Tobacco use disorder among patients with smoking-related chronic medical disease: Association with co-morbid substance use disorders

Ajay Manhapra, MD[1,2,3] and **Robert Rosenheck, MD**[1,2]

[1]VA Hampton Medical Center, Hampton, VA

[2]VA New England Mental Illness Research and Education Center, West Haven, CT

[3]Department of Psychiatry, Yale School of Medicine, New Haven, CT

[4]Department of Internal Medicine, Yale School of Medicine, New Haven, CT

Abstract

INTRODUCTION—Very little is known of the behavioral vulnerabilities of patients diagnosed with smoking-related chronic medical illness who continue to smoke, potentially worsening morbidity and mortality risks. This study explores the association of tobacco use disorder (TUD) among those with smoking-related chronic medical illnesses with other substance use disorders (SUD) and risk factors.

METHODS—Among veterans with smoking-related chronic medical illnesses identified from the National Veterans Health Administration (VHA) administrative records from Fiscal Year 2012, we compared the characteristics of those with a diagnosis of TUD (ICD 9 code 305.xx; n=519,918), and those without such a diagnosis (n=2,691,840). Using multiple logistic regression, we further explored the independent association of factors associated with TUD.

RESULTS—SUD prevalence was markedly higher among those with TUD (24.9% Vs 5.44%), including alcohol use disorder (AUD: 20.4% Vs. 4.3%) and drug use disorder (DUD: 13.5% Vs. 2.6%) compared to non-smokers. On multiple logistic regression analyses, AUD (OR = 2.94, 95% CI 2.90–2.97) and DUD (OR=1.97, 95% CI 1.94–1.99) were independently associated with current TUD diagnosis. Having any single SUD was associated with considerably high odds of having TUD (OR 3.32; 95% CI 3.29–2.36), and having multiple SUDs with even further increased risk (OR 4.09, 95% CI 4.02–4.16).

CONCLUSIONS—A substantial proportion of people with tobacco use disorder diagnosis despite concurrent smoking-related medical illnesses are also likely to have other comorbid

Corresponding Author Address: Ajay Manhapra, MD, VA Hampton Medical Center, PRIME 5, 100 Emancipation Drive, Hampton, VA 23667, Telephone: 757 722 9961; Ext. 5916, ajay.manhapra@yale.edu.

substance use disorders complicating efforts at smoking cessation, and requiring a broader approach than standard nicotine dependence interventions.

Keywords

Tobacco smoking; chronic disease; substance use disorder; tobacco use disorder; prevalence

INTRODUCTION

Cigarette smoking increases the risk for many chronic medical diseases, and continued smoking after the onset of such medical diseases imposes even more severe adverse health burdens. (Gritz et al., 2007) Receiving a diagnosis of a chronic medical disease or suffering a major acute medical illness tends to encourage quitting smoking as reflected in higher quit rates compared to those without such diagnoses or medical events. Nevertheless, a substantial proportion of patients continue to smoke. (Falba, 2005; Newsom et al., 2012). National US data shows that smoking rates among individuals with smoking-related chronic medical illness are higher than in the general population (CDC, 2007), and there has been no evidence of a decline in smoking rates in recent years in this population, as has been observed in the general population. (Fan et al., 2013) Despite the additional health burden and the adverse economic impact of smoking related chronic medical illnesses, there is a paucity of available data regarding the correlates or possible causes of continued smoking among these patients (Gritz et al., 2007). Small studies in addressing this issue have focused largely on demographic characteristics such as age, gender, race and socioeconomic status, and the widely recognized clinical barriers to quitting smoking such as pain, stress, depressed mood, medical comorbidity, tobacco dependence and stressful psychosocial environments. (Cooley et al., 2009; Daniel et al., 2009; Eklund et al., 2012; Gregor and Borrelli, 2012; Patel et al., 2009; Walker et al., 2006; Wiggers et al., 2005) Studies of continued smoking have not typically explored the role of comorbid substance use disorders (SUD) or psychiatric disease, both of which are well-recognized drivers of persistent heavy smoking in general population.

