Association between Tobacco Use and COVID-19 Severity in Ambulatory Patients

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Background

- Smoking is a proven chronic disease risk factor for most organ systems and holds risks for severe pulmonary and cardiovascular diseases. Due to its novelty, little is known about the relationship between COVID-19 and smoking.
- The COVID+ Smoking project is a subproject from the Moonshot Cancer Center Cessation Initiative (C3I). The project seeks to leverage existing relationships between cancer centers and their associated health systems to collect data on COVID-19-positive and COVID-19-presumptive patients to better understand the relationship between risk of COVID-19 infection and smoking. (https://sites.google.com/wisc.edu/c3icovidsmoking/home).
- The University of Maryland Greenebaum Comprehensive Cancer Center participates in this project, collecting data from the 13 hospitals at the University of Maryland Medical System (UMMS).
- **Objective:** To explore an association between COVID-19 severity and tobacco use and to identify potential risk factors in ambulatory care at the first presentation of COVID-19.
- **Study Population:** Data for 49,588 UMMS patients who tested positive for COVID-19 between February 1, 2020 – October 31, 2021. Data on 17,852 patients who were ambulatory at first presentation were analyzed.

Methods

- Data were extracted from the Epic using NCI guidelines and scripts provided by the University of Wisconsin Center for Tobacco Research and Intervention.
- COVID-19 severity ambulatory patients were measured in mutually exclusive categories based on symptom expression: low (no symptoms), moderate (symptoms without SOB or pneumonia), and high (symptoms with SOB or pneumonia).
- Smoking status was determined at the time of the first presentation or at later time point when smoking history was completed. Any form of tobacco (including cigarettes, pipes, cigars, snuff, chew, and e-cigarettes) was determined if the response was “Yes” at first encounter.
- The CDC/ATSDR Social Vulnerability Index (CDC/ATSDR SVI) ranks 15 U.S. census social factors, including poverty, lack of vehicle access, and crowded housing, and groups them into four related themes and provides an overall ranking. For individual states, tracts or counties are ranked against other tracts or counties in that state based FIPS11.
- Social Vulnerability Index (SVI) was assessed by matching patient zip code with CDC FIPS 11-digit ID. We used Median SVI for each unique zip code. (https://svi.cdc.gov/Documents/Data/2018_SVI_Data/SVI2018Documentation.pdf).
- Number of chronic conditions were identified by International Classification of Disease (ICD)10 codes for diagnoses and medical problems. Chronic conditions were selected based on the CMS-defined list of 21 chronic diseases; multiple chronic conditions (MCC) were categorized based on the CMS definition. (Chronic Conditions | CMS. Accessed September 13, 2021. https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Chronic-Conditions/CC_Main)
- Ordinal logistic multivariable regression analysis was used to model health care utilization as an outcome of parameters of interest.
- Data were analyzed using SAS 9.4 software.

Table 1. Patient Demographics of Initial Ambulatory Visit

		Ambulatory Patients at first presentation (N=17852)
Age (years) mean±sd		47.92±18.35
Median Social Vulnerability Index mean±sd		0.48±0.26
Gender n(%)	Male	6745(37.78%)
	Female	11107(62.22%)
Race n(%)	White NH	10258(57.46%)
	Black NH	5798(32.48%)
	Other NH	1001(5.61%)
	Hispanic	795(4.45%)
Number of Chronic Conditions n(%)	Less than 2	10620(59.49%)
	2 to 3	4891(27.40%)
	4 to 5	1640(9.19%)
	6 or more	701(3.93%)
Smoking Status n(%)	Yes	5951(33.34%)
	No	11901(66.66%)
COVID-19 Severity n(%)	Low	10418(58.36%)
	Medium	4141(23.20%)
	High	3293(18.45%)
Health Care Utilization n(%)	Ambulatory Only	14616(81.87%)
	Emergency Department	1445(8.09%)
	Hospital Admission	1791(10.03%)

NH: Non-Hispanic
Social Vulnerability Index Range is from 0 to 1

Factors associated with increased probability of ED visit or hospitalization in COVID-19 positive patients

