

Gestational Diabetes Mellitus

Ashley Boerrigter, M.D.
Assistant Professor | Maternal-Fetal Medicine

FINANCIAL DISCLOSURES

- None

OBJECTIVES

At the conclusion of this lecture, attendees will be able to:

- Counsel patients on morbidities associated with GDM in pregnancy.
- Describe the tests available for diagnosing pre-existing DM and GDM.
- List the benefits of treating GDM.
- Discuss the optimal blood glucose surveillance frequency in pregnancy.
- Describe non-pharmacologic treatments for GDM.
- Initiate insulin treatment for GDM.
- Discuss recommendations for enhanced fetal surveillance and delivery timing in the setting of GDM.
- Counsel a postpartum patient who had GDM in pregnancy on recommended lifetime surveillance.



American College of
Obstetricians & Gynecologists



U.S. Preventive Services
TASK FORCE

BACKGROUND

- Gestational Diabetes Mellitus (GDM) is a condition in which carbohydrate intolerance develops during pregnancy.
- Classification:
 - Diet-controlled GDM = A1
 - GDM that requires insulin = A2
- 2009: 7% of pregnancies complicated by diabetes; of these, 86% are GDM
- Increased prevalence in Hispanic, Black, Native American, Asian / Pacific Islander women
- Increased prevalence with obesity and sedentary lifestyles.

MATERNAL & FETAL COMPLICATIONS

Co-morbidity	GDM	No GDM
Pre-eclampsia	18%	9.8%
Cesarean delivery	25% (A2), 17% (A1)	9.5%
Lifetime risk DM	70%	33%

- Fetal / neonatal: macrosomia, shoulder dystocia, birth trauma, neonatal hypoglycemia, hyperbilirubinemia
- Childhood: childhood and adult-onset obesity and diabetes in offspring

MAKING THE DIAGNOSIS: PRE-EXISTING DM

- Peri-conceptional HbA1C > 7.0% → malformations, miscarriage
- Early screening for undiagnosed Type 2 DM
- At the entrance to prenatal care; based on risk factors (see Box 1)
- Which test?
 - A1C – decreased sensitivity
 - 2h OGTT (75g glucose load)
 - 2-step screen (1h GCT w/ 50g load, 3h GTT w/ 100g glucose load)

Box 1. Screening Strategy for Detecting Pregestational Diabetes or Early Gestational Diabetes Mellitus ↵

Consider testing in all women who are overweight or obese (ie, have a body mass index greater than 25 or greater than 23 in Asian Americans) and have one or more of the following additional risk factors:

- Physical inactivity
- First-degree relative with diabetes
- High-risk race or ethnicity (eg, African American, Latino, Native American, Asian American, Pacific Islander)
- Have previously given birth to an infant weighing 4,000g (approximately 9 lb) or more
- Previous gestational diabetes mellitus
- Hypertension (140/90 mm Hg or on therapy for hypertension)
- High-density lipoprotein cholesterol level less than 35 mg/dL (0.90 mmol/L), a triglyceride level greater than 250 mg/dL (2.82 mmol/L)
- Women with polycystic ovarian syndrome
- A_{1c} greater than or equal to 5.7%, impaired glucose tolerance, or impaired fasting glucose on previous testing
- Other clinical conditions associated with insulin resistance (eg, prepregnancy body mass index greater than 40 kg/m², acanthosis nigricans)
- History of cardiovascular disease

If pregestational or gestational diabetes mellitus is not diagnosed, blood glucose testing should be repeated at 24–28 weeks of gestation.

Adapted with permission from the American Diabetes Association. Classification and Diagnosis of Diabetes. *Diabetes Care* 2017;40 (Suppl. 1):S11–S24. Copyright 2017 American Diabetes Association.

MAKING THE DIAGNOSIS: GDM

- 2014: USPSTF recommends universal screening (24-28wks)
- One-step approach:
 - 2h OGTT, 75g glucose load
 - Diagnosed if any value exceeds the thresholds: 92 / 180 / 153 mg/dL
 - Endorsed by IADPSG
- Two-step approach:
 - 1h GCT, 50g glucose load
 - 3h GTT, 100g glucose load (OR 1wk accuchecks)

DIAGNOSTIC THRESHOLDS

- 1-hr GCT: 130, 135, or 140mg/dL
 - Consistency in your practice is key!

