Diabetes Mellitus in Pregnancy

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Learning Objectives

- Describe the differences in the pathophysiology of Type 1, Type 2, and gestational diabetes and the expected effect these differences will have on glycemic control
- State the rationale for the goal of tight glycemic control in pregnancy and discuss collaborative measures to attain this goal in the hospitalized antepartum, intrapartum, and post- partum patient
- Review methods of treating diabetes in pregnancy

Introduction

- Diabetes effects 8% of pregnancies in the United States
  - **10% of these cases are Gestational Diabetes**
  - 1-2% of those are Type 1 and Type 2
- Diagnosis of diabetes during pregnancy has increased in recent years and continues to rise
- From 2000 to 2010, the percentage of pregnant women with gestational diabetes increased **56%** and the percentage of women with type 1 or type 2 diabetes before pregnancy increased **37%.**
- **DIABETES RISK FACTORS**
  - AMA
  - Family history
  - Ethnicity
  - Overweight/obese
  - Sedentary

Definitions

- **GESTATIONAL DIABETES (GDM)-** any degree of impaired glucose tolerance with onset or first recognition during pregnancy

- **PRE-EXISTING DIABETES OR PREGESTATIONAL DIABETES-** diagnosis of diabetes prior to pregnancy
  - Type 1 Diabetes , Type 2 Diabetes

Diagnosis of GDM

<u>2-step approach (preferred method at OUHSC)</u>:

- To be done 24-28 wks (unless risk factors present indicating earlier screening)

1. 50 gram glucola screen:

Normal <135. If <u>≥</u> 135 <200, do 3 hr GTT below

If <u>≥</u> 200, do not do GTT and proceed with treatment for GDM

↓

2. 100 gram, 3-hr GTT **(Carpenter & Coustan)**

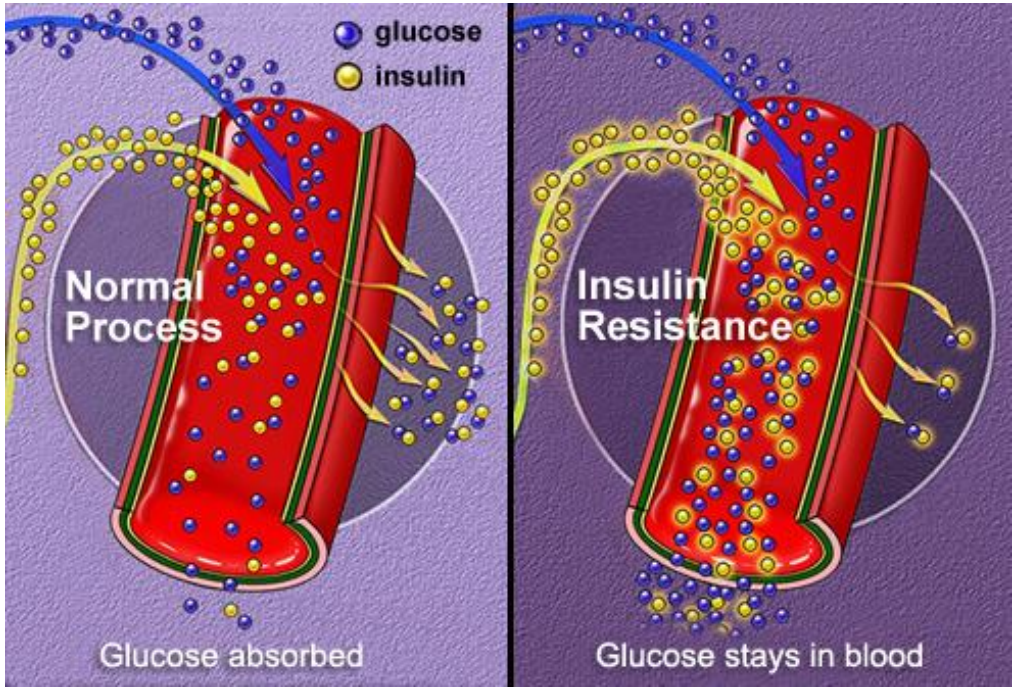
<u>Parameters for diagnosis:</u>

meet or exceed: 95 / 180 / 155 / 140

2 or more abnormal values: GDM

Pathophysiology- GDM

- **Gestational Diabetes**
  - **<u>Pregnancy hormones</u>** cause insulin resistance
  - The body isn't able to make enough insulin for the pregnancy