Prior studies have shown substantially higher rates of smoking rates and of tobacco use disorder or nicotine dependence among people with psychiatric diagnoses, especially SUD as compared to those without such diagnoses. (Breslau, 1995; Degenhardt and Hall, 2001; Grant et al., 2004) There also has been robust research demonstrating low quit rates, and participation in smoking cessation treatment among those with SUD and other psychiatric diseases.(Gartner and Hall, 2015; Smith et al., 2014; Tidey and Miller, 2015) Although only 7.1% of the adult population in United States have nicotine dependence with SUD and psychiatric disease, they are estimated to consume 34.2% of all cigarettes. (Grant et al., 2004) In addition, those with SUD and other mental health disorders have high burden of chronic medical illnesses including those related to smoking. (WHO, 2006)

Despite the well-demonstrated association of SUD and psychiatric disease with nicotine dependence and smoking related chronic medical illnesses, the potential role of co-morbid SUD or other psychiatric disorders in *continued* smoking among those with smoking related medical illnesses has not been examined in a large sample. (Gregor and Borrelli, 2012; Gritz

et al., 2007) Smokers with SUD and psychiatric disorders are less likely to quit and the limited evidence suggests that standard interventions like nicotine replacement therapy and other psychosocial interventions are less likely to be effective for them, thus defining a potentially difficult to treat sub population of patients with tobacco use disorder among patients with chronic medical illness.(Gartner and Hall, 2015; Smith et al., 2014; Tidey and Miller, 2015) A detailed examination of the patterns of comorbid SUD and other psychiatric disorders among those with smoking related chronic medical illnesses may substantially improve our ability to develop interventions for this vulnerable population.

This observational study of all veterans receiving Veterans Health Administration (VHA) care nationally in fiscal year 2012 who were diagnosed with chronic medical illnesses likely to have been caused by and/or whose outcomes are worsened by continued smoking focuses on the prevalence of comorbid SUD diagnosis among those with and without diagnosed tobacco use disorder (TUD). We also examine the association of other psychiatric disorders with TUD in this high risk population. As the enormous challenge of fostering smoking cessation among those with SUD has been recognized lately, and specifically within VHA (Baca and Yahne, 2009; Kalman et al., 2005; Reid et al., 2008; Shealy and Winn, 2014), examination of the prevalence of SUD may have significant implication for smoking cessation treatment among those who continue to smoke despite having smoking related chronic medical illnesses. (Gregor and Borrelli, 2012)

METHODS

Sample and Data Source

National VHA administrative records in Fiscal Year (FY) 2012 were used to identify all veterans with a diagnosis of one of the well-known chronic medical illnesses known to be caused by cigarette smoking and/or whose outcomes were worsened by cigarette smoking (hereafter referred to as smoking-related chronic medical illnesses). The following diagnoses were identified as smoking-related chronic medical illnesses: myocardial infarction, congestive heart failure, peripheral vascular disease, cerebrovascular accident, chronic obstructive airway disease, cancer, diabetes mellitus, hepatic disease, renal disease, and HIV. From this group, we also identified those with and without a diagnosis of TUD in FY 2012 ((ICD 9 code 305.1).

Measures

We identified the following sociodemographic characteristics available in VHA administrative files: age, gender, income, receipt of Veterans Affairs (VA) disability compensation or pension payments, service in the Iraq or Afghanistan theater of war (OIF/OEF), and a designation of urban vs. rural residence based on zip codes and Rural-Urban Commuting Area (RUCA) codes (depts.washington.edu/uwruca). Recent homelessness was identified by participation in a VHA specialized homeless service program or a V-60 code indicating housing problems. Information available on race included black, white and others, and data on ethnicity specified whether Hispanic or not.