Table 1. Proposed Diagnostic Criteria for Gestational Diabetes Mellitus* ↩

- 3-hr GTT:

Status	Plasma or Serum Glucose Level Carpenter and Coustan Conversion		Plasma Level National Diabetes Data Group Conversion	
	mg/dL	mmol/L	mg/dL	mmol/L
Fasting	95	5.3	105	5.8
1 hour	180	10.0	190	10.6
2 hours	155	8.6	165	9.2
3 hours	140	7.8	145	8.0

*A diagnosis generally requires that two or more thresholds be met or exceeded, although some clinicians choose to use just one elevated value.

Adapted with permission from the American Diabetes Association. Classification and Diagnosis of Diabetes. [Diabetes Care 2017;40 \(Suppl. 1\):S11–S24](#). Copyright 2017 American Diabetes Association.

BENEFITS OF TREATING GDM

- Reduced serious newborn complications (perinatal death, shoulder dystocia, birth trauma such as fracture or nerve palsy)
- Reduced pre-eclampsia
- Reduced macrosomia, LGA infants, and neonatal fat mass
- Reduced rates of Cesarean delivery

HOW TO MONITOR BLOOD GLUCOSE

- Optimal frequency of blood glucose testing is unclear
- General recommendation: fasting and post-prandial breakfast / lunch / dinner
 - 1 or 2hr post-prandial both acceptable
- Fasting values are most predictive of neonatal fat mass
- Optimal glycemic targets:
 - Fasting: <95 mg/dL
 - 1h PP: < 140 mg/dL
 - 2h PP: < 120 mg/dL
- Once glycemic control is obtained, reducing frequency of glucose checks is reasonable. Consider 2 per day (fasting and rotating post-prandial).

NONPHARMACOLOGIC TREATMENTS

- Dietary modifications aka medical nutrition therapy
 - ADA recommends nutritional counseling by a registered dietitian and development of a personalized nutrition plan
 - 3 major nutritional components: 1- caloric allotment, 2- carbohydrate intake, 3- caloric distribution
 - Carbs 33-40%, protein 20%, fat 40%
 - Complex > simple carbohydrates
- Exercise
 - 30min moderate-intensity aerobic exercise 5 days a week

PHARMACOLOGIC TREATMENTS

- No conclusive evidence for a specific threshold value at which medical therapy should be started.
- **Insulin**
 - Does not cross the placenta
 - Achieves rapid glycemic control
- **Metformin**
 - Does cross the placenta, concentration ~equivalent to maternal
 - Long-term metabolic influence on offspring is unknown
- **Sulfonylureas**
 - Does not cross the placenta
 - Increased risk of neonatal hypoglycemia
 - Not FDA – approved for GDM

INSULIN THERAPY

- Basal – bolus regimen
- Long-acting: glargine or detemir
 - Twice-daily
- Short-acting: lispro or aspart
 - With meals (insulin:carb or set dose)
 - Correction

Table 2. Action Profile of Commonly Used Insulin Agents ↩

Type	Onset of Action	Peak of Action (h)	Duration of Action (h)
Insulin lispro	1–15 min	1–2	4–5
Insulin aspart	1–15 min	1–2	4–5
Regular insulin	30–60 min	2–4	6–8
Isophane insulin suspension (NPH insulin)	1–3 h	5–7	13–18
Insulin glargine	1–2 h	No peak	24
Insulin detemir	1–3 h	Minimal peak at 8–10	18–26

Modified from Gabbe SG, Graves CR. Management of diabetes mellitus complicating pregnancy. *Obstet Gynecol* 2003;102:857–68.

FETAL ASSESSMENT

- Enhanced fetal surveillance to prevent stillbirth is conducted with non-stress tests.
- Increased risk of fetal demise is in patients with pregestational diabetes is related to suboptimal glycemic control.
 - A2 GDM → presumably had suboptimal control at one point, surveillance indicated
 - A1 GDM → adequately controlled and never needed insulin; no consensus regarding surveillance

DELIVERY CONSIDERATIONS

- A1 GDM: 39wks to 40w6d
- A2 GDM: 39w0d – 39w6d
 - Earlier if poorly controlled: 37w0d – 38w6d
 - Delivery in late preterm period (34w0d – 36w6d) reserved for those who fail in-hospital management or have abnormal fetal testing
- When to recommend Cesarean?
 - Of US-diagnosed LGA infants, only 22% were LGA at birth.
 - EFW 4000g+: NNT 962 Cesareans to prevent 1 case permanent brachial plexus palsy
 - EFW 4500g+: NNT 588



POSTPARTUM COUNSELING

- Increased risk of T2DM
 - 15-70% will develop diabetes (predominantly type 2) later in life
 - 7x increased risk than women without T2DM
- Screening at 4-12wks postpartum - 2h OGTT (75g)
- Ensure follow-up with primary care; DM testing q1-3yrs

