Changes in Veteran Tobacco Use Identified in Electronic Medical Records

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Introduction: Electronic medical records represent a new source of longitudinal data on tobacco use.

Methods: Electronic medical records of the U.S. Department of Veterans Affairs were extracted to find patients' tobacco use status in 2009 and at another assessment 12–24 months later. Records from the year prior to the first assessment were used to determine patient demographics and comorbidities. These data were analyzed in 2015.

Results: An annual quit rate of 12.0% was observed in 754,504 current tobacco users. Adjusted tobacco use prevalence at follow-up was 3.2% greater with alcohol use disorders at baseline, 1.9% greater with drug use disorders, 3.3% greater with schizophrenia, and lower in patients with cancer, heart disease, and other medical conditions (all differences statistically significant with $p < 0.05$). Annual relapse rates in 412,979 former tobacco users were 29.6% in those who had quit for <1 year, 9.7% in those who had quit for 1–7 years, and 1.9% of those who had quit for >7 years. Among those who had quit for <1 year, adjusted relapse rates were 4.3% greater with alcohol use disorders and 7.2% greater with drug use disorders (statistically significant with $p < 0.05$).

Conclusions: High annual cessation rates may reflect the older age and greater comorbidities of the cohort or the intensive cessation efforts of the U.S. Department of Veterans Affairs. The lower cessation and higher relapse rates in psychiatric and substance use disorders suggest that these groups will need intensive and sustained cessation efforts.
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INTRODUCTION

Accurate information on quit and relapse rates is needed to evaluate population-level tobacco control programs, to design clinical trials of new interventions, and to model their long-term cost effectiveness. Changes in tobacco use status have been studied by population surveys,[1–4] follow-up studies of smokers,[5–7] by following participants in clinical trials,[8] biochemical verification,[9] and more recently, by using data gathered in routine care and included in electronic medical records.

Tobacco-cessation rates increase with age and relapse is less likely in older quitters.[1–5,10] Few studies have examined the association between changes in tobacco use status and medical illness. There is limited evidence that cessation rates are higher in smokers with cancer, cardiovascular disease, asthma, or diabetes.[10] Relapse has been found to be less likely in those with heart problems.[4]

Even less information is available on changes in tobacco use in individuals with psychiatric conditions or substance use disorders. Limited evidence suggests that cessation rates are lower in those who consume more alcohol[5] and that relapse is more likely in those with mental health problems.[4] This lack of information is especially troubling given that people with mental illness

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and substance use disorders have a high prevalence of tobacco use and have been assigned a high priority in tobacco control efforts.[11]

Electronic medical records can fill these information gaps. They contain tobacco use status and demographic and diagnostic information. These data have been used to identify the smoking prevalence of health plan members by race and ethnic group,[12] to find quit rates,[10,13] and to determine the association between quit rates and medical comorbidities.[10]

This study used electronic medical records of the U.S. Department of Veterans Affairs (VA) to determine how tobacco-cessation and relapse rates are associated with patient demographics, medical illness, psychiatric problems, and substance use disorders.

METHODS

Study Sample

A retrospective analysis of VA electronic medical records was conducted to determine the association of age, gender, region, and illness with the cessation rates of current tobacco users and the relapse rates of former tobacco users. The study protocol was approved by the panel for the protection of human subjects of Stanford University.

The cohort included patients determined to be a current or former tobacco user at an assessment conducted in the year ending September 30, 2009 who had an additional assessment of tobacco use status within the next 12–24 months. Other inclusion criteria were availability of demographic and diagnostic information for prior year and residence in one of the four U.S. Census regions.

Measures

Provider responses to electronic clinical reminders are found in the national VA repository of electronic medical records, including results of screening for tobacco use status. These entries have been validated against independent data on tobacco status.[14] They have been used to identify outcomes in a trial of cessation services[15] and to evaluate the relationship between tobacco use status and pain.[16]

The VA guidelines recommend annual screening of current tobacco users and former users that quit in the prior year and no further screening of those who have never used tobacco or quit for >7 years. Screening results are recorded as 40-character text entry with the date and time of the entry and a patient identifier. Entries for the 3 years ending on September 30, 2011 were assigned to standard categories of current user of tobacco, never user, and former users characterized by duration of quit: within the last year, 1–7 years previously, or >7 years previously. Multiple entries on a single date were resolved by using the most specific entry; for example, entries of "former smoker" and "quit <1 year" were assigned to the category former user that had quit within the last year. Over the 3 years, 14.43 million tobacco use assessments of 4.96 million patients were abstracted. Assessments included use of smokeless tobacco. Full details of the method are available elsewhere.[17] Analysis was conducted in 2015.

Date of birth, gender, and region of residence were obtained from VA administrative data sets. Residential address at baseline was used to assign veterans to one of four U.S. Census regions. Those who had a missing address or were living outside of the 50 states (chiefly veterans living in Puerto Rico, Guam, and other U.S. possessions) were excluded. Date of death was obtained from the VA Vital Status file, a source that combines information on deaths reported to VA and Medicare.

Diagnosis codes from VA inpatient and outpatient data sets for federal Fiscal Year 2008 (the year ending on September 30, 2008) were used to create indicators of illnesses. These indicators were created using standard lists of diagnosis codes.[18–21] Conditions were selected because of their hypothesized association with changes in tobacco use, and included alcohol dependence or abuse, asthma, cancer, congestive heart failure, chronic obstructive pulmonary disease, depression, diabetes, drug dependence or abuse, chronic hepatitis C infection, HIV/AIDS, ischemic heart disease, lung cancer, pneumonia, post-traumatic stress disorder, renal failure, schizophrenia, and stroke.

The annual quit rate (Q) for those initially assessed as current tobacco users was determined from the mean number of years (Y_c) between the initial and final assessment in this group and the ratio of the number of final (T_f) to initial (T_i) tobacco users: $(1-Q)^{Y_c} = \frac{T_f}{T_i}$. The annual relapse rate (R) for former tobacco users was determined by the mean number of years (Y_f) between assessments in this group and the ratio of the number of final (F_f) to initial (F_i) former tobacco users: $(1-R)^{Y_f} = \frac{F_f}{F_i}$.

Statistical Analysis

Univariate tests evaluated differences in the proportion of cohort members with each baseline characteristic by tobacco use status. Each baseline characteristic was the dependent variable in a logistic regression that had indicators for baseline tobacco use status as independent variables. Post-hoc tests tested the statistical significance of differences in groups defined by baseline tobacco status.

Prevalence of tobacco use at follow-up was determined in four cohorts defined by baseline tobacco use status: current tobacco users, former tobacco users who had quit within the prior year, former users who had quit for 1–7 years, and former users who had quit for >7 years. Within each cohort, unadjusted prevalence was found for subgroups defined by each baseline demographic characteristic and diagnosis. Poisson regression can be used to estimate relative risk when log-binomial models do not converge.[22] The adjusted difference in prevalence was found using a generalized linear model using Poisson distribution and the identity link function.[23] Robust SEs were estimated to correct for the overestimate of variance in Poisson risk models.[24] These models used abstinence at follow-up as the dependent variable and patient characteristics (age, gender, chronic illnesses, and region) as independent variables. The length of time between baseline and follow-up assessment, which ranged from 365 to 730 days, was included as a covariate.

RESULTS

There were 1,020,510 current tobacco users identified in the study year (the year ending on September 30, 2009). At 24 months after baseline assessment, 43,780 (4.3%) died without a follow-up tobacco assessment, leaving 976,730 survivors. A follow-up assessment conducted