Original Articles

Medical management of patients before the incidence of a cardiovascular event

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OBJECTIVE: We sought to examine the diagnoses and medical management patterns of patients before the incidence of a cardiovascular (CV) event.

METHODS: A retrospective study of claims data from a national managed care plan was conducted. Eligible patients had a myocardial infarction, stroke, or revascularization between January 1, 2004 and December 31, 2005, and at least 3 years of continuous enrollment before the CV event. Patients were stratified by whether or not they had a diagnosis of atherosclerosis in the 3 years before the CV event. Diagnostic testing, lipid monitoring, and statin treatment patterns were assessed during the 3-year period before the CV event.

RESULTS: There were 16,543 patients with a CV event, and 65% had no previous diagnosis of atherosclerosis. For all patients, 58% were men, and mean age was 60 years. Angiography or cardiac imaging was performed in <3% of patients, and cardiac stress testing was performed in 13% of patients before the event. Only 19% of patients had ≥1 lipid test in the 12 months and 32% in the 3 years before the event, and their 12-month mean low-density lipoprotein cholesterol was 113 mg/dL. Thirty-four percent of patients were on statin therapy within the 3 years before event. The patient subgroup diagnosed with atherosclerosis had significantly more patients with cardiac testing, lipid monitoring, and statin therapy compared with patients with no previous diagnosis of atherosclerosis.

CONCLUSION: These results from an actual clinical practice dataset indicate opportunities for improved detection and management of underlying atherosclerotic heart disease to avoid future cardiovascular events.
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Atherosclerosis is a progressive disease beginning in young adulthood. Intima-media thickening of the arterial walls occurs as early as adolescence, and the frequency of definite atherosclerotic lesions increases from age 40 in men and with menopause in women.[1,2] Atherosclerotic plaques increase in prevalence with age, affecting 49% of men and 39% of women aged <60 years and 65% and 75% of men and women, respectively, aged >70 years.[3] Pathological studies and multiple epidemiological studies demonstrated the presence of atherosclerotic lesions and increasing prevalence of established cardiovascular (CV) risk factors in children and young adults.[1] However, a CV

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event such as myocardial infarction (MI) or stroke is often the presenting clinical sign of atherosclerosis.[4]

The Healthy People 2010 initiative and the Public Health Action Plan to Prevent Heart Disease and Stroke call for the improvement of CV health through the prevention, detection, and treatment of risk factors; early identification and treatment of heart attacks and strokes; and prevention of recurrent CV events.[5–7] However, little is known about what medical management or treatment is provided to patients before an incident CV event. When and what type of patients receive a diagnosis of atherosclerosis, and what diagnostic testing and risk factor management occur before a CV event? The present study's objective was to understand the CV health status and routine clinical management of patients in the 3 years before presenting with a CV event (ie, MI, stroke, angioplasty, coronary artery bypass graft) to ascertain whether patients are diagnosed with atherosclerosis and/or treated for risk factors before their event.

Methods

A retrospective study of claims data from a national managed care plan (commercial and Medicare Advantage) was conducted. The database includes more than 14 million covered lives annually that are covered by both medical and pharmacy benefits. The health plan is an independent practice model managed care plan spanning the United States. Eligible patients had an MI, stroke, transient ischemic attack (TIA), or revascularization between January 1, 2004, and December 31, 2005, based on the following International Classification of Diseases (ICD)–9 diagnostic codes or procedure codes: 410, 433–436, 38.12–38.18, 38.34, 38.44, 39.22–39.29, 36.0, and 36.1. To be included, the MI, stroke, or TIA had to be associated with a hospital or emergency department stay on the same day as the event. The first CV event within the time window was classified as the index event, and the date of the event was the index date. Eligible patients also had to have at least 36 months (3 years) of continuous enrollment before their index event to be included in the study. No restrictions were applied to follow-up after the index event. Any patient with a CV event in the 3 years before his or her index date was excluded.

Study patients were stratified as to whether or not they had a diagnostic code of atherosclerosis (ICD-9 code of 440.x, 414.xx, 437.0, 437.1, 437.3) before their index event. Patients with no previous diagnostic code for atherosclerosis were compared with patients with a diagnostic code of atherosclerosis within the 3 years before their CV event. The subgroup analysis was performed to determine whether patients with a diagnosis of atherosclerosis before a CV event were more aggressively monitored and managed than patients not diagnosed with atherosclerosis. Patients with no diagnostic code for atherosclerosis may have had clinical atherosclerosis (eg, angina, peripheral vascular

disease, ischemic heart disease), but it was not coded as an atherosclerosis diagnosis.

The comorbid conditions, diagnostic testing, lipid monitoring, health-care resource utilization, and statin treatment patterns were assessed during the 3-year period before the index CV event. The proportions of patients with each characteristic (eg, comorbid condition, diagnostic test, lipid test) in the 12 months immediately preceding the index event and the total 36 months preceding the index event were computed. These proportions were also stratified by sex and age (<65 years and ≥65 years) to assess differences between men and women and younger and older patients. The Charlson comorbidity index[8] was computed as the overall measure of comorbidity by use of the 19 categories of comorbidity based on ICD-9-CM diagnoses and procedure codes to reflect the cumulative likelihood of 1-year mortality. Mean LDL-C level before the index event (when such a value was available) was computed for several time periods (0–12 months, 13–24 months, and 25–36 months previously). Mean and median number of hospitalizations, emergency department stays, and physician office visits were computed for 0–12 months and 0–36 months before the index event. Mean cost of care after index event was captured as inpatient, outpatient, emergency department, diagnostic and laboratory, and retail pharmacy costs. Costs were derived from claims for hospital or emergency department stays, office/outpatient visits, outpatient prescriptions, laboratory/diagnostic tests, and medical procedures. Costs were defined as the allowed charge for these claims, comprising the amount paid by the insurance plan plus the patient copayment, deductible and coinsurance.

Statistical analysis

Comparisons were made between patients with no previous diagnostic code for atherosclerosis and patients with a diagnostic code for atherosclerosis. Differences between the groups were assessed by use of t tests for continuous variables and chi-square tests for categorical variables. Statistical significance was set *a priori* at $P < .05$.

Results

A total of 16,543 patients had an incident CV event, and 10,831 (65%) of these patients had no previous diagnosis of atherosclerosis in the preceding 3 years. Average age was 60 years, 58% were men, and 63% had CHD and 98% had hypertension (Table 1). Approximately one-third of patients had an MI, 39% had a stroke or TIA, and 31% had revascularization as their incident index event.

Patients diagnosed with atherosclerosis (ICD-9 code, n = 5,712) were significantly older and had a greater Charlson comorbidity score compared with patients with no previous history of atherosclerosis diagnosis in the preceding 3 years ($P < .01$; Table 1). Two-thirds of the patients diagnosed with atherosclerosis were classified as very high