Pathophysiology- GDM

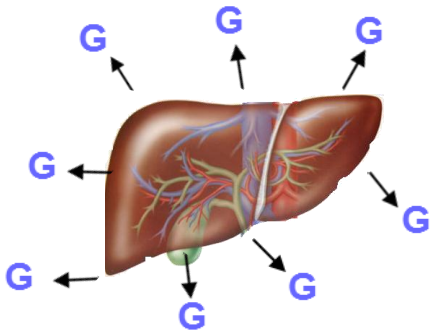
Pregnancy HORMONES

insulin resistance

+

not enough insulin for pregnancy

+



too much glucose from the liver

=

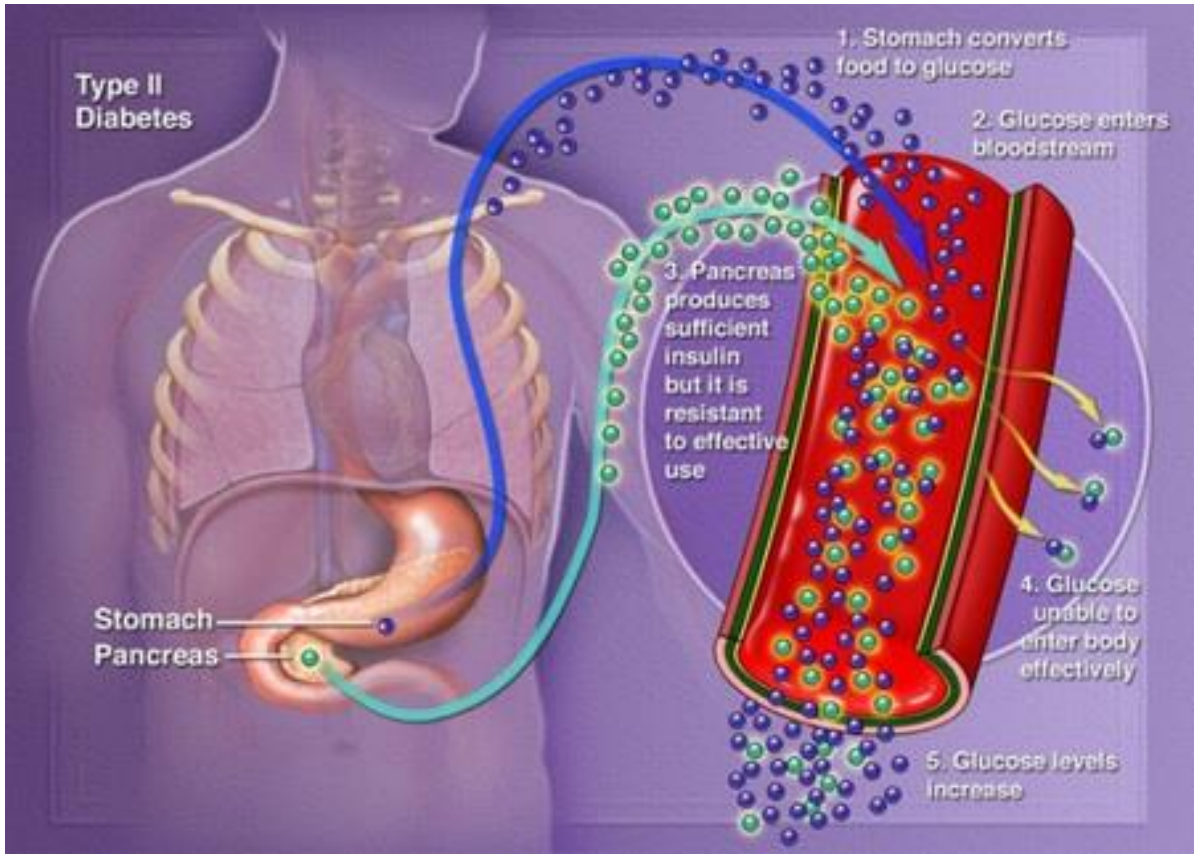
