Nasolaryngoscopy in a family medicine clinic: indications, findings, and economics

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ABSTRACT

Background:

Nasopharyngeal complaints are common in primary care. Patients with these complaints are often referred for nasolaryngoscopy evaluation to exclude serious conditions, e.g., laryngeal cancer.

Methods:

This study is a retrospective case series in which 276 charts were reviewed for adult outpatients who were referred for nasolaryngoscopy. We examined patient demographics, procedure indications and findings, complications, changes in clinical management.

Results:

Nasolaryngoscopy was completed in 273 (98.9%) patients (mean age, 51.3 +/- 14.6, 71.4% women). The most common indications for nasolaryngoscopy were hoarseness (51.3%), globus sensation (32.0%), and chronic cough (17.1%), and the most common findings included laryngopharyngeal reflux (LPR) (42.5%), chronic rhinitis (32.2%), and vocal cord lesion (13.2%). Laryngeal cancer was diagnosed in 3 patients (1.1%) and was significantly associated with a prior history of smoking (p=0.03). No major complications occurred.

Conclusions:

We found that nasolaryngoscopy is a safe procedure in primary care with no major complications in our series. Patients who have ever smoked and complain of hoarseness are at higher risk for laryngeal cancer. An alarming 1% of patients in our series were diagnosed with laryngeal cancer. This is the first study to define the rates of LPR, vocal

cord lesions, and laryngeal cancer in primary care.

INTRODUCTION

In the United States in 2008, 12,250 new cases of laryngeal cancer were diagnosed, and an estimated 3,670 deaths occurred from laryngeal cancer [1]. The death rates from laryngeal cancer did not significantly change from 2.97 per 100,000 in 1990 to 2.24 per 100,000 in 2004. The 5-year survival rates decreased minimally from 67% in 1975 to 64% in 2003 [1]. Early diagnosis and definitive treatment is the key to increasing survival from laryngeal cancer. Currently, there are no screening guidelines for laryngeal cancer. While a primary care series of adult smokers 40 years and older found a 3% prevalence of laryngeal cancer [2], the prevalence of nasopharyngeal symptoms in primary care is largely unknown.

Family physicians commonly evaluate patients with nasopharyngeal complaints, e.g., hoarseness, dysphagia, chronic cough, throat clearing, globus sensation, or chronic sore throat, and some of these patients may have serious conditions, e.g., laryngeal cancer. In a primary care practice research network, the prevalence of dysphagia was 23% [3]. In another primary care series, the prevalence of hoarseness was 11% . The association between gastroesophageal reflux disease (GERD) and laryngopharyngeal reflux (LPR) is well established, and extra-esophageal symptoms, e.g., hoarseness and globus sensation, improve with acid suppression [4]. A systematic review found an increased risk of chronic cough in patients with GERD (OR 1.7; 95% CI 1.4–2.1) [5] and a national cross-sectional postal survey in Scotland found a prevalence of 31% for sore throat [6].

Nasolaryngoscopy is often utilized to exclude serious medical conditions, e.g., laryngeal cancer, in patients with nasopharyngeal complaints, but this procedure is only

performed by 6% of family physicians in the United States [7]. Nasolaryngoscopy is performed in the office setting with topical anesthesia and nasal decongestants. An initial study in 1988 of nasolaryngoscopies (n=66) performed by family physicians reported a mean exam time of 4.6 minutes, and the procedure was well tolerated by patients [8]. In a subsequent study, 210 patients were evaluated by nasolaryngoscopies performed by family physicians in which 90% of cases resulted in changes in diagnosis or management following the procedure; however, both of these case series were published 20 years ago. In this paper and in our study we define nasolaryngoscopy to mean a nasopharyngoscopy (endoscopy of the nose and nasopharynx) or a nasolaryngoscopy (endoscopy of the nose, nasopharynx, and larynx). The purpose of this study was to determine the common indications, findings, the rate of laryngeal cancer, and quantify the economics of nasolaryngoscopy in a urban university-based family medicine clinic in the Southeastern United States.

