Use of HbA1c in the Diagnosis of Diabetes in Adolescents


Study Overview

Objective. To examine the screening practices of family practitioners (FPs) and pediatricians for type 2 diabetes (T2D) in adolescents.

Design. Cross-sectional study.

Setting and participants. The researchers randomly sampled 700 pediatricians and 700 FPs who participated in direct patient care using the American Medical Association Physician Masterfile using a mail survey. Exclusion criteria included providers who were residents, hospital staff, retirees, or employed by federally owned medical facilities, certified with a subspecialty, or over age 70.

Main outcome measures. Providers were given a hypothetical case of an obese, female, teenaged patient with concurrent associated risk factors for T2D (family history of T2D, minority race, signs of insulin resistance) and asked what initial screening tests they would order. Respondents were then informed of the updated American Diabetes Association (ADA) guidelines that added hemoglobin A1c as a screening test to diagnose diabetes. The survey then asked if knowing this change in recommendation has changed or will change their screening practices in adolescents.

Main results. 1400 surveys were mailed. After 2 were excluded due to mailing issues, 52% of providers provided responses. Of these, 129 providers reported that they did not care for adolescents (age 10–17), resulting in 604 providers in the final sample, 398 pediatricians and 335 FPs.

The vast majority (92%) said they would screen the hypothetical case for diabetes, with most initially ordering a fasting test (fasting plasma glucose or 2-hour glucose tolerance test) (63%) or A1c test (58%). Of the 58% who planned to order HbA1c, only 35% ordered it in combination with a fasting test. HbA1c was significantly more likely to be ordered by pediatricians than by FPs (P = 0.001). After being presented with the new guidelines, 84% said then would now order HbA1c, a 27% increase.

Conclusion. In response to information about the new guidelines, providers were more likely to order A1c as part of initial testing. Due to the lower test performance in children and increased cost of the test, the use of HbA1c without fasting tests may result in missed diagnosis of T2D in adolescents as well as increased health care costs.

Commentary

Rates of childhood obesity continue to rise throughout the United States. Obese children are at risk for numerous
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comorbidities such as hypertension, hyperlipidemia, and T2D [1,2]. It is important for providers to use effective screening tools for risk assessment of prediabetes/T2DM in children.

The standard tests for diagnosing diabetes are the fasting plasma glucose test and the 2-hour plasma glucose test. While accurate, these tests are not convenient. In 2010, the ADA added an easier method of testing for T2D: an HbA1c, with results greater than or equal to 6.5% indicating diabetes [3]. However, this recommendation is controversial, given studies suggesting that HbA1c is not as reliable in children as it is in adults [4–6]. The ADA itself acknowledges that there are limited data in the pediatric population.

In this study, most providers were unaware of the 4-year-old revised guidelines offering the A1c option but are planning to apply the guidelines going forward. According to the study, this would result in a 27% increase in providers utilizing HbA1c.

Should increased uptake of A1c as an initial screening test be a concern? Using it in combination with other tests may be useful for assessing which adolescents will need further testing [3–6]. Additionally, by starting with a test that can be performed in the office with no regard to fasting time, it is possible that more cases of T2D will be found by primary care providers treating adolescents.

A weakness of the study is the potential for response bias related to mailed surveys. An additional weakness is that the researchers utilized only 1 hypothetical situation. Providing additional hypothetical situations may have allowed for further understanding of screening practices. The investigators also did not include nurse practitioners or physician assistants in their sample, a growing percentage of whom may care for adolescent populations at risk for T2D or be primary referral sources.

Applications for Clinical Practice

Providers can use HbA1c to screen for diabetes in non-fasting adolescents at risk for diabetes. While the test may not be as accurate in pediatric patients, utilizing HbA1c as directed by the ADA may aid in diagnosing patients that may otherwise miss follow-up appointments to complete a fasting test.

—Jennifer L. Nahum, MSN, CPNP-AC, PPCNP-BC, and Allison Squires, PhD, RN

References

English Ability and Glycemic Control in Latinos with Diabetes


Study Overview

Objective. To determine if there is an association between self-reported English language ability and glycemic control in Latinos with type 2 diabetes.

Design. Descriptive correlational study using data from a larger cross-sectional study.

Setting and participants. 167 adults with diabetes who self-identified as Latino or Hispanic recruited at clinics in the Chicago area from May 2004 to May 2006. The dataset was collected using face-to-face interviews with diabetic patients aged ≥ 18 years. All participants attended clinics affiliated with an academic medical center or physician offices affiliated with a suburban hospital. Patients with type...
1 diabetes and those with < 17 points on the Mini-Mental State Examination were excluded. English speaking ability was categorized as speaking English “not at all,” “not well,” “well,” or “very well” based on patient self-report. A multivariable logistic regression model was used to examine the predictive relationship between English language skills and HbA1c levels, with covariates selected if they were significantly correlated with English language ability. The final regression model accounted for age, sex, education, annual income, health insurance status, duration of diabetes, birth in the United States, and years in the United States.

Main outcome measure. HbA1c ≥ 7.0% as captured by chart review.

