

Management of Diabetes in  
Reproductive Aged Women

Rupesh Patel, DO  
Maternal Fetal Medicine  
Advocate Health Medical Group

---

---

---

---

---

---

---

---

Disclosures

- I have no disclosures

---

---

---

---

---

---

---

---

Objectives

- Accurately diagnose and manage diabetes
- Recognize the goals for diabetes management in pregnancy
- Assess and explain long term health and reproductive risks associated with diabetes.

---

---

---

---

---

---

---

---

## Introduction

### Diabetes

- **Total:** 38.4 million people have diabetes (11.6% of the US population)
- **Diagnosed:** 29.7 million people, including 29.4 million adults
- **Undiagnosed:** 8.7 million people (22.8% of adults are undiagnosed)

### Prediabetes

- **Total:** 97.6 million people aged 18 years or older have prediabetes (38.0% of the adult US population)
- **65 years or older:** 27.2 million people aged 65 years or older (48.8%) have prediabetes

---

---

---

---

---

---

---

---




---

---

---

---

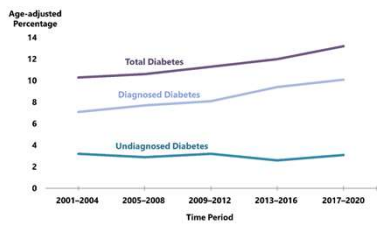
---

---

---

---

Figure 1. Trends in age-adjusted prevalence of diagnosed diabetes, undiagnosed diabetes, and total diabetes among adults aged 18 years or older, United States, 2001-2020



Notes: Diagnosed diabetes was based on self-report. Undiagnosed diabetes was based on fasting plasma glucose and A1C levels among people self-reporting no diabetes. Time period 2017-2020 covers January 2017 through March 2020 only.  
Data sources: 2001-March 2020 National Health and Nutrition Examination Surveys.

---

---

---

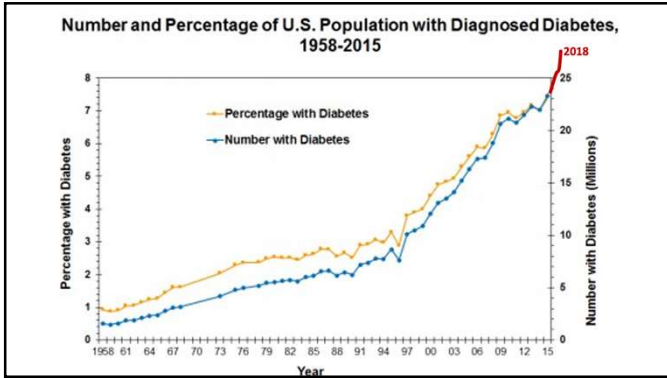
---

---

---

---

---




---

---

---

---

---

---

---

---

How big a problem is this?

- Women of child bearing age= **63M**
- Prevalence of know Type 1 DM= **1%**
  - **630K women**
- Prevalence of known Type 2 DM= **2.9%**
  - **1.8M women**
- Prevalence of unknown Type 2 DM= **0.5%**
  - **314K women**

**SO: 2.7 million women with preconception Diabetes!**

---

---

---

---

---

---

---

---

Criteria for Diagnosis of Overt Diabetes	• A1c $\geq 6.5\%$ OR
	• Fasting blood glucose $\geq 126$ mg/dL OR
	• 2-hour plasma glucose $\geq 200$ mg/dL after 75-g oral glucose tolerance test OR
	• Patient with classic symptoms of hyperglycemia, with a non-fasting plasma glucose $\geq 200$ mg/dL

ADA: American Diabetes Association.  
Source: Reference 1.

---

---

---

---


---

---

---

---

### High Blood Sugar Symptoms To Be Aware Of



Excessive thirst

Excessive urination

Extreme hunger

Fatigue

Unexplained weight loss

Blurry vision

If you have symptoms, please reach out to your healthcare provider.

---

---

---

---




---

---

---

---

### Type 2 Diabetes is a Rising Threat in Youth

PREDIABETES	Who has PREDIABETES?	What Can You Do?
<p>increases the risk of developing type 2 diabetes and heart disease.</p> 	<p><b>1 in 5</b> aged 12-18 years</p> <p><b>1 in 4</b> aged 19-34 years</p> <p><b>PREDIABETES is higher in males and people with obesity</b></p> 	<ul style="list-style-type: none"> <li>Parents should talk to their child's health care provider about testing for type 2 diabetes</li> <li>Adults aged 18 and over can take a 1-minute risk test at <a href="http://www.cdc.gov/diabetes/risktest">www.cdc.gov/diabetes/risktest</a></li> </ul> 

---

---

---

---



---

---

---

---

### Hispanic and Asian subgroups are at higher risk for diabetes

HISPANICS AND NON-HISPANIC ASIANS	SUBGROUPS WITH DIABETES*	KNOW YOUR RISK																				
<p>Collectively account for <b>23%</b> of the US population</p>  <p>Are at a higher risk for prediabetes and type 2 diabetes</p>	<table border="1"> <tr> <th colspan="2">Hispanics</th> </tr> <tr> <td>Mexicans</td> <td>25%</td> </tr> <tr> <td>Puerto Ricans</td> <td>22%</td> </tr> <tr> <td>Cuban/Dominicans</td> <td>21%</td> </tr> <tr> <td>Central Americans</td> <td>19%</td> </tr> <tr> <td>South Americans</td> <td>12%</td> </tr> <tr> <th colspan="2">Non-Hispanic Asians</th> </tr> <tr> <td>South Asians</td> <td>23%</td> </tr> <tr> <td>Southeast Asians</td> <td>22%</td> </tr> <tr> <td>East Asians</td> <td>14%</td> </tr> </table>	Hispanics		Mexicans	25%	Puerto Ricans	22%	Cuban/Dominicans	21%	Central Americans	19%	South Americans	12%	Non-Hispanic Asians		South Asians	23%	Southeast Asians	22%	East Asians	14%	<p>If your <b>BMI IS 25 OR MORE</b> or if you are of <b>ASIAN HERITAGE</b> with a <b>BMI OF 23 OR MORE</b>, ask your health professional if you should be tested for type 2 diabetes.</p> 
Hispanics																						
Mexicans	25%																					
Puerto Ricans	22%																					
Cuban/Dominicans	21%																					
Central Americans	19%																					
South Americans	12%																					
Non-Hispanic Asians																						
South Asians	23%																					
Southeast Asians	22%																					
East Asians	14%																					

---

---

---

---

---

---

---

---

### Pre-Diabetes

- In 2010 the ADA committee on diagnosis and classification recognized an intermediate group
- Blood glucose not high enough to have diabetes but also not normal.
- IFG (impaired fasting glucose) fasting 100mg/dl – 125 mg/dl
- IGT (impaired glucose tolerance) 2 hr value on the OGTT of 140mg/dl – 199 mg/dl