METHODS

This retrospective chart review examines the medical records of 276 adult, English-speaking, non-emergent, consecutive outpatients over the age of 18 years who had a nasolaryngoscopy performed in a university-based family medicine clinic. Our family medicine clinic has approximately 30,000 patient visits per year with 47% African American and 66% female. Nasolaryngoscopy was deemed necessary by the patient's primary care physician based on nasopharyngeal complaints and was performed as part of a medical evaluation of these complaints. All patients referred for this procedure were scheduled without exclusion criteria. Data was not tracked on the percent of patients who missed or canceled their appointment for this procedure. After informed consent, patients

were anesthetized using a method we have described previously [9]. The procedures in this study were performed by or supervised by the author (TW) between February 2002 and April 2008 using either XEF-140Y1 gastrointestinal videoscope or ENF-P3 laryngoscope (Olympus America Inc, Melville, NY). The XEF-140Y1 has an outer diameter of 4.0 mm at the insertion tube, a working length of 600 mm, a bending section of upward 180 degrees and downward 90 degrees (with no right or left deflection), and a field of view of 120 degrees. The ENF-P3 has an outer diameter of 3.7 mm at the insertion tube, a working length of 30 mm, a bending section of upward 130 degrees and downward 130 degrees (with no right or left deflection), and a field of view of 85 degrees. The study was approved by the authors' Institutional Review Board.

A list of subjects were obtained by a clinical query of our electronic medical record using "nasolaryngoscopy" as a search term and by reviewing an established list of procedures that is maintained by the procedure nurse in the family medicine clinic. We reviewed the chart records for demographic data, indications, findings, and need for further consultation or evaluation. Complications were also noted.

Data Analysis

The primary analyses for the study included descriptive statistics of the indications and findings for nasolaryngoscopy. Subsequent chi-square analyses examined the influence of the following independent factors on indications and findings: patient's age, gender, ethnicity, and alcohol and tobacco use. SPSS software version 11 (SPSS Inc, Chicago, Ill) was used for all analyses.

RESULTS

Two-hundred seventy-six patients were included in this case series. The mean age of

the patients was 51.3 years +/- 14.6, and 71.4% were female, 48.1% White, and 46.9% Black. See Table 1 for demographics of patients in this series. The most common indications for the nasolaryngoscopy were hoarseness (51.3%), globus sensation (32.0%), chronic cough (17.1%), chronic rhinitis (13.5%), and sore throat (10.9%). See Table 2 for a list of common indications for nasolaryngoscopy as well as how each indication varied across demographic groups. Chronic rhinitis and chronic sinusitis were more common in patients less than 50 years of age compared to patients greater than 50 years of age (p=.007 and .02, respectively). Dysphagia was more common in patients who drank alcohol (12.8%) compared to those that did not drink (3.3%, p=.003). Vocal cord polps were more common in smokers (6.7%) versus non-smokers (0.6%, p=.004).

Nasolaryngoscopy was completed in 273 (98.9%) of the patients. Three patients could not tolerate the procedure due to pain. Minor complications occurred in 3 procedures (1.1%); 2 patients experienced pain but the procedure was completed and 1 patient experienced mild epistaxis controlled with pressure. Most of the procedures (98.6%) were performed nasally, with 3 procedures (1.1%) performed orally, and one (0.3%) procedure completed via both routes. While we did not record procedure times, in our experience, procedure times are generally 5 minutes or less. A resident assisted in 154 procedures (55.8%). In our clinic, 80% of procedures were nasolaryngoscopy and 20% of procedures were nasopharyngoscopy.

