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Demographics and Efficacy of Head and Neck Cancer Screening

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Abstract

Objectives—This study was designed to (1) describe the demographics and (2) determine the efficacy of a head and neck cancer screening program in order to optimize future programs.

Methods—After IRB approval, we conducted a retrospective cohort study to review a single institution's 14-year experience (1996–2009) conducting a free annual head and neck cancer screening clinic. Available demographic and clinical data, as well as clinical outcomes were analyzed for all participants (n=761). The primary outcome was the presence of a finding suspicious for head and neck cancer on screening evaluation.

Results—Five percent of participants had findings suspicious for head and neck cancer on screening evaluation, and malignant or pre-malignant lesions were confirmed in one percent of participants. Lack of insurance (p=.05), tobacco use (p<.001), male gender (p=.03), separated marital status (p=.03), and younger age (p=.04) were the significant demographic predictors of a lesion suspicious for malignancy. Patients complaining of a neck mass (p<.001) or oral pain (p<.001) were significantly more likely to have findings suspicious of malignancy. A high percentage (40%) was diagnosed with benign otolaryngologic pathologies on screening evaluation.

Conclusions—A minority of patients presenting to a head and neck cancer screening clinic will have a suspicious lesion identified. Given these findings, in order to achieve maximal potential benefit, future head and neck cancer screening clinics should target patients with identifiable risk factors and take full advantage of opportunities for education and prevention.

Introduction

Head and neck cancer encompasses a range of malignancies with a relatively stable incidence. Approximately 30,000 such cancers are diagnosed annually in the United States, with roughly 10,000 deaths each year.¹ Morbidity and mortality from head and neck cancer are closely linked to stage; patients diagnosed with tumors restricted to the primary site have an average five-year survival of 80 percent, compared to only 40 percent when patients present with locoregional or distant metastasis.² The majority of newly-diagnosed head and neck cancers are identified at an advanced stage.³ Despite advancements in diagnostics and treatment, prognosis remains poor, with a low average survival when compared with other neoplasms.⁴

The fundamental goal of screening programs is the identification of individuals at risk for a disease for which early detection is possible. In the 1960s, Wilson and Junger described oft-cited characteristics of diseases that merit screening programs, including the significance of

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the health problem, the presence of a detectable early stage at which point interventions are more efficacious, and the availability of a suitable, facile and cost-effective screening test.⁵ Given significant morbidity and mortality, the survival advantage of early detection, the ability to diagnose early stage tumors with a clinic-based examination, and the fact that patients with certain risk factors (such as tobacco and alcohol abuse) have a substantially higher incidence, head and neck cancer appears ideally suited for screening programs.⁶ As a result, head and neck cancer screening programs have received significant attention.^{7,8}

Screening can take many forms, ranging from cross-sectional public health efforts, to primary care-based programs, to periodic clinics organized by head and neck surgeons. The existing data are not conclusive concerning the efficacy and utility of routine screening for head and neck cancer. The major limiting factor is the absence of well-designed, randomized prospective trials, which has led the United States Preventive Services Task Force not to recommend routine screenings.⁹ The only randomized controlled trial to date, involving greater than 100,000 patients, suggested that visual screening for oral cancers is only efficacious in high-risk populations, namely tobacco and alcohol abusers.¹⁰

Otolaryngologists are uniquely equipped to conduct head and neck cancer screening due to detailed knowledge of and experience with upper airway anatomy and pathology, and the accessibility of the implements necessary to visualize the upper aerodigestive tract. A detailed physical examination is the single best modality to detect neoplasms at early stages.⁶ The University of Michigan has conducted a free annual screening clinic for head and neck cancer for the past 14 years. This study is designed to review our experience with this screening program, and to guide the design and implementation of future such clinics.

Materials and Methods

Screening Clinics and Subjects

The University of Michigan Department of Otolaryngology, in conjunction with the University of Michigan Comprehensive Cancer Center, has conducted a free community clinic head and neck cancer screening program on an annual basis. Patients were recruited in a variety of ways, including advertisements in print media, flyers placed in buses and low-income health clinics, and via the internet. Participants were encouraged to make an appointment in advance via an advertised telephone number, although walk-ins were also accepted as space allowed. Those presenting for evaluation filled out a questionnaire designed for the screening clinic with demographic data and information about their risk factors and presenting symptoms.

