.6%	25.0%	
South	42.0%	49.5%	
West	20.0%	14.9%	
Live in Metropolitan Statistical Area			<0.001
Yes	85.1%	82.6%	
No	14.9%	17.4%	
Employment status			< 0.001
Active full time	44.3%	48.0%	
Active part time or seasonal	0.9%	0.8%	
Early retiree	7.2%	8.3%	
Medical eligible retiree	14.9%	13.0%	
Retiree	4.6%	3.3%	
COBRA continue	0.2%	0.2%	
Long term disability	0.3%	0.3%	
Surviving spouse/dependent	2.2%	1.9%	
Laryngeal disorder			< 0.001
Unilateral vocal fold paralysis	0.66%	1.59%	
Bilateral vocal fold paralysis	0.03%	0.06%	
Vocal fold paresis	0.17%	0.36%	
Non-specific dysphonia	18.97%	31.09%	
Acute laryngitis	46.0%	32.54%	
Benign laryngeal/vocal fold pathology	4.91%	7.97%	
Other larynx/vagus	0.24%	0.37%	
Chronic laryngitis	8.05%	10.39%	
Laryngeal cancer	0.72%	1.52%	

Variable	With Medicine	Without Medicine	p-value
Laryngeal spasm	1.45%	1.79%	
Late effect cerebrovascular disease, other speech deficits	0.11%	0.7%	
Multiple diagnoses	18.69	11.62	
Comorbidity			< 0.001
Sinusitis	3.5%	6.4%	
Asthma	1.5%	2.2%	
Chronic obstructive pulmonary disease	2.9%	4.4%	
Gastro-esophageal reflux	11.5%	15.8%	
Acute pharyngitis	10.3%	13.3%	
Acute bronchitis	8.1%	12.4%	
Acute upper respiratory infection	0.4%	0.5%	
Pneumonia	2.6%	3.3%	
Allergic rhinitis	3.7%	5.3%	
Provider type			< 0.001
Primary care physician	49.0%	56.0%	
Otolaryngologist	47.4%	38.0%	
Both	3.6%	6.0%	

Table 5

Multiple logistic regression for medication trial or no medication trial adjusted for all other variables in the table.

Covariate	Adjusted Odds Ratio (OR)	95% Confidence Interval	p-value
Provider			
Primary care physician only	Reference		
Otolaryngologist	0.92	0.90–0.94	< 0.001
Both primary care physician and otolaryngologist	1.29	1.23–1.34	< 0.001
Age			
< 18	0.68	0.66 – 0.70	< 0.001
18–35	1.00	0.98 – 1.03	0.783
36–64	1.20	1.18 – 1.23	< 0.001
> 65	Reference		< 0.001
Gender			< 0.001
Male	Reference		
Female	1.02	1.01 – 1.04	0.022
Geographic region			
South	Reference		< 0.001
Northeast	0.69	0.67 – 0.71	< 0.001
North central	0.93	0.91 – 0.94	< 0.001
West	0.69	0.67 – 0.70	< 0.001
Metropolitan statistical area			< 0.001
Yes	0.92	0.90 – 0.94	< 0.001
No	Reference		
# of comorbidities			
0	Reference		
1	1.51	1.49–1.54	< 0.001
2	1.97	1.91–2.04	< 0.001
3	2.51	2.37–2.66	< 0.001
Laryngeal disorder			
Late effect cerebrovascular disease, other speech deficits	Reference		
Unilateral vocal fold paralysis	2.15	1.77–2.60	< 0.001
Bilateral vocal fold paralysis	2.70	1.76–4.16	< 0.001
Vocal fold paresis	2.44	1.92–3.09	< 0.001
Non-specific dysphonia	2.90	2.44–3.46	< 0.001
Acute laryngitis	6.95	5.84–8.27	< 0.001
Benign laryngeal/vocal fold pathology	3.02	2.53–3.61	< 0.001
Other larynx/vagus	3.13	2.49–3.92	< 0.001
Chronic laryngitis	3.68	3.08–4.39	< 0.001

Covariate	Adjusted Odds Ratio (OR)	95% Confidence Interval	p-value
Laryngeal cancer	2.41	1.99–2.92	< 0.001
Laryngeal spasm	4.41	3.67–5.30	< 0.001
Multiple diagnoses	7.15	5.99–8.53	<0.001