Clinical diagnostic data included psychiatric and medical diagnoses based on International Classification of Diseases, 9th edition [ICD-9] codes that were assigned to each patient at least once during the study year. The Charlson Index(Charlson et al., 1987), an aggregate measure of medical co-morbidity, has been shown to predict the ten-year mortality for patients based on the presence of a broad range of co-morbid medical conditions and was used to assess medical co-morbidity. Data on co-morbid psychiatric diagnoses included all ICD-9 codes 290.00 through 319.99 (coded into 11 classes; available on request - see Table 2). VHA inpatient and outpatient service utilization was documented including medical and surgical outpatient visits and emergency room visits. Outpatient mental health specialty care and substance use disorder clinic visits were also identified by standard VHA clinic stop codes. Pharmacy benefit records documenting all filled VHA prescriptions were used to identify the total number of prescriptions filled by these patients in five psychiatric medication classes: antidepressants, antipsychotics, sedative/hypnotics/ anxiolytics, mood stabilizers (anti-epileptics), and lithium. The total number of psychotropic prescriptions filled by each veteran during the year was determined by summing the numbers of prescriptions in each of these classes as well as the total number of classes from which a prescription was filled. Medications in these classes that were not on the VHA formulary were not included in the analysis.

Analysis

First, we conducted bi-variate analyses comparing the sociodemographic characteristics, medical and psychiatric diagnoses, health service use, and psychotropic medication fills between those with and without a TUD diagnosis. Given the large sample size and the fact that it represents the entire VA population of interest, effect sizes were used rather than p-values to identify meaningful differences (i.e. odds ratios (OR) for dichotomous measures and Cohen's d for continuous measures). Odds ratios greater than 2.0 or less than 0.5 were considered to represent substantial differences on dichotomous variables. The difference between means divided by the pooled standard deviation was used to calculate Cohen's d for continuous variables. A value greater than 0.20 was considered to represent more than small differences (Ferguson, 2009).

Logistic regression was then used to identify variables independently associated with a diagnosis of TUD. Groups of variables (demographic, medical and psychiatric diagnoses, SUD, service utilization and psychiatric medication utilization) were sequentially added to the models. In each of these groups of variables, covariates that showed substantial differences on bivariate analyses were added in forward inclusion stepwise manner, and then variables that did not have significant relationship to the dependent variables of interest at p<.01 were excluded. We report the adjusted odds ratio (OR) with 95% confidence intervals (CI) for the variables that were found to be independently associated with outcomes of interest (TUD diagnosis). To compare the magnitude of the effects the independent variables that are measured in different units of measurement, we also report the standardized regression coefficients for each significant variable. SUD variables were entered in two separate ways creating two separate models (called A & B). In model A, SUD variables entered included alcohol use disorder and drug use disorder. In model B, SUD variables entered were 'one SUD diagnosis' and 'more than one SUD diagnoses'. ORs with 95% CIs

were calculated separately in each of these models in each step for the main variables of interest (SUD), and other variables that were found to be independently associated with TUD diagnosis.

RESULTS

In FY 2012 we identified 3,211,758 VHA service users with one or more of the smoking-related chronic medical illnesses identified above. Among them, 16.19% (519,918) had a diagnosis of tobacco use disorder (TUD) and the rest did not have such a diagnosis (2,691,840).

Bivariate comparison of those with and without tobacco use disorder

Demographic characteristics—Those with TUD were significantly younger (Mean age 59.73 Vs 66.70 years; Cohens d −0.50 (table 1) and the groups had similarly overwhelming majorities of males and predominance of urban residents. Although rates were low, homelessness was substantially higher among those with TUD (8.81% vs 2.30%; OR 4.10).

Smoking-related chronic medical Illnesses—Congestive heart failure was the most common chronic medical illness and the rates was slightly higher among those with TUD compared to those without TUD (83.69 Vs. 71.59%; OR 2.04). The rates of chronic obstructive airway disease (37.25% VS 19.65%; OR 2.43) and peripheral vascular disease (13.24 Vs. 7.67; OR 1.84) were somewhat higher among those with TUD, while the rates of diabetes mellitus, renal disease and cancer were slightly lower compared to those without TUD (table 1).

