Risk factors for lack of statin therapy in patients with diabetes and coronary artery disease

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BACKGROUND: Patients with both diabetes and coronary artery disease (CAD) have exceedingly high cardiovascular risk. Nevertheless, little is known about prevalence of statin therapy in this population and reasons why some patients may not be receiving this potentially life-saving treatment.

OBJECTIVE: To investigate prevalence and predictors of statin therapy in patients with combined diabetes and CAD.

METHODS: We conducted a retrospective cohort study of primary care patients with diabetes and CAD followed at 2 academic medical centers between 2000 and 2011. We used multivariable logistic regression to identify patient and provider characteristics associated with (1) statin initiation (any history of statin therapy) and (2) statin persistence (active statin prescription at the study end).

RESULTS: Of 8488 study patients, 7427 (87.5%) ever received statins and 6212 (73.2%) had persistent statin therapy. Younger age (odds ratio [OR], 1.26 per decade), smoking (OR, 1.49) and cardiologist evaluation (OR, 2.26) were associated with statin initiation ($P < .0001$ for all). Younger age (OR, 1.17), family history of CAD (OR, 1.39), no adverse reactions to statins (OR, 1.40; $P < .0001$ for all), female sex (OR, 1.22; $P = .005$), history of smoking (OR, 1.22; $P = .003$), cardiologist evaluation (OR, 1.23; $P = .002$), and lower HbA1c (OR, 1.04; $P = 0.003$) were associated with persistent statin therapy. Only 362 (29.8%) of the 1215 patients without persistent statin therapy had tried at least 2 statins, and 58 (4.8%) tried 3 statins.

CONCLUSIONS: Many patients with combined CAD and diabetes are not treated with statins, although in this very high-risk group, even moderate-intensity statins result in meaningful reductions in cardiovascular events. Higher cardiovascular risk and cardiologist evaluation were associated with higher prevalence of statin therapy.
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Diabetes mellitus (DM) has reached epidemic proportions in the United States and worldwide, and its prevalence is continuing to increase.[1,2] Patients with DM have a higher risk of developing coronary artery disease (CAD),[3] and most DM patients die as a consequence of cardiovascular diseases, including CAD.[4,5] The

implications of a diagnosis of DM with respect to cardiovascular risk are nearly as severe as a history of myocardial infarction (MI) and the 2 are profoundly synergistic.[6] In patients with DM, CAD tends to be a more complex disease characterized by small, diffuse, calcified, and multivessel involvement,[7] higher mortality after MI, and worse overall long-term prognosis.[8]

Statins therapy reduces the risk of death and cardiovascular events in patients with CAD.[9] In individuals with diabetes mellitus >40 years, treatment with statins has been shown to decrease the incidence of cardiovascular events and likely reduce mortality.[9,10] Consequently, the guidelines recommend that statins should be used in all adult patients with clinical atherosclerotic cardiovascular disease and in all patients with diabetes >40 years if there is no contraindication.[4,5] Patients with combined DM and CAD face an even higher cardiovascular risk than individuals with just 1 of these conditions, and it is therefore even more imperative that they be treated with statins. However, little is known about how many of these patients receive statin therapy and reasons why some of them may not be. We therefore conducted a study to investigate the frequency and predictors of statin initiation and persistence in patients with combined DM and CAD.

Research design and methods

Design

We conducted a retrospective cohort study to evaluate factors associated with absence of statin therapy in patients with DM and CAD.

Study cohort

Study participants included adult patients with DM and CAD followed in primary care practices affiliated with Brigham and Women's Hospital (BWH) or Massachusetts General Hospital (MGH) for at least a year during the study period from January 1, 2000, to December 31, 2011. Treatment in a primary care practice was defined as having notes in a primary care clinic on at least 2 distinct dates during the study period. Patients were excluded from the study if demographic information (eg, median household income by zip code) was not available.

For an individual patient study, entry date was defined as the later of (1) date of diagnosis of diabetes, (2) date of diagnosis of CAD, and (3) the first primary care practice note after January 1, 2000. Date of the last note in a primary care clinic during the study period served as the study exit date. This study was approved by the institutional review board at the Partners HealthCare System, and the requirement for written informed consent was waived.

Study measurements

An individual patient served as the unit of analysis. Patients were categorized as having persistent statin therapy if they had an active statin electronic medical record (EMR) medication record at the time of study exit (defined as a statin medication record updated within 12 months before the study exit without a subsequent explicit discontinuation).

Patient age was calculated at study entry. Diagnoses of DM and CAD, history of coronary artery bypass grafting (CABG) and myocardial infarction (MI), and family history of CAD were established from the EMR data. Highest low-density lipoprotein cholesterol (LDL-C) and HbA1c level were defined as the highest LDL-C and HbA1c recorded before the study exit. Baseline body mass index (BMI) and smoking status were identified from the EMR records before the study entry. Patient was categorized as having been evaluated by a cardiologist if they had at least 1 note in a cardiology clinic within the Partners HealthCare system during the study period. Information on reported adverse reactions to statins (clinical events/symptoms documented by health care providers as thought to have been caused by a statin) was obtained from a combination of structured EMR data and computational processing of narrative electronic provider notes using natural language processing software. The software achieved sensitivity of at least 86.5% and specificity of at least 91.9% for identification of documented reported adverse reactions to statins.[11]

Demographic information, medication, and laboratory data were obtained from the EMR at Partners HealthCare System—an integrated health care delivery network in eastern Massachusetts that includes BWH and MGH. No changes were made to the Partners EMR system over 12 years of this study.

Statistical analysis

Summary statistics were calculated using frequencies and proportions for categorical data and means (SDs), medians, and ranges for continuous variables. Quantitative variables were compared using t test and categorical variables using chi-square. A multivariable logistic regression model was used to identify patient characteristics associated with initiation or persistence of statin therapy, compared to no statin therapy or nonpersistent use of statins. Patient demographics (age, sex, race, health insurance, primary language, and median income by zip code), family history of CAD, history of smoking, maximum LDL level, maximum HbA1c level, baseline BMI, cardiologist evaluation, and reported adverse reactions (only in the analysis of persistence of statin therapy) were included as covariates in the analysis. Multiple imputation was used for missing data. The analysis was adjusted for clustering within primary care providers. Thresholds for statistical significance were adjusted for multiple hypothesis testing using Simes–Hochberg method.[12,13]