---

---

---

---

---

---

---

---



---

---

---

---

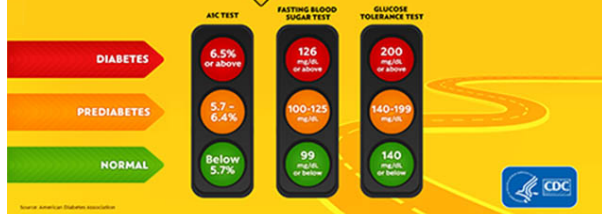
---

---

---

---

### THE ROAD TO TYPE 2 DIABETES



---

---

---

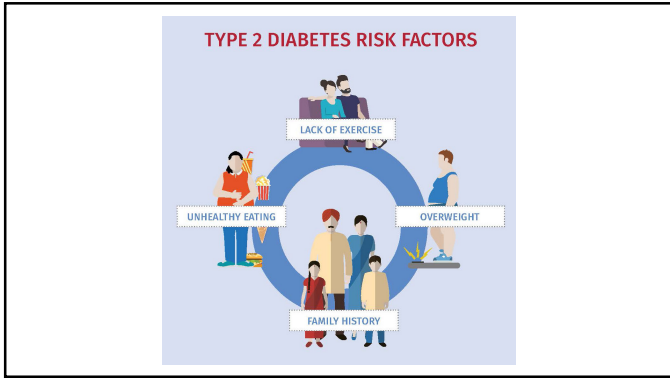
---

---

---

---

---



---

---

---

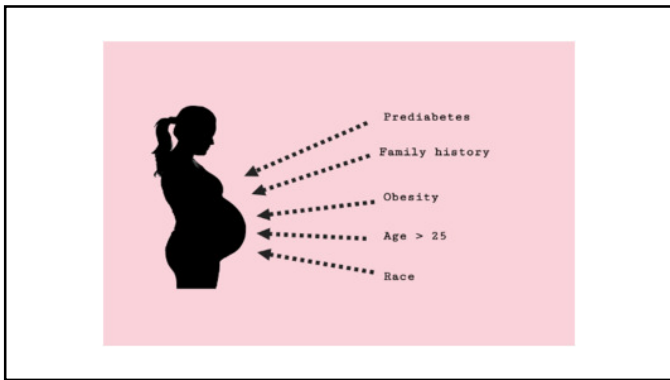
---

---

---

---

---



---

---

---

---

---

---

---

---

Hgb A1C

- A1C of 5.5-6.0% have a 5 year cumulative incidence of diabetes from 12% to 25%
- Data indicates that A1C of 5.5 -6.0% identifies people with IFG and IGT.
  - More likely to transition to diabetes when pregnant

---

---

---

---

---

---

---

---

### Hgb A1C

- Compared to a fasting glucose of 100 mg/dl – using A1C 5.7% or above is 66% sensitive and 88% specific for the development of diabetes in 6 years.
- Individuals with A1C 5.7-6.4 should be informed of the risk and receive counseling regarding changes in lifestyle

---

---

---

---

---

---

---

### Categories of increased risk

- Fasting 100mg/dl – 125 mg/dl
- 2h values on the 75gOGTT 140mg/dl-199 mg/dl
- A1C of 5.7-6.4

---

---

---

---

---

---

---

### Comorbidities seen in pregnant women

- Obesity
- Hypertension
- Age over 35
- High cholesterol
- Family history

---

---

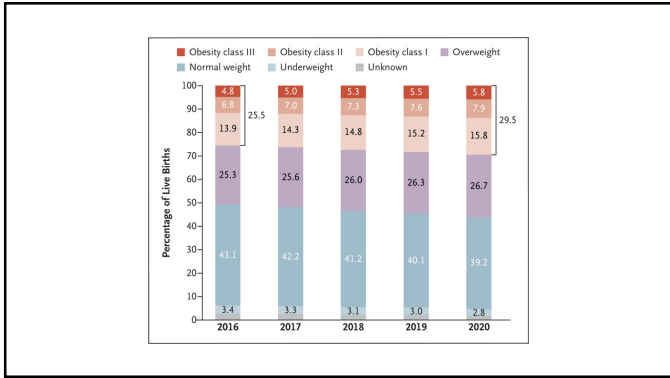
---

---

---

---

---




---

---

---

---

---

---

---

---

Hypothetical patient

- Mary Jane, 34 years old
  - Type II diabetes, taking metformin 1000 mg BID
  - BMI 38
  - Hypertension on enalapril
- Has 2 children ages 5 and 3, not currently planning for more children, but open to it

---

---

---

---

---

---

---

---

- Advise reproductive age women with diabetes about reliable birth control
  - **NOTE:** Metformin in PCOS may improve fertility → need to warn about possible pregnancy
  - Metformin safe for ovulation induction in PCOS
- Achieving a healthy weight is essential – obesity associated with adverse pregnancy outcomes

---

---

---

---

---

---

---

---



15. Management of Diabetes in Pregnancy: Standards of Care in Diabetes—2023

Diabetes Care 2023;46(Suppl. 1):S254–S266 | <https://doi.org/10.2337/623-S015>

---

---

---

---

---

---

---

---

Table 15.1—Checklist for preconception care for people with diabetes (16,19)

Preconception education should include:

- Comprehensive nutrition assessment and recommendations for:
  - Overweight/obesity or underweight
  - Meal planning
  - Correction of dietary nutritional deficiencies
  - Caffeine intake
  - Safe food preparation technique
- Lifestyle recommendations for:
  - Regular moderate exercise
  - Avoidance of hyperthermia (hot tubs)
  - Adequate sleep
- Comprehensive diabetes self-management education
- Counseling on diabetes in pregnancy per current standards, including natural history of insulin resistance in pregnancy and postpartum; preconception glycemic targets; avoidance of DKA/severe hyperglycemia; avoidance of severe hypoglycemia; progression of retinopathy; PCOS (if applicable); fertility in people with diabetes; genetics of diabetes; risks to pregnancy including miscarriage, still birth, congenital malformations, macrosomia, preterm labor and delivery, hypertensive disorders in pregnancy, etc.
- Supplementation
  - Folic acid supplement (400 µg routine)
  - Appropriate use of over-the-counter medications and supplements

---

---

---

---

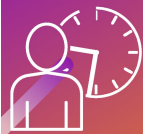
---

---

---

---

WHAT IS THE RECOMMENDED EXERCISE?



