

Gestational Diabetes Mellitus

Reviewed by the Professional Practice Committee

Diabetes mellitus is the most common medical complication of pregnancy¹, giving Diabetes Care & Education Specialists many opportunities to positively impact the health care and health outcomes of both mother and child. The goal of this paper is to outline the topics that should be covered by Diabetes care & education specialists when teaching women with Gestational Diabetes Mellitus (GDM) and their families or significant others.

It discusses diagnostic criteria and emphasizes the importance of individualized education and goal-setting to assist the woman with GDM in implementing effective diabetes self-care behaviors. Although there may be similarities in diabetes education strategies, this paper does not cover the topic of preexisting diabetes with pregnancy.

What is GDM?

GDM is diagnosed in the second or third trimester of pregnancy and is neither preexisting type 1 or type 2 diabetes ¹ Approximately 9% to 18% of all pregnancies are impacted by GDM, depending on the population and method of diagnosis.² It is characterized by glucose intolerance during pregnancy and is associated with a variety of adverse birth outcomes including excessive fetal weight gain and related increases in the rate of cesarean delivery and perinatal injury. GDM increases the risk for a number of long-term adverse outcomes including progression to maternal type 2 diabetes and the increased risk of obesity, diabetes and possibly adult cardiovascular disease in the infant. ^{1,2}

Diabetes care & education specialists should remember that the ultimate goal is a positive outcome for both mother and infant.¹ Targeted diabetes self-management education and support delivered by a multidisciplinary team is a key component of successful glycemic control.³ Non-pharmacologic medical nutrition therapy, including

dietary changes, meal planning, and increased physical activity are recognized as the cornerstone of treatment for GDM.^{3,4} Insight about engaging in these self-care behaviors to achieve glycemic control can be effectively delivered by diabetes care & education specialists, who play a critical and unique role in supporting the pregnant woman with GDM.

Screening guidelines:

- Screen for undiagnosed diabetes at the first prenatal visit in those with risk factors, using American Diabetes Association diagnostic criteria.^{4,5}
- Screen for GDM using a 75-gram Oral Glucose Tolerance Test (OGTT) with plasma glucose measurement fasting, 1-hour and 2-hour or 100-gram OGTT with plasma glucose measurement fasting, 1-hour, 2-hour and 3 hour at 24 to 28 weeks gestation in pregnant women not previously known to have diabetes. ^{4,5}
- Screen for GDM using a “Two-step” approach with a 50-gram non-fasting screen, followed by a

100-gram OGTT for those who screen positive.^{4,5}

- Screen women with GDM for persistent diabetes at 4 to 12 weeks postpartum, using a 75-gram oral glucose tolerance test (OGTT) and clinically appropriate, non-pregnancy diagnostic criteria.^{4,5}
- Women with a history of GDM should have lifelong screening for the development of diabetes or prediabetes every 1 to 3 years if the 75-gram OGTT is normal.^{4,5}
- Women with a history of GDM found to have prediabetes should receive intensive lifestyle interventions and/or metformin to prevent diabetes.⁴

A significant body of evidence from the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study (a large, multinational cohort of

approximately 23,000 pregnant women) suggested that elevated blood glucose levels during pregnancy may contribute to worse maternal and fetal birth outcomes, even at levels that until recently were considered normal for pregnancy. In 2011, this prompted new guidelines from the American Diabetes Association (ADA) that advocated universal screening for GDM using more stringent diagnostic criteria than have been used in the past.^{4,5}

Currently, there are two approaches to diagnosing GDM in the United States, the “One-Step Approach” and the “Two-Step Approach”.¹ In the “One-Step Approach”, the diagnosis of GDM is made when one or more of the blood glucose results are greater than or equal to the values in Table 1.^{1,4,5,7}

Table 1 “One-Step Approach” using a 75-gram Glucose Load with Overnight Fast of 8 hours or more^{1,4,5,7}

Glucose Measure	Glucose concentration threshold
Fasting plasma glucose	≥92 mg/dL (≥5.1 mmol/L)
1-h plasma glucose	≥180 mg/dL (≥10.0 mmol/L)
2-h plasma glucose	≥153 mg/dL (≥8.5 mmol/L)

The “Two-Step Approach” uses either of the two sets of criteria for diagnosing GDM as listed in Tables 2.1 and 2.2. The American College of Obstetricians and Gynecologists (ACOG) supports this method stating that in their studies, the “One-Step Approach” did not decrease the incidence of macrosomia or large-for-gestational-age infants, but did increase the rate of primary cesarean deliveries⁷. The Carpenter/Coustan criteria is more sensitive and may diagnose more women with GDM.⁵ The significant-increase in the number of women with GDM presents diabetes care & education specialists with tremendous opportunities and challenges in making a difference in their pregnancy outcomes.

