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The Contribution of Tobacco Use to High Health Care Utilization and Medical Costs in Peripheral Artery Disease

A State-Based Cohort Analysis

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ABSTRACT

BACKGROUND Tobacco use is an important preventable cause of peripheral artery disease (PAD) and a major determinant of adverse clinical outcomes.

OBJECTIVES This study hypothesized that tobacco use by PAD patients would be associated with higher health care utilization and associated costs.

METHODS We conducted a retrospective, cross-sectional study using 2011 claims data from the largest Minnesota health plan. The total cohort included individuals with 12 months of continuous enrollment and ≥1 PAD-related claim. Tobacco cessation pharmacotherapy billing codes were queried in a subgroup with pharmacy benefits. Outcomes were total costs, annual proportion of members hospitalized, and primary discharge diagnoses.

RESULTS A PAD cohort of 22,203 was identified, comprising 1,995 (9.0%) tobacco users. A subgroup of 9,027 with pharmacy benefits included 1,158 (12.8%) tobacco users. The total cohort experienced 22,220 admissions. The pharmacy benefits subgroup experienced 8,152 admissions. Within 1 year, nearly one-half the PAD tobacco users were hospitalized, 35% higher than nonusers in the total cohort ($p < 0.001$) and 30% higher in the subgroup ($p < 0.001$). In both cohorts, users were more frequently admitted for peripheral or visceral atherosclerosis ($p < 0.001$), acute myocardial infarction ($p < 0.001$), and coronary heart disease ($p < 0.05$). Observed costs in the total cohort were $64,041 for tobacco users versus $45,918 for nonusers. Costs for tobacco users also were consistently higher for professional and facility-based care, persisting after adjustment for age, sex, comorbidities, and insurance type.

CONCLUSIONS Tobacco use in PAD is associated with substantial increases in PAD-related hospitalizations, coronary heart disease and PAD procedures, and significantly greater costs. The results suggest that immediate provision of tobacco cessation programs may be especially cost effective. (J Am Coll Cardiol 2015;66:1566–74)

Atherosclerotic lower-extremity peripheral artery disease (PAD) affects between 5% and 10% of adults in the United States (7 to 12 million people) (1–3), and has recently been shown to affect at least 202 million individuals globally (4). Atherosclerotic PAD causes major disability by decreasing functional capacity due to exercise-associated limb pain (claudication), with individuals

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experiencing high rates of depression, social isolation, and chronic pain. Tobacco use is the single most important etiological factor for the development of incident PAD (1,2,5–7).

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In individuals with PAD, ongoing tobacco use is also associated with worsened leg ischemic symptoms, a higher incidence of critical limb ischemia, early failure of all revascularization therapies, a higher risk of amputation, and higher short-term rates of nonfatal myocardial infarction (MI), stroke, and death (3,8,9). Furthermore, continuing use of tobacco is associated with poorer measures of exercise capacity during treadmill testing and earlier onset of claudication pain during walking (10–12). Tobacco users with PAD report a lower quality of life than nonusers with PAD (13).

PAD patients with a history of tobacco use but who manage to quit have far higher survival rates than those who continue using tobacco (8,9,14,15). Consistent provision of contemporary intensive tobacco cessation counseling and pharmacotherapies in individuals with PAD can greatly improve the adjudicated quit rate from 6.8% to 21.3% (16).

Among individuals with PAD who use tobacco, the high rates of short-term adverse cardiovascular ischemic events (major adverse cardiac events and major adverse limb events) suggest that the economic burden of disease among users may be of particular significance. Recent studies have estimated high overall PAD-attributable costs (17–20), but none have assessed the direct health economic contribution of smoking in this population. Estimates of tobacco-associated medical care utilization and costs within a PAD population are essential for informing allocation of scarce resources, targeting efforts toward PAD prevention, providing tobacco cessation best practices, offering focus for future PAD clinical care guidelines, and implementing cost-effective treatments. This study was designed to provide these estimates and could inform future practice-based resource allocation.

METHODS

This study was performed using data derived from a large national health plan, Blue Cross Blue Shield of Minnesota (Blue Cross). With a history of more than 75 years, Blue Cross is the largest and oldest health plan operating in Minnesota and covers 2.7 million members in the state and nationwide through its health plans or plans administered by its affiliates. A retrospective, cross-sectional study design was used.

DATA AND STUDY POPULATION. We extracted insured enrollee 2011 administrative claims data for individuals at least 40 years of age who were either commercially insured, government program enrollees, or enrolled in a Blue Cross Medicare supplemental plan. Commercially insured individuals included members of fully and self-insured health plans; public program enrollees included members in the Prepaid Medical Assistance Program (Minnesota's Medicaid managed-care program), as well as MinnesotaCare, a state-subsidized program for low-income employed persons. We excluded data from employer groups who do not allow Blue Cross to use their data for research purposes (<5%). We restricted our study population to individuals with 12 months of continuous plan enrollment to assure that clinical event and cost data collection were maximally complete. The primary study population focused on all continuous medical plan enrollees (the total PAD cohort). We also a priori identified a subpopulation with both a medical and pharmacy benefit plan (pharmacy subgroup). This pharmacy benefit subgroup ostensibly permitted more specific identification of current tobacco users via their prescribed tobacco cessation medications (e.g., varenicline, nicotine replacement therapies, and buproprion).

As in previous publications (17–20), we used International Classification of Diseases-Ninth Revision-Clinical Modification (ICD-9-CM) diagnosis and procedure codes to identify individuals with PAD in medical claims. The specific diagnosis and procedure codes for case ascertainment are shown in Online Table 1. Diagnosis codes found in the first through fifth positions on medical claims incurred in 2011 were considered positive for PAD. If any of the listed procedure codes were found in these claims, then the individual was identified as having PAD. Those individuals with lower extremity amputation codes (ICD-9: 84.xx) found in combination with diagnostic codes for cancer or trauma on the same service date (Online Table 2) were excluded, as this combination of codes is suggestive of a non-PAD–related amputation. By design, the study population included individuals with prevalent PAD (of unknown duration) and not just newly identified (incident) cases.

Patient descriptive information obtained from 2011 administrative membership files included age, sex, and geographic residence (Minnesota and border counties vs. national). The presence of comorbid conditions in 2011 (renal failure and cancer) or cardiovascular ischemic events (MI or stroke), and known risk factors for PAD (hypertension and

ABBREVIATIONS AND ACRONYMS

CCS = Clinical Classification Software

CHD = coronary heart disease

COPD = chronic obstructive pulmonary disease

ICD-9-CM = International Classification of Diseases-Ninth Revision-Clinical Modification

PAD = peripheral artery disease