Characterizing Tobacco Usage in Otolaryngology Patients to Target Smoking Cessation Efforts

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ABSTRACT

OBJECTIVE: Smoking cessation is critical in reducing incidence of head and neck cancers (HNC) and improving postoperative outcomes. Accurate documentation of tobacco usage is necessary to understand prevalence in patients to target smoking cessation. This study aims to characterize tobacco usage documentation, including electronic nicotine delivery systems (ENDS) use, among otolaryngology patients.

STUDY DESIGN: Retrospective chart review.

SETTING: Penn State Health Milton S. Hershey Medical Center (PSHMC).

METHODS: A retrospective chart review was conducted on adult otolaryngology patients seen from January 1, 2020 – December 31, 2020. Patient demographics, details of alcohol and tobacco usage, including type of tobacco, and subspecialty seen were collected. Associations were evaluated using chi-square tests and a multivariable logistic regression model.

RESULTS: Patients (n = 2137) were an average of 58.4 years old ±18.0, 59.3% female, and 78.0% white. Of participants with documented tobacco history (n = 944), 56.7% were never users, 28.9% were former users, and 14.4% were current users. Among current users (n = 308), 86.4% used cigarettes, and 5.2% used ENDS. The remainder used chew (4.9%) and cigars (3.25%). Odds of tobacco use were 1.5x greater for males (95% CI 1.19-2.00), 1.6x greater for unmarried patients (95% CI 1.24-2.09), 2.1x greater for those with no insurance vs government (95% CI 1.43-3.18), and 2.4x greater for those diagnosed with HNC (95% CI 1.64-3.49).

CONCLUSION: Most patients report cigarette smoking when asked about tobacco use. Taking into consideration the rise of ENDS use, our sample showed ENDS use that was higher than the national average. There is significant opportunity for improved history taking, especially within general and head and neck oncology subspecialties for more comprehensive treatment.

KEYWORDS: otolaryngology, tobacco, cessation, electronic nicotine delivery

Introduction

Tobacco use, particularly cigarette smoking, is a well-established detriment to human health that leads to various systemic pathological and malignant conditions; however, cigarette use remains prominent, with about 12% of United States adults in 2021 reporting current cigarette smoking.[1] Unfortunately, in the United States, cigarette smoking alone accounts for about 48% of all cancer-related deaths.[2,3] Evidence suggests that not only does smoking cause cancer, continued smoking after cancer diagnoses increases the risk of developing other smoking-related illnesses, secondary primary tumors, cancer recurrence and mortality.[4] In addition to the well-known systemic effects and public health concerns, smoking presents a major challenge to surgical populations as it has been shown to correlate with multiple postoperative complications including infections, impaired wound healing, general morbidity and admission to the intensive care unit.[5]

Head and neck cancers (HNC), particularly head and neck squamous cell carcinoma (HNSCC), are one of the many cancers that are strongly associated with tobacco use. Up to 85% of head and neck cancers have been linked to tobacco use.[6] A study investigating the independent association of tobacco use in developing HNSCC found an odds ratio (OR) of 2.13 among smokers vs never-smokers and showed a dose-dependent relationship for the frequency, duration, and number of pack-years of cigarette smoking.[7] Additionally, a study following recent HNC survivors found that smokers were 4.9 times more likely to die during a follow-up period of a

median of 51 months, and up to a maximum of 90 months.[8] Smoking cessation has been shown to decrease this risk, with a study reporting that 20 or more years of cessation can reduce the risk of HNSCC to that of a never-smoker.[9] Taken together, these studies emphasize the importance of smoking cessation in the prevention and prognosis of HNC.

In addition to tobacco products with established harm, ENDS are a relatively newer product class that were introduced to the United States in 2007. ENDS have gained widespread popularity due to their potential reduced harms compared with cigarette smoking, with 4.5% of United States adults in 2021 reported as being current e-cigarette users.[2,10,11] It has been shown that e-cigarette aerosols have fewer toxic elements compared to cigarette smoke.[12] ENDS have been utilized in smoking cessation, with a 2024 systematic review concluding with high-certainty that ENDS is more effective than nicotine replacement therapy in aiding smoking cessation practices.[13] It is important to note, however, that its efficacy as a smoking cessation tool remains dependent on nicotine content, as shown by a review of 20 studies published in 2022. Authors concluded there is no significant increase in smoking cessation among users of e-cigarettes without nicotine as opposed to those with nicotine.[14] Overall, the surge in ENDS usage is a public health concern because their long-term health effects and perioperative risks have not been well described or studied, possibly due to the rapid evolution of the products.[15] Although, these are smoke-free devices, they still deliver nicotine, which is known to cause deleterious effects on various organ systems. Of note, it is also a carcinogen.[16] Although there are less toxins compared to cigarettes, ENDS still have components such as acrolein and aldehydes that can cause precancerous lesions (stomatitis) and damage to the endothelial cell barrier, respectively.[17] Few cases have also been reported of patients who developed oral cavity cancer with heavy exposure to ENDS but no other risk factors.[18] Therefore, there is need to characterize ENDS usage to study these gaps.