High Blood Glucose

or

hyperglycemia

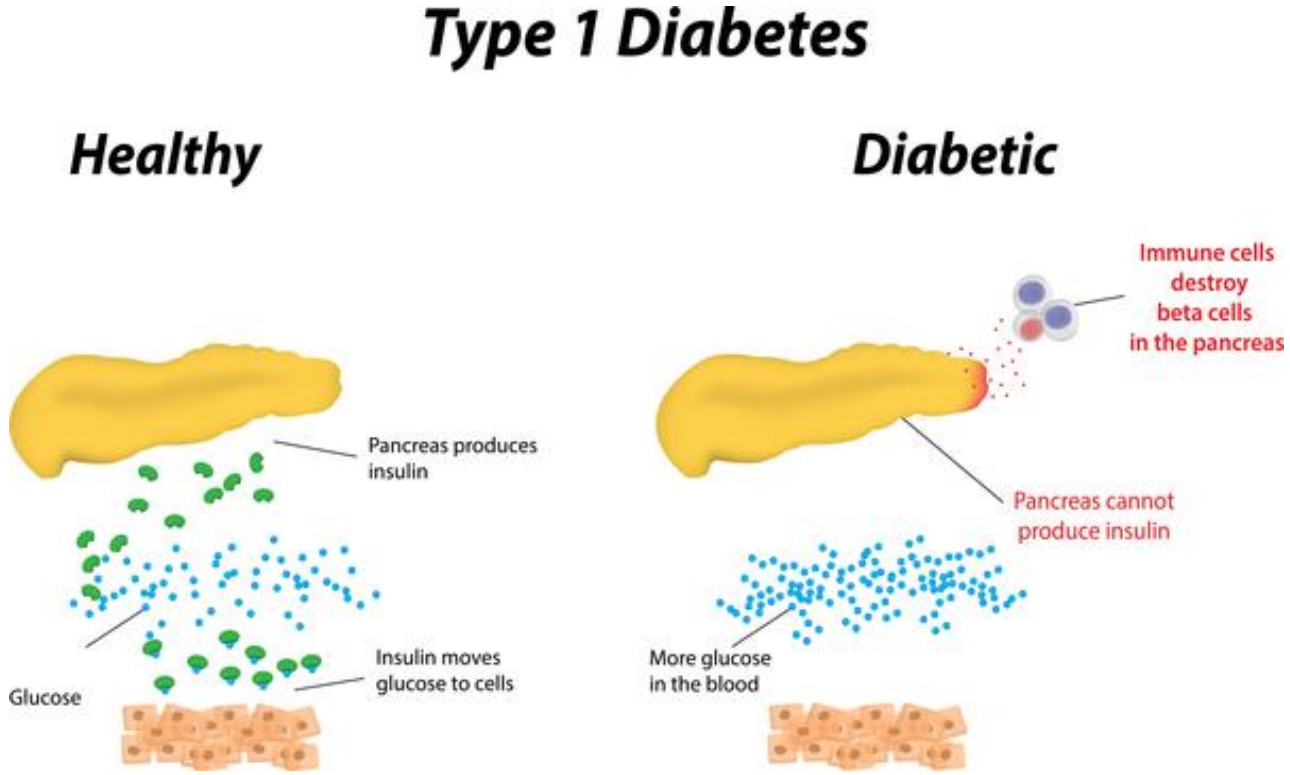
Pathophysiology- Type 2 Diabetes

- **Most common type of diabetes in reproductive aged women**
- **Insulin resistance**



