

**RESEARCH LETTER**

# Variations in Glucose Test Ordering Practices by Diabetes Risk Factors

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Although the American Diabetes Association<sup>1</sup> and the US Preventive Services Task Force (USPSTF)<sup>2</sup> recommend screening individuals with diabetes risk factors, approximately one third of diabetes cases remain undiagnosed.<sup>3</sup> Because either set of guidelines would be effective in detecting new cases of type 2 diabetes mellitus (DM2),<sup>4</sup> one explanation for why there are so many cases of undiagnosed cases of diabetes may be that screening guidelines are applied inconsistently. This study addresses this important issue in clinical practice by assessing physician recognition of diabetes risk factors based on ordering laboratory tests for patients described in clinical vignettes.

## Methods

In a study conducted in the Department of Family Medicine at the University of Texas Medical Branch, Galveston, health care providers were presented with case descriptions that systematically varied well-known risk factors for diabetes<sup>1,2</sup> and were asked to list any tests or procedures that they might recommend for each patient (case) at an annual health visit. A clinical case was created for each of the 11 risk factors; some additional cases had no risk factors. Responses including glucose tests were classified into 3 categories: a fasting plasma glucose (FPG), an oral glucose tolerance

test, or a hemoglobin A<sub>1C</sub> (A1C); a random blood glucose/fingerstick; or a metabolic panel (including an FPG).

## Results

Participants (n = 51) were 60.0% female, 47.3% white, 32.7% faculty, and 60.0% residents. The highest rates of testing occurred for patients with pre-diabetes or gestational diabetes (96.1% and 90.2%, respectively; see Table 1). Overall screening rates for hypertension and dyslipidemia were only 66.7% and 45.1%, respectively, and screening rates were low (15.7%) for cases without a risk factor. Differences in test ordering between faculty and residents were significant for several risk factors. Residents requested fewer FPG/oral glucose tolerance test /A1C tests and 2 to 3 times as many metabolic panel tests than faculty for patients with a history of hypertension, those of older age ( $\geq 45$ ), and minorities ( $P < .05$ ).

## Conclusions

Overall, glucose test ordering does not seem to be in accordance with recommended screening guidelines. Risk factors (pre-diabetes or gestational diabetes) that may be indicators of early disease resulted in the highest glucose screening estimates. These risk factors were similar in that their vignettes contained phrases (ie, “gestational diabetes,” “elevated blood sugars”) that may “trigger” thinking about diabetes. Furthermore, approximately 20% and 8% of providers reported they would specifically order an A1C for patients with pre-diabetes and gestational diabetes, respectively. Therefore, it seems that the use of the A1C test is primarily for the follow-up of diabetes symptoms (for patients with a history of elevated glucose, for example), and less so for patients without symptoms. Having a first-degree relative with diabetes also was likely to trigger screening. This particular risk factor is well-known and contains the word

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**Table 1. Faculty and Resident Test Ordering by Risk Factors (n = 51)**

Risk Factor	Any Glucose Test	Faculty			Residents		
		FPG/OGTT/A1C	Panel	None	FPG/OGTT/A1C	Panel	None
Possible indicators of early disease							
History of pre-diabetes	96.1	77.8	11.1	11.1	72.7	27.3	0
History of GDM	90.2	72.2	16.7	11.1	69.7	21.2	9.1
USPSTF Indicators for Screening							
History of hypertension*	66.7	27.8	33.3	38.9	6.1	63.6	30.3
Dyslipidemia	45.1	27.8	11.1	61.1	18.2	30.3	51.5
Other risk factors for diabetes							
First-degree relative with diabetes	84.3	61.1	22.2	16.7	57.6	27.3	15.2
Minority ethnicity*	62.8	55.6	22.2	22.2	3.0	51.5	45.5
History of vascular disease	58.8	27.8	33.3	38.9	9.1	48.5	42.4
Sedentary lifestyle	45.1	16.7	16.7	66.7	9.1	42.4	48.5
Overweight (BMI $\geq 25$ kg/m <sup>2</sup> )	45.1	33.3	11.1	55.6	18.2	27.3	54.6
Age $\geq 45$ *	41.2	27.8	11.1	61.1	3.0	39.4	57.6
PCOS	39.2	27.8	11.1	61.1	15.2	24.2	60.6
No known diabetes risk factors	15.7	5.6	7.4	88.9	3.0	16.2	81.8

Values in table represent percentages. \* $P < .05$ , a comparison of the faculty versus resident percentages for FPG/OGTT/A1C, metabolic panel, and none.

FPG, fasting plasma glucose; OGTT, oral glucose tolerance test; A1C, hemoglobin A<sub>1c</sub>; GDM, gestational diabetes; USPSTF, US Preventive Services Task Force; BMI, body mass index; PCOS, polycystic ovary syndrome.

“diabetes,” but it is not a sensitive indicator of undiagnosed diabetes (sensitivity, 44%) as is older age (sensitivity, 84%).<sup>4</sup> Glucose testing for patients with hypertension or dyslipidemia as recommended by the USPSTF was low.

For most risk factors, residents ordered approximately twice as many panel tests as did faculty. It is unclear whether this difference is because of a more focused diagnostic approach by faculty or other factors. Studies show that the average number of tests ordered is a function of knowing the cost of the tests.<sup>5-8</sup> Educational efforts (and continuing education) might focus not only on presenting (a) risk factors for the development of DM2,<sup>1,2</sup> but also (b) their relative sensitivity for detecting new cases of DM2<sup>4</sup> and (c) recommendations of the USPSTF to target cardiovascular risk factors, because of the link between diabetes and cardiovascular disease.

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