Since continued tobacco use is associated with increased risks among those with diagnosed cancers, it is important to provide tobacco cessation treatment to all cancer patients. The first step to providing treatment is to identify the need for services. Identification of tobacco users remains difficult due to lack of proper documentation. To improve patient identification, this study aims to characterize tobacco usage, including ENDS use, among adult otolaryngology clinic patients. We aim to characterize whether there is a particular otolaryngologic patient demographic (including their disease characteristics) that is more likely to use tobacco, helping to delineate why standard tobacco use documentation is important, especially when it comes to newer tobacco products that are not routinely inquired about. This data will be a useful step in identifying areas that need improvement when obtaining tobacco use history to best assist identified patients in tobacco use cessation. The results of our study will also provide evidence for how frequently conventional and electronic tobacco usage is reported in otolaryngology patients, as this is an important component of medical record documentation.

Methods

Data Source

Electronic medical records at Penn State Health Milton S. Hershey Medical Center (PSHMC) were reviewed for all new patients seen at the ambulatory otolaryngology clinic between January 1, 2020 – December 31, 2020. Patients who were younger than 18 or did not have adequate records to determine tobacco use or medical history were excluded. Demographic information including age, sex, marital status, insurance, diagnosis, subspecialty seen, and details of alcohol and tobacco usage were collected using chart review and intake surveys at the time of the initial otolaryngology clinic visit. The intake form queried patients of current or history of tobacco use, method of tobacco use, how much tobacco they used daily, and number of years they used tobacco in an open-ended fashion. Current tobacco users were defined as those who were using any form of tobacco at the initial clinic visit. Former tobacco users were patients who used any form of tobacco in the past but were not using at the initial clinic visit. Never tobacco users were defined as those who had no reported tobacco use history. Ever tobacco users refer to patients with any sort of tobacco usage history, past or current. Alcohol use on the intake form was asked about in terms of if the patient drank alcohol, and if so, how much alcohol was consumed. Diagnoses for malignant disease were further described by location and grouped into one of eight categories including squamous cell, salivary gland, oropharynx, sarcoma, skin, lymphoma or leukemia, thyroid or other.

Statistics

Descriptive statistics were reported to characterize the sample. Categorical variables were expressed as frequencies and percentages, continuous variables were summarized with means (SDs) and medians (quartiles). Bivariate associations with current tobacco use status were evaluated with t-tests and chi-square tests, and factors that were significantly associated with $P < .05$ were evaluated simultaneously in a multivariable logistic regression model. A backward selection process was used to determine the most parsimonious model, and the remaining significant factors were interpreted in terms of odds ratios and 95% confidence intervals. Statistical significance was defined as $P < .05$, and all statistical analyses were performed with SAS statistical software version 9.5 (SAS Institute Inc, Cary NC).

Results

In total, 2182 charts were reviewed. Forty-five patients (2.1%) were excluded due to incomplete information of tobacco use or disease history, resulting in a sample of 2137 patients. The average age of the cohort was 58.4 ± 18.0 years. Most patients

were female (n = 1266, 59.3%), white (n = 1667, 78.0%), married (n = 1108, 53.3%), and had private insurance (959, 44.9%). Most participants were never tobacco users (n = 1211, 56.7%), while 618 (28.9%) were former tobacco users, and 308 (14.4%) were current tobacco users. A summary of the demographics is shown in Table 1.

Among current users, most participants reported smoking cigarettes (n = 266, 86%). Other products used included cigars (10, 3%), ENDS (16, 5%), and chew (15, 5%). When looking at frequencies of documentation details, packs per day and years of cigarette use were consistently documented (93%, 90%), respectively. However, when looking at other products, times used per day and years used were less consistently documented. Within cigar users, this data was

reported 40% of the time. Within ENDS users, 12.5% of users had data for times per day used, and 69% of users had number of years used. Patients using chew had data for daily use 33% of the time, and 60% of patients had information about number of years used. When looking at number of years used, cigarettes had the longest amount (median years (lower quartile Q1, upper quartile Q3)) (30 (15, 40)). Chew tobacco was second highest (18 (8, 30)). The shortest documented number of years was seen in ENDS patients (4 (2, 6)). These results are illustrated in Table 2.