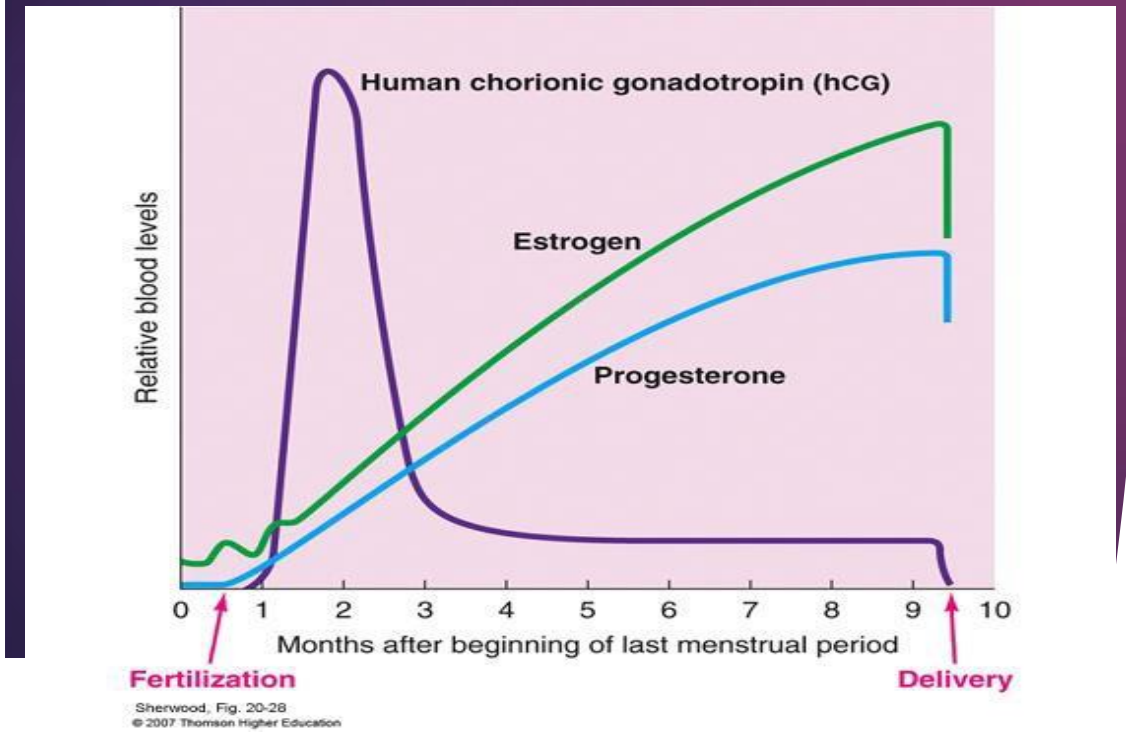
Pathophysiology- Type 1 Diabetes

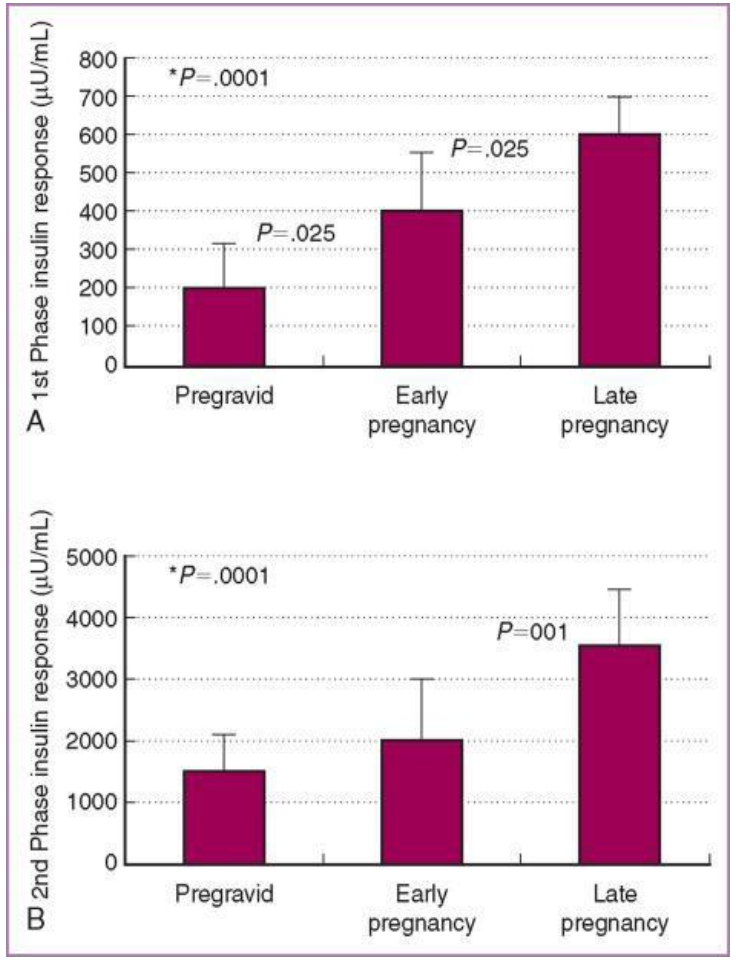
- **No insulin production**
- **Dependent on insulin**