Nasoloaryngoscopy was normal in 35 (12.8%) patients. The most common findings from the nasolaryngoscopy were LPR (42.5%), chronic rhinitis (32.2%) and vocal cord lesions (13.2%), e.g., granuloma or polyp. See Table 3 for a list of common findings. A new medication, e.g. proton pump inhibitor, antihistamine, or intranasal steroid was

added in 140 patients (50.7%) and in 9 (3.3%) patients a medication was discontinued, e.g. H2-blocker. A referral to otolaryngology was made in 72 patients (26.1%). See Table 4 for management changes following nasolaryngoscopy.

Of the 72 patients referred to otolaryngology, 3 (1.1%) patients were diagnosed with laryngeal cancer and 9 (3.3%) were diagnosed with vocal cord lesions. One hundred sixteen patients were diagnosed with LPR with nasolaryngoscopy, and an additional 18 patients were classified with LPR in subsequent testing, for a total of 134 (48.5%). See Table 5 for referral outcomes.

Chi-square analysis was used to determine which factors were significantly associated with referral outcomes. Laryngeal cancer was associated with prior or current tobacco use (p=.03). Vocal cord lesions were associated with hoarseness (p=.003) and prior or current tobacco use (p<.0001). LPR was associated with hoarseness (p=.009) and sore throat (p=.03).

DISCUSSION

In our case series, 276 patients underwent nasolaryngoscopy for various nasopharyngeal symptoms, including hoarseness, globus sensation, chronic cough, chronic rhinitis, sore throat, epistaxis, dysphagia, and reflux. Laryngeal cancer should be excluded in patients with persistent or chronic nasopharyngeal symptoms especially in those patients with risk factors for developing cancer, which include tobacco and alcohol use, GERD, and occupational exposure. The prevalence of laryngeal cancer in our series was an alarming 1%. This finding is of particular importance in patients presenting with nasopharyngeal complaints, e.g. hoarseness, but this finding may not be generalizable. We were interested in determining the rate of tobacco use in our series. Nationally, 24%

of individuals self report tobacco use [10] compared with 26% in our study; however, self-report of tobacco use has been shown to be an underestimation of the true smoking prevalence [11].

The overall prevalence of LPR was 48.5%. LPR is a condition in which gastric contents flow in a retrograde fashion and contact the tissues of the upper aerodigestive tract. LPR is associated with hoarseness, cough, globus sensation, refractory asthma, laryngeal ulcers and granulomas, subglottic stenosis, and laryngeal cancer. Physiological barriers protect the oropharyngeal tract from reflux injury; however, the epithelium of the respiratory tract is sensitive to damage when these mechanisms fail. A recent Cochrane review found insufficient evidence to support acid suppression for the treatment of hoarseness [12]; however, acid suppression with proton pump inhibitors is effective at decreasing the symptoms of LPR and possibly decreasing the risk of complications from LPR.

Common CPT billing codes for nasolaryngoscopy include 31575 (Laryngoscopy, flexible fiber optic) and 92511 (Nasopharyngoscopy with endoscope). Typical medicare and private insurance reimbursement rates are $67.75 and $230.00, respectively, for CPT code 31575 and $53.28 and $65.37, respectively, for CPT code 92511. The fixed equipment startup costs to perform nasolaryngoscopy in primary care include a nasolaryngoscope, light source, guide cable, and rigid eyepiece for viewing, and are estimated at $8,675 to $10,850. A service contract can be added for $2,000 per year yielding a total fixed startup cost for the first year of $10,675 to $12,850, assuming a cash purchase. In our clinic, eighty percent of procedures billed are laryngoscopy flexible fiber optic (31575), and with our payor distribution mix (80% private insurance and 20%

Medicare), it would take approximately 76 procedures to break even during the first year. While we did not calculate break even point for subsequent years, the break even point would be substantially less including maintenance and cleaning costs of equipment. See Table 6 for an estimation of breakeven points assuming various mixtures of payor sources and ratios of CPT billing codes. This rudimentary cost model assumes labor cost to be a sunk cost and no variable costs (such as cleaning costs and supplies such as lidocaine and afrin). Further, opportunity costs are considered to be zero.

