Prevalence and Causes of Dysphonia in a Large Treatment-Seeking Population

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Abstract

Objective: To determine the prevalence and common causes of dysphonia as diagnosed by primary care physicians (PCPs) and otolaryngologists, and to evaluate differences in etiologies offered by these providers.

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

Methods: Patients were identified as dysphonic based on ICD-9-CM codes from January 1, 2004 to December 31, 2008. Data regarding age, gender, geographic location, and type of physician providing the dysphonia diagnosis were collected. Overall and age-related prevalence rates, as well as frequency of specific etiologies by provider type were calculated.

Results: Of the almost 55 million individuals in the database, 536,943 patients, ages 0 to > 65 years, were given a dysphonia diagnosis (point prevalence rate of 0.98%). The prevalence rate was higher among females as compared to males (1.2% versus 0.7%) and among those > 70 years of age (2.5%). The most frequent diagnoses overall were acute laryngitis, non-specific dysphonia, benign vocal fold lesions, and chronic laryngitis. PCPs more commonly diagnosed acute laryngitis, whereas otolaryngologists more commonly diagnosed non-specific dysphonia and laryngeal pathology. Gastro-esophageal reflux was more commonly diagnosed as a comorbid condition by otolaryngologists than by PCPs. Overall laryngeal cancer prevalence in this treatment-seeking population was 2.2% and was greatest among males > 70 years of age.

Conclusion: This analysis of insurance claims data from a nationally representative database represents the largest study of its kind. Important differences in dysphonia prevalence related to age, gender, diagnosis, and physician type were identified.

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Introduction: The public health impact of vocal dysfunction is becoming increasingly recognized. Dysphonia adversely impacts communication with physical, social, and work-related effects. Patients suffer social isolation, depression, impaired disease-specific and general quality of life, and work absenteeism.[1-4] Thus, voice disorders negatively impact individuals and burden society.

To better understand the prevalence and consequences of voice disorders, epidemiologic data are necessary. Although the need for prevalence studies has been previously recognized, some limitations exist within the literature. Prevalence rates of voice disorders or voice complaints depend upon the population studied and the definition of a voice disorder.[7, 8] Reports from specific geographic regions may not represent the general population, highlighting the need for studies on a national level.[2, 9, 10] Furthermore, while a few studies provide data regarding the underlying causes of dysphonia, some were limited in their ability to determine the prevalence of specific conditions, such as laryngeal malignancy.[5, 6] Lastly, studies focusing on laryngeal pathology identified in otolaryngology practices do not address the contribution of primary care providers to the diagnosis and management of patients with dysphonia.[5, 10]

Further research exploring the frequency of dysphonia and its causes is needed on a national level. How prevalence and diagnoses vary by demographic variables, geography, and physician specialty is not fully known. Such information may help to identify at-risk populations, aid in health care resource management, and provide an initial understanding of the practice patterns associated with voice disorders. The purpose of this study is to:

1) determine the overall prevalence of dysphonia in a treatment-seeking population

2) establish the prevalence of specific causes of dysphonia

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3) examine differences in diagnoses offered by primary care physicians (PCPs) and otolaryngologists

4) examine relationships between dysphonia diagnoses and age and gender

5) assess comorbid conditions associated with dysphonia.

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Methods: This study was approved by the Duke University Medical Center Institutional Review Board. This was a retrospective analysis using 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 the period January 1, 2004 to December 31, 2008. The MarketScan® database contains the annual health care claims of approximately 55 million individuals, including employees (< 65 years of age) and their dependents from roughly 100 employers and health plans covered by preferred provider organizations, point-of-service plans, indemnity plans, and health maintenance organizations, and annual Medicare supplemental medical claims for employees ≥ 65 years of age, retirees, and dependents covered by their previous employers. Data include inpatient and outpatient medical claims, outpatient pharmacy claims, emergency room visits, and behavioral health care. Data from individual patients are integrated from all care providers and connected to health care utilization and cost records at the patient level.