Main results. Of the 167 patients, 38% reported speaking English very well, 21% reported speaking well, 26% reported speaking not very well, and 14% did not speak English at all. Reflecting immigration-sensitive patterns, patients who spoke English very well were younger and more likely to have graduated high school and have an annual income over $25,000 per year. Comorbidities and complications did not differ by English speaking ability except for diabetic eye disease, which was more prevalent among those who did not speak English at all (42%, P = 0.04). Whether speaking ability was treated as a continuous or dichotomous variable, HbA1c levels formed a U-shaped curve: those who spoke English very well (odds ratio [OR] 2.32, 95% CI, 1.00–5.41) or not at all (OR 4.11, 95% CI 1.35–12.54) had higher odds of having an elevated HbA1c than those who spoke English well, although this was only statistically significant for those who spoke no English. In adjusted analyses, the U-shaped curve persisted with the highest odds among those who spoke English very well (OR 3.20, 95% CI 1.05–9.79) or not at all (OR 4.95, 95% CI 1.29–18.92).

Conclusion. The relationship between English speaking ability and diabetes management is more complex than previously described. Interventions aimed at improving diabetes outcomes may need to be tailored to specific subgroups within the Latino population.

Commentary

Immigrant health is complex and language is an under-studied factor in health transitions of those who migrate for new lives or temporary work. For Latinos, migration abroad was once thought to improve health, but a recent systematic review by Teruya et al [1] suggests that the migration experience has a wide variety of effects on health, many of which can be negative.

The notion that English fluency confers health care benefits is questionable, as the authors state. Those unfamiliar with the acculturation literature might think that English speaking ability is a good marker of acculturation, but recent research on the subject suggests otherwise. Acculturation is a complex phenomenon that cannot be measured or gauged by a single variable [2–5]. Among the many factors influencing acculturation, the migration experience and country of origin will play a major role in acculturation and how it occurs in the arrival country. Health care providers seeking to understand the complexity of acculturation better to improve care for their immigrant patients would benefit from examining the extensive social science literature on the subject. The results of this study suggest that providers should not take for granted someone’s English speaking ability as a marker of acculturation and thus assume that their health outcomes would be equivalent to native born populations.

This study has number of weaknesses. The main concern is that the study did not consider a number of important health service delivery factors. The researchers did not assess for the number of visits the patient had with appropriate interpretation services, whether or not there were language concordant visits between patients and providers (limited English proficiency patients are more likely to form consistent service relationships with language concordant providers [6–10]), or whether the patient had diabetes education classes or individual counseling sessions to facilitate self-management. These service-based factors could potentially explain some of the results seen. The small sample size, age of the data in the study, and failure to distinguish the country of origin of the Latino patients are other weaknesses.

Applications for Clinical Practice

Providers can improve their clinical practice with limited English proficiency Latino patients with diabetes by being more sensitive to the potential effects of language on diabetes outcomes in this population. The results suggest that providers should not assume that a Latino patient’s English language skills mean that they are better at self-managing their diabetes and will have better outcomes. Asking patients about their country of origin and migration experiences may help differentiate the effects of language in concert with other potentially confounding
variables that can help elucidate the effects of language on diabetes related outcomes.

—Allison Squires, PhD, RN

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Bariatric Surgery Leads to 3-Year Resolution of Diabetes in 24% to 38% of Patients


Study Overview

Objective. To examine the 3-year efficacy of bariatric surgery on resolution of diabetes.

Design. Randomized controlled trial.

Setting and participants. Patients were participants in the STAMPEDE trial, a single-center study with enrollment from March 2007 to January 2011. 150 patients aged 20 to 60 years with a hemoglobin A1c of > 7% and a BMI of 27 to 43 kg/m2 were studied. Patients were excluded for a history of bariatric surgery or complex abdominal surgery and poorly controlled medical or psychiatric conditions [1]. Patients were randomized to intensive medical therapy, Roux-en-Y gastric bypass, or sleeve gastrectomy. All participants received intensive medical therapy, including lifestyle education, diabetes medical management, and cardiovascular risk reduction administered by a diabetes specialist every 3 months for 2 years and every 6 months thereafter. All surgeries were performed by a single surgeon, using equipment by Ethicon (a sponsor of the study, along with the National Institutes of Health, LifeScan, and the Cleveland Clinic).

Main outcome measure. HbA1c of ≤ 6% at 3 years.

Main results. At baseline, 68% were women and 74% were white. Participants had a mean age of 48 years (SD 8), mean A1c of 9.3% (1.5%), and mean BMI of 36 (3.5). 43% required insulin at baseline. Follow-up at 3 years was 91% (9 participants dropped out after enrollment, 4 lost to follow-up), and at this time, A1c levels were ≤ 6% for 5% of intensive medical therapy participants, 38% who had gastric bypass (P < 0.001 compared with medical therapy), and 24% who had sleeve gastrectomy (P = 0.01 compared with medical therapy); the difference between bypass and sleeve gastrectomy arms was not significant (P = 0.17). Nearly all of the participants reaching the primary outcome in the bariatric surgery arms achieved this goal A1c without using diabetic medications (35% and 20%). For the secondary outcome of A1c ≤ 7%
Conclusion. Gastric bypass and sleeve gastrectomy surgery leads to substantial resolution of diabetes compared to medical therapy.