**Be active**

at least **150** minutes moderate intensity per week  
moderate intensity: brisk walking, able to talk

OR

at least **75** minutes vigorous intensity per week  
vigorous intensity: stair climbing and difficulty talking

or a combination of both

**Build strength**

To keep muscles, bones and joints strong

on at least **2** days a week

**Minimise sedentary time**

Break up periods of inactivity

**Improve balance**

For older adults, to reduce the chance of frailty and falls

2 days a week

---

---

---

---

---

---

---

---

**Table 1. Folic Acid Supplementation for the Prevention of Neural Tube Defects: Clinical Summary of the USPSTF Recommendation**

<b>Population</b>	Women who are planning or capable of pregnancy
<b>Recommendation</b>	Take a daily supplement containing 0.4 to 0.8 mg (400 to 800 μg) of folic acid Grade: A
<b>Risk assessment</b>	All women of childbearing age are at risk of having a pregnancy affected by neural tube defects. Some factors increase this risk, including a personal or family history of neural tube defects, use of particular antiepileptic medications, maternal diabetes, obesity, and mutations in folate-related enzymes.
<b>Preventive medication</b>	Folic acid is the synthetic form of folate, a water-soluble B vitamin. Folic acid is usually given as a multivitamin, prenatal vitamin, or single supplement, and is also used to fortify some grain products. Folate occurs naturally in foods such as dark green leafy vegetables, legumes, and oranges. However, most women do not receive the recommended daily intake of folate from diet alone.
<b>Timing</b>	The critical period for supplementation starts at least 1 month before conception and continues through the first 2 to 3 months of pregnancy.
<b>Dosage</b>	Supplementation with a multivitamin containing 0.4 to 0.8 mg (400 to 800 μg) of folic acid decreases the risk of neural tube defects.
<b>Balance of benefits and harms</b>	The USPSTF concludes with high certainty that the net benefit of daily folic acid supplementation to prevent neural tube defects in the developing fetus is substantial for women who are planning or capable of pregnancy.

NOTE: For a summary of the evidence systematically reviewed in making this recommendation, the full recommendation statement, and supporting documents, go to <http://www.uspreventiveserVICES.org/>.  
USPSTF = U.S. Preventive Services Task Force.

---

---

---

---

---

---

---

---

---

**Health assessment and plan should include:**

- General evaluation of overall health
- Evaluation of diabetes and its comorbidities and complications, including OSA/severe hyperglycemia, severe hypoglycemia/hypoglycemia unawareness, barriers to care, comorbidities such as hyperlipidemia, hypertension, NAFLD, PCOS, and thyroid dysfunction; complications such as macrovascular disease, nephropathy, neuropathy (including autonomic bowel and bladder dysfunction), and retinopathy
- Evaluation of obstetric/gynecologic history, including a history of: cesarean section, congenital malformations or fetal loss, current methods of contraception, hypertensive disorders of pregnancy, postpartum hemorrhage, preterm delivery, previous macrosomia, Rh incompatibility, and thrombotic events (DVT/PE)
- Review of current medications and appropriateness during pregnancy

**Screening should include:**

- Diabetes complications and comorbidities, including comprehensive foot exam; comprehensive ophthalmologic exam; ECG in individuals starting at age 35 years who have cardiac signs/symptoms or risk factors and, if abnormal, further evaluation; lipid panel; serum creatinine, TSH; and urine protein-to-creatinine ratio
- Anemia
- Genetic carrier status (based on history):
  - Cystic fibrosis
  - Sickle cell anemia
  - Tay-Sachs disease
  - Thalassemia
- Others if indicated
- Infectious disease
  - *Neisseria gonorrhoeae*/*Chlamydia trachomatis*
  - Hepatitis C
  - HIV
  - Pap smear
  - Syphilis

---

---

---

---

---

---

---

---

---

**Immunizations should include:**

- Rubella
- Varicella
- Hepatitis B
- Influenza
- Others if indicated

**Preconception plan should include:**

- Nutrition and medication plan to achieve glycemic targets prior to conception, including appropriate implementation of monitoring, continuous glucose monitoring, and pump technology
- Contraceptive plan to prevent pregnancy until glycemic targets are achieved
- Management plan for general health, gynecologic concerns, comorbid conditions, or complications, if present, including hypertension, nephropathy, retinopathy, Rh incompatibility; and thyroid dysfunction

---

---

---

---

---

---

---

---

---

Potential Contraindications to Pregnancy in Women with Established Diabetes

- Ischemic heart disease
- Untreated active proliferative retinopathy
- Renal insufficiency
- Severe gastroenteropathy

Zivanovic, et al. MS. Obstet / Med. 2009; 76: 268-280.

31

---

---

---

---

---

---

---

---

Risks attributed to pregestational diabetes

Maternal

- Preeclampsia
- Hypertensive disorders
- Diabetic retinopathy
- DKA

Fetal

- Miscarriage
- Stillbirth
- Major congenital anomalies
- Preterm birth
- Fetal macrosomia
- Fetal hypertrophic cardiomyopathy
- Neonatal hypoglycemia, hyperbilirubinemia
- Respiratory distress syndrome
- Long-term risks to the offspring include increased rates of childhood obesity, childhood diabetes mellitus and prediabetes, and cardiovascular diseases in later life.

---

---

---

---

---

---

---

---

Birth Defects

- Most important FACTOR: glycemic control during embryogenesis
- If Gestational diabetes begins after first trimester; no increase in birth defects
- In women with pre-existing diabetes: 8.5% increase in cardiac defects, 5.3% in CNS defects, and 3.5% in GI and GU defects
- HGA1c levels prior to embryogenesis determine the risks for birth defects. A1c greater than 6.5% increases the risk

---

---

---

---

---

---

---

---

### Neonatal Morbidity

- Hypoglycemia
- Polycythemia
- Hyperbilirubinemia
- Hypocalcemia
- Cardiomyopathy
- Respiratory Distress
- Birth Trauma

---

---

---

---

---

---

---

---

### Diabetes Effect on the Pregnancy

- Dystocia
- Preeclampsia
- Pyelonephritis
- Pelvic trauma

---

---

---

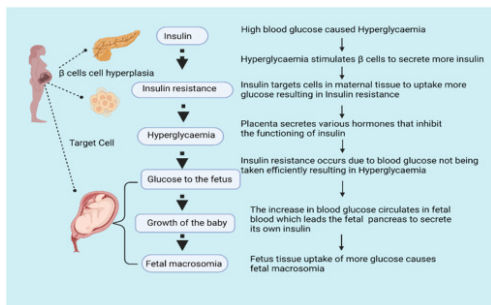
---

---

---

---

---



---

---

---

---

---

---

---

---

### Preconception Care for Women With Established T1D or T2D

<p><b>All Women of Child-Bearing Age</b></p> <ul style="list-style-type: none"> <li>• Provide counseling on effective contraception for all who wish to avoid pregnancy</li> <li>• Evaluate and treat diabetes-related complications</li> </ul>	<p><b>Women Seeking to Become Pregnant</b></p> <ul style="list-style-type: none"> <li>• Review risks of uncontrolled diabetes during pregnancy</li> <li>• Provide counseling on medications contraindicated during pregnancy                             <ul style="list-style-type: none"> <li>• Statins, angiotensin-converting-enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), and most non-insulin antihyperglycemic agents</li> </ul> </li> </ul>
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Handbergman YH, et al. Endocr Pract. 2015;21(suppl 1):1-87.  
ADA. Diabetes Care. 2018;41(suppl 1):S137-S143.