Figure 1 Smoking Status by Patient Category

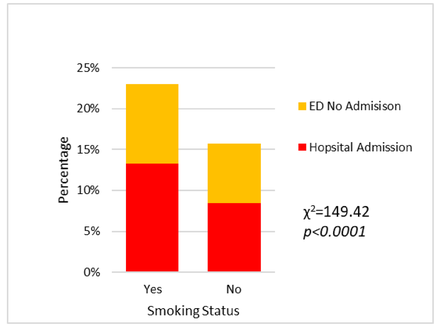


Figure 2 Race by Patient Category

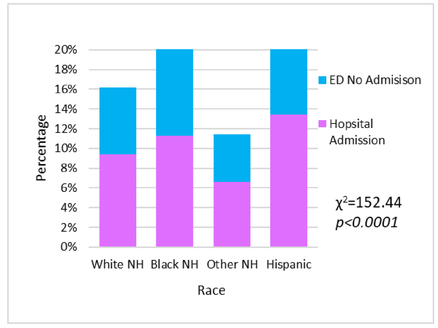


Figure 3 COVID-19 Severity Level by Patient Category

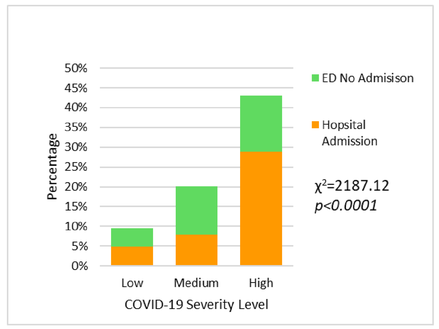
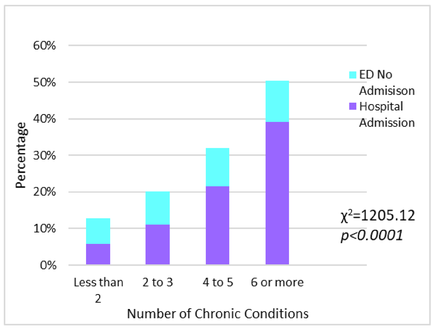


Figure 4 Number of Chronic Conditions by Patient Category



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- The contents provided are solely the responsibility of the authors and do not necessarily represent the official views of HHS or any of its agencies.
- We thank the University of Maryland Research Harbor team for their help with data extraction.

Table 2. Ordinal Multivariable Logistic Regression Model

	Patient Category	OR	95% CI	P value
Age	Hospital	1.000	0.996, 1.004	0.9285
	ED visit	0.983	0.980, 0.987	**<.0001**
Gender (ref=Male)				
	Hospital	1.200	1.070,1.344	**0.0018**
	ED Visit	1.216	1.079,1.371	**0.0014**
Race (ref=White)				
Black Non-Hispanic	Hospital	1.193	1.047, 1.360	0.8979
	ED visit	1.305	1.143, 1.489	**<.0001**
Other Non-Hispanic	Hospital	0.906	0.688, 1.195	**0.0080**
	ED visit	0.698	0.513, 0.949	**0.0021**
Hispanic	Hospital	1.932	1.521, 2.453	**<.0001**
	ED visit	1.132	0.856, 1.498	0.2867
Median Social Vulnerability Index	Hospital	1.857	1.480, 2.329	**<.0001**
	ED visit	2.775	2.188, 3.520	**<.0001**
Number of Chronic Conditions(ref=Less than 2)				
2 to 3	Hospital	1.689	1.471, 1.940	**<.0001**
	ED Visit	1.524	1.327, 1.750	0.1201
4 to 5	Hospital	3.361	2.818, 4.009	**<.0001**
	ED Visit	2.006	1.634, 2.463	**0.0126**
6 or more	Hospital	6.804	5.458, 8.483	**<.0001**
	ED Visit	2.503	1.872, 3.347	**<.0001**
Tobacco Status (ref=No)	Hospital	1.167	1.039, 1.311	**0.0092**
	ED visit	1.412	1.249, 1.595	**<.0001**
COVID-19 Severity (ref=Low)				
Medium	Hospital	1.926	1.659, 2.236	**<.0001**
	ED visit	3.137	2.742, 3.590	**<.0001**
High	Hospital	7.818	6.896, 8.863	**<.0001**
	ED visit	5.118	4.436, 5.905	**<.0001**

Abbreviations: CI= Confidence Interval, OR= Odds Ratio.
Significance: $p < 0.05$

Summary

Factors associated with health care utilization in COVID-19 positive patients who first presented as ambulatory were smoking status, COVID-19 severity, number of chronic conditions, age, gender, race, and median SVI.

Controlling for all other factors:

- Smokers had 1.2 times higher likelihood of being admitted to the hospital and 1.4 times greater odds of being sent to the ED compared to non-smokers.
- Patients with moderate COVID-19 severity had almost 2 times greater odds of being admitted to the hospital and 3 times greater odds of being sent to the ED compared to patients with low COVID-19 severity.
- Patients with high COVID-19 severity were 8 times more likely to be hospitalized and 5 times more likely to go to the ED compared to patients with low COVID-19 severity.
- Higher SVI scores were associated with greater chance of going to the hospital or ED compared to lower scores (OR=2, 2.8 respectively).
- Odds of going to the ED were almost 31% higher in blacks compared to whites.
- Hispanic patients had 93% greater odds of being admitted to the hospital compared to white patients.
- Older patients were more likely to be admitted to the hospital or ED.
- Females were more likely than males to go to the ED or hospital after initial ambulatory visit.