Commentary

Over the last several decades, bariatric surgery has emerged as important treatment for obesity. Observational studies have demonstrated sustained weight loss persisting up to 15 years, as well as reductions in cardiovascular risk, diabetes, and even mortality [2–5]. In the Swedish Obesity Study, a nonrandomized study of 2010 participants undergoing bariatric surgery and 2037 matched controls, gastric bypass led to a 32% reduction from baseline body weight at 1–2 years after surgery with sustained weight loss of 27% at 15 years [2,3]. Patients undergoing gastric banding lost a bit less weight, with 20% weight loss at 1–2 years and 13% at 15 years. Control subjects lost very little.

Among diabetic Swedish Obesity Study participants, bariatric surgery led to a much higher rate of remission from diabetes over 10 years compared with control patients (36% after surgery, 13% among controls) [2] and lower rates of microvascular and macrovascular complications [6]. Among participants who were not diabetic at baseline, the incidence of diabetes was just 7% in the surgery arm and 24% in the control arm [2]; this difference in incidence persisted for 15 years of follow-up [4].

Among randomized controlled trials, several studies have found short-term resolution of diabetes after surgery. A study of 60 patients (age 30 to 60 years, BMI ≥ 35, A1c ≥ 7%) found that 75% of patients undergoing gastric bypass and 95% of patients undergoing biliopancreatic diversion had fasting glucose of < 100 mg/dL and A1c < 6.5% at 2 years; none of the control subjects met these thresholds for diabetes resolution [7]. Another 1-year trial of 120 US and Taiwanese patients (age 30 to 67 years, BMI 30 to 39.9, A1c ≥ 8%) found that 48% randomized to gastric bypass met a combination endpoint of A1c < 7%, LDL cholesterol < 100 mg/dL, and systolic blood pressure of < 130 mm Hg after 1 year compared with 19% assigned to intensive medical therapy [8]. In the gastric bypass arm, 75% reached an A1c of < 7% compared with 32% receiving medical therapy.

What does the study by Schauer and colleagues contribute? First, the study extended data on diabetes resolution to 3 years, longer than prior studies, and found substantial diabetes resolution in more than 1/3 of gastric bypass patients and 1/4 of sleeve gastrectomy patients (5% receiving medical therapy); over 2/3 and 1/3, respectively, were no longer taking any diabetes medications compared with 2% receiving medical therapy. In an earlier published study reporting on 1-year outcomes of this study, Schauer found diabetes resolution in 42% of those undergoing gastric bypass, 37% with sleeve gastrectomy, and 12% with medical therapy, demonstrating some regression over time [1]. Second, the study compared patients undergoing gastric bypass and sleeve gastrectomy. Sleeve gastrectomy is a newer procedure with less long-term outcome data; for example, none of the Swedish Obesity Study participants had sleeve gastrectomy. Schauer et al demonstrated that both procedures provide similar results for the primary outcome, but use of glucose-lowering medications was less and weight loss was more in the gastric bypass arm. These results provide some evidence that bypass surgery might be superior. Third, the study provided important data on cardiovascular risk factors, showing improvement in triglycerides and HDL cholesterol and quality of life. Quality of life was better after surgery than with medical therapy.

In this study, only 4 patients required reoperations, and no deaths or life-threatening complications were reported. However, mortality and morbidity remain a concern in bariatric surgery. In the earlier published study of this trial, authors noted that 22% of gastric bypass required hospitalization in the year after surgery compared
with 8% in the sleeve gastrectomy and 9% in the medical therapy arms [1]. Observational data has shown higher rates of complications. In a study of patients at 10 clinical sites across the US from 2005 to 2007, 30-day mortality was 2.1% for open Roux-en Y gastric bypass and 0.2% for laparoscopic bypass [9]. That study also found substantial morbidity, with nearly 8% of patients after open bypass surgery reaching a composite end-point of death, deep venous thromboembolism, a repeat operation, or persistent hospitalization for 30 days after surgery; 4.8% reached this composite outcome after laparoscopic bypass. In another study of Medicare patients, 30-day mortality was 4.8% after open gastric bypass surgery compared with 1.7% for younger patients [10].

This trial by Schauer and colleagues demonstrates important benefits of gastric bypass and sleeve gastrectomy. While bariatric surgery still has some risk, it increasingly appears to be a viable treatment for patients with obesity, especially if they also have diabetes. Ideal future studies would be large enough to provide more data on predictors of diabetes resolution and long-term successful weight loss. Such information would allow clinicians and patients to better predict how patients might respond to surgery over the long term.

**Applications for Clinical Practice**

Bariatric surgery leads to a substantial reduction in diabetes over 3 years. While reduction was similar after gastric bypass and sleeve gastrectomy, secondary endpoints demonstrate some superiority of gastric bypass surgery. Clinicians should feel increasingly confident recommending bariatric surgery for their patients with diabetes and obesity.

—Jason P. Block, MD, MPH

**References**


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