Table 2.1 First Step of the “Two-Step Approach” using a 50-gram Glucose Load and non-fasting^{1,5,6,7}

Glucose Measure	ADA/ACOG glucose concentration threshold	ACOG glucose concentration threshold in high risk populations
Non-Fasting Plasma Glucose 1-hour	≥140 mg/dL (7.8 mmol/L)	≥135 mg/dL (7.5 mmol/L)

Table 2.2 Second Step of the “Two-Step Approach” using a 100-Gram Glucose Load ^{5,6}

Glucose Measure	Carpenter/Coustan	National Diabetes Data Group
Fasting	≥95 mg/dL (5.3 mmol/L)	≥105 mg/dL (5.8 mmol/L)
1 hour	≥180 mg/dL (10.0 mmol/L)	≥190 mg/dL (10.6 mmol/L)
2 hours	≥155 mg/dL (8.6 mmol/L)	≥165 mg/dL (9.2 mmol/L)
3 hours	≥140 mg/dL (7.8 mmol/L)	≥145 mg/dL (8.0 mmol/L)

Clinical experts in all groups strongly agree that reaching a consensus on the optimal diagnostic criteria for GDM is paramount.⁵ Long-term studies are ongoing to enable the eventual establishment of uniform criteria. Even though this research is beyond the scope of work for the Diabetes Care & Education Specialist, Diabetes Care & Education Specialists should strive to maintain a current knowledge base of the latest blood glucose guidelines and should check with the individual's provider regarding which set of diagnostic criteria were used for diagnosis.

Although obesity contributes to the rising prevalence of GDM,^{8,9} not all women with GDM are overweight. Insulin resistance during pregnancy is a physiologic phenomenon driven by the metabolic demands of the maternal-fetal unit, stress and pregnancy-induced hormonal changes. These changes can occur in women of any size.¹⁰ Approximately 25% of women are overweight and 22% are obese at the time of conception.¹¹ Experts recommend that healthcare professionals assess for excessive weight gain in early pregnancy and intervene immediately to help prevent the complications of excessive maternal weight gain, including GDM.¹² Other studies demonstrate weight-based ethnic differences that

influence the development of GDM, as one study involving people of South Asian descent, found that the greatest predictor of the development of GDM was the pre-pregnancy body mass index (BMI) and not the amount of weight gained in a pregnancy. Those women starting pregnancy with a higher BMI had an increased prevalence of GDM.¹³

Gestational weight gain guidelines from The Institute of Medicine (IOM) recommend a weight gain of 25 to 35 pounds for normal-weight women (BMI 18.5 to 24.9); 15 to 25 pounds for women who are overweight (BMI 25 to 29.9); and 11 to 20 pounds for women who are obese (BMI ≥ 30).⁶ These recommendations, however, are directed to all women, not specifically to women with GDM.^{6,9}

In one qualitative study which investigated the perceptions of weight gain, physical activity and nutrition counseling during prenatal visits, women reported receiving limited lifestyle counseling from their providers and this information was inconsistent with evidence-based guidelines. Many barriers to effective counseling were identified including lack of time, inadequate provider training, and cultural differences, among several others.¹² The diabetes care & education specialist, in partnership with the advanced level provider, has an opportunity to facilitate the setting of a weight

management goal for the woman with GDM while supporting lifestyle changes that enhance her ability to attain her goal

Treatment of GDM

Depending on the population, studies suggest that at least 70% to 85% of women diagnosed with GDM using the Carpenter/Coustan or the National Diabetes Data Group (NDDG) criteria will be able to establish glycemic control with lifestyle modification alone.¹⁴ The diabetes care & education specialist has many opportunities to support the woman with GDM in setting SMART (specific, measurable, attainable, realistic, time-bound) lifestyle modification goals as related to the AADE7 Self-Care Behaviors™ to facilitate successful achievement of glycemic control.¹