The medical encounter involved a medical history and physical examination (including flexible pharyngoscopy and laryngoscopy where appropriate) with a physician or physician assistant. All patients with concerning findings were referred for further care as appropriate, and schedulers were present on site in order to secure future appointments as part of the screening clinic. Patients who preferred not to arrange follow-up appointments at our institution were encouraged to seek care elsewhere. Financial counseling was made available to all patients who required assistance with obtaining medical insurance and access to medical care. Patients with findings or symptoms requiring follow-up by a primary care provider or other specialty provider were referred appropriately. Clinical information regarding findings, concerns and recommendations were provided to all participants both verbally and in writing, to be shared with their primary care or other health care providers. Both formal and informal smoking cessation counseling and education about cancer risk factors (including individual discussions, group sessions and handouts) were also integral parts of the program.

Data Acquisition

After IRB approval, all of the prospectively-collected information available from the screening clinics was amassed for secondary data analysis within an electronic database. Demographic information, presenting symptoms, clinical findings and medical recommendations were extracted from the questionnaires. Outcomes, including follow-up data and the results of workup for malignancy, were obtained retrospectively through chart abstraction.

Data Analysis

SAS Version 9.2 (Cary, NC) was used to obtain descriptive statistics and fit models to the data. Frequency distributions for all variables were calculated. The logistic regression model was run to estimate the odds ratios of a finding a lesion suspicious for cancer given each of the variables. A logistic model was also fit to determine the probability of returning for a follow-up appointment when this was recommended. Logistic regression was used to determine odds ratios and p-values for each pair of symptoms.

Results

Demographics

Of 761 eligible subjects, two did not have analyzable data and were excluded. Among the included subjects, 58% were male, and ages ranged from 17 to 100 years with a mean of 58 years (Table 1). Most subjects (76%) were Caucasian, 57% were married, 86% had a primary care provider (PCP) and 68% reported having medical insurance. With regard to tobacco use, 66% were current or former tobacco users. Concerning alcohol use, 37% of patients reported drinking regularly. The majority of patients (55%) learned of the screening clinic through newspaper advertisements. Further demographic information is summarized in Table 2.

Symptoms and Outcome

The vast majority (87%) of patients reported at least one symptom. The most common complaint reported was hoarseness (60%), followed by dysphagia (42%). Symptom frequencies are summarized in Table 3.

Slightly more than half (53%) of patients had normal screening examinations, and the remaining 47% had abnormal findings. Abnormal findings that were presumably benign were identified in 42% of all participants. Laryngopharyngeal reflux was the most common diagnosis, identified in 25% of patients in whom pathology was recognized. All of the abnormal findings and their frequencies are summarized in Table 4.

There were 41 patients (5%) who had findings suspicious for cancer. Of these, 7 patients (0.9%) had malignant or pre-malignant lesions confirmed. These included four cases of mucosal squamous cell carcinoma, two cases of dysplastic leukoplakia, and one case of papillary thyroid cancer; three of the five invasive cancers were diagnosed at early stages (see Table 5). Another 12 of these individuals underwent workup and were diagnosed with benign conditions. The remaining 25 patients did not return to our institution for follow-up.

Predictors of Primary Outcome

Lack of insurance ($p=0.05$) was a significant demographic predictor of a lesion suspicious for malignancy. Participants who currently chew tobacco had significantly higher rates of suspicious findings compared to those who never used tobacco ($p<0.001$). Neither users of inhaled tobacco (current and former) nor “ever” tobacco users had significantly different

outcomes compared to those without a tobacco abuse history. Regular alcohol use was not significantly associated with the primary outcome. Male gender ($p=0.03$) and separated marital status ($p=.002$ vs. married) both correlated with a significantly higher incidence of a suspicious finding. The odds ratios and significance of each demographic variable and symptom in predicting a finding suspicious for cancer are presented in Tables 2 and 3.

