Journal of Adolescent Health 54 (2014) 139–143

ELSEVIER

JOURNAL OF ADOLESCENT HEALTH

www.jahonline.org

Original article

Screening Practices for Identifying Type 2 Diabetes in Adolescents

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Article history: Received April 19, 2013; Accepted July 5, 2013
Keywords: Screening; Adolescent; Diabetes mellitus type 2; Hemoglobin A1c

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A B S T R A C T

Objective: To characterize pediatrician and family physician (FP) screening practices for type 2 diabetes among adolescents and to examine the impact of the 2010 American Diabetes Association (ADA) guidelines, recommending use of Hemoglobin A1c (HbA1c).
Methods: We conducted a cross-sectional mail survey of a random sample of 1,400 U.S. pediatricians and FPs and we received 604 eligible responses. Our main outcome measure was the types of tests ordered by physicians, particularly HbA1c, when presented with a hypothetical scenario.
Results: The overall response rate was 52% (57% for pediatricians and 48% for FPs). Fasting glucose and HbA1c were the most commonly ordered tests. Overall, at least 58% of physicians ordered HbA1c; 35% ordered HbA1c in conjunction with fasting tests; and 22% ordered HbA1c alone or with nonfasting tests. Only 38% of providers were aware of the new ADA recommended HbA1c screening guidelines. However, a majority (67%) said they would change their screening practices. In the context of the guidelines, 84% of physicians would now order HbA1c. Furthermore, there was a large increase in the proportion of physicians who would shift to using HbA1c only or with other nonfasting tests.
Conclusions: When screening adolescents for type 2 diabetes, providers are more likely to order HbA1c and order fewer fasting tests in response to the new ADA guidelines. HbA1c has lower sensitivity and higher costs than other testing modalities in children, therefore increasing uptake of this test (HbA1c) in children may have implications for both detection rates and healthcare costs.

IMPLICATIONS AND CONTRIBUTION

We are unaware of studies that have evaluated awareness of and the potential impact of the 2010 American Diabetes Association recommendations for type 2 diabetes screening in adolescents. This study shows that the 2010 ADA recommendations would lead to increased uptake of HbA1c as a screening test for identifying adolescent patients for type 2 diabetes, which may impact detection rates and the cost-effectiveness of screening.

In the 1990s, the well-known epidemic of childhood obesity in the United States was accompanied by reports of increasing rates of type 2 diabetes (T2D) [1]. In response, national organizations including the American Diabetes Association (ADA) and the American Academy of Pediatrics (AAP) released screening guidelines in 2000 for identifying children with T2D. These guidelines recommended that children with body mass index $\geq$ 85th percentile and any two additional risk factors be screened with a fasting plasma glucose (FPG) or a 2-hour glucose tolerance test (OGTT) every 2 years starting at age 10 years, or at onset of puberty [2,3].

Although the FPG and the 2-hour OGTT were recommended as screening tests, they are also the gold standard tests for

Financial Disclosure: None of the authors have anything to disclose.
Conflict of Interest: None of the authors have conflicts of interest to disclose.
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1054-139X/$ – see front matter
http://dx.doi.org/10.1016/j.jadohealth.2013.07.003

diagnosing diabetes. However, in 2010, the ADA modified its diagnostic guidelines, recommending that HbA1c tests also be used for diagnosing diabetes (HbA1c $\geq$ 6.5%) and prediabetes (HbA1c = 5.7%–6.4%) in both adults and children [4]. The rationale for a shift to HbA1c was that it does not require patients to fast prior to testing, has a lower variability [5], and has been linked to the development of diabetes complications in epidemiologic studies [6]. However, the guidelines are not without controversy, particularly in the pediatric population, given concerns about nonglycemic test factors impacting HbA1c [7,8] and lower test performance of HbA1c for children compared with adults [9–11].

Although a few studies have evaluated providers' screening practices and tests of choice for identifying adolescents with T2D, these studies were conducted in geographically narrow populations [12], did not include family practitioners [12,13], and were conducted prior to the release of the new guidelines regarding HbA1c [12,13]. Therefore, the objectives of our study were to evaluate current screening practices for pediatric T2D among a nationally representative sample of pediatricians and family practitioners, to determine physician awareness of the recent ADA guidelines, and to examine the impact of these new guidelines on the adoption of HbA1c as a diabetes screening test.