Regarding cancer diagnosis, 16.0% of current users and 8.6% of former/never users had a had a head and neck cancer (HNC) diagnosis ($P < .001$). The data is shown in Table 3. Breakdown of cancer type is shown in Table 4.

Table 1. Demographics of current users vs former/never users including age, sex, race, ethnicity, marital status, and primary insurance.

TOTAL N = 2137	CURRENT TOBACCO USERS (N = 308)	FORMER/NEVER USERS (N = 1829)	P-VALUE
Age (mean ± SD), years	53.6 ± 15.82	59.2 ± 18.23	$P < .001$
Sex (n, %)			$P = .001$
Male	151 (49.0)	719 (39.3)	
Female	157 (51.0)	1109 (60.7)	
Race (n, %)			$P = .17$
American Indian/Alaska native	1 (.3)	1 (.05)	
Asian	4 (3.7)	67 (1.3)	
Black or African American	20 (6.5)	111 (6.1)	
More than one race	7 (2.3)	27 (1.5)	
Native Hawaiian or other Pacific Islander	1 (.3)	1 (.05)	
Other	18 (5.8)	113 (6.2)	
Unknown/not reported	17 (5.5)	82 (4.5)	
White	240 (77.9)	1427 (78.0)	
Ethnicity (n, %)			$P = .17$
Hispanic or Latino	28 (9.1)	131 (7.2)	
Not Hispanic or Latino	255 (82.8)	1587 (86.8)	
Unknown/not reported	25 (8.1)	111 (6.1)	
Marital status (n, %)			$P < .001$
Married	129 (42.9)	979 (55.0)	
Not married	167 (55.5)	784 (44.1)	
Prefer not to answer	5 (1.7)	16 (.9)	
Primary insurance (n, %)			$P < .001$
Private	140 (45.5)	819 (44.8)	
Government	45 (14.6)	491 (26.9)	
None	123 (40.0)	519 (28.4)	

Table 2. Frequency of documentation of tobacco use for current users and length/amount of use (median years (lower quartile Q1, upper quartile Q3)).

TYPE OF PRODUCT (N, %)	CURRENT TOBACCO USERS	
	FREQUENCY OF DOCUMENTATION (N, %)	MEDIAN (Q1, Q3)
Cigarettes (266, 86%)		
Packs per day	248 (93.2%)	1 (.5, 1)
Cigarette, years	239 (89.8%)	30 (15, 40)
Cigars (10, 3%)		
Cigars per day	4 (40%)	1 (.6, 1)
Cigar, years	4 (40%)	11 (8.5, 13.5)
ENDS (16, 5%)		
ENDS times per day	2 (12.5%)	4 (.3, 8)
ENDS, years	11 (68.8%)	4 (2, 6)
Chew (15, 5%)		
Chew per day	5 (33.3%)	2 (1, 3)
Chew, years	9 (60%)	18 (8, 30)

Table 3. Current tobacco use status in relation to cancer diagnosis.

TOBACCO USE STATUS	HNC DIAGNOSIS		
	YES	NO	TOTAL
Current	49 (16.0%)	258 (84.0%)	307
Former/never	158 (8.6%)	1670 (91.4%)	1828
Total	207	1928	2142

Table 4. Type of HNC in current tobacco users.

TYPE OF HNC	N	%
Lymphoma/leukemia	4	8.2
Other	3	6.1
Salivary gland	2	4.1
Sarcoma of the head	0	0.0
Skin	3	6.1
Squamous cell carcinoma	33	67.4
Thyroid/parathyroid	3	6.1

Lastly, a multivariable analysis was performed to identify the most significant predictors of tobacco usage. With adjustment for all other factors in the model, the odds of tobacco use were .8 times lower for every 20-year increase in age (95% CI 0.67-.91), but greater for men, those who were unmarried, and those with a cancer diagnosis. Odds of tobacco use was also greater for those without insurance or with private insurance compared to those with government insurance. These results are shown in Table 5.

Discussion

In this study, we aimed to characterize tobacco usage and documentation in otolaryngology - head and neck surgery patients. Most current smokers used cigarettes, with about 80% of users reporting this type of tobacco use, and this was the tobacco modality with the most documentation regarding years and amount. The least commonly used form of tobacco was cigars (3%), and the least documented modality for daily use was ENDS (12.5%). The least documented years of use was seen in chew users (60%). We found current tobacco users were more likely to have a head and neck cancer diagnosis compared to former/never users. Tobacco usage was more likely in older patients, males, unmarried, uninsured or with private insurance, and patients with a cancer diagnosis.