Nasolaryngoscopy is often done with local anesthesia and nasal decongestants without the need for sedation. It is a brief procedure with short recovery time, and patients are able to return to their usual activity including working and driving immediately following the procedure. Another inherent advantage of nasolaryngoscopy is that results are immediately available, and the endoscopist can review results with the patient following the procedure. Another potential advantage for patients and physicians is that this is a brief office procedure (less than 5 minutes).

Nearly 75% of patients in this study had rhinitis or LPR which can be managed by family physicians without the need for specialty referral. Undergoing the procedure in the primary physician's office has a number of other potential advantages. It allows the primary care physician to be directly involved with patient care, eliminates the wait time for the patient to be evaluated by another physician, may decrease cost by decreasing evaluation by specialists, improves convenience for the patient with fewer office visits, decreases anxiety awaiting procedure and results, and improves compliance with completing the procedure. The apparent disadvantages of nasolaryngoscopy include the somewhat narrow field of view, less maneuverability than other endoscopes with

up/down and left/right controls, lack of biopsy or suction capability, and missed diagnosis, e.g., missed laryngeal cancer.

Our study was done at an academic university-based medical center, which may not represent the typical primary care practices from a racial (primarily White and Black patients), social (alcohol and tobacco use), or economic (insurance and payer mix) point of view. There was an over representation of women in our case series (71.4%), the most likely explanation is that it reflects the higher percentage of women (66%) seen in our clinic. Other possible reasons for more women in our series are that more women discuss nasopharyngeal complaints with their physicians or more women agree to nasolaryngoscopy as compared to men. We did not record the time of the procedure. No information was reported on the total patient population initially referred for nasolaryngoscopy versus those who were seen and had a procedure. Patient tolerance of the procedure, pain, and level of anxiety, and the patient's willingness to undergo a repeat nasolaryngoscopy were not evaluated in our study. Additionally, the effectiveness and accuracy of nasolaryngoscopy performed by primary care physicians versus specialists has not been evaluated. Training of family medicine residents in nasolaryngoscopy is not standardized and varies by residency program. Our residency training program requires a minimum of ten procedures, evaluation of technical skills by an attending physician, and a written exam.

Future studies should assess training variation among family medicine residency programs and competency of graduates to perform nasolaryngoscopy. Additional studies might address the diagnostic accuracy of nasolarynoscopy performed by family physicians compared to a gold standard. Another interesting study might examine the

cost effectiveness of managing patients with nasopharyngeal complaints in primary care versus specialty care. Lastly, a future study should address the natural history of patients with nasopharyngeal complaints in primary care and those that progress to laryngeal cancer.

In our series, there was a 1% prevalence of laryngeal cancer in patients referred for nasolaryngoscopy. While there is no screening recommendation for laryngeal cancer, those patients at high risk, e.g., smokers with chronic hoarseness or throat pain, should be considered for nasolaryngoscopy. LPR was a common diagnosis in our case series. This is an important diagnosis because of the risk of complications, e.g., vocal cord granuloma, laryngeal ulcer, etc., and these patients have improvement in their symptoms with aggressive acid suppression. We also found that nasolaryngoscopy is a safe procedure performed in primary care. In our experience with training family medicine residents in nasolaryngoscopy, technical expertise is rapidly acquired in as few as 10 supervised procedures. While the procedure is technically easy to learn, confidence in accurately making a diagnosis and ruling out cancer can be more challenging. With only 6% of family physicians performing nasolaryngoscopy, this procedure is an important but underutilized procedure in family medicine. Given our findings and potential revenue, can family physicians afford not to offer nasolaryngoscopy?

Table 1 – Demographics of patients referred for nasolaryngoscopy (n=276).

