

Gestational Diabetes Clinic in the Public Health Setting

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Gestational diabetes mellitus (GDM), or “carbohydrate intolerance of variable severity with onset or first recognition during pregnancy,” results from insulin resistance and relative insulin deficiency, usually in the second trimester.¹ This condition affects between 4 and 9% of all pregnancies.² With GDM, there are increased fetal complications of macrosomia, shoulder dystocia, and neonatal hyperglycemia, as well as maternal risks of preeclampsia and polyhydramnios.^{3,4} Also, it has been shown that 33% of GDM patients require Cesarean section compared to 20% of pregnant patients without GDM.⁵ Women who are of Hispanic or Asian descent are at the highest risk of developing GDM.⁶

According to the American Diabetes Association (ADA),⁷ assessment for undiagnosed type 2 diabetes should be completed at the first prenatal visit. Patients who are high risk (those with severe obesity, a history of GDM, a diagnosis of polycystic ovarian syndrome, a strong family history of type 2 diabetes, or glycosuria) should be screened using standard diagnostic testing. Diagnosis is based on the following results: A1C $\geq 6.5\%$, fasting plasma glucose level ≥ 126 mg/dl, 2-hour plasma glucose level ≥ 200 mg/dl during an oral glucose tolerance test (OGTT), or classic symptoms of hyperglycemia with a random blood glucose level ≥ 200 mg/dl.⁷

All remaining pregnant women who are not known to have diabetes should have testing for GDM at 24–28 weeks of gestation using a 75-g, 2-hour OGTT. Patients are diagnosed with GDM if they have any of the following plasma glucose

values: fasting ≥ 92 mg/dl, 1-hour ≥ 180 mg/dl, or 2-hour ≥ 153 mg/dl.⁷

Upon diagnosis of GDM, medical nutrition therapy, self-monitoring of blood glucose (SMBG), and fetal monitoring are initiated. A study by Landon et al.⁸ found that treatment of mild GDM resulted in a lower incidence of fetal overgrowth and a lower rate of preeclampsia compared to standard prenatal care.

For patients who reach and maintain a goal fasting blood glucose level ≤ 95 mg/dl and a 2-hour postprandial blood glucose level ≤ 120 mg/dl, the initial treatment plan should be continued. For patients who are unable to reach these glycemic goals, insulin therapy should be initiated.⁹ Insulin is the primary pharmacotherapy choice for women with GDM, although glyburide and metformin have been studied and are becoming more widely used for this purpose.^{1,9}

Both the study by Landon et al.⁸ and the Australian Carbohydrate Intolerance Study in Pregnant Women¹⁰ support the active management of even mild GDM to decrease fetal complications.

Women with GDM should be screened 6–12 weeks postpartum for type 2 diabetes.⁹ ADA recommends that these patients have a nonpregnant 2-hour OGTT and annual blood glucose screenings.⁷ The diagnostic threshold for the 2-hour OGTT is a plasma glucose level ≥ 200 mg/dl.⁷ Ideally, these patients should receive follow-up medical nutrition therapy and physical activity counseling during their postpartum visit.

History of the Gestational Diabetes Clinic

Hall County is located in Northeast Georgia, 50 miles northeast of Atlanta. It lies at the southern edge of the Chattahoochee National Forest and the foothills of the Blue Ridge Mountains. The population of Hall County is ~ 187,700. In 2007, the average household income of county residents was \$56,358. Industry within the county is 24% service, 22.6% manufacturing, 14.2% government, and 11.8% health care.¹¹

The Hall County Health Department Prenatal Clinic provides access to comprehensive, high-quality, affordable prenatal care for low-income, uninsured women in a 13-county area (public health district), with the goal of decreased infant and maternal morbidity and mortality. The health department began seeing indigent obstetric patients in the 1970s in response to an increasing number of women without prenatal care who presented to Northeast Georgia Health System for delivery. At that time, local physicians donated their time to the clinic. Physicians and health department nursing staff worked together to provide obstetric care. In the late 1980s, a midwifery program was added to the clinic.