Patients were identified as having dysphonia if they had a primary or non-primary diagnosis of at least one of the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) codes listed in Table I. The index date was defined as the day a dysphonia diagnosis was offered during the period January 1, 2004 to December 31, 2008. Diagnostic codes given at the index date were recorded and grouped as follows: paralysis (478.30, 478.32), bilateral paralysis (478.34), 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 vocal fold lesion (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),

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laryngeal spasm (478.75), and other speech (438.10, 438.19). ICD-9-CM codes listed in conjunction with a dysphonia ICD-9-CM code were tabulated to assess comorbid conditions.

Age, gender, geographic location, and type of physician providing a dysphonia diagnosis were collected for each patient at the index date. *Otolaryngologists* were classified as otolaryngology, pediatric otolaryngology, or head & neck surgery; *PCPs* as medical doctor (NEC), osteopathic medicine, internal medicine, multispecialty group, emergency medicine, hospitalist, family practice, geriatric medicine, preventative medicine, pediatrician, nurse practitioner, or physician assistant based on the MarketScan® database dictionary. *Other specialists* included physicians not included in PCP or otolaryngology categories.

Geographic locations, determined by state of employment, were divided into four regions: northeast, north central, south, and west. All 50 states were represented. Patient location was further defined as urban versus rural based on whether their location of employment was in a metropolitan statistical area (MSA). [11] Employment status and industry of employment were defined based on the database-defined categories for either the employee or beneficiary.

Descriptive statistics were used as appropriate. Overall and categorical prevalence rates were determined by dividing the number of dysphonic patients by the total number of unique individuals, per category, enrolled in the MarketScan® databases during January 1, 2004 to December 31, 2008. All MarketScan® database management and statistical analysis was performed with Stata Version 11.1 (Stata Corp, TX, USA).

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Results: From January 1, 2004 to December 31, 2008, 54,600,465 unique patients were enrolled in the MarketScan® database. Based upon the ICD-9-CM codes in Table I, 536,943 unique patients had a dysphonia diagnosis, giving an overall prevalence rate of 0.98%.

Most dysphonic patients were employed or dependents of someone employed, with manufacturing as the main industry. Dysphonic patients represented diverse geographic regions with most (85%) from urban areas (Table II). The dysphonic population was 63.4% female and 36.6% male with a mean age of 46.3 years (standard deviation 21.5 years).

Trends in prevalence rates of dysphonia were identified. The prevalence rate of dysphonia in this treatment-seeking population decreased slightly after 0-9 year olds and increased after age 30, peaking among the > 70 year olds (Table III). Compared to males, females had a higher prevalence of dysphonia (1.2% versus 0.74%). Within age categories, males had a higher prevalence rate in 0-9 year olds while females had higher prevalence beginning with puberty and persisting until > 70 years (Table III). Most patients were evaluated as an outpatient (97.8%) compared to inpatient (1.7%). Forty-eight percent of dysphonic patients were evaluated by a PCP, 33.5% by an otolaryngologist, and 18.9% by another specialist (5.1% unknown). PCPs were more likely to treat younger dysphonic patients compared to otolaryngologists (Table IV).

The dysphonic patients had a wide range of etiologies. Acute laryngitis, non-specific causes of dysphonia, benign vocal fold lesions, and chronic laryngitis were the most common dysphonia diagnoses overall with higher prevalence of acute laryngitis among PCPs and non-specific dysphonia, chronic laryngitis, and laryngeal pathology among otolaryngologists (Table V). The overall laryngeal cancer prevalence at initial diagnosis in this treatment-seeking population was 2.2% with a range of 1.9% in the south to 3.0% in the north central region.