Monitoring

Experts recommend that women with GDM periodically perform self-monitoring of blood glucose (SMBG). Both the American Diabetes Association and the American College of Obstetrics and Gynecology recommend the following SMBG targets: fasting ≤ 95 mg/dL and 1 hour post prandial ≤ 140 mg/dL or 2-hours post prandial ≤ 120 mg/dL.^{1,5,14} In addition to teaching SMBG technique, the diabetes care & education specialist's role includes instructing woman with GDM on ways to use SMBG as a problem-solving tool to enable effective self-management of her meal plan, physical activity routine, and assessment of potential insulin needs. Note: Urine ketone testing is not generally recommended by the experts unless there is persistent weight loss or a concern that the woman is not consuming enough calories or carbohydrates.^{1,5}

Healthy Eating

It is clear that nutrition-based interventions are effective for GDM, yet experts cannot agree on a definition of the ideal diet for GDM. The goal is to establish good nutrition, appropriate weight gain and excellent glycemic control.^{1,5} General dietary guidelines for all pregnant women indicate the Dietary Reference Intakes (DRI) for carbohydrates

is a minimum of 175 grams per day, a minimum of 71 grams of protein per day and 28 grams of fiber per day.^{5,14} Because pregnancy presents the woman with GDM a challenge in carbohydrate tolerance, an individualized distribution pattern of 3 meals plus 2 to 4 snacks throughout the day may temper the glucose excursions associated with consuming large amounts of carbohydrate at one time.^{1,5} In addition to focusing on macronutrients, meal planning instruction should also emphasize food safety tips to help prevent food-borne illnesses such as listeriosis and salmonella as well as avoiding fish that are high in methylmercury.¹

Studies show that culturally competent care may improve both treatment adherence and health outcomes.¹⁶ With the expanding population of minority ethnic groups in the United States and their increased prevalence of GDM, the diabetes care & education specialist should facilitate culturally-relevant meal planning by assisting the woman with GDM to incorporate her traditional foods into the personal meal plan.

Being Active

Being physically active is known to be beneficial in establishing and maintaining glycemic control and maintaining a healthy gestational weight. ACOG endorses that women who were previously active (either on a recreational or professional level), can remain physically active with modifications as medically indicated. Healthy women who were previously inactive should strive for 150 minutes of moderate intensity aerobic activity per week unless there are obstetrical or medical conditions that pose contraindications to being physically active.¹⁸ Even activity intervals of 10 minutes duration can be effective.¹ Experts state that pregnancy is not the time to initiate a strenuous activity routine, however most women are able to tolerate walking. A 15 to 20 minute walk can potentially lower blood glucose by 20 to 40 mg/dL.¹ The diabetes care & education specialist should support the provider's recommendations for physical activity and assist the woman with GDM to find enjoyable ways to incorporate physical activity into her daily routine.

Taking Medications

If nutrition care and increased physical activity fail to maintain adequate glucose control, treatment should be intensified to include pharmacologic therapy by an appropriate healthcare professional.¹⁴ Approximately 15 to 30% of women with GDM may require medication to establish glycemic control.² Insulin is the first-line treatment in GDM because it does not cross the placenta,¹⁴ and the insulin regimen should be individualized to meet glycemic targets.^{1,2,14}

There is growing use of the oral antidiabetic agents, glyburide and metformin, because of increased convenience and potential cost savings. Both oral agents cross the placenta.¹⁴ A network meta-analysis comparing glyburide and metformin in 18 random-controlled trials with over 2500 women, demonstrated that when compared to metformin, glyburide was associated with a higher risk of neonatal hypoglycemia and macrosomia.^{14,15} Additionally, metformin may slightly increase the risk of premature birth.¹⁴ While controlled trials support the short-term safety and efficacy of both metformin and glyburide, there are currently no long-term safety data available for any oral agent.¹⁴ In addition to educating the woman with GDM about diabetes medication, the diabetes care & education specialist's role is to support the woman's and provider's medication choice.