Why Is This A Concern?

- As pregnancy progresses, insulin resistance increases → Caused by increased hormones of pregnancy

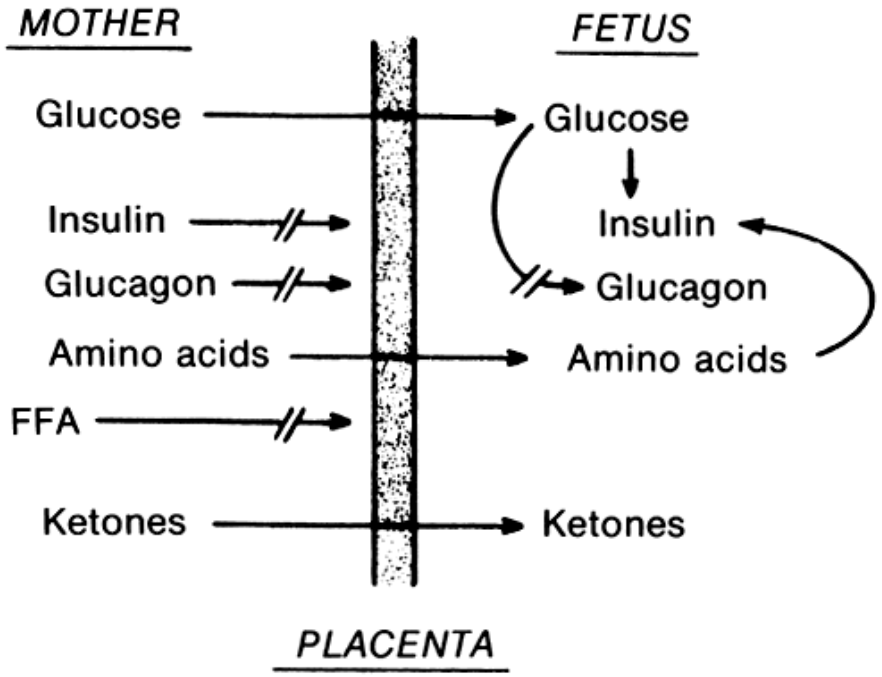


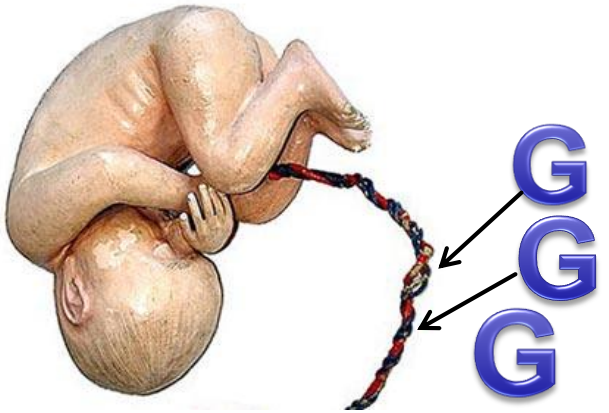


- **Insulin production is more than twice non-pregnant levels**

Why is this a Concern?