In a univariate analysis, the patient-reported symptoms that were significantly associated with a finding suspicious for cancer were oral pain ($p<0.001$) and neck mass ($p<0.001$). Examining the symptom distribution by age, the odds of oral pain and neck mass both decreased significantly as age increased. Age was also a significant covariate ($p=0.04$), with the likelihood of a suspicious finding decreasing as age increased; the average age of patients with a suspicious lesion was 54 years, compared with an average of 59 years amongst the remainder of the population (Table 1).

Follow-Up

A total of 94 subjects were encouraged to return to the outpatient otolaryngology clinic and given the option to make follow-up appointments at the time of the screening clinic. This included 41 patients with suspicious lesions and 53 with suspected benign otolaryngologic conditions. Of these, 39 (41%) returned for appointments. Nineteen of 41 patients (46%) with findings suspicious for cancer made and kept appointments at our institution. Twenty of 53 patients (38%) with suspected benign conditions returned to the clinic for follow up. Data were not available concerning patients who chose to seek care at other institutions. On univariate analysis, using gender, education, referral pattern, presence of a PCP, and insurance status as variables, there were no significant predictors of whether or not these patients returned for evaluation, although there was a trend towards better follow-up in patients with insurance (Table 6).

Discussion

Primary Outcome

As in prior studies, the incidence of suspicious lesions and confirmed neoplasms in our study was low. A review of nine studies on oral cancer screening programs involving a combined total of more than 13 million patients reported a range from 0.2% to 9.5% of patients with suspicious lesions, with confirmed malignancies between 0% and 2.4%.¹¹ Smaller studies evaluating utility of screening for laryngeal cancer have demonstrated similar results.¹² The largest study of laryngeal cancer screening (including more than 26,000 patients) identified 9% of individuals with concerning findings, of which 0.3% had confirmed malignant or pre-malignant pathology.¹³ Programs utilizing screening of high-risk individuals by primary care providers have proven feasible and successful, but the number of malignancies diagnosed remained low.¹⁴

One explanation for these results is the low incidence of head and neck cancer compared to other diseases for which screening programs have proven efficacious.¹⁵ As a result, modalities other than the conventional physical exam have been explored. The roles of brush biopsy, fluorescence imaging and toluidine blue staining for oral cancer screening are without definitive supporting evidence to date; a meta-analysis of toluidine blue as an adjunct to screening programs questioned its practicality in this setting.¹⁶ The dearth of convincing data has led advisory groups and systematic reviews to conclude that there is insufficient evidence to recommend routine screening for oral cancers.^{11,15}

One encouraging finding in our study was the fact that most of the neoplasms identified were either pre-cancers or early stage tumors, implying that screening was effective in discovering tumors when they were more curable. A German study from 1976 also

identified relatively few malignancies, but the authors were encouraged because three percent of the study population presented with pre-malignant lesions.¹⁷ As noted above, larger studies and meta-analyses have not confirmed these findings on a broader scale, although differing types of clinical screening programs and variable research design make direct comparisons somewhat difficult.

Demographics

Patients who did not have medical insurance were more likely to have suspicious lesions. This may reflect a lack of health care access, and confirms data demonstrating a higher risk of head and neck neoplasms amongst patients with limited socioeconomic resources and medical access.^{18,19} Prior screening programs that focused upon populations without access to medical care also noted that a majority exhibited high-risk behaviors, and that there were significant socioeconomic and cultural barriers to performing screenings.²⁰ The low percentage of uninsured patients in our population is also noteworthy, but echoes similar findings elsewhere.²¹ Similarly, many participants had a primary care provider, and some were even referred to the screening clinic by a physician. The majority of our patients were Caucasian, despite the fact that minorities are disproportionately affected by head and neck cancer with worse outcomes on the whole, and frequently have barriers to establishing care.¹ In general, one of the goals of free screening clinics such as ours is to provide service to populations that do not otherwise have access to medical care. Given this objective, compounded by a significantly higher rate of suspicious lesions in this population both in our study and in the literature, future clinics should attempt to recruit patients who do not have access to medical services through more traditional means.