---

---

---

---

---

---

---

---

### Preconception Checklist for Women with Pre-existing Diabetes

- ✓ Use reliable birth control until adequate glycemic control
- ✓ Attain a preconception A1C of  $\leq 6.5\%$  ( $\leq 6.0\%$  if possible)
- ✓ May remain on metformin + glyburide until pregnancy, otherwise switch to insulin
- ✓ Assess for and manage any diabetes complications
- ✓ Folic Acid 1 mg/d: 3 months pre-conception to 12 weeks post-conception
- ✓ Discontinue potential embryopathic meds:
  - ✓ **ACE inhibitors / ARB** (prior to or upon detection of pregnancy in those with significant proteinuria)
  - ✓ **Statin** therapy

---

---

---

---

---

---

---

---

### Recommendations

Pre-existing Diabetes

*Preconception care*

1. All women of reproductive age with type 1 or type 2 diabetes should receive ongoing counselling on reliable birth control, the importance of glycemic control prior to pregnancy, the impact of BMI on pregnancy outcomes, the need for folic acid and the need to stop potentially embryopathic drugs prior to pregnancy

---

---

---

---

---

---

---

---

### Recommendations

Pre-existing Diabetes

*Preconception care*

- 2. Women with type 2 diabetes with irregular menses/PCOS who lose significant weight or are started on metformin should be advised that fertility may improve and be counselled regarding possible pregnancy and receive preconception counseling

---

---

---

---

---

---

---

---

### Recommendations

Pre-existing Diabetes

*Preconception care*

- 3. Before attempting to become pregnant, women with type 1 or type 2 diabetes should:
  - a) Receive preconception counselling that includes optimal diabetes management, including nutrition, preferably in consultation with an interprofessional pregnancy team to optimize maternal and neonatal outcomes

---

---

---

---

---

---

---

---

Pre-existing Diabetes

*Preconception care*

- b) Strive to attain a **preconception A1C ≤6.5%** (or A1C ≤6.0% if can safely be achieved) to decrease the risk of:
  - Spontaneous abortion [Grade C, Level 3]
  - Congenital anomalies [Grade C, Level 3]
  - Preeclampsia [Grade C, Level 3]
  - Progression of retinopathy in pregnancy [Grade A, Level 1 for type 1 diabetes; Grade D, Consensus for type 2 diabetes]
  - Stillbirth [Grade C, Level 3]

---

---

---

---

---

---

---

---

Pre-existing Diabetes  
**Preconception care**  
 c) Supplement their diet with multivitamins containing **1 mg of folic acid** at least **3 months preconception** and continuing **until at least 12 weeks of gestation** to prevent congenital anomalies [Grade D, Level 4]

---

---

---

---

---

---

---

---

Pre-existing Diabetes  
**Preconception care**  
 d). **Discontinue medications** that are potentially **embryopathic**, including any from the following classes:  
 i. **ACE inhibitors and ARBs**  
 • prior to conception in women with hypertension alone  
 • upon detection of pregnancy in women with CKD  
 ii. **Statins** [Grade D, Level 4]

---

---

---

---

---

---

---

---

**Table 2. Medications for Hypertensive Disorders of Pregnancy**

Drug	Dose	Effects
Methyldopa	250 mg PO BID up to 1,000 mg PO every 8 hours (3,000 mg total daily dose)	Agent with greatest available data in pregnancy and followup of offspring; limited by maternal dizziness, fatigue.
Labetalol	100 mg PO BID up to 800 mg PO every 8 hours, 10-80 mg IV for BP ≥160/110 (2,400 mg total daily dose)	First line for acute hypertensive crisis; uteroplacental flow mostly unaffected; no fetal growth impairment in contrast to atenolol, propranolol.
Nifedipine	Short-acting: 10 mg PO every 8 hrs.; extended release: 30-90 mg PO qd (120 mg total daily dose)	Short-acting use preferable; rapid vasodilation/hypotension; pregnancy data limited.
Hydralazine	10 mg PO every 6 hours up to 50 mg PO every 6 hours, 2.5-10 mg IV for BP ≥160/110 (200 mg total daily dose)	Consider for acute hypertensive crisis; note delayed onset, reflex tachycardia, flushing, headache.
ACE inhibitors/Angiotensin Receptor Blockers	Any dosage	Contraindicated, adverse fetal effects in later gestation.

---

---

---

---

---

---

---

---

Recommendations

Pre-existing Diabetes  
*Preconception care*

4. Women on metformin and/or glyburide preconception may continue on these agents if glycemic control is adequate until pregnancy is achieved. Women on other antihyperglycemic agents, should switch to insulin prior to conception as there are no safety data for the use of other antihyperglycemic agents in pregnancy

---

---

---

---

---

---

---

---

Recommendations

Pre-existing Diabetes  
*Assessment and management of complications*

5. Women should undergo an ophthalmological evaluation by a vision care specialist during pregnancy planning, the first trimester, as needed during pregnancy after that and, again, within the first year postpartum in order to identify progression of retinopathy. More frequent retinal surveillance during pregnancy as determined by the vision care specialist should be performed for women with more severe pre-existing retinopathy and poor glycemic control, especially those with the greatest anticipatory reductions in A1C during pregnancy, in order to reduce progression of retinopathy

---

---

---

---

---

---

---

---

Recommendations

Pre-existing Diabetes  
*Assessment and management of complications*

6. Women with albuminuria or CKD should be followed closely for the development of hypertension and preeclampsia

---

---

---

---

---

---

---

---



Screening for:

1. Retinopathy: Need ophthalmological evaluation
2. Nephropathy: Assess creatinine + urine albumin to creatinine ratio (ACR)
  - Women with albuminuria or overt nephropathy are at ↑ risk for hypertension and preeclampsia

---

---

---

---

---

---

---

---

---

---

### Diabetes in Pregnancy: Avoiding Complications

- Preconception care**
  - Advances in diagnosis and treatment have dramatically reduced morbidity and mortality in both mothers and infants
- Careful evaluations at each visit**
  - Renal impairment, cardiac disease, neuropathy
- Regular ophthalmologic exams**
  - 1st trimester through 1st year postpartum
  - Examine active lesions more frequently
- Hypertension management**
  - Target: systolic BP 110-129 mmHg; diastolic BP 65-79 mmHg
  - Lifestyle changes, behavior therapy, and pregnancy-safe medications (ACE inhibitors and ARBs contraindicated in pregnancy)

ACE, angiotensin-converting enzyme; ARB, angiotensin II receptor blocker; BP, blood pressure.  
Handelman HK, et al. Endocr Pract. 2015;21(suppl 1):1-87. ADA. Diabetes Care. 2018;41(suppl 1):S137-S143. Jovanovic L, et al. Diabetes Care. 2012;35:53-54.