As the demographics of the Hall County community evolved, the percentage of Hispanics in the obstetric clinic grew to 20% in the early 1990s. During the past 20 years, the percentage of Hispanics has increased to ~ 90%, reflecting the significant increase in the community's Latino population. Hall County has a large population of Latino immigrants. The poultry industry employs many of these individuals, who have no health care infrastructure.

In the mid-1990s, The Longstreet Clinic (TLC), a regional multidisciplinary physician practice, joined efforts to operate the obstetric clinic with the Hall County Health Department. As the need grew for management of GDM and preexisting type 1 or type 2 diabetes, a collaboration was formed in the late 1990s, allowing diabetes care to be provided by a physician-nurse team.

A nurse certified diabetes educator (CDE) began to manage the diabetes care for these patients under the direction of an obstetrician. In 2008, a public health pharmacist who was a CDE began managing the GDM patients, working under the protocol of a TLC obstetrician.

Clinic Structure

The clinic, now called Gestational Diabetes Clinic, is now a collaboration involving services provided and financial support among TLC, the Northeast Georgia Health System, and the Hall County Health Department. The clinic's novel approach has not been duplicated elsewhere. The team of providers includes a TLC obstetrician, a certified nurse midwife, a pharmacist CDE who is also board certified in advanced diabetes management, and a registered dietitian (RD) with the Hall County Health Department. The pharmacist manages the overall diabetes treatment plan and ongoing diabetes monitoring under a protocol with the TLC obstetrician. The RD provides medical nutrition therapy.

The majority of patients (90%) are indigent Hispanics; the remaining patients are indigent white non-Hispanics, Asians, and African Americans. These patients have either GDM (98%) or preexisting type 1 (0.5%) or type 2 (1.5%) diabetes. The clinic name, Gestational Diabetes Clinic, is misleading in that obstetric patients with type 1 or type 2 diabetes or GDM receive care there. All patients are initially screened for GDM using a 1-hour glucose challenge test (GCT). If results are ≥ 140 mg/dl, a 3-hour glucose tolerance test (GTT) is performed. Diagnosis of GDM and referral to the clinic is made if patients have abnormal results from the 3-hour GTT. Because of patients' financial and transportation constraints and lack of a telephone, a small percentage (< 5%) of patients with abnormal 1-hour GCTs do not follow up for a 3-hour GTT. In response to patients not having telephone service, patient letters are now sent.

During the initial clinic visit, patients receive education on diabetes pathophysiology, treat-

ment options, SMBG instructions, tracking of blood glucose values, frequency of SMBG (fasting and 2 hours postprandially after breakfast and dinner), and blood glucose goals (< 95 mg/dl fasting and < 120 mg/dl 2 hours postprandially). Interpreters are essential team members to have during each clinic visit. These interpreters not only provide linguistic services, but also offer a cultural understanding that assists educators in managing patients. In addition, illiteracy is a barrier that must be addressed during clinic visits so that patients can be educated and empowered to self-monitor their blood glucose, follow nutrition therapy recommendations, and take their medication as directed.

Patients receive a blood glucose monitor at the initial visit and test supplies at each subsequent clinic visit. Because patients receive all blood glucose testing supplies and diabetes medications during their visits, the clinic has achieved a 98% compliance rate for SMBG and diabetes medications. The level of compliance has been determined based on patients' SMBG log sheets, which are submitted during each clinic visit, as well as from questioning patients about their medication compliance.

All patients meet with the RD for medical nutrition therapy evaluation and counseling at the initial visit. The RD who works with patients is bilingual and has an in-depth understanding of Latino cultural foods.

A1C testing is performed at the initial visit to provide a baseline for the clinician. Because of limited finances, patients will sometimes have a choice between paying the clinic visit fee or paying for the A1C test. The clinic policy allows patients to be seen by the CDE even if they cannot pay the visit fee. Educators have been working to secure grants to pay for A1C tests, blood glucose monitors and strips, and insulin.

For patients who come to the clinic with type 1 diabetes, their current insulin regimen is continued. For those with type 2 diabetes, insulin may be initiated. During clinic visits, patients receive in-depth counseling about their diabetes medications.