The association between tobacco and alcohol abuse and head and neck cancers has been long established, and epidemiologic studies have convincingly demonstrated causation.²² Based upon the only randomized controlled trial to address this issue, routine head and neck cancer screening should target those with established risk factors.¹⁰ One potential explanation for our findings may reflect skewed data, as self-selected patients who present to a screening clinic constitute a demographic distinct from the general population, including a higher percentage of smokers relative to the national average. A similar study demonstrated a comparably disproportionate percentage of smokers attending screening clinics.²³ The emergence of human papilloma virus (HPV)-related tumors may also be altering the demographics and risk factor profile of newly diagnosed head and neck cancers.²⁴ Our study did not collect information about patients' sexual histories or test whether or not diagnosed lesions were HPV-related, thus this explanation remains purely conjecture.

Younger age was a significant predictor of a concerning finding in our study. However, the average age in this group was within the same decade and only four years younger than the rest of the study population. Our findings are consistent with published demographics, which indicate that the majority of head and neck malignancies are diagnosed in the fifth through seventh decades.¹ The statistical significance of this finding does not clearly translate into clinical significance, given both the concordance with published literature and the small absolute difference in age amongst patients with and without concerning findings. Our study also corroborates the male predominance with regard to head and neck cancers.²⁵

Clinical Factors

The extremely high number of patients who presented with head and neck symptoms is noteworthy. This argues that our subjects might not have been interested in a purely screening evaluation, but also a problem-based appointment in order to address a specific issue. This may explain, in large part, the fact that traditional risk factors (older age, tobacco

and alcohol use, for example) were not significant predictors in our population given the bias based upon self-referral patterns. One study analyzing a screening clinic similar in structure to ours also reported a majority of patients who presented with symptoms, although they did not correlate with abnormal findings in their study.²¹ To our knowledge, ours is the first report to specify the presenting symptoms and benign conditions diagnosed in this type of clinic, both of which were considerably more common than expected.

Oral pain was the most significant predictor of patients with suspicious lesions. Oral pain is an established harbinger of head and neck cancer, and is one of the more common presenting symptoms; the absence of conspicuous symptoms prior to the onset of pain may explain the relatively advanced state of most lesions at the time of diagnosis.²⁶

Patients complaining of a neck mass were more likely to have suspicious lesions, corroborating the fact that many head and neck cancer patients present with locoregionally advanced disease. On initial glance, this contradicts our finding that the neoplasms that were confirmed were mostly diagnosed at early stages. However, a number of neck masses which were concerning for malignancy were related to benign causes, and patient follow-up was also quite poor. As a general rule, all patients presenting with a neck mass, particularly in the presence of significant risk factors for cancer, merit further workup.

Surprisingly, patients complaining of hoarseness did not have significantly higher rates of suspicious lesions despite the established association between persistent hoarseness and head and neck cancer, and the striking frequency of this complaint.²⁷ Patient perceptions of vocal pathology are subjective, and do not always correlate with medically diagnosed vocal disorders. Moreover, a variety of benign pathologies, many of which were common in our study population, frequently contribute to a range of vocal problems.²⁸

Symptoms that are concerning for head and neck cancer are nonspecific, and have considerable overlap with those that are caused by a litany of benign diseases. This may also help explain why the incidence of benign pathologies was higher in our study.

Follow-up

One unexpected finding of this study was the poor follow-up in patients for whom further evaluation was deemed necessary. Less than half of all of these patients, with an equivalent rate in those with benign and potentially malignant conditions, returned. Given that patients knew where to present (the screening clinic took place in the departmental outpatient facility) and that schedulers were available to make appointments on the day of the screening clinic, logistical issues were unlikely contributory. Prior oral cancer screening clinics in urban underserved areas have also demonstrated poor follow-up rates among patients with concerning findings.²⁹

Interestingly, in our study, the social variables which were measured did not influence patients' ability to return; patients with primary care providers and medical insurance had similarly poor follow-up rates to those who did not have open access to medical care. The trend towards better follow-up amongst those with insurance would be expected. Future clinics should attempt to explore barriers to follow-up with patients to ensure that they are appropriately managed, especially when a finding suspicious for malignancy is encountered.

