

# Gestational Diabetes Mellitus Screening Using the One-Step Versus Two-Step Method in a High-Risk Practice

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**G**estational diabetes mellitus (GDM) is a common condition complicating pregnancy. Its prevalence varies depending on risk factors such as age, race, and BMI. In low-risk populations (< 25 years of age, Caucasian, and normal prepregnancy BMI), the rate is 2–3% versus high-risk populations (obese, family history of GDM in a first-degree relative, Hispanic/Indian/Asian ethnicity, previous pregnancy with GDM), in which the rates range from 18 to 25%.<sup>1,2</sup>

There is debate regarding the best approach to GDM screening. Currently, the American College of Obstetricians and Gynecologists recommends that all pregnant women be screened for GDM by patient history, clinical risk factors, or a 50-g, 1-hour glucose test.<sup>3</sup> If the 50-g glucose test is positive, it should be followed by a 100-g, 3-hour oral glucose tolerance test (OGTT) to diagnose GDM. This two-step process has been the most commonly used screening approach to diagnosing GDM. Other researchers have investigated screening with a one-step process using a 75-g, 2-hour test.<sup>4–6</sup> Using criteria from the International Association of the Diabetes and Pregnancy Study Groups for the one-step process, the rate of GDM would increase up to two to three times the rate using the two-step screening process.<sup>4,7,8</sup>

Our primary hypothesis was that the 75-g, one-step screening method would decrease the rate of

macrosomia and cesarean delivery in a high-risk obstetrical practice. Our secondary hypothesis was that one-step screening would improve neonatal outcomes.

## Research Design and Methods

This study took place in the Women's Ambulatory Health Services (WAHS) clinic at Hartford Hospital, an inner-city, tertiary care hospital in Hartford, Conn. In July 2011, the WAHS clinic changed its routine GDM screening from the 50-g, two-step process to the 75-g, one-step process. Routine management included testing all nondiabetic pregnant women for GDM between 24 and 28 weeks' gestation. High-risk women (patients with a history of GDM or macrosomia or who were obese) were screened at their initial prenatal visit. If that screening was negative, they were screened again between 24 and 28 weeks' gestation.

Using the two-step method, women were considered to have screened positive for GDM if they had a serum

glucose value  $\geq 135$  mg/dl 1 hour after the nonfasting 50-g challenge test. These women then underwent a 100-g, 3-hour OGTT. The threshold values used for the OGTT were: fasting  $\geq 95$  mg/dl, 1-hour  $\geq 180$  mg/dl, 2-hour  $\geq 155$  mg/dl, and 3-hour  $\geq 140$  mg/dl, based on the criteria of Carpenter and Coustan,<sup>9</sup> with two abnormal values required for diagnosis. Women with a 50-g test result  $> 183$  mg/dl were not given the OGTT and were diagnosed with GDM.<sup>9</sup> For the one-step screening, fasting patients were given a 75-g glucose challenge test. The criteria used for this method were based on the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study.<sup>4</sup> The threshold values were: fasting  $\geq 92$  mg/dl, 1-hour  $\geq 180$  mg/dl, and 2-hour  $\geq 153$  mg/dl. Only one abnormal value was required to diagnose GDM. All women diagnosed with GDM were treated in a similar manner throughout the study period with dietary modification and/or insulin depending on their capillary blood glucose values.

Glucose screening and outcome data from the 9 months (1 October 2010 to 30 June 2011) preceding the change in screening method were collected and compared to data from the first 6 months (1 July 2011 to 31 December 2011) of the one-step screening process. For patients who had glucose testing performed at the end of the study period, data collection continued for an additional 3 months (1 January 2012 to 30 March

## IN BRIEF

Screening for gestational diabetes mellitus is controversial. In their high-risk obstetrical practice, the authors did not find a difference in delivery or neonatal outcomes when using a one-step versus a two-step screening process. They did find lower rates of compliance with screening when using the one-step method.