Healthy Coping

The diagnosis of GDM is very stressful for most women. They may suddenly perceive their pregnancy as a disease-state, experience anxiety and frustration over the urgent need to make immediate lifestyle changes, and/or fear suffering maternal and fetal complications of GDM.¹ The diabetes care & education specialist has the opportunity to address concerns, answer questions and provide emotional support for women dealing with the psychological impact of GDM and diabetes distress should be continually monitored. Consideration of referral to a mental health specialist who is familiar with diabetes management for evaluation and treatment may be helpful in certain situations.¹⁷

Post-Pregnancy Management

The recurrence of GDM in a subsequent pregnancy is not uncommon; women with a history of GDM have a 60% to 70% probability of developing a metabolic disorder in a future pregnancy.¹⁶ In addition, women with a history of GDM are at risk for conversion to type 2 diabetes, and this risk is not limited to within the 4 to 12-week postpartum timeframe.^{14,16} According to one systematic review of studies, up to 70% of women with GDM had progressed to type 2 diabetes (T2DM), putting women at 10 times greater risk for developing T2DM and future metabolic abnormalities such as hypertension, dyslipidemia and obesity.¹⁹

Guidelines advocate careful post-pregnancy surveillance to monitor for T2DM. Screening for impaired glucose tolerance is recommended at 4 to 12 weeks following delivery with a 75-gram OGTT using non-pregnancy criteria and then every 1 to 3 years thereafter.¹⁴ Despite these guidelines, evidence indicates that only half of women with GDM receive appropriate post-partum screening for T2DM in most populations.²⁰ Barriers to screening may be related to the person (e.g. lack of awareness regarding risk status), provider-related (e.g. uncertainty regarding recommended screening intervals), system-related (e.g. lack of communication between obstetric and postpartum providers), or due to limited access to the healthcare system.²⁰

The American Diabetes Association further recommends that women with a history of GDM found to have prediabetes should receive lifestyle interventions or metformin to prevent diabetes. The combination of metformin and lifestyle intervention has been shown to prevent or delay progression to overt diabetes in these women.¹⁴ Experts endorse that many women feel abandoned by the healthcare system after a pregnancy with GDM; they do not receive the needed ongoing healthcare and support to maintain a healthy lifestyle and reduce the risks of diabetes and cardiovascular disease.²¹ Diabetes care & education specialists have the potential to play a vitally important role in addressing these barriers, both through the education of patients and providers and by serving as a bridge between the prenatal and postnatal care teams.

Impact of Breastfeeding on Maternal and Child Health

In addition to adopting a healthy lifestyle and achieving a healthy weight, breastfeeding is another modifiable behavior that has been found to have a positive health impact for both mother and infant.²² The American Academy of Pediatrics (AAP) recommends that women breastfeed their infant for at least 12 months.²³ Both the World Health Organization (WHO) and the AAP recommend exclusive breastfeeding for the first six months of life.^{23,24}

Breastfeeding benefits infants in the general population by providing passive immunity against communicable diseases, as well as adequate amounts of nutrients and calories needed for growth; studies show that it also decreases the risk of obesity.^{24,26} In some studies, breastfed infants of mothers with GDM showed a lower incidence of developing obesity and improved glycemic stability in the immediate postpartum period,²⁷ but a longer duration of lactation was needed to achieve the anti-obesity effect.²⁶

In two separate studies, women with GDM who breastfed had a median time to developing T2DM of 12.3 years compared with 2.3 years among women who did not breastfeed.²² Short-term maternal benefits of breastfeeding include increased caloric burn for milk production, better lipid profile, lower blood glucose and improved

insulin sensitivity.²³ One prospective study found that lactation for ≥ 12 months was an independent predictor of a lower likelihood of the development of Prediabetes/diabetes at three years postpartum.^{23,25} Long-term maternal benefits have not been thoroughly studied, however epidemiological studies have found that middle-aged women reporting longer durations of lactation earlier in life have a lower risk of T2DM, perhaps through sustained post-weaning effects on insulin sensitivity.^{22,23}

Despite guidelines from several experts, in 2014 the Centers for Disease Control and Prevention reported that only 26.7% of women breastfed for 12 months and only 18.8% do so exclusively for 6 months.²³ Some studies demonstrate that women with GDM are less likely to breastfeed than those without GDM. In one study, the crude prevalence rate of exclusive breastfeeding among women with GDM was 62.2% compared with an exclusive breastfeeding rate of 75.4% among women without GDM at the time of hospital discharge.²⁷ Some experts believe that this may be the result of the inpatient care focus on glycemic management and other issues in lieu of breastfeeding.²² Diabetes care & education specialists have ample opportunities to provide education on the positive health impact of breastfeeding and support the breastfeeding efforts of women in the early postpartum period to potentially impact long-term breastfeeding success and health outcomes of both mothers and their children.

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Acknowledgements

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