Ambulatory Hypercholesterolemia Management in Patients with Atherosclerosis

Gender and Race Differences in Processes and Outcomes

Stephen D. Persell, MD, MPH,1 Saferio M. Maviglia, MD,2 David W. Bates, MD, MSc,2 John Z. Ayanian, MD, MPP2,3

1Division of General Internal Medicine, Feinberg School of Medicine, Northwestern University, Chicago, IL, USA; 2Division of General Internal Medicine and Primary Care, Department of Medicine, Brigham and Women’s Hospital and Harvard Medical School, Boston, MA, USA; 3Department of Health Care Policy, Harvard Medical School, Boston, MA, USA.

OBJECTIVE: To determine whether outpatient cholesterol management varies by gender or race among patients with atherosclerosis, and assess factors related to subsequent cholesterol control.

DESIGN: Retrospective cohort study.

SETTING: Primary care clinics affiliated with an academic medical center.

PARTICIPANTS: Two hundred forty-three patients with coronary heart disease, cerebrovascular disease, or peripheral vascular disease and low-density lipoprotein cholesterol (LDL-C) > 130 mg/dl.

MEASUREMENTS AND MAIN RESULTS: The primary process of care assessed for 1,082 office visits was cholesterol management (medication intensification or LDL-C monitoring). Cholesterol management occurred at 31.2% of women’s and 38.5% of men’s visits (P=.01), and 37.3% of black and 31.7% of white patients’ visits (P=.09). Independent predictors of cholesterol management included female gender (adjusted risk ratio [ARR], 0.77; 95% confidence interval [CI], 0.60 to 0.97), seeing a primary care clinician other than the patient’s primary care physician (ARR, 0.23; 95% CI, 0.11 to 0.45), and having a new clinical problem addressed (ARR, 0.60; 95% CI, 0.48 to 0.74). After 1 year, LDL-C < 130 mg/dl occurred less often for women than men (41% vs 61%; P=.003), black than white patients (39% vs 58%; P=.01), and patients with only Medicare insurance than with commercial insurance (37% vs 58%; P=.008). Adjustment for clinical characteristics and management attenuated the relationship between achieving an LDL-C < 130 mg/dl and gender.

CONCLUSIONS: In this high-risk population with uncontrolled cholesterol, cholesterol management was less intensive for women than men but similar for black and white patients. Less intense cholesterol management accounted for some of the disparity in cholesterol control between women and men but not between black and white patients.


Female1–5 and black patients4–11 are less likely than male and white patients, respectively, to undergo cardiac catheterization and revascularization. Clinical differences may explain a portion of the observed differences in procedure use between men and women,1,2,12,13 whereas socioeconomic factors,4–11 procedural availability,16 and patient preferences17–19 may explain some of the differences observed between black and white patients. Even after adjustment for these differences, gaps in treatment by gender and race remain. Clinicians’ decision making may be subject to subtle biases, as was suggested by one study of simulated patients in which black women were least likely to be referred for cardiac catheterization.20

Patients’ gender and race may also affect clinicians’ decisions about cardiovascular drug treatment. Women at high risk for cardiovascular events appear to be less likely than men to achieve control of cholesterol21–24 or other coexisting cardiac risk factors.25 While some studies suggest that women with coronary artery disease are less likely to be given effective medications such as aspirin, beta-blockers, and thrombolytics in the hospital setting,26 studies examining gender differences in inpatient and outpatient use of cholesterol-lowering medication have had mixed results.24–26 Black adults are less likely than white adults to have cholesterol screening or use cholesterol-lowering medications,27,31–33 and are less likely to achieve target cholesterol levels and control of other cardiac risk factors.23,25,34 Most prior studies have been cross-sectional in design, however, so the role of clinicians’ treatment decisions in these disparities is not well understood. Also, group disparities in intermediate clinical outcomes such as cholesterol level could be due to differences in clinical care or could be from other causes.35

Our goal was to examine ambulatory care of patients with cardiovascular disease and elevated low-density lipoprotein cholesterol (LDL-C) to assess whether cholesterol management decisions and subsequent control of LDL-C differed by patients’ gender or race. We addressed the following questions: is gender or race associated with the intensity of medical therapy and cholesterol monitoring in the office setting? What other factors are associated with the intensity of cholesterol management? Do patients of different gender or race receiving care from the same clinics achieve similar cholesterol control over time?

METHODS

Identification of Patient Population

We selected patients from all of the primary care internal medicine practices affiliated with an academic medical center in Boston, MA (4 hospital-based practices and 6 community-located practices). The Institutional Review Board of Brigham and Women’s Hospital approved the study.

We identified patients with coronary heart disease (CHD), peripheral vascular disease (PVD), or cerebrovascular disease (CVD) by electronically searching a physician-maintained coded
patient problem list in an electronic medical record for the following terms: angina, myocardial infarction, claudication, transient ischemic attack, stroke, percutaneous transluminal coronary angioplasty, coronary artery bypass surgery, carotid endarterectomy, peripheral artery angioplasty, or peripheral artery bypass. We included patients with at least one visit to a general internist between November 14, 1999 and November 13, 2000. We identified 1,608 patients with CHD, CVD, or PVD who had office visits with general internists during this time interval, of whom 409 (25.4%) had no LDL-C determination in the prior year, 337 (21.0%) had LDL-C measured at >130 mg/dl, 441 (27.4%) had a value between 100 and 130 mg/dl, and 421 (26.2%) had a value below 100 mg/dl. We included patients whose most recent LDL-C measurement in the prior year was >130 mg/dl.