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Almost ninety-seven percent of dysphonic patients had one initial diagnosis with 3.2% having two to three diagnoses and 0.13% four to five diagnoses. Diagnoses did not vary whether the patient was employed in a rural or urban setting. Common comorbid conditions diagnosed in conjunction with a dysphonia diagnosis included upper airway inflammatory conditions such as acute pharyngitis, acute bronchitis, pneumonia, and upper respiratory illness and were five times more commonly diagnosed by PCPs than otolaryngologists; gastro-esophageal reflux (GER) was two times more commonly diagnosed by otolaryngologists than PCPs.

Among otolaryngology evaluations, the dysphonia diagnoses varied across age and gender. Non-specific dysphonia was more commonly diagnosed among pediatric and elderly patients with women more frequently diagnosed than males among adults (> 20 year olds) (Figure 1). Chronic laryngitis was diagnosed by otolaryngologists more in the adult (> 19 year old) population and more commonly in males than females ages 20 to 59 (Figure 1). While benign vocal fold lesions were more commonly diagnosed in younger age groups, vocal fold paralysis and laryngeal cancer were more commonly diagnosed as age increased, especially among males (Figure 2). Among otolaryngology diagnoses at the index date, prevalence rates of laryngeal cancer were less than 1% for both genders until the age of 40 years. After age 40, males had higher prevalence rates of laryngeal cancer than females (40 – 49 years: 1.5% versus 0.5%; 50 -59 years: 3.9% versus 0.8%; 60-69 years: 6.3% versus 1.4%; > 70 years: 6.1% versus 1.5%, respectively).

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Discussion: Epidemiologic studies of the treatment seeking population with dysphonia are important for understanding the impact, evaluation, and management of this population. Such investigations are necessary to advance the assessment and treatment of dysphonic patients. A strength of this analysis is that a large U.S. commercial administrative claims database was used to evaluate the prevalence and etiology of dysphonia in a geographically diverse group of patients with a variety of types of insurance coverage.

Our prevalence rate of dysphonia based on the selected ICD-9-CM codes was roughly 1%. This rate is higher than the 0.26% office visit prevalence rate for a voice complaint reported in a National Ambulatory Medical Care Survey (NAMCS) population-based study.[6] The rate difference may be explained by the methodological differences in data collection. [12] While the adult population has been found to have a lifetime voice disorder prevalence of almost 30% and point prevalence of 6.6% to 7.5%, only 5.9% to 22.1% with voice problems actually sought medical evaluation.[2, 9] With our total at risk population of 54,600,465 and these point prevalence and evaluation rates, between 212,614 and 905,002 patients would be expected to seek medical attention for dysphonia. Thus, while our prevalence rate is consistent with previous epidemiologic studies, actual rates may be higher.

Age and gender related differences in dysphonic prevalence rates were identified. Similar to previous studies, females represented the majority of the treatment-seeking dysphonic population.[5, 6, 10] Furthermore, except for the 0-9 year and >70 year category, females had a higher prevalence of dysphonia for each age category (Table III). While females are known to use more health care resources than males, differences in laryngeal anatomy may also explain the female predominance.[2, 13] As in other reports, the 40-59 year group was the most common age category for the dysphonic, treatment-seeking population.[2, 5, 10] However, the elderly (>70 year

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olds) actually had the highest prevalence rate for dysphonia, even though they represented only 14% of the treatment-seeking population (Table III). Similarly, one study found that only 22.4% of the elderly had seen a physician for voice problems, and the authors identified several barriers preventing evaluation, including being unaware of treatment options and viewing dysphonia as a normal aspect of aging.[14] Thus, further exploration of the obstacles to the evaluation of dysphonia and methods of screening at-risk populations are needed.