- Maternal glucose crosses the placenta and increases baby's glucose levels



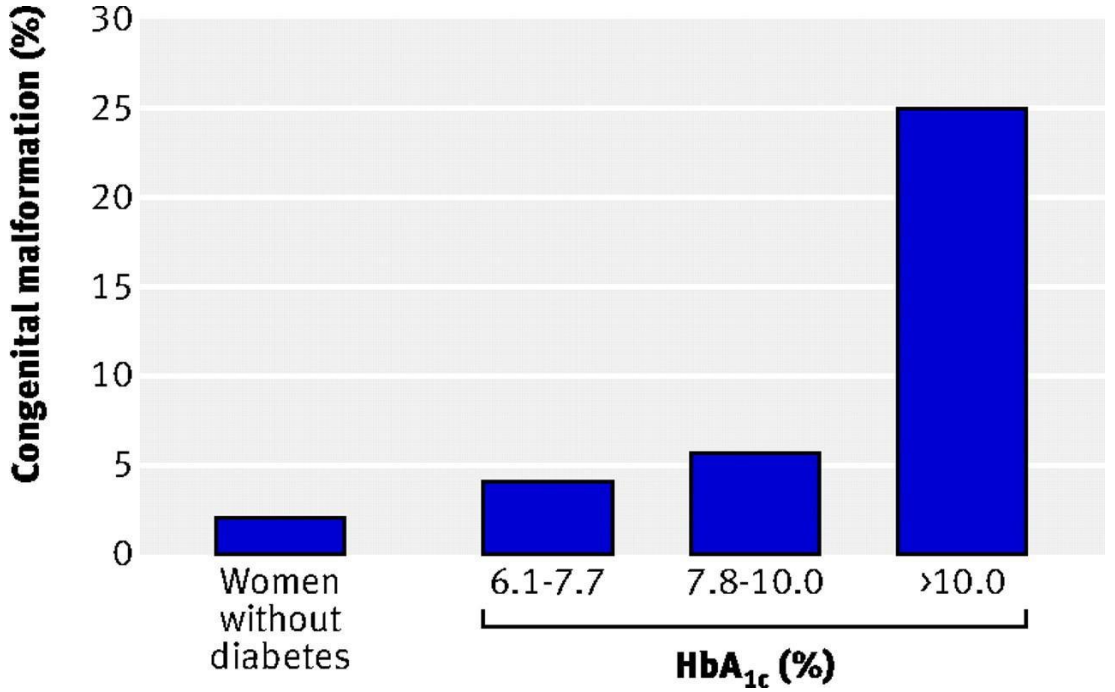


Maternal and Fetal Risks Gestational Diabetes

- Fetal Risks
  - Growth disturbances
  - Intrauterine fetal demise
- Neonatal
  - Hyperbilirubinemia
  - Hypoglycemia
  - Obesity
  - Diabetes
- Maternal Risks
  - Pregnancy induced hypertension
  - Preeclampsia
  - Polyhydramnios
  - UTI/pyelonephritis

Maternal and Fetal Risks Pre-Existing Diabetes

- Fetal Risks
  - Growth disturbances
  - Congenital anomalies
  - Intrauterine fetal demise
  - Miscarriage
- Neonatal
  - Hyperbilirubinemia
  - Hypoglycemia
  - Obesity
  - Diabetes
- Maternal Risks
  - Pregnancy induced hypertension
  - Preeclampsia
  - Polyhydramnios
  - UTI/pyelonephritis



How to Treat Diabetes in Pregnancy

- Monitoring
- Nutrition / Meal Planning
- Exercise
- Medicine

Diabetes in Pregnancy
Goals of Treatment

- Achieve normal blood glucose and hemoglobin A1C levels
  - Fasting < 95 mg/dL and 1hr PP <140 mg/dL

- Prevent and/or minimize maternal and perinatal morbidity/mortality
    - **How?**
      - **Diabetes Education:** Monitoring, Nutrition, Exercise, **Medication**

Diabetes Management: Monitoring

ACOG Guidelines - GDM, T2DM