Other Advantages of Screening Clinics

The role of education and risk factor modification with regard to head and neck cancer cannot be stressed enough. Head and neck cancer is closely associated with tobacco and alcohol abuse, and symptoms of early neoplasms are not well known by the general public. In a study of patients attending a free head and neck cancer screening clinic, participants had

considerable gaps in knowledge about risk factors for and symptoms of these pathologies, and a large proportion had significant high-risk features.²⁴ Head and neck cancer screening programs have proven successful at increasing awareness of the disease, as well as risk factors and warning signs.²¹ Thus, screening clinics provide tremendous opportunities to disseminate information about not only the disease process itself, but also to encourage risk factor modification with smoking and alcohol cessation.²⁷

The psychological benefit of reassuring a patient that he/she does not have head and neck cancer is also worthwhile, as a sizable percentage of patients presenting for otolaryngologic evaluation have a significant fear of malignancy.³⁰ Given that the vast majority of patients presented to our clinic with physical symptoms, it is likely that many were not only motivated by the prospect of routine screening, but also to address specific concerns. The fact that almost half of participants had abnormal findings also indicates the usefulness of the program; while cancer is obviously the primary interest, the diagnosis, treatment and education for a litany of benign head and neck-related conditions in hundreds of patients is also quite valuable.

Outcomes involving education, prevention, community engagement and facilitated access to health care are less easily measured. Data were not collected in this study about rate of risk factor cessation attributable to interventions introduced at the screening clinics. One might argue that these interventions are equally valuable, as they directly benefit more participants, whereby a considerably smaller subset will have a lesion identified. The effort and manpower necessary for intensive education and risk factor modification are considerable; having resources in place on a day dedicated to this task both relieves opportunity cost and facilitates logistics.

Strengths and Weaknesses

To our knowledge, this is the largest study evaluating an annual, departmentally-organized head and neck cancer screening clinic of this kind. While retrospective in nature, patient recruitment and all data concerning the screening clinic encounter was amassed prospectively, thereby eliminating recall bias. Given that this is a single-institution series in a population with a distinct demographic makeup, the data may or may not be directly relevant to other such programs, although the general lessons certainly are. A major shortcoming of this study is the fact that about half of the patients asked to follow up for a suspicious lesion did not return to our clinic. This precluded the ability to confirm or exclude neoplasms in that cohort. However, using the presence of a “suspicious lesion” as the primary outcome was deemed appropriate, given that the general goal of screening programs is to identify patients who require a more intensive workup.

Conclusion

A small percentage of patients presenting to a head and neck cancer screening clinic will have a suspicious lesion identified on examination. The demographic factors, signs and symptoms associated with a higher risk of such a lesion include lack of health insurance, oral pain, or neck mass. Screening clinics additionally provide an excellent opportunity to disseminate information about head and neck cancer and to introduce interventions designed to modify risk factors. Given these findings, future head and neck cancer screening clinics should target patients with identified risk factors, and should take full advantage of opportunities for education and prevention.

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Figure 1.
Outcome of Screening Clinic (n=761)

Table 1

Age by Decade

Decade	Frequency (%)	Suspicious Cancer Incidence
10–20	6 (0.8%)	0
21–30	17 (2.2%)	2 (11.8%)
31–40	67 (8.8%)	5 (7.5%)
41–50	143 (18.8%)	14 (9.8%)
51–60	191 (25.1%)	9 (4.7%)
61–70	170 (22.3%)	7 (4.1%)
71–80	139 (18.3%)	4 (2.9%)
81–90	23 (3.0%)	2 (8.7%)
91–100	5 (0.7%)	0