Follow-up assessment occurs 1 week later. The clinician reviews patients' blood glucose logs, weight, and nocturia to determine treatment adjustment. The purpose in tracking nocturia is to detect very high blood glucose values that patients might not self-report. It is encouraging that the 98% compliance rate with SMBG is achieved by the follow-up assessment.

If patients are achieving their blood glucose goal values, they are instructed to continue medical nutrition therapy and SMBG and return to the clinic in 2 weeks. If they are not achieving goal values, they are referred back to the RD for adjustments in nutrition therapy. After the initial visit, patient adherence with necessary dietary adjustments is 85%. This adherence rate has been determined by patient self-reporting of dietary changes and decreases in their blood glucose values between the initial and second clinic visits. After the third visit, patient compliance with necessary dietary adjustments has increased to 95%.

If blood glucose values are elevated to ≥ 120 mg/dl, insulin is initiated. Insulin doses are determined by patients' current trimester and body weight. The clinic uses NPH insulin and insulin aspart. At any one time, an average one-third of clinic patients require insulin therapy. These patients are motivated to achieve their blood glucose goals so they can have clinic visits every other week instead of weekly.

The timing of future follow-up visits are based on whether patients have achieved their blood glucose goals. Those who control their diabetes with medical nutrition therapy are seen in the clinic every 2 weeks to assess their continuing glycemic control until delivery of the baby. For patients with GDM or type 1 or type 2 diabetes who are being treated with medical nutrition therapy and insulin, visits are weekly until they achieve glycemic control and then every 2 weeks until the baby is delivered. A1C tests are performed every 8 weeks.

For GDM patients, A1C testing and patient counseling about the results are completed 6 weeks postpartum. Patients with an A1C

$< 5.7\%$ are counseled to have annual blood glucose tests, be physically active 5 days a week for 30 minutes per day, and maintain modest carbohydrate intake. Patients with an A1C of 5.7–6.4% and those with an A1C $\geq 6.5\%$ receive all of the counseling points listed above and are referred to one of two local indigent clinics. Patients with preexisting type 1 or type 2 diabetes are seen sooner than 6 weeks postpartum for referral to one of the two indigent clinics.

Currently, patient compliance with the 6-week postpartum visit is 95%. Initially, patients had to have two separate visits for the 3-hour GTT and 6-week postpartum visit with the educator, at which time compliance with the 6-week postpartum visit was 80%. The A1C test has replaced the 3-hour GTT as the test for postpartum blood glucose assessment. The format was changed so that the A1C test and visit with diabetes educator occur on the same day, which improved compliance. Currently, 90% of patients have normal A1C results, whereas 8% have values indicative of pre-diabetes ($\geq 5.7\%$ and $< 6.5\%$) and 2% have values indicative of diabetes ($\geq 6.5\%$).

Challenges and Ongoing Development

These indigent patients face several challenges including financial, cultural, and linguistic constraints and immigrant status. Lack of financial resources is the primary barrier; difficulty with transportation costs, office visit fees, and the expense of healthy foods make up the majority of the costs. Many of these patients are undocumented residents who face difficulties finding employment while also serving as the primary caregiver for their families. Those who are undocumented immigrants fear deportation, which has created distrust of others. Additionally, patients who have had no previous health care infrastructure have a distrust of health care professionals.

Funding for the clinic is an ongoing challenge because state funding has significantly decreased. Financial support from TLC and the Northeast Georgia Health System has continued in light of the clinic providing

essential prenatal care and GDM management. Currently, grant applications are being submitted to obtain funds for A1C tests, SMBG supplies, and insulin.

One goal for the clinic is to create a database to track pregnancy A1C results, medication and visit compliance data, postpartum A1C testing, infant birth weights, and patient follow-up with primary care providers regarding abnormal postpartum A1C levels. Collection of patient satisfaction data is another goal for the near future. Various research projects involving A1C testing and medication compliance are on the horizon.

In conclusion, the Gestational Diabetes Clinic at the Hall County Health Department is providing diabetes care based on the ADA recommended standards of care for GDM patients, as well as for patients with type 1 or type 2 diabetes, with the goal of preventing fetal and maternal complications.

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