

The Impact of Family History of Diabetes on Glucose Testing and Counseling Behavior in Primary Care

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Epidemiological evidence has revealed increasing prevalence rates of type 2 diabetes (1,2), with an estimated 6.3% of the U.S. adult population having either diagnosed or undiagnosed diabetes (3). Individuals with a family history of diabetes are at increased risk of developing diabetes, and lifestyle modification can help reduce this risk (4–6). Several studies have demonstrated that lifestyle choices, such as regular exercise or healthy dietary choices, are associated with a reduced risk of developing diabetes (7–10). The purpose of this study was to determine whether a family history of diabetes was associated with a provider's decision to screen for diabetes or with a provider's counseling about lifestyle modifications.

RESEARCH DESIGN AND METHODS

The study was conducted at two academic primary care clinics in Boston, Massachusetts, that are affiliated with Brigham and Women's Hospital. A consecutive sample of new patients seen between May 2001 and February 2002 were identified through searching clinic administrative databases. Patient visits associated with either an ICD-9-CM code for a routine medical (V70.0 and V70.9) or gynecologic (V72.3 and V76.2) examination (11) or a CPT (Current Procedural Terminology) code for an annual/preventative visit in an adult (99385,

99386, and 99387) (12) were included within our study sample. We excluded patients with a personal history of diabetes. This study was approved by the Brigham and Women's Institutional Review Board.

We abstracted information from patient charts regarding demographics, personal medical history, and family history. A family history was considered positive in cases where a first-degree relative had been identified. First-degree relatives included mother, father, sibling, or child. Information was obtained from chart review regarding the ordering of laboratory tests. We conservatively overestimated potential screening for diabetes by including all plasma glucose testing as possible screening for diabetes, regardless of whether the sample was fasting or random. We also reviewed the visit note for any documentation by the provider of inquiring about and counseling with regards to diet and exercise activity.

Demographic data and clinical characteristics were summarized using means and percentiles. For univariate analyses, categorical data were analyzed using the χ^2 test. Continuous variables were compared using the Wilcoxon's rank-sum test for two median comparisons and a two-sample *t* test for means.

For weight data, 55 patients (11%) did not have weight documented. There were no statistically significant differences in patient characteristics between

individuals with their weight recorded and those without weight recorded. Models constructed using imputed weight data (based on sex and age matching) and nonimputed weight data were not significantly different, and the results shown do not include imputed data.

We constructed hierarchical regression models to determine patient and provider factors associated with a family history of diabetes documented within the medical record and used generalized estimating equations to account for physician-level clustering (13). All analyses were performed using SAS software version 8.2 (SAS Institute, Cary, NC).

RESULTS — A total of 516 new patient annual preventative visits were included in our analysis. Patient characteristics and rates of glucose testing and lifestyle counseling are presented in Table 1.

Seventy-nine patients (15%) had identified one or more first-degree relative with a history of diabetes. Fifty-two percent of patients with a first-degree relative with diabetes had a plasma glucose determination ordered compared with only 19% of individuals without a family history ($P < 0.0001$). There were no statistically significant differences between the two groups with regards to diet or exercise counseling.

In multivariate modeling, a family history of diabetes was strongly associated with a provider ordering plasma glucose, with an odds ratio (OR) of 2.90 (95% CI 1.25–6.71, $P = 0.01$) even after adjusting for patient age, sex, weight, and systolic blood pressure. Having a first-degree relative affected with diabetes had no influence on diet counseling (0.90 [0.59–1.38]) and exercise counseling (0.81 [0.50–1.34]).

CONCLUSIONS — We found that approximately one in six patients presenting to a primary care provider as a new patient for an annual preventative visit had a family member with diabetes. Patients who identified a relative as having diabetes were almost three times as likely to

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A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

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Table 1—Comparison of patient and visit characteristics stratified by family history of diabetes

Characteristic	Total	Family history of diabetes	No family history of diabetes	P
n	516	79	437	
Age (mean in years)	34.2	40.7	33.1	<0.0001
Sex	426 (83)	65 (82)	361 (83)	0.94
Insurance type (Medicare/Medicaid)	13 (3)	4 (5)	9 (2)	0.12
Median weight (kg)*	65.9	68.6	65.5	0.14
Systolic blood pressure (≥ 140 mmHg on presentation)	41 (8)	13 (16)	28 (6)	0.002
Personal history of hypertension	15 (3)	5 (6)	10 (2)	0.05
Personal history of hyperlipidemia	13 (3)	5 (6)	8 (2)	0.02
Family history† of hypertension	130 (25)	21 (26)	109 (25)	0.76
Family history† of hyperlipidemia	58 (11)	8 (10)	50 (11)	0.73
Family history† of coronary artery disease	88 (17)	24 (30)	64 (15)	0.0006
Provider counseled about diet	195 (38)	28 (35)	167 (38)	0.64
Provider counseled patients about physical activity	250 (48)	34 (43)	216 (49)	0.30
Provider ordered a plasma glucose	126 (24)	41 (52)	85 (19)	<0.0001
Provider ordered a plasma cholesterol	359 (70)	53 (67)	306 (70)	0.60

Data are n (%) unless otherwise indicated. *Weight was not recorded for 55 patients (11%). Weight was not recorded for 8 of 79 patients (10%) with a family history of diabetes and 47 of 437 patients (11%) with no family history of diabetes. †Family history defined as a first-degree relative identified as having the disease.

have a plasma glucose determination when compared with individuals without a family history. Rates of counseling for lifestyle modifications were low, and patients who identified a family history of diabetes received counseling regarding diet and exercise at rates similar or less than patients without a family history of diabetes.

Overall, glucose testing was infrequently performed in our sample, which was likely influenced by the characteristics of our study sample. Although consecutively sampled from new visits, most participants were <40 years of age. Previous data have suggested that increased age is associated with increased screening rates (14), and providers may have been less concerned about diabetes in this younger cohort.

Of note, while family history information was strongly associated with glucose testing, familial risks had no influence on lifestyle counseling. Behavioral modification can require substantial time resources, and providers may have been targeting lifestyle-counseling interventions to known diabetic individuals. This strategy, however, results in substantial missed opportunities for primary prevention in high-risk individuals.

As in all chart abstraction studies, the precision of the data collected is limited by the accuracy of the medical records examined. Some providers might have

determined that a patient had a family history of diabetes or counseled a patient with regards to diet and exercise but not have recorded this information. To minimize this, we selected visits in which the provider did not identify any competing diagnoses and specifically coded the visit as a preventive or annual exam visit,

With mounting evidence suggesting that lifestyle modifications can reduce the likelihood of developing diabetes, it is increasingly important to identify pre-symptomatic high-risk individuals. Population-based screening for diabetes is not recommended, and current screening efforts target high-risk individuals. Significant opportunities exist in primary care to identify individuals at high risk for diabetes and implement lifestyle interventions. A positive family history of diabetes appeared to have no effect on lifestyle modification counseling, and this could represent a substantial area for improvement.

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