Methods

Study population

We randomly sampled 700 pediatricians and 700 family physicians (FPs) from the American Medical Association Physician Masterfile, through a contracted vendor. We included allopathic (MD) and osteopathic (DO) physicians self-described as pediatricians or FPs in direct patient care. We excluded physicians who were residents, hospital staff, or retirees, as well as physicians who were employed at federally owned medical facilities, who had subspecialty board certification, or who were 70 years of age or older.

Survey design

We created a four-page paper survey consisting of 17 items that focused on physicians' screening practices for adolescents at risk for T2D. We provided the following hypothetical scenario to respondents: *Imagine that you are seeing a 14-year-old female in your clinic for the first time for a well-child visit. She is obese (body mass index $\geq$ 95th percentile) and has at least 2 risk factors (e.g., family history of T2D, minority race, or signs of insulin resistance), and therefore meets criteria for T2D screening. Currently she has no symptoms of diabetes (e.g., no frequent urination or frequent thirst). She has not been screened previously for diabetes and did not fast before this visit.* Respondents were asked what initial screening tests they would order. After indicating their test choices, respondents were asked whether they were aware of the new ADA recommendations for using HbA1c to diagnose diabetes and whether this had changed or would change their screening practices for adolescents. Next, they were asked if they felt test accuracy or patient convenience was more important in screening tests. Finally, respondents were asked what organizations or professional societies they use to guide their decisions regarding T2D screening in adolescents, whether they manage or refer patients with T2D, and characteristics of their practice setting. Demographic information was retrieved from the Masterfile.

Survey administration

We pilot tested the survey with a group of local providers in Michigan, to ensure clarity and ease of administration. The initial survey mailing was sent in December 2011 to 700 pediatricians and 700 FPs. The mailing included a personalized cover letter, the survey instrument, a $5 cash incentive, and postage-paid return envelope. We sent nonrespondents two additional mailings at 3–4-week intervals. The institutional review board of the University of Michigan Medical School approved this study.

Study definitions

In our analyses we defined "fasting tests" as fasting glucose or 2-hour OGTT, and "nonfasting tests" were defined as random glucose, finger stick glucose with glucometer, HbA1c, and urine dipstick. We then divided providers into two groups, those who order only nonfasting tests and those who order at least one fasting test. Insulin was removed from the analysis when comparing fasting and nonfasting tests but was included in the analysis of proportion of tests.

Statistical analyses

At the provider level, we assessed the number and proportion of physicians who would order a specific type of test. At the test level, we assessed the frequency and proportion of tests that were ordered, with the denominator determined by the total number of tests ordered, given that physicians could order multiple tests.

To evaluate the frequency of providers who would use HbA1c after discussion of the guidelines, we included individuals who used HbA1c in the initial scenario and had no intention of changing their screening practices, as well as those who responded that they would run HbA1c either alone or with other tests they typically run. We generated univariate frequencies for each variable and performed χ^2 analyses for categorical variables and *t*-tests for continuous variables to examine differences between pediatricians and FPs. We also conducted multivariate analyses predicting the likelihood of ordering a nonfasting test for the hypothetical scenario, according to age, sex, preference of test convenience, public versus private practice setting, whether they had an on-site blood draw station, and whether they used the ADA as their main source of information on diabetes screening in adolescents. A 2-tailed α-level of .05 was determined as the threshold for statistical significance. All of the analyses were conducted using Stata 10.0 (StataCorp, College Station, TX).

Results

Respondent characteristics

Of the 1,400 physicians included in the mailing sample, two were excluded because mailing materials were returned as undeliverable (one pediatrician and one FP). Surveys were returned by 733 (398 pediatricians and 335 FPs) of the remaining 1,398 physicians, providing an overall response rate of 52% (57% pediatricians and 48% FPs).

There were 129 physicians (46 pediatricians and 83 FPs) who returned surveys reporting that they do not provide outpatient primary care to adolescents aged 10–17 years, leaving 604