2012) to include delivery outcomes. Included records were those of female patients  $\geq 18$  years of age who were seen at the WAHS clinic during the allotted time period. Excluded records were those of female patients who were  $< 18$  years of age, had pre-existing diabetes, or had a history of gastric bypass surgery. Institutional review board approval was obtained from Hartford Hospital.

Maternal data included race, BMI, weight gain during pregnancy, and mode of delivery. Neonatal outcomes included birth weight, Apgar score, neonatal intensive care unit (NICU) admission, small-for-gestational-age (SGA) status, large-for-gestational-age (LGA) status, hypoglycemia, hyperbilirubinemia, respiratory distress syndrome (RDS), intraventricular hemorrhage, culture-proven sepsis, and necrotizing enterocolitis (NEC).

Data were compared using Student's *t* test,  $\chi^2$  test, and Fisher's exact test. Results were considered statistically significant if the *P* value was  $< 0.05$ .

## Results

A total of 832 patients delivered during the study period; 10 had pre-existing diabetes, 1 had a history of gastric bypass, and 9 were  $< 18$  years of age, leaving 812 patients meeting inclusion criteria. No differences were found between the two groups regarding average BMI, prepregnancy weight, parity, pregnancy weight gain, or race. Of all study patients, 60.4% were overweight or obese, 29.1% were overweight with a BMI of 25–29.9 kg/m<sup>2</sup>, and 31.3% were obese with a BMI  $\geq 30$  kg/m<sup>2</sup>. The average prepregnancy BMI was 27.7 kg/m<sup>2</sup>. The overall distribution of race was Hispanic 74%, African American 16.7%, and Caucasian 7%.

The 1-hour, 50-g (two-step) screening was performed in 458 patients, and 75 patients (16.4%) required a 3-hour screening. The

**Table 1. Maternal Characteristics and Delivery Outcomes**

	Two-Step (1-Hour) Screening Group	One-Step (2-Hour) Screening Group	<i>P</i>
Parity	1.2	1.2	0.7
Hispanic (%)	72.70	76.30	0.5
Black (%)	16.70	16.70	0.5
Caucasian (%)	8.20	5	0.4
Prepregnancy BMI (kg/m <sup>2</sup> )	27.6	27.9	0.6
Prepregnancy weight (lb)	154.1	156.7	0.4
Pregnancy weight gain (lb)	29.6	28.9	0.5
Vaginal delivery (%)	71.40	71.90	0.9
Cesarean delivery (%)	28.70	28.10	0.9
Infant birth weight (g)	3,222	3,248	0.5
Apgar score (at 1 and 5 minutes)	8.1, 8.9	8.1, 8.9	0.6, 0.9

2-hour, 75-g (one-step) screening was performed in 257 patients. Of the patients who had the 1-hour screening, 32 (7%) ultimately tested positive for GDM after a 3-hour OGTT. Of the 257 patients who had the 2-hour screening, 30 (11.7%) tested positive. Of the women who were seen during the 1-hour screening period, 49 (9.9%) were not compliant with GDM testing compared to 52 (16.4%) seen during the 2-hour screening period. This difference was significant (*P* = 0.007).

With regard to delivery outcome, there were no differences between the two groups for mode of delivery, average birth weight, or Apgar score (Table 1). The rates of NICU admission, SGA, LGA, RDS, NEC, hyperbilirubinemia, sepsis, and length of NICU stay were similar between the two groups (Figure 1). We also evaluated for a difference in composite neonatal outcome among infants admitted to the NICU and did not find a difference between the two groups. The rate of hypoglycemia was lower during the one-step

screening process, but this was not statistically significant (*P* = 0.056).