---

---

---

---

---

---

---

---

---

---

**Sample checklist for antepartum care of pregnant women with type 2 diabetes mellitus**

**Checklist for Antepartum Care of Pregnant Women with Type 2 Diabetes Mellitus (AW)**

1. The patient is advised to attend to her health and pregnancy at every antepartum visit.
2. The patient is advised to attend to her health and pregnancy at every antepartum visit.
3. The patient is advised to attend to her health and pregnancy at every antepartum visit.

**History**

1. Review type of visit (AW)
2. Review medical history
3. Review obstetric history
4. Review social history
5. Review family history
6. Review current symptoms
7. Review current medications
8. Review current diet
9. Review current exercise
10. Review current stress
11. Review current mood
12. Review current support system
13. Review current knowledge of pregnancy
14. Review current knowledge of diabetes
15. Review current knowledge of complications
16. Review current knowledge of self-management
17. Review current knowledge of when to seek help
18. Review current knowledge of when to stop driving or operating machinery
19. Review current knowledge of when to stop working
20. Review current knowledge of when to stop exercising
21. Review current knowledge of when to stop drinking alcohol
22. Review current knowledge of when to stop smoking
23. Review current knowledge of when to stop using recreational drugs
24. Review current knowledge of when to stop using prescription drugs
25. Review current knowledge of when to stop using over-the-counter drugs
26. Review current knowledge of when to stop using herbal supplements
27. Review current knowledge of when to stop using vitamins
28. Review current knowledge of when to stop using minerals
29. Review current knowledge of when to stop using essential fatty acids
30. Review current knowledge of when to stop using probiotics
31. Review current knowledge of when to stop using prebiotics
32. Review current knowledge of when to stop using synbiotics
33. Review current knowledge of when to stop using nutraceuticals
34. Review current knowledge of when to stop using botanicals
35. Review current knowledge of when to stop using minerals
36. Review current knowledge of when to stop using vitamins
37. Review current knowledge of when to stop using essential fatty acids
38. Review current knowledge of when to stop using probiotics
39. Review current knowledge of when to stop using prebiotics
40. Review current knowledge of when to stop using synbiotics
41. Review current knowledge of when to stop using nutraceuticals
42. Review current knowledge of when to stop using botanicals
43. Review current knowledge of when to stop using minerals
44. Review current knowledge of when to stop using vitamins
45. Review current knowledge of when to stop using essential fatty acids
46. Review current knowledge of when to stop using probiotics
47. Review current knowledge of when to stop using prebiotics
48. Review current knowledge of when to stop using synbiotics
49. Review current knowledge of when to stop using nutraceuticals
50. Review current knowledge of when to stop using botanicals
51. Review current knowledge of when to stop using minerals
52. Review current knowledge of when to stop using vitamins
53. Review current knowledge of when to stop using essential fatty acids
54. Review current knowledge of when to stop using probiotics
55. Review current knowledge of when to stop using prebiotics
56. Review current knowledge of when to stop using synbiotics
57. Review current knowledge of when to stop using nutraceuticals
58. Review current knowledge of when to stop using botanicals
59. Review current knowledge of when to stop using minerals
60. Review current knowledge of when to stop using vitamins
61. Review current knowledge of when to stop using essential fatty acids
62. Review current knowledge of when to stop using probiotics
63. Review current knowledge of when to stop using prebiotics
64. Review current knowledge of when to stop using synbiotics
65. Review current knowledge of when to stop using nutraceuticals
66. Review current knowledge of when to stop using botanicals
67. Review current knowledge of when to stop using minerals
68. Review current knowledge of when to stop using vitamins
69. Review current knowledge of when to stop using essential fatty acids
70. Review current knowledge of when to stop using probiotics
71. Review current knowledge of when to stop using prebiotics
72. Review current knowledge of when to stop using synbiotics
73. Review current knowledge of when to stop using nutraceuticals
74. Review current knowledge of when to stop using botanicals
75. Review current knowledge of when to stop using minerals
76. Review current knowledge of when to stop using vitamins
77. Review current knowledge of when to stop using essential fatty acids
78. Review current knowledge of when to stop using probiotics
79. Review current knowledge of when to stop using prebiotics
80. Review current knowledge of when to stop using synbiotics
81. Review current knowledge of when to stop using nutraceuticals
82. Review current knowledge of when to stop using botanicals
83. Review current knowledge of when to stop using minerals
84. Review current knowledge of when to stop using vitamins
85. Review current knowledge of when to stop using essential fatty acids
86. Review current knowledge of when to stop using probiotics
87. Review current knowledge of when to stop using prebiotics
88. Review current knowledge of when to stop using synbiotics
89. Review current knowledge of when to stop using nutraceuticals
90. Review current knowledge of when to stop using botanicals
91. Review current knowledge of when to stop using minerals
92. Review current knowledge of when to stop using vitamins
93. Review current knowledge of when to stop using essential fatty acids
94. Review current knowledge of when to stop using probiotics
95. Review current knowledge of when to stop using prebiotics
96. Review current knowledge of when to stop using synbiotics
97. Review current knowledge of when to stop using nutraceuticals
98. Review current knowledge of when to stop using botanicals
99. Review current knowledge of when to stop using minerals
100. Review current knowledge of when to stop using vitamins

**Physical Examination**

1. General appearance
2. Vital signs
3. Weight
4. Blood pressure
5. Heart
6. Lungs
7. Abdomen
8. Extremities
9. Fundus
10. Fetal heart rate
11. Cervix
12. Vagina
13. Perineum
14. Anus
15. Skin
16. Hair
17. Nails
18. Teeth
19. Eyes
20. Ears
21. Nose
22. Throat
23. Neck
24. Chest
25. Back
26. Pelvis
27. Genitalia
28. Perineum
29. Anus
30. Skin
31. Hair
32. Nails
33. Teeth
34. Eyes
35. Ears
36. Nose
37. Throat
38. Neck
39. Chest
40. Back
41. Pelvis
42. Genitalia
43. Perineum
44. Anus
45. Skin
46. Hair
47. Nails
48. Teeth
49. Eyes
50. Ears
51. Nose
52. Throat
53. Neck
54. Chest
55. Back
56. Pelvis
57. Genitalia
58. Perineum
59. Anus
60. Skin
61. Hair
62. Nails
63. Teeth
64. Eyes
65. Ears
66. Nose
67. Throat
68. Neck
69. Chest
70. Back
71. Pelvis
72. Genitalia
73. Perineum
74. Anus
75. Skin
76. Hair
77. Nails
78. Teeth
79. Eyes
80. Ears
81. Nose
82. Throat
83. Neck
84. Chest
85. Back
86. Pelvis
87. Genitalia
88. Perineum
89. Anus
90. Skin
91. Hair
92. Nails
93. Teeth
94. Eyes
95. Ears
96. Nose
97. Throat
98. Neck
99. Chest
100. Back