Factor	
Age (mean +/- standard deviation)	51.3 +/- 14.6
Sex, N (%)	
Female	197 (71.4)
Race, N (%)	
Black	121 (46.9)
White	124 (48.1)
Other	13 (4.7)
Alcohol Use, N (%)	
Current (yes)	66 (24.7)
Past (yes)	83 (31.1)
Tobacco use, N (%)	
Current	70 (25.8)
Ever	104 (38.4)

Table 2 – Indications for nasolaryngoscopy (N=276)

	Age			**Sex**			**Race**			**Alcohol use**			**Tobacco use**		
	<50 yo N(%)[1,2]	>= 50 yo N(%)	p-value[3]	Female N(%)	Male (N(%)	p-value	Black N(%)	White (N(%)	p-value	None (N(%)	Ever N(%)	p-value	None N(%)	Ever N(%)	p-value
Symptoms															
Chr Cough[4]	17(14.2)	30(19.9)	.22	38(19.4)	9(11.4)	.11	18(15.0)	22(17.7)	.56	34(18.9)	12(14.0)	.32	30(18.1)	17(16.3)	.72
Globus sensation	41(34.2)	47(31.1)	.60	65(33.2)	23(29.1)	.52	33(27.5)	47(37.9)	.08	54(30.0)	32(37.2)	.24	55(33.1)	31(29.8)	.57
Hoarseness	59(49.2)	81(53.6)	.46	103(52.6)	38(48.1)	.50	65(52.4)	62(51.7)	.91	93(51.7)	44(51.2)	.94	81(48.8)	58(55.8)	.26
Reflux	6 (5.0)	9 (6.0)	.73	13 (6.6)	2 (2.5)	.18	10 (4.1)	4 (3.2)	.09	10 (5.6)	5 (5.8)	.93	9 (5.4)	6 (5.8)	.91
Sore throat	17(14.2)	13 (8.6)	.15	24(12.2)	6 (7.6)	.26	14(11.3)	12(10.0)	.74	23(12.8)	6(20.7)	.16	21(12.7)	8 (7.7)	.20
Diagnoses															
Chr Rhinitis	24(20.0)	13(8.6)	.007	24 (12.2)	13(16.5)	.35	19(15.8)	14(11.3)	.30	27(15.0)	9(10.5)	.31	26(15.7)	10 (9.6)	.16
Chr Sinusitis	11 (9.2)	4(2.6)	.02	11 (5.6)	4 (5.1)	.86	8 (6.7)	5 (4.0)	.36	9 (5.0)	3 (3.5)	.58	11 (5.5)	3 (4.3)	.69
Dysphagia	4 (3.3)	13(8.6)	.08	10 (5.1)	7 (8.9)	.24	7 (5.8)	10 (8.1)	.49	6 (3.3)	11(12.8)	.003	7 (4.2)	10 (9.6)	.08
Epistaxis	5 (4.2)	10(6.6)	.38	12 (6.1)	6 (7.6)	.66	9 (7.5)	8 (6.5)	.75	9 (5.0)	8 (9.3)	.18	12 (7.2)	6 (5.8)	.64
Hemoptysis	2 (1.7)	1(0.7)	.43	2 (1.0)	1 (1.3)	.86	2 (1.7)	0 (0.0)	.15	3 (1.7)	0 (0.0)	.23	3 (1.8)	0 (0.0)	.17
Hx of vocal cord polyp	1 (0.8)	7(4.6)	.07	5 (2.6)	3 (3.8)	.58	3 (2.5)	2 (1.6)	.63	5 (2.8)	2 (2.3)	.83	1 (0.6)	7 (6.7)	.004

[1] N indicates the number of patients in that demographic category with the given indication. (eg., There were 38 female patients in the sample with chronic cough.)

[2] % indicates what percentage of that demographic category had the indication. [e.g., 38 female patients with chronic cough divided by the number of female patients in the sample (196); 38/196=19.4%] Note: Denominator numbers may vary slightly from numbers listed in Table 1 due to missing data for that particular analysis.