Table 2

Demographics

	Frequency (%) [*]	Suspicious Cancer Incidence	Odds Ratio	95% CI	P-Value	Overall P-Value
Gender						
Female (Ref)	442 (41.9%)	18 (4.1%)	1.00			
Male	319 (58.1%)	25 (7.8%)	2.00	1.07 – 3.74	p=0.03	
Race						
Caucasian (Ref)	578 (76.0%)	33 (5.7%)	1.00			p=0.71
African-American	54 (7.1%)	3 (5.6%)	0.97	0.29 – 3.28	p=0.96	
Asian	25 (3.3%)	0	0.32	0.02 – 5.36	p=0.43	
Hispanic ^f	5 (0.7%)	0				
Multi-racial ^f	4 (0.5%)	1 (25.0%)				
Marital Status						
Married (Ref)	436 (57.3%)	21 (4.8%)	1.00			p=0.026
Divorced	100 (13.1%)	4 (4.0%)	0.82	0.28 – 2.45	p=0.72	
Single	130 (17.1%)	7 (5.4%)	1.12	0.47 – 2.70	p=0.80	
Separated	16 (2.1%)	4 (25.0%)	6.57	1.95 – 22.12	p=0.002	
Widowed	67 (8.8%)	6 (9.0%)	1.20	0.75 – 5.00	p=0.17	
Education						
Advanced Degree (Ref)	29 (3.8%)	1 (3.5%)	1.00			p=0.33
College Degree	348 (45.7%)	18 (5.2%)	1.53	0.20 – 11.87	p=0.69	
HS Diploma	339 (44.6%)	20 (5.9%)	1.76	0.23 – 13.57	p=0.59	
Did Not Graduate HS	30 (3.9%)	4 (13.3%)	4.31	0.45 – 41.09	p=0.20	
Employment						
Employed (Ref)	346 (45.5%)	20 (5.8%)	1.00			p=0.21
Retired	316 (41.5%)	15 (4.8%)	0.81	0.41 – 1.62	p=0.55	
Unemployed	80 (10.5%)	8 (10.0%)	1.81	0.77 – 4.28	p=0.18	
Referral						
						p=0.80

	Frequency (%) [*]	Suspicious Cancer Incidence	Odds Ratio	95% CI	P-Value	Overall P-Value
Newspaper (Ref)	416 (54.7%)	23 (5.5%)	1.00			
Online	41 (5.4%)	0	0.22	0.01 – 3.77	p=0.30	
Physician	55 (7.2%)	4 (7.3%)	1.34	0.45 – 4.03	p=0.60	
Flyer	112 (15.5%)	7 (6.3%)	1.14	0.48 – 2.73	p=0.77	
Other Media	101 (13.9%)	9 (8.9%)	1.67	0.75 – 3.73	p=0.21	
PCP						
No (Ref)	75 (9.9%)	7 (17.5%)	1.00			
Yes	654 (85.9%)	33 (5.1%)	0.52	0.22 – 1.21	p=0.13	
Medical Insurance						
No (Ref)	42 (5.5%)	5 (11.9%)	1.00			
Yes	515 (67.7%)	24 (4.7%)	0.36	0.13 – 1.00	p=0.05	
Alcohol						
No (Ref)	463 (60.8%)	29 (6.3%)	1.00			
Yes	282 (37.1%)	14 (5.0%)	0.78	0.41 – 1.51	p=0.46	
Tobacco Use						
Never (Ref)	260 (34.2%)	13 (5.0%)	1			p<0.001
Current (Inhaled)	169 (22.2%)	16 (9.5%)	1.99	0.93 – 4.25	p=0.08	
Current (Chewing)	18 (2.4%)	5 (27.8%)	7.31	2.26 – 23.61	p<0.001	
Former (Inhaled)	282 (37.1%)	7 (2.5%)	0.48	0.19 – 1.23	p=0.13	
Former (Chewing)	25 (3.3%)	2 (8.0%)	1.65	0.35 – 7.78	p=0.53	
Any Tobacco	494 (64.9%)	30 (6.1%)	1.23	0.63 – 2.40	p=0.55	

* Percentages are calculated based upon total number of subjects and may not equal 100 due to missing data.

[†] Frequencies too low for statistical analysis.