Psychiatric diagnoses and Substance use disorders—As expected, psychiatric diagnoses and SUD were generally more common among those with TUD (table 2). While the proportion of veterans diagnosed with any psychiatric disorder was not substantially higher (OR 2.50) among those with TUD, a SUD diagnosis was present in about a quarter of the patients (24.98%) with TUD, but only 5.44% of those without TUD had a SUD diagnosis (OR 5.76). AUD and DUD diagnoses were comparably higher among those with TUD (OR 5.78 and 5.85 respectively).

Service use and psychotropic medication fills—Utilization of emergency room services and of any outpatient clinic services including psychiatric or mental health outpatient clinics was higher among those with TUD (see table 3). There was also slightly higher utilization of psychotropic agents and opioid prescriptions among those with TUD.

Logistic Regression—After controlling for demographic characteristics, medical diagnosis and psychiatric diagnoses, AUD (OR 2.94) and DUD (OR 1.97) were associated with significantly higher odds of having TUD (table 4) with a stronger association for AUD than DUD. Having any single SUD (exclusive of TUD) was associated high odds of having TUD (OR 3.32), and even higher among those with multiple SUDs (OR 4.09). Other factors that had significant and strong independent association with TUD were age (OR 0.72 for 10-year increment; standardized regression coefficient [SRC] =0.24), and medical diagnoses of peripheral vascular disease (OR 2.37; SRC=0.13) and chronic obstructive airway disease

(OR 2.36; SRC 0.20). Several other variables had weaker independent association with TUD (table 4).

DISCUSSION

A notable proportion of veterans with smoking-related chronic medical illnesses (16.2%) smoked cigarettes with sufficient severity that they were given a diagnosis of TUD, and almost a quarter of those with TUD had another comorbid SUD compared to the much lower rates of SUD (5.4%) among those without TUD. Multiple logistic regression analysis showed SUD (exclusive of TUD) independently and strongly predicted increased odds of having TUD among veterans with smoking-related chronic medical illnesses. We also found that medical diagnoses of peripheral vascular disease and chronic obstructive airway disease, two diseases with strong causal connection to cigarette smoking, also were strongly associated with higher odds of having TUD, whereas increasing age was strongly associated with lower odds of TUD. Surprisingly, there was only weak associations between psychiatric disorders and TUD among those with smoking-related chronic diseases in our study. Although the associations of TUD with SUD and smoking-related chronic diseases have been separately studied before, (Breslau, 1995; CDC, 2007; Degenhardt and Hall, 2001; Grant et al., 2004) this is to our knowledge the first study that explores the association of concurrent comorbidity of TUD and SUDs among patients with smoking-related chronic disease.

The primary implication of this finding is that appropriately urgent efforts to curtail smoking among patients with smoking-related chronic medical illnesses must include evaluation of and contend with the potentially complicating presence of co-morbid addictive disorders. The presence of smoking and co-morbid smoking-related medical disorder should thus prompt further screening for other SUDs. Smoking may be regarded by primary care providers as among the milder of the addictions, but in this context, it is often reinforced by far more formidable co-morbid addictions. Additional diagnostic, therapeutic and research attention to this poorly recognized co-morbidity is warranted.

Success with smoking cessation is low among smokers with smoking-related chronic diseases, and the results with standard smoking cessation approaches and pharmaceutical monotherapy are less than impressive. (Gritz et al., 2007) Our data indicating a significant additional burden of other SUDs among these patients lends further support to the notion that the treatment of persistent smoking among those with smoking-related chronic disease is much more complex problem potentially requiring more than the standard smoking cessation intervention. One clinical trial among those with smoking-related chronic diseases reported that triple pharmacotherapy (nicotine patch, nicotine inhaler, and bupropion) for extended time as per patient need was associated with better smoking cessation rates at 26 weeks than standard 12-week nicotine patch treatment (35% Vs. 19%) although this difference is modest in magnitude. AUD and DUD were associated with poorer outcomes in this study on univariate analysis, but not after multiple adjustments. (Steinberg et al., 2009). The complex challenge of managing the risk burden of TUD among those with other SUDs has been increasingly recognized, and a focus of treatment has shifted towards an integrated concurrent management of TUD and SUD, especially within VHA. (Baca and Yahne, 2009;

Kalman et al., 2005; Reid et al., 2008; Shealy and Winn, 2014) However, there is scant data regarding the simultaneous management of TUD and SUD among those with concurrent smoking-related chronic medical illness.