[3] Chi-square analyses for other demographics

Table 3 – Findings from completed nasolaryngoscopy (N=273) [1].

Findings	**N (%)** [2]
Laryngopharyngeal Reflux	116 (42.5)
Chronic rhinitis	88 (32.2)
Other [3]	84 (30.8)
Vocal cord lesion	36 (13.2)
Nasal polyps	10 (3.7)
Other pharyngeal lesion	8 (2.9)
Precancerous lesion	5 (1.8)
Laryngeal mass	2 (0.7)
Normal findings	35 (12.8)

[1] Three of the 276 patients did not complete the entire nasolaryngoscopy procedure.

[2] Percentages do not sum to 100% because patients may have had more than one finding.

[3] "Other" includes tissue hypertrophy, acute inflammation, aspiration, eustachian tube dysfunction, candidal infection, septal perforation, bony spur, aphthous ulcer, vocal cord dysfunction, prominent vessel, hemangioma.

Table 4 – Management changes following nasolaryngoscopy (N=276).

Management	**N (%)**[1]
Medication changes	
Added	140 (50.7)
Deleted	9 (3.3)
Referrals	
Otolaryngology	72 (26.1)
Gastroenterology	8 (2.9)
Other diagnostic tests	
CAT scan	18 (6.5)
Barium swallow	14 (5.1)
Esophagogastroduodenoscopy	12 (4.3)
Repeat nasolaryngoscopy	5 (1.8)
Other [2]	16 (5.8)
No changes to therapeutic plan	56 (20.3)

[1] Percentages do not sum to 100%. Patient may have had more than one change.

[2] "Other" includes sleep study, Allergy/Immunology consult, manometry, pillcam, transnasoesophagoscopy.

Table 5. Referral outcomes[1].

	Referred patients (N=127)	**Overall (N=276)**
Referral Outcome	**N (%) [2]**	**%**
Laryngeal cancer (confirmed by biopsy)	3 (2.4)	(1.1)
Vocal cord lesion	9 (7.1)	(3.3)
Laryngopharyngeal Reflux	25 (19.7)	(9.1)
Other[3]	40 (31.5)	(14.5)

[1] 127 patients were referred for follow-up assessment by Otolaryngology or Gastroenterology or for other diagnostic tests.

[2] Patient may have more than one outcome.

[3] "Other outcome" includes vocal cord granuloma, sinonasal disease, nodules, vocal cord polyp, esophageal cancer with metastasis, parotid adenoma, small cell lung cancer, enlarged thyroid, esophagitis, and gastritis.

Table 6. Estimated breakeven points assuming various ratios of payor sources and CPT billing codes

Relative Payor Ratio

Relative CPT Billing Code Ratio†	0 % Medicare 100% Private insurance	20% Medicare 80 % Private insurance	40% Medicare 60 % Private insurance	60% Medicare 40% Private insurance	80% Medicare 20% Private insurance	100% Medicare 0% Private insurance
0 % 92511 100 % 31575	56	66	78	97	129	190
20 % 92511 80% 31575	66	76	90	110	141	199
40% 92511 60% 31575	79	90	105	125	156	208
60% 92511 40% 31575	98	111	126	147	175	218
80% 92511 40% 31575	131	143	158	176	199	229
100% 92511 0% 31575	197	205	213	222	231	242

† CPT 92511: Nasopharyngoscopy with endoscope; CPT 31575: Laryngoscopy, flexible fiber optic.

Q = # of procedures required to breakeven at the end of 1st year is calculated as follows where:

N = % of procedures performed coded as nasopharyngoscopy
L = % of procedures performed coded as laryngoscopy
M = % of procedures covered by Medicare Insurance
P = % of procedures covered by Private Insurance
T = total estimated startup costs for 1st year = $12,850

Q = T/(N((M*53.28) + (P*65.37)) + L((M*67.75) + (P*230)))

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