ENDS usage in the general United States population is estimated to be around 2.3%.[19] Our study showed that the documented ENDS usage for current users was varied, with significant issue capturing amount used daily. Additionally, despite ENDS having come to the United States in 2007, the median number of years used was only 4 in our dataset. Previous studies show that there is inconsistency in electronic medical record documentation of ENDS use, and ENDS usage is usually added alongside other tobacco use in patient notes, making the process disorganized.[20,21] One possible explanation for this finding is lack of proper questioning when asking patients about ENDS usage specifically. Instead of times per day, number of cartridges used in a determined amount of time and type of cartridge could aid in definitive quantification. Another possibility in lack of documentation may lie in lapses within resident training, shown by one study demonstrating that 93% of residents never receive formal education during training on the topic of e-cigarette use, and two-thirds of residents rarely or never ask their patients about e-cigarette

Table 5. Odds of tobacco usage as a factor of demographic characteristics (- *denotes reference category*).

PREDICTORS		ODDS RATIO	95% CI
Age	20-year incremental increase	0.8	(.67, .91)
Gender	Male	1.54	(1.19, 2.00)
	Female	-	-
Marital status	Unmarried	1.61	(1.24, 2.10)
	Prefer not to answer	2.51	(.88, 7.15)
	Married	-	-
Insurance status	Private	1.63	(1.11, 2.39)
	Uninsured	2.13	(1.11, 2.39)
	Government	-	-
Cancer diagnosis	Yes	2.40	(1.64, 3.49)
	No	-	-

usage.[22] Lack of knowledge about this topic can lead to lapses when obtaining a social history from patients, leading to missed documentation because the patient was never asked. This may have skewed numbers in our data, leading to falsely lower numbers of current users that regularly utilize ENDS. It may also explain why traditional cigarettes had the most documentation.

This study shows the need for improved documentation in the electronic patient record, including ENDS use. Although there is limited data on the long-term effects of ENDS, studies have shown that vapor from ENDS, regardless of nicotine content, can be cytotoxic and induce DNA-strand breaks in epithelial cells.[15,23,24] In patients using ENDS referred to otolaryngology-head and neck surgery, about half are diagnosed with an inflammatory condition, confirming that usage can contribute negatively to overall health starting at the cellular level.[15,25] However, there is also data showing that ENDS use poses a lower risk of developing head and neck squamous cell carcinoma compared to other tobacco products.[26] Furthermore, many patients implement ENDS as a means of smoking cessation as it has been shown to be useful for smoking cessation, especially when comparing to routine nicotine replacement therapy.[27]

There are several limitations to this study, with the primary limitation being the retrospective nature of this study. Additional limitations include recall bias and reliance on patient documentation as the main source of data. This data was collected from patients seen over 2020, and the impact of the COVID-19 pandemic may have skewed and underpredicted some of the metrics. Additionally, reporting of tobacco usage is largely varied, as packs/year reporting is specific to cigarette use and does not represent all types of tobacco. This demonstrates a need to standardize how tobacco use is characterized and include frequency and amount of tobacco usage for all types of tobacco, including loose tobacco and ENDS. Future work should include expanding this investigation to include pediatric

otolaryngology patients. One study showed that the daily use of ENDS in high school students and young adults has doubled between 2017-2019, thus it would be important to study the age group that uses ENDS the most.[28] Additionally, given the limited data on side effects of ENDS, future research should include documentation of these effects and followed over a longitudinal period to guide future recommendations for alternative nicotine sources to otolaryngology patients.

Conclusion

In conclusion, this study highlights the need for standardization of tobacco documentation in the otolaryngology clinic, especially within patients seen for head and neck cancer-related concerns. Current practices of social history documentation largely focus on traditionally used tobacco products. A possible explanation for this includes lack of education of how to quantify tobacco use for modalities other than cigarette use, and this rings even more true for electronic nicotine delivery systems (ENDS). Therefore, education on the topic of newer modalities of nicotine delivery (e.g., ENDS) is needed to help health care professionals comprehend the importance of expanding on the social history that is currently gathered.

Author Contributions

Pallavi Kulkarni was involved in data collection, data analysis, interpretation of data, authorship, and critical review and editing of manuscript. Joseph Dao was involved in study design, data collection, data analysis, interpretation of data, authorship, and critical review and editing of manuscript. Tonya King was involved in data analysis, interpretation of data, and critical review and editing of manuscript. Jessica Yingst was involved in study design, data analysis, interpretation of data, and critical review and editing of manuscript. Karen Y. Choi conceived the study, was involved in study design, interpretation of data, critical review and editing of

manuscript, supervised the entirety of the project and is responsible for the overall content as the guarantor.

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