It has been estimated that the need for SUD treatment among elder population in United States will likely increase nearly fourfold from 2000 to 2020 (Gfroerer, 2003), and the high prevalence of concurrent TUD and smoking-related chronic diseases in this population present a unique national challenge. Approaching current smoking as a multifactorial chronic disease rather than a simple risk factor to be controlled (Hudson and Mannino, 2010) is a conceptualization that is likely to be appropriate for many patients with smoking-related chronic disease and SUD who suffer from serious risks of continued smoking. (Gritz et al., 2007; Hurt et al., 1996) An integrative approach including multiple pharmacotherapeutic agents for as long as required, behavioral therapies and psychosocial support within a chronic disease model may offer the greatest therapeutic promise and deserves careful evaluation.

The lack of independent association between psychiatric disorders and TUD among those with smoking-related chronic diseases in our study is initially a bit surprising. However in both the general population and among veterans treated by VHA, the association of current smoking and TUD with non-SUD psychiatric disorders is significantly weaker than its association with SUD.(Breslau, 1995; Duffy et al., 2012; Grant et al., 2004) On bivariate analysis in our study, the association of TUD with any psychiatric disorder, while significant, (OR 2.50) was substantially weaker that with any SUD (OR 5.76). Although the rate of any SUD was markedly higher among those with TUD compared to those without TUD, a majority of those with SUD (>80%) also had a psychiatric diagnosis in both groups (see table 2). This might have further weakened the independent association of psychiatric disorders and TUD in logistic regression analyses.

It is also notable that chronic obstructive pulmonary disease (COPD) and peripheral arterial disease (PAD), two chronic diseases with direct causal relation to cigarette smoking, were associated with increased TUD prevalence. Since the strength of this association was not altered substantially after adjustment for other comorbid SUDs, it is more likely that in this case, the direction of causality was reversed reflecting the impact of continued smoking on these smoking-related medical illnesses. COPD has been found to be associated with higher prevalence of persistent smoking among US adults at a rate twice that of other chronic diseases, (CDC, 2007) and our data along with previous studies (Murabito et al., 2002; Selvin and Erlinger, 2004) suggests that PAD patients may also have similar excess prevalence of persistent smoking. Further investigations into these associations are required for better understanding of these relationships.

Limitations

Our study is based on administrative data, and the diagnoses recorded by clinicians may imprecisely represent the actual prevalence of smoking-related medical illnesses and SUDs, as well as smoking itself. We lacked any data regarding the prevalence of current smoking, which might have added to the generalizability of study findings. Only a third of the current smokers enrolled in VHA residential addiction treatment programs are reported to have a

documented TUD diagnosis (Gifford et al., 2013) while about 50% of smokers in general population have tobacco dependence (or TUD). (Grant et al., 2004) These rates may be even higher among veterans (Wagner et al., 2007) and those with smoking-related chronic disease (Darville and Hahn, 2014; Kalman et al., 2005; Westmaas et al., 2015). The prevalence estimate in one national survey for current smoking among those with a smoking-related chronic disease was 36.9% (vs. 19.3% in those without a chronic disease). (CDC, 2007) The actual prevalence of TUD and current smoking among veterans with smoking-related chronic diseases is probably higher than that reported in our study, although this is not likely to have affected our results.

In addition, the association of SUD with TUD in smoking-related medical illness, while robust in this study, must be recognized as correlational and causal inferences must be made with caution in view of the cross-sectional nature of the study.

Conclusions

This study suggests that a substantial proportion of people with tobacco use disorder diagnosis despite having smoking-related medical illnesses are also likely to have other comorbid substance use disorders which are likely to impede the achievement of smoking cessation. Standard nicotine dependence interventions may not suffice for patients with these co-morbidities and they may require more integrative care incorporating simultaneous treatment of multiple substance use disorders and tobacco use disorder along with chronic disease management using novel integrative approaches.