## Conclusion

Debate continues about the best screening and diagnostic method for GDM. In our high-risk patient population, we did not find a difference in delivery or neonatal outcomes when the one-step screening was used, despite a 4.7% increase in GDM (from 7 to 11.7%). Others have found an even higher incidence (ranging from 16 to 27%) of GDM using the one-step screen and the thresholds proposed by the HAPO study and the International Association of the Diabetes and Pregnancy Study Groups.<sup>4,8</sup>

The lack of a difference in outcome and a lower-than-expected increase in GDM may be related to decreased compliance with testing. A decreased rate of GDM testing compliance is not unexpected. The one-step screening is less convenient because patients must be fasting, and it takes longer to complete than the nonfasting, 1-hour test for the first part of the two-step testing protocol. A decrease in compliance

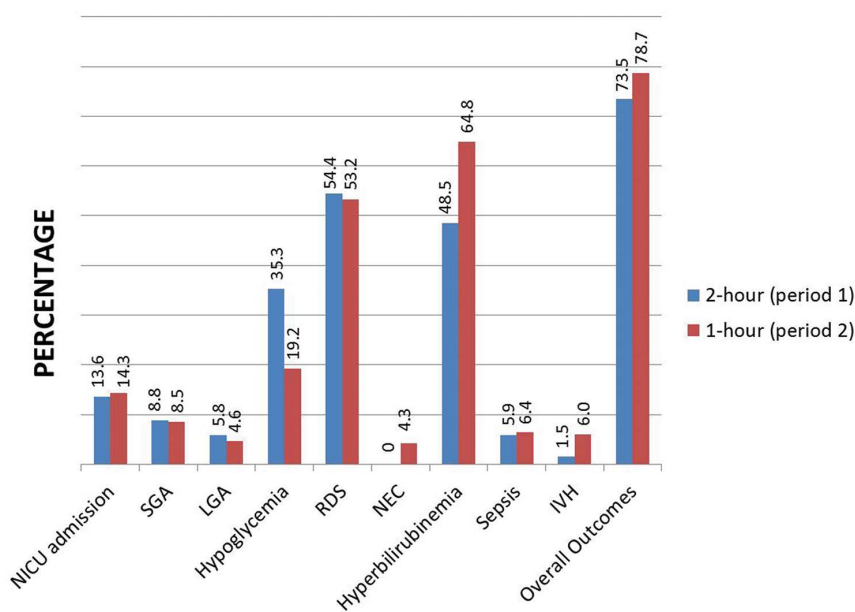


Figure 1. Neonatal outcomes (all  $P > 0.05$ ).

may not be seen in other pregnancy populations and would potentially affect delivery or neonatal outcomes. Decreased compliance would likely be seen in similar obstetrical practices with high minority rates and decreased overall health care compliance.

Although not statistically significant, the rate of hypoglycemia was lower in patients in the one-step protocol. With increased compliance, the rate of hypoglycemia may be lower for women who undergo the one-step screening. If no other differences in neonatal outcome are seen with the one-step screening, the impact of this may not be considered clinically significant if the infants with hypoglycemia do not require more than minimal intervention or monitoring. This impact also may not be significant enough to inconvenience women undergoing routine screening. For example, women who are employed may be required to take time off to complete fasting blood work, whereas they could complete the 50-g screening at a more convenient time.

A limitation to this study is a lack of data on compliance with therapy. At WAHS, women diagnosed with

GDM are referred to a nutritionist and instructed to check both fasting and 2-hour postprandial blood glucose levels. They are started on oral or insulin therapy if their blood glucose is consistently  $> 95$  mg/dl fasting and  $> 120$  mg/dl postprandially. Another limitation is the historical nature of the data collected, although both groups, the health care providers, and the practices were similar throughout the study period.

The one-step, 2-hour screening for GDM appears to be associated with an increased rate of GDM, despite decreased rates of screening, without improving maternal or neonatal outcomes. An increase in the rate of GDM using the one-step screening would also be expected to increase health care costs by increasing doctor visits, ultrasounds, nutrition and diabetes team counseling, and home glucose testing.

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