**Diabetes Mellitus**

1. Current weight
2. Current weight gain
3. Current weight loss
4. Current weight stability
5. Current weight fluctuation
6. Current weight gain/loss
7. Current weight stability
8. Current weight fluctuation
9. Current weight gain/loss
10. Current weight stability
11. Current weight fluctuation
12. Current weight gain/loss
13. Current weight stability
14. Current weight fluctuation
15. Current weight gain/loss
16. Current weight stability
17. Current weight fluctuation
18. Current weight gain/loss
19. Current weight stability
20. Current weight fluctuation
21. Current weight gain/loss
22. Current weight stability
23. Current weight fluctuation
24. Current weight gain/loss
25. Current weight stability
26. Current weight fluctuation
27. Current weight gain/loss
28. Current weight stability
29. Current weight fluctuation
30. Current weight gain/loss
31. Current weight stability
32. Current weight fluctuation
33. Current weight gain/loss
34. Current weight stability
35. Current weight fluctuation
36. Current weight gain/loss
37. Current weight stability
38. Current weight fluctuation
39. Current weight gain/loss
40. Current weight stability
41. Current weight fluctuation
42. Current weight gain/loss
43. Current weight stability
44. Current weight fluctuation
45. Current weight gain/loss
46. Current weight stability
47. Current weight fluctuation
48. Current weight gain/loss
49. Current weight stability
50. Current weight fluctuation
51. Current weight gain/loss
52. Current weight stability
53. Current weight fluctuation
54. Current weight gain/loss
55. Current weight stability
56. Current weight fluctuation
57. Current weight gain/loss
58. Current weight stability
59. Current weight fluctuation
60. Current weight gain/loss
61. Current weight stability
62. Current weight fluctuation
63. Current weight gain/loss
64. Current weight stability
65. Current weight fluctuation
66. Current weight gain/loss
67. Current weight stability
68. Current weight fluctuation
69. Current weight gain/loss
70. Current weight stability
71. Current weight fluctuation
72. Current weight gain/loss
73. Current weight stability
74. Current weight fluctuation
75. Current weight gain/loss
76. Current weight stability
77. Current weight fluctuation
78. Current weight gain/loss
79. Current weight stability
80. Current weight fluctuation
81. Current weight gain/loss
82. Current weight stability
83. Current weight fluctuation
84. Current weight gain/loss
85. Current weight stability
86. Current weight fluctuation
87. Current weight gain/loss
88. Current weight stability
89. Current weight fluctuation
90. Current weight gain/loss
91. Current weight stability
92. Current weight fluctuation
93. Current weight gain/loss
94. Current weight stability
95. Current weight fluctuation
96. Current weight gain/loss
97. Current weight stability
98. Current weight fluctuation
99. Current weight gain/loss
100. Current weight stability

**Diabetes Mellitus (continued)**

1. Current weight gain/loss
2. Current weight stability
3. Current weight fluctuation
4. Current weight gain/loss
5. Current weight stability
6. Current weight fluctuation
7. Current weight gain/loss
8. Current weight stability
9. Current weight fluctuation
10. Current weight gain/loss
11. Current weight stability
12. Current weight fluctuation
13. Current weight gain/loss
14. Current weight stability
15. Current weight fluctuation
16. Current weight gain/loss
17. Current weight stability
18. Current weight fluctuation
19. Current weight gain/loss
20. Current weight stability
21. Current weight fluctuation
22. Current weight gain/loss
23. Current weight stability
24. Current weight fluctuation
25. Current weight gain/loss
26. Current weight stability
27. Current weight fluctuation
28. Current weight gain/loss
29. Current weight stability
30. Current weight fluctuation
31. Current weight gain/loss
32. Current weight stability
33. Current weight fluctuation
34. Current weight gain/loss
35. Current weight stability
36. Current weight fluctuation
37. Current weight gain/loss
38. Current weight stability
39. Current weight fluctuation
40. Current weight gain/loss
41. Current weight stability
42. Current weight fluctuation
43. Current weight gain/loss
44. Current weight stability
45. Current weight fluctuation
46. Current weight gain/loss
47. Current weight stability
48. Current weight fluctuation
49. Current weight gain/loss
50. Current weight stability
51. Current weight fluctuation
52. Current weight gain/loss
53. Current weight stability
54. Current weight fluctuation
55. Current weight gain/loss
56. Current weight stability
57. Current weight fluctuation
58. Current weight gain/loss
59. Current weight stability
60. Current weight fluctuation
61. Current weight gain/loss
62. Current weight stability
63. Current weight fluctuation
64. Current weight gain/loss
65. Current weight stability
66. Current weight fluctuation
67. Current weight gain/loss
68. Current weight stability
69. Current weight fluctuation
70. Current weight gain/loss
71. Current weight stability
72. Current weight fluctuation
73. Current weight gain/loss
74. Current weight stability
75. Current weight fluctuation
76. Current weight gain/loss
77. Current weight stability
78. Current weight fluctuation
79. Current weight gain/loss
80. Current weight stability
81. Current weight fluctuation
82. Current weight gain/loss
83. Current weight stability
84. Current weight fluctuation
85. Current weight gain/loss
86. Current weight stability
87. Current weight fluctuation
88. Current weight gain/loss
89. Current weight stability
90. Current weight fluctuation
91. Current weight gain/loss
92. Current weight stability
93. Current weight fluctuation
94. Current weight gain/loss
95. Current weight stability
96. Current weight fluctuation
97. Current weight gain/loss
98. Current weight stability
99. Current weight fluctuation
100. Current weight gain/loss

---

---

---

---

---

---

---

---

---

---

Pregestational diabetes	Gestational diabetes
1. Preconception counseling	1. Prevention, Screening & Diagnosis
2. Management during pregnancy	2. Management during Pregnancy
3. Management in labour	3. Management in labour
4. Postpartum considerations	4. Postpartum considerations

---

---

---

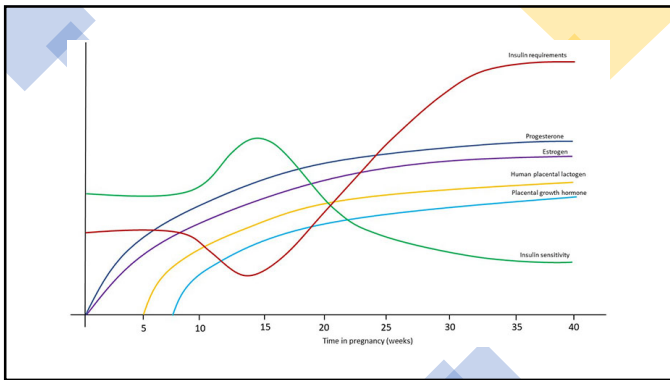
---

---

---

---

---




---

---

---

---

---

---

---

---

### Pathophysiology

Hormone	Peak elevation (weeks)	Diabetogenic potency
Prolactin	10	Weak
Estradiol	26	Very weak
HPL	26	Moderate
Cortisol	26	Very strong
Progesterone	32	Strong

Adapted from Jovanovic-Peterson L, Peterson C: Review of gestational diabetes mellitus and low-calorie diet and physical exercise as therapy. Diabetes Metab 12:287-308, 1996.