Acknowledgments

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Table 1

Demographics and smoking-related chronic medical illnesses among those with and without tobacco use disorder (TUD)

	Tobacco Use Disorder	No Tobacco Use Disorder	TUD Vs. No TUD
	N= 519,918	2,691,840	
	Mean (SD)	Mean (SD)	Cohen's d
Age (years)	59.73 (11.45)	66.70 (14.28)	−0.50
BMI	28.63 (16.95)	30.51 (16.36)	−0.01*
Annual income ($)	24,811.56 (43704.05)	34,659.65 (71923.44)	−0.14*
	Percent	Percent	Unadjusted Odds Ratio
Male	94.33	94.75	0.92
Urban area residents	67.06	69.48	0.89
Rural area residents	32.94	30.52	1.12
OIF/OEF Era Veterans	5.08	4.69	1.09
VA Pension	5.82	2.66	2.26
Service Connected 50	25.63	24.86	1.04
Homeless during the year	8.81	2.30	4.10
RACE			
White	78.05	80.37	0.87
Black	18.60	15.91	1.21
Other	4.35	3.72	1.18
Ethnicity			
Hispanic	8.16	12.46	0.68
Medical Diagnoses			
Myocardial Infarction	2.82	2.15	1.32
Congestive Heart Failure	83.69	71.59	2.04
Peripheral Vascular Disease	13.24	7.67	1.84
Cerebrovascular Accident	9.49	8.51	1.13
Chronic obstructive airway disease	37.25	19.65	2.43
Hepatic Disease	5.63	2.55	2.28
Diabetes Mellitus	31.95	41.66	0.66
Renal Disease	6.07	10.22	0.57
HIV	0.72	0.41	1.73
Cancer	12.82	15.30	0.81

Table 2

Psychiatric diagnoses and substance use disorders

	Tobacco Use Disorder	No Tobacco Use Disorder	TUD Vs. No TUD
	N= 519,918	N= 2,691,840	
	Percent	Percent	Unadjusted Odds Ratio
Psychiatric Diagnoses			
Schizophrenia	4.15	1.40	3.05
Bipolar Disorder	4.71	1.74	2.79
Major Depression	10.18	5.56	1.93
Dysthymia	25.80	15.06	1.96
PTSD	18.57	11.34	1.78
Anxiety Disorder	13.78	8.01	1.83
Adjustment Disorder	5.20	2.90	1.84
Personality Disorder	2.36	0.76	3.14
Other Psychiatric Diagnoses	14.18	10.23	1.45
Any Psychiatric Diagnoses	58.58	36.17	2.50
Severe Mental Illness	30.27	17.02	2.12
Substance use disorders			
Any Substance Use Disorder	24.89	5.44	5.76
Alcohol use disorder	20.41	4.29	5.68
Any drug use disorder	13.54	2.61	5.85
Cannabis Use Disorder	4.95	0.82	6.32
Cocaine Use disorder	5.39	0.83	6.77
Dual Diagnosis [*]	20.33	4.42	5.51

[*] Dual diagnosis was defined as veterans with both: 1) any diagnosis of a non-addiction-related Axis 1 psychiatric disorder during the year and 2) a diagnosis of alcohol or drug addictive disorder during the year