A physician (S.D.P.) reviewed patients’ electronic medical records. Patients who did not have a qualifying diagnosis or procedure in an office note on or before the index visit were excluded. Patients with angina but no ischemia on stress tests were excluded. Patients with stroke were excluded if they only had a hemorrhagic or small- vessel ischemic stroke seen on brain imaging. Patients with a transient ischemic attack or large- vessel ischemic stroke were excluded if they had atrial fibrillation, valvular heart disease, or cardiomyopathy as a risk factor for stroke and did not have carotid artery stenosis on an imaging study. Of the 337 patients with LDL-C >130 mg/dl, we excluded 75 patients who did not have a confirmed atherosclerosis diagnosis and 19 patients who on review did not have available office notes or whose records documented that their primary care was obtained elsewhere. The remaining 243 patients constituted the study cohort. We designated the first visit in the time interval with a preceding LDL-C of >130 mg/dl as the index visit.

Data Collection

For patients with confirmed CHD, PVD, or CVD a physician reviewed office notes in the electronic medical record from visits with a general internist, cardiologist, nurse practitioner, or diabetes specialist within 1 year following the index visit using a structured chart review instrument as well as other documentation in the medical record from these providers or their office staff. For each visit, we recorded the type of provider, up to 4 problems addressed in the visit, current cholesterol-lowering medications, adverse reactions to cholesterol-lowering medications, patient nonadherence to cholesterol-lowering therapy, and patient refusal of cholesterol-lowering therapy. We also collected information on severe noncardiac comorbidities (active cancer, severe pulmonary disease, end-stage renal disease, dementia or memory loss, and chronic active liver disease) as well as diabetes mellitus, hypertension, current smoking, heart failure, and psychiatric illness (depression, bipolar disorder, schizophrenia, or psychosis). We classified patients as nonadherent to treatment for hypercholesterolemia if their medical record during the 1 year of review mentioned that the patient stopped or reduced a medication for hypercholesterolemia on their own accord or declined to take a medication when recommended. A visit was considered to address a new clinical problem if a symptom or condition was mentioned in the clinician’s note and this problem had not been previously noted more than 30 days before the visit. Changes in medical management for hypercholesterolemia were categorized as adding a new medication, increasing the current medication, resuming or increasing a medication a patient had discontinued or reduced, reducing or discontinuing a medication, or substituting one medication for another. Age, gender, race/ethnicity, and type of health insurance were abstracted from the electronic record. Providers were classified by gender, specialty, and level of training.

Process of Care Measures at Office Visits

For individual visits we evaluated 3 processes of care: LDL-C monitoring, intensification of medical therapy, and the combined measure of intensification of medical therapy or LDL-C monitoring. Because appropriate management of hypercholesterolemia depends on both medication adjustment and laboratory monitoring, and because a composite measure provided us with greater statistical power for group comparisons, a priori we chose this combination as the primary visit-level measurement of treatment intensity. We considered visits ineligible for assessment of the process measures if a preceding LDL-C measurement was <100 mg/dl or a medication change occurred in the prior 6 weeks. The LDL-C monitoring measure was met if the note mentioned any cholesterol testing was to be done following that visit or there was a new LDL-C measurement in the electronic record within 14 days after the office visit (but prior to subsequent visits). We considered the intensification process measure met if there was documentation that a provider added a cholesterol-lowering medication, increased the dose, resumed a medication the patient had discontinued, or substituted a medication with greater expected LDL-C lowering for another medication. This criterion was also met if there was documentation of intensification occurring by telephone or letter within 1 month after the visit but prior to the next visit.

Outcome at one Year

We determined whether there was an LDL-C below 130 mg/dl within 1 year from the index visit. We chose the threshold of an LDL-C <130 mg/dl as the primary patient outcome because there was expert agreement during the time of our study that patients with atherosclerosis and LDL-C above 130 mg/dl should be offered medical therapy, and the 130 mg/dl threshold has been adopted by the Health Plan and Employer Data and Information Set as a measure of quality of care for patients following a myocardial infarction.

Statistical Analysis

For descriptive analyses, we used the $\chi^2$ test for categorical variables, Student’s $t$ test for normally distributed continuous variables, and the Wilcoxon rank sum test for nonnormally distributed continuous variables.

To assess the adjusted association of gender and race with outcomes, we used multivariable logistic regression with generalized estimating equations (PROC GENMOD, SAS 8.2, SAS Institute, Cary, NC) to account for clustering at the level of the patient for analysis of visit processes of care and at the level of the primary care provider for the patient outcome at 1 year. Because age was not linearly associated with the study outcomes, we treated it as a categorical variable. When data were missing, an indicator variable was used to denote missing data in multivariable models. We added other explanatory variables that were associated with the outcome in univariate analysis ($P<.1$) to models that included patient gender, race,