---

---

---

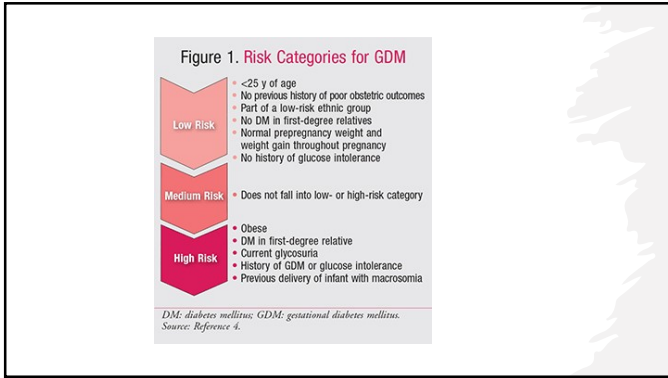
---

---

---

---

---




---

---

---

---

---

---

---

---

**Screening  
2 step testing**

- Universal vs High risk
- 24 –28 wks
- **Step 1.** 1 hr 50 gram – no fasting necessary
- Venous plasma (>140 mg/dl) identifies 80% of women with GDM. A value >130mg/dl identifies 90% of women with GDM
- **Step 2.** 3 hour 100g after an overnight fast

---

---

---

---

---

---

---

---

**Table 1: ACOG and ADA Recommendations for Diagnosing GDM<sup>a</sup>**

	ACOG Criteria (use either)		ADA Criteria
	Carpenter and Coustan	National Diabetes Data Group	
<b>Status of Glucose</b>			
Fasting	95 mg/dL	105 mg/dL	92 mg/dL
1 h	180 mg/dL	190 mg/dL	180 mg/dL
2 h	155 mg/dL	165 mg/dL	153 mg/dL
3 h	140 mg/dL	145 mg/dL	N/A

<sup>a</sup> ACOG recommends using a 100-g OGTT and choosing one of the two threshold sets listed above (Carpenter and Coustan or National Diabetes Data Group). ADA recommends using a 75-g OGTT and the listed threshold set. One set should be chosen to use consistently in a practice setting.  
ACOG, American College of Obstetrics and Gynecology; ADA, American Diabetes Association; GDM, gestational diabetes mellitus; OGTT, oral glucose tolerance test.  
Source: References 1, 5.

---

---

---

---

---

---

---

---

All diabetes is not the same

- During pregnancy – goals are:
- Prevent macrosomia
  - Prevent fetal death
  - Prevent other fetal complications

---

---

---

---

---

---

---

---

This means you can't treat them the same

- During pregnancy
- more frequent visits when not controlled
  - stricter glycemic goals

---

---

---

---

---

---

---

---

Glucose Targets for Pregnant Women: ADA Recommendations

Condition	Treatment Goal
<b>GDM or Pre-existing T1D or T2D</b>	
Preprandial glucose, mg/dL	≤95*
1-Hour PPG, mg/dL	≤140*
2-Hour PPG, mg/dL	≤120*
A1C	6.0% to 6.5%*†

\*<6% may be optimal as pregnancy progresses.<sup>1</sup>  
 †If achievable without hypoglycemia.

PPG, fasting plasma glucose; GDM, gestational diabetes mellitus; PPG, postprandial glucose; T1D, type 1 diabetes; T2D, type 2 diabetes.  
 ADA. Diabetes Care. 2018;41(suppl 1):S137-S143.

---

---

---

---

---

---

---

---

### Dietary recommendations

- 3 meals and 3 snacks
- Composition: CHO-30%-prot-20%;fat-30-40%
- Wt gain: 25-35 lb; if overweight(15-25); underweight (30-40)
- Caloric distribution;10%-breakfast,20-30 % for lunch,30-40 % for dinner,30% for snacks
- Exercise is also very important in the management of all women with diabetes

---

---

---

---

---

---

---

---

### Carbohydrate Budget

- Breakfast            1-2 carbohydrate choices
- Lunch                3-4 carbohydrate choices
- Supper               3-4 carbohydrate choices
- Snacks (1-3 )       1-2 carbohydrate choices
- Amount of CHO typically found in a 2200 calorie diet

---

---

---

---

---

---

---

---

### Nutrition Guidelines

- Carbohydrate counting/label reading
- CHO restriction at breakfast
- Avoid sugar, concentrated sweets, refined/processed starches
- Eliminate liquid CHO (juices), test milk
- Ok to use aspartame(Equal), sucralose (Splenda).  
saccharine (Sweet n Low)
- Increase high fiber foods (25-30 grams)

---

---

---

---

---

---

---

---

### Pharmacokinetics of Insulins Safe for Use During Pregnancy

Name	Type	Onset	Peak Effect	Duration	Recommended Dosing Interval
Aspart	Rapid-acting (bolus)	15 min	60 min	2 hrs	Start of each meal
Lispro	Rapid-acting (bolus)	15 min	60 min	2 hrs	Start of each meal
Regular insulin	Intermediate-acting	60 min	2-4 hrs	6 hrs	60-90 minutes before meal
NPH	Intermediate-acting (basal)	2 hrs	4-6 hrs	8 hrs	Every 8 hours
Detemir	Long-acting (basal)	2 hrs	n/a	12 hrs	Every 12 hours

Following a positive pregnancy test, patients with preexisting diabetes being treated with insulin or oral antihyperglycemic medications should be transitioned to one of the above options

Hendelman YH, et al. Endocr Pract. 2015;21(suppl 1):1-47. ADA. Diabetes Care. 2018;41(suppl 1):S137-S143. 64

---

---

---

---

---

---

---

---

---

---

### Insulin Therapy Lispro(Humalog)

- Rapid Acting-good for pre-meals!
- Onset-15min
- Peak-30-90min
- Duration-3-5 hours
- Little antibody formation; more effective than regular insulin