Table 3

Service utilization and psychotropic medication fills

	Tobacco Use Disorder	No Tobacco Use Disorder	TUD Vs. No TUD
	N= 519,918	2,691,840	
Service Use (number)	**Mean (SD)**	**Mean (SD)**	**Cohen's d**
Emergency Room Visits	83.03 (2.13)	48.20 (1.39)	0.23
Medical/Surgical Outpatient Visits	11.37 (11.91)	9.19 (10.73)	0.20
Psychiatric or Substance Use Disorder Outpatient Visits	7.92 (26.80)	2.25 (11.35)	0.38
All Outpatient Visits	19.29 (30.51)	11.44 (16.48)	0.40
Number of prescription fills	**Mean (SD)**	**Mean (SD)**	**Cohen's d**
Antidepressants	4.37 (12.65)	2.28 (9.36)	0.21
Antipsychotics	1.81 (11.08)	0.66 (7.46)	0.14
Anxiolytic/Sedative/Hypnotics	1.94 (5.44)	1.17 (3.89)	0.18
Stimulants	0.06 (1.08)	0.04 (0.70)	0.02
Anticonvulsant/Mood Stabilizer	1.80 (9.35)	0.92 (6.57)	0.12
Lithium	0.13 (2.50)	0.04 (1.42)	0.06
All Psychotropics	10.35 (28.52)	5.51 (19.97)	0.22
Opioid prescriptions	7.97 (8.07)	6.21 ((6.88)	0.24

Table 4

Odds for independent association of variables with tobacco use disorder in logistic regression models

	Model A		Model B	
	Odds Ratio (95% CI)	Coefficient		Coefficient
Alcohol Use disorder [*]	2.94 (2.90–2.97)	0.15	--	--
Drug Use disorder [*]	1.97 (1.94–1.99)	0.08	--	--
1 Substance Use disorder [*]	--	--	3.32 (3.29–3.36)	0.17
>1 Substance Use Disorder [*]	--	--	4.09 (4.02–4.16)	0.12
Age (10 year increments) [*]	0.724 (0.722–0.726)	−0.24	0.724 (0.722–0.726)	−0.24
PVD [*]	2.37 (2.34–2.39)	0.13	2.37 (2.34–2.39)	0.13
COPD [*]	2.36 (2.38–2.41)	0.20	2.39 (2.37–2.41)	0.20
VA Pension receipt	1.66 (1.63–1.69)	0.05	1.65 (1.62–1.67)	0.05
Homeless	1.34 (1.32–1.36)	0.03	1.35 (1.33–1.37)	0.03
CHF	0.96 (0.95–0.97)	−0.01	0.96 (0.95–0.97)	−0.01
Liver disease	1.30 (1.27–1.32)	0.03	1.28 (1.26–1.30)	0.02
Diabetes Mellitus	0.84 (0.84–0.85)	−0.05	0.84 (0.84–0.85)	−0.05
Schizophrenia	1.78 (1.74–1.82)	0.04	1.76 (1.72–1.79)	0.04
Bipolar disorder	1.15 (1.13–1.17)	0.01	1.14 (1.12–1.17)	0.01
Dysthymia	1.01 (1.00–1.02)	0.003	0.95 (0.92–0.97)	−0.003
Personality disorder	0.94 (0.92–0.97)	−0.004	--	--
Emergency room visits	0.98 (0.97–0.98)	−0.02	0.98 (0.97–0.98)	−0.02
Med/Surg outpatient visits (10 visit increments)	1.07 (1.067–1.073)	0.01	1.07 (1.067–1.073)	0.01
Psychiatric/Substance Use Disorder outpatient visits (10 visit increments)	1.013 (1.011–1.016)	0.01	1.013 (1.011–1.016)	0.02
Any psychiatric medications	1.09 (1.08–1.10)	0.02	1.09 (1.07–1.10)	0.02
Antidepressants	1.20 (1.18–1.21)	0.05	1.19 (1.18–1.20)	0.04
Antipsychotics	1.05 (1.04–1.06)	0.01	1.05 (1.03–1.06)	0.01
Opiates	1.33 (1.32–1.34)	0.07	1.32 (1.31–1.33)	0.07

Model A: Substance use variable entered as any alcohol use disorder and drug use disorder. Model B: Substance use variables entered as 1 substance use disorder and >1 substance use disorder Other variables entered in the model included baseline demographic characteristics, medical diagnoses, psychiatric diagnoses, substance use disorders, service use, and psychotropic medication use.

[*]
Variables highlighted in bold letters were found to be significantly associated with tobacco use disorder as indicated by higher standardized coefficient values