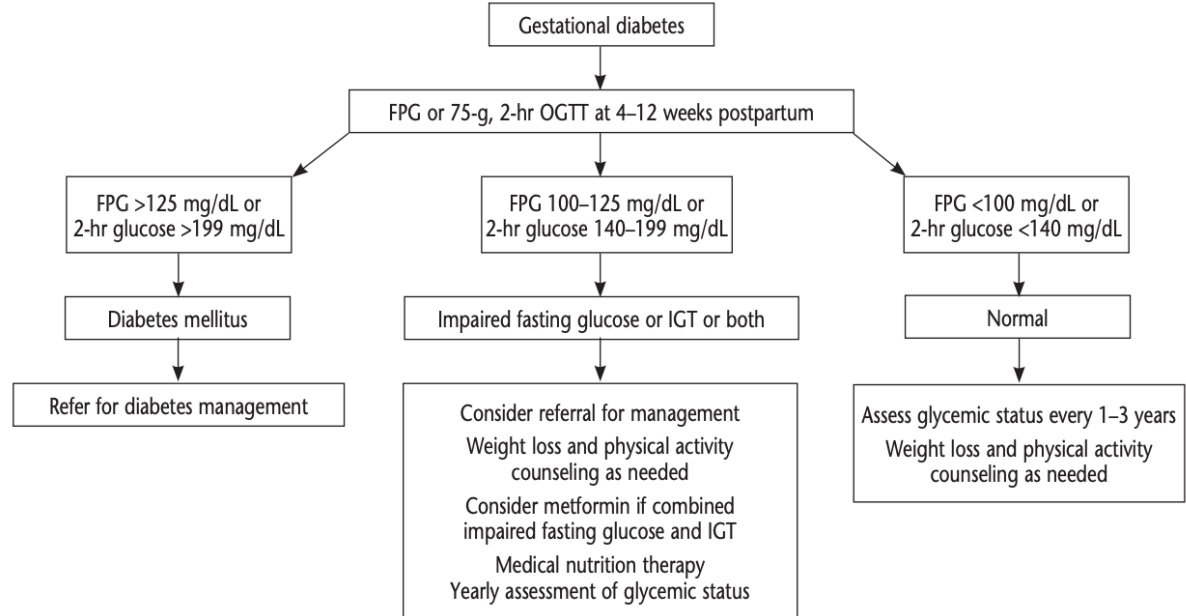


Figure 1. Management of postpartum screening results. Abbreviations: FPG, fasting plasma glucose; OGTT, oral glucose tolerance test; IGT, impaired glucose tolerance. ➡

Level A	Level B	Level C
Nutrition and exercise counseling; initiate medications if these fail	Screen all pregnant women for GDM with a laboratory-based screening test(s) using blood glucose levels.	Select a single consistent cutoff for 1h GCT and 3h GTT.
Insulin is the preferred treatment	If insulin is not an option, metformin is a reasonable alternative choice.	Blood glucose surveillance is required once medical nutrition therapy is started.
	Glyburide should not be recommended as a first-choice.	3 meals and 2-3 snacks are recommended to distribute carb intake and reduce postprandial glucose fluctuations.
	Counsel women of the limitations in safety data when prescribing oral agents for GDM.	30min x 5d / wk or a minimum of 150min / wk
		Delivery timing
		Glucose screening 4-12wk PP, refer if elevated. Repeat testing q1-3yrs in patients who had GDM.
		Counsel regarding r/b/a of CD when EFW 4500g+

REFERENCES

- ACOG Practice Bulletin No. 190: Gestational Diabetes Mellitus. Obstet Gynecol. 2018 Feb;131(2):e49-e64. doi: 10.1097/AOG.0000000000002501. PMID: 29370047.
- Amylidi S, Mosimann B, Stettler C, Fiedler GM, Surbek D, Raio L. First-trimester glycosylated hemoglobin in women at high risk for gestational diabetes. Acta Obstet Gynecol Scand. 2016 Jan;95(1):93-7. doi: 10.1111/aogs.12784. Epub 2015 Oct 26. PMID: 26400192.
- Sacks, David A. MD; Metzger, Boyd E. MD. Classification of Diabetes in Pregnancy: Time to Reassess the Alphabet. Obstetrics & Gynecology 121(2 PART 1):p 345-348, February 2013. | DOI: 10.1097/AOG.0b013e31827f09b5

DISCUSSION