Differences in practice patterns were identified. In contrast to the NAMCS study wherein dysphonic patients were more commonly seen by otolaryngologists than PCPs (59.4% versus 30.6%), 48.4% of our dysphonic patients were evaluated by a PCP and 33.5% by an otolaryngologist.[6] Dysphonic pediatric patients were more commonly seen by PCPs with increasing otolaryngology and decreased PCP evaluation with increased patient age (Table IV). While these trends may reflect changes in pathology among the dysphonic population, such as increased vocal fold paralysis and laryngeal cancer with age, other possibilities may explain the low prevalence of otolaryngology evaluation among pediatric dysphonic patients. In a survey study of PCPs treating adult patients, only 36.5% routinely evaluated their patients for voice problems, with PCPs citing more pressing health issues and uncertainty about how to evaluate for voice problems as barriers.[15] How comfortable pediatricians are in recognizing an abnormal voice and their awareness about voice disorders is unknown. Additionally, studies comparing outcomes for dysphonic patients managed with and without otolaryngology referral are needed to identify variations in the management of dysphonic patients and to foster efficient care.

Specific diagnoses also differed by treating specialty. PCPs most commonly offered diagnoses of acute laryngitis, non-specific dysphonia, and chronic laryngitis. While otolaryngologists more commonly diagnosed laryngeal pathology, such as vocal fold paralysis

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and benign vocal fold lesions, they also commonly diagnosed non-specific dysphonia, most commonly in females, and chronic laryngitis, more frequently in males (Table V, Figure 1). While a higher female predominance of muscle tension dysphonia has been cited, a diagnostic bias could exist where males are more frequently ascribed a physical condition. [5, 10, 16] Furthermore, the diagnoses provided represent the initial diagnosis and may change during the evaluation process. Longitudinal studies are needed to determine how the diagnoses and outcomes of dysphonic patients change during the evaluation process among PCPs and otolaryngologists.

Certain methodological issues must be addressed. Data from an administrative claims database have intrinsic potential sources of bias. Variables that might affect study outcomes, such as measures of disease severity or socioeconomic status, were not available, and confirmation of coding accuracy was not possible. PCPs and otolaryngologists diagnosed similar percentages of laryngeal cancer even though PCPs are not examining the larynx (Table VII). PCPs may have thought a patient had laryngeal cancer, provided a laryngeal cancer diagnosis in error, or used a laryngeal cancer diagnosis based on an otolaryngology evaluation. Because the study population was drawn from a population of individuals and their dependents with employer-sponsored health insurance, the findings may not be generalizable to the entire U.S. population, particularly individuals covered by Medicaid. In addition, the database only included claims from a 4-year period, and pharmacy and medical benefits change over time. Yet, this large national population-based study provides important insights regarding dysphonia prevalence and causes and will serve as the foundation for future longitudinal studies regarding the practice patterns and outcomes associated with the management of dysphonic patients.

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Conclusion: In a retrospective analysis of medical insurance claims data from a large nationally representative administrative U.S. claims database, the overall prevalence of dysphonia was approximately 1% and was highest among > 70 year olds. A higher prevalence rate was noted in males 0-9 years old than in females in the same age group, followed by higher prevalence rates among females over males starting in puberty until the > 70 year age group. Diagnoses differed depending on physician specialty, with PCPs more commonly diagnosing acute laryngitis, and otolaryngologists more commonly diagnosing laryngeal pathology. Diagnoses also varied with age and gender, with benign conditions more prevalent in younger ages, and vocal fold paralysis and laryngeal cancer increasing in frequency with age, especially in males. Future studies are planned to examine longitudinally changes in diagnoses and outcomes, such as health care utilization associated with different practice patterns.

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Tables

Table I. ICD-9-CM codes used to determine presence of dysphonia.