---

---

---

---

---

---

---

---

---

---

- Type 1 diabetes: Continuous glucose monitoring should be considered in all women
  - ↓ LGA, NICU >24 hrs, neonatal hypoglycemia, infant length of hospital stay
- Encourage weight gain according to Institute of Medicine recommendations
- ASA to reduce the risk of pre-eclampsia, starting at 12-16 weeks gestational age

---

---

---

---

---

---

---

---

---

---

Pre-Pregnancy BMI (kg/m <sup>2</sup> )	Recommended range of total weight gain (kg)	Recommended range of total weight gain (lb)
BMI <18.5	12.5 – 18.0	28 – 40
BMI 18.5 - 24.9	11.5 – 16.0	25 – 35
BMI 25.0 - 29.9	7.0 – 11.5	15 – 23
BMI ≥30	5.0 – 9.0	11 – 20

---

---

---

---

---

---

---

---

**Insulin Therapy**  
**NPH**

- Intermediate Acting Insulin
- Onset 1-2 hours
- Peak 4-8 hours
- Duration 12 hours
- Good for HS to Fasting window
- May add in Am to cover midday

---

---

---

---

---

---

---

---

**LANTUS(glargine-DNA origin)**

- Long acting
- Once a day insulin injection
- No peak
- Steady release of insulin
- Acidic pH 4. After SQ injection it is neutralized forming micro precipitates.
- Cannot be mixed with any other insulin
- Category C

---

---

---

---

---

---

---

---

### Insulin Total Daily Dose Regimen

- 1<sup>st</sup> trimester .7 u/kg
- 2<sup>nd</sup> trimester .8u/kg
- 3<sup>rd</sup> trimester 1.0u/kg
  
- Dose range .25u/kg to 1.0u/kg

---

---

---

---

---

---

---

---

### Management of GDM/type 2 oral agents

- Metformin – insulin sensitizer
- Maximum dose studied 2000mg/day but have seen patients on up to 2500.
- Crosses the placenta in appreciable amounts
- Doesn't cause hypoglycemia
- Most common side effect is GI upset

---

---

---

---

---

---

---

---

### Medication Management Rules of the Road

1. There must always be a combination of medicine and diet.
2. Starting medication is just that. A start. Patient will not be controlled immediately after you start medication. It will have to be adjusted. This is particularly true of insulin
3. Exercise makes everything better
4. Oral agents wont work if blood glucose consistently  $\geq 170\text{mg/dl}$

---

---

---

---

---

---

---

---



**Retinopathy Surveillance**

- one visit in first trimester
- visits thereafter: as needed
- more often in:
  - more severe retinopathy
  - large drop in A1C
  - poor glycemic control

**Nephropathy**

- Good BP control
- Watch for hypertension, preeclampsia

---

---

---

---

---

---

---

---

**Fetal Surveillance**

• **Ultrasound**

- Early dating and viability scan
- 20 week level II ultrasound
- Fetal echocardiogram
- Every 4 weeks for growth

Cell free fetal DNA > 10 weeks, 2<sup>nd</sup> trimester MSAFP

Kick count at 28 weeks (+/-)

Pre-existing diabetes, GDM A-2, NST twice/week starting at 30-32 weeks, or BPP once/week starting at 32-34 weeks

---

---

---

---

---

---

---

---

**Post Partum Care**

- Breastfeeding is encouraged
- 2 hour 75 –gm glucola at 6 weeks post-partum)
- Euglycemia, IFG, IGT, Overt Type 2
- 50-60% of GDM will develop Type 2 diabetes in 5-10 years

---

---

---

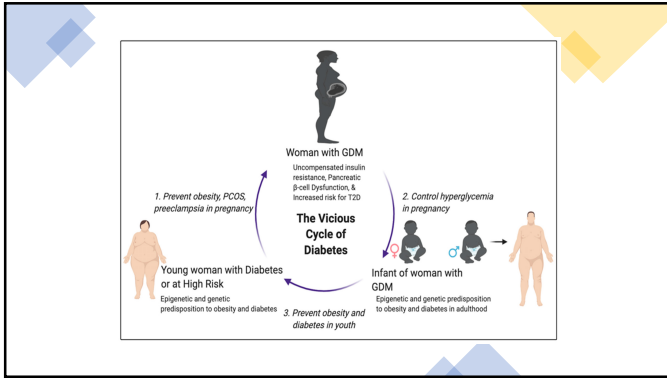
---

---

---

---

---




---

---

---

---

---

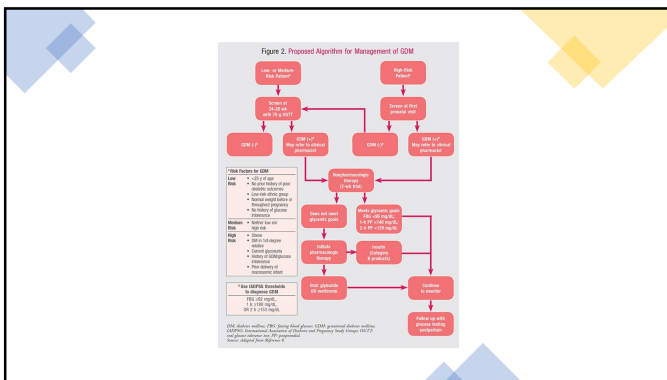
---

---

---

---

---




---

---

---

---

---

---

---

---

---

---

**Gestational Diabetes**

**Postpartum**

- In women who were diagnosed with diabetes in early pregnancy based on A1C (see recommendation 29), if ongoing hyperglycemia is not evident postpartum, a confirmatory test for diabetes with a FPG or 75 g OGTT should be done at 6 to 8 weeks postpartum

---

---

---

---

---

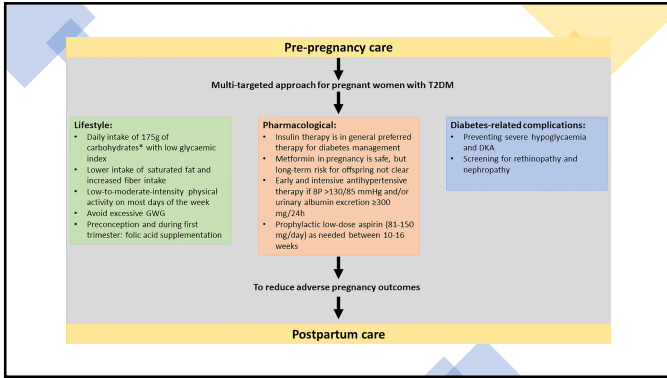
---

---

---

---

---



---

---

---

---

---

---

---

---

**Take home points**

- Optimize diabetes, HgA1c
- Exercise, diet, optimize BMI
- Avoid ace inhibitors
- Start prenatal vitamin or folic acid in relevant patients
- Check for prediabetes
- Do not just stop all medications when pregnant

---

---

---

---

---

---

---

---



---

---

---

---

---

---

---

---