Table 3

Presenting Symptoms

Symptom	Frequency (%)	Suspicious Cancer Incidence	Odds Ratio	95% CI	P-Value
Hoarseness	455 (59.8%)	29 (6.4%)	1.42	0.74 – 2.73	p=0.30
Dysphagia	318 (41.8%)	18 (5.7%)	1.00	0.54 – 1.87	p=0.99
Nasal Obstruction	185 (24.3%)	9 (4.9%)	0.82	0.38 – 1.73	p=0.60
Ear Pain	147 (19.3%)	10 (6.8%)	1.29	0.62 – 2.67	p=0.50
Nasal Bleeding	132 (17.5%)	7 (5.3%)	0.92	0.40 – 2.12	p=0.85
Odynophagia	128 (16.8%)	10 (7.8%)	1.54	0.74 – 3.21	p=0.25
Oral Pain	90 (11.8%)	13 (14.4%)	3.61	1.81 – 7.21	p<0.001
Neck Mass	76 (10.0%)	12 (15.8%)	3.96	1.94 – 8.08	p<0.001
Oral Sores	63 (8.3%)	4 (6.4%)	1.15	0.40 – 3.32	p=0.80
Ear Drainage	41 (5.4%)	4 (9.8%)	1.89	0.64 – 5.56	p=0.25
Oral Bleeding	33 (4.3%)	2 (6.1%)	1.08	0.25 – 4.68	p=0.92
Hemoptysis	29 (3.8%)	(6.9%)	1.25	0.29 – 5.43	p=0.77
Denture problem	25 (3.3%)	2 (8.0%)	1.47	0.34 – 6.47	p=0.61

Table 4

Diagnoses Among Patients With Identified Pathology (n=356)

Diagnosis	Frequency	Percent
LARYNGOPHARYNGEAL REFLUX	193	54.2
DYSPHAGIA	31	8.7
GLOTTIC LESION	22	6.2
OROPHARYNGEAL LESION	10	3.6
NECK MASS	12	3.3
ORAL CAVITY LESION	12	3.3
ASYMMETRIC HEARING LOSS	8	2.2
THYROID NODULE	8	2.2
ALLERGIC RHINITIS	7	2
DYSPHONIA	7	2
DENTAL CARIES	6	1.7
MIDDLE EAR DISEASE	6	1.7
TMJ DISEASE	4	1.1
VOCAL FOLD PARESIS	4	1.1
CUTANEOUS INFECTION	3	0.8
COUGH	3	0.8
HEMOPTYSIS	3	0.8
NASAL POLYPS	3	0.8
RECURRENT TONSILLITIS	3	0.8
CUTANEOUS LESION	2	0.6
OBSTRUCTIVE SLEEP APNEA	2	0.6
SIALOADENITIS	2	0.6
APHTHOUS ULCER	1	0.2
ATYPICAL MOLE	1	0.2
CANDIDIASIS	1	0.2
DYSPNEA	1	0.2
NASAL LESION	1	0.2

Table 5

Diagnosis of Patients with Confirmed Neoplasm (n=7)

Diagnosis at Screening	Site	Final Diagnosis	TNM (Stage)
Oral cavity lesion	Lower lip	Leukoplakia with dysplasia	N/A
Glottic lesion	True vocal fold	Leukoplakia with dysplasia	N/A
Thyroid nodule	Thyroid	Papillary carcinoma	T1N0M0 (I)
Glottic lesion	True vocal fold	Squamous cell carcinoma	T1aN0M0 (I)
Glottic lesion	True vocal fold	Squamous cell carcinoma	T2N0M0 (II)
Glottic lesion	Supraglottis	Squamous cell carcinoma	T3N1M0 (III)
Oropharynx lesion	Pharyngeal wall	Squamous cell carcinoma	T4N2aM0 (IV)

Table 6

Predictors of Follow-Up

	Odds Ratio	95% CI	P-value
Gender			
Female (Ref)	1.00		
Male	1.03	0.44 – 2.39	p=0.95
Education			
HS diploma or less (Ref)	1.00		
Post-HS training	0.48	0.19 – 1.21	p=0.12
Referral			
Newspaper (Ref)	1.00		
Online	5.55	0.21 – 143.91	p=0.30
Physician	0.54	0.10 – 2.89	p=0.47
Other Media	2.81	0.85 – 9.32	p=0.09
Flyer	1.25	0.38 – 4.14	p=0.72
PCP			
No (Ref)	1.00		
Yes	2.30	0.58 – 9.18	p=0.22
Medical Insurance			
No (Ref)	1.00		
Yes	12.31	0.67 – 225.32	p=0.09