ICD-9-CM code	Diagnosis
478.30	Paralysis of vocal folds or larynx
478.31	Unilateral, partial vocal fold paralysis
478.32	Unilateral, complete vocal fold paralysis
478.33	Bilateral, partial vocal fold paralysis
478.34	Bilateral, complete vocal fold paralysis
784.40	Voice and resonance disorder, unspecified
784.41	Aphonia
784.42	Dysphonia
784.49	Other voice and resonance disorder
464.00	Acute laryngitis without mention of obstruction
464.01	Acute laryngitis with obstruction
464.20	Acute laryngotracheitis without mention of obstruction
464.21	Acute laryngotracheitis with obstruction
478.4	Polyp of vocal fold or larynx
478.5	Other diseases of vocal folds (abscess, cellulitis, granuloma, leukoplakia, nodules)
478.6	Edema of larynx
478.70	Unspecified disease of larynx
478.71	Cellulitis and perichondritis of larynx
478.75	Laryngeal spasm
478.79	Other disease of larynx (abscess, necrosis, obstruction, pachyderma, ulcer)
476.0	Chronic laryngitis
476.1	Chronic laryngotracheitis
212.1	Benign neoplasm of larynx
438.10	Speech and language deficit, unspecified
438.19	Other speech and language deficit
352.3	Disorders of vagal nerve
161.0	Malignant neoplasm of glottis
161.1	Malignant neoplasm of supraglottis
161.2	Malignant neoplasm of subglottis
161.3	Malignant neoplasm of laryngeal cartilages
161.8	Malignant neoplasm of other specified site of larynx
161.9	Malignant neoplasm of larynx, unspecified

Table II. Characteristics of the dysphonic population.

Variable	Percent
Employment status	
Active full time	44
Active part time or seasonal	0.9
Early retiree	6.6
Medicare eligible retiree	12.6
Retiree (status unknown)	3.1
COBRA continue	0.4
Long term disability	0.3
Surviving spouse/dependent	1.8
Other/unknown	30.3
Geographic location	
Northeast	11.5
North central	24.1
South	45.7
West	18.0
Unknown	0.7
Industry	
Oil & gas extraction, mining	1.7
Manufacturing, durable goods	37.6
Manufacturing, nondurable goods	10.5
Transportation, communication, utilities	21.9
Retail trade	4.0
Finance, insurance, real estate	12.3
Services	12.0

Table III. Dysphonia prevalence rates and percent of population by age and by age and gender.

Age at Diagnosis	Percent*	Prevalence Rate	Male %†	Female %†	Male Prevalence Rate	Female Prevalence Rate
0-9	7.9	0.6	12.7	5.2	0.7	0.5
10-19	6.2	0.4	6.2	6.1	0.3	0.6
20-29	7.4	0.5	5.0	8.8	0.2	0.7
30-39	12.3	0.8	9.8	13.8	0.5	1.1
40-49	17.5	1.1	14.5	19.2	0.7	1.4
50-59	20.9	1.5	19.4	21.8	1.1	1.9
60-69	13.8	1.8	15.5	12.8	1.6	2.1
> 70	14.0	2.5	16.9	12.3	2.6	2.4

* Percent is calculated out of total dysphonic population. N = 536,943

† Percent is calculated out of total male and female dysphonic population, respectively. N = 196,682 and 340,261, respectively.

Table IV. Percent* of patients given a dysphonia diagnosis at index date by provider and age at dysphonia diagnosis.

Evaluating Physician	0-9 years	10-19 years	20-29 years	30-39 years	40-49 years	50-59 years	60-69 years	> 70 years
Primary care physician	62.3	62.3	58.7	55.2	49.8	45.0	38.7	36.2
Otolaryngologist	17.3	18.4	23.1	28.5	34.5	37.8	42.5	40.9
Other specialist	21.8	20.8	19.0	16.6	16.7	17.3	20.0	22.1
No report	5.6	3.7	4.4	4.2	3.9	4.3	5.5	8.6

*Some patients saw more than one provider.

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Figure Legend

Figure 1. Percent of dysphonia diagnoses (acute laryngitis, chronic laryngitis, and non-specific dysphonia) given by *otolaryngologists* at index date.

Figure 2. Percent of dysphonia diagnoses (vocal fold paralysis, vocal fold paresis, benign vocal fold pathology, and laryngeal cancer) given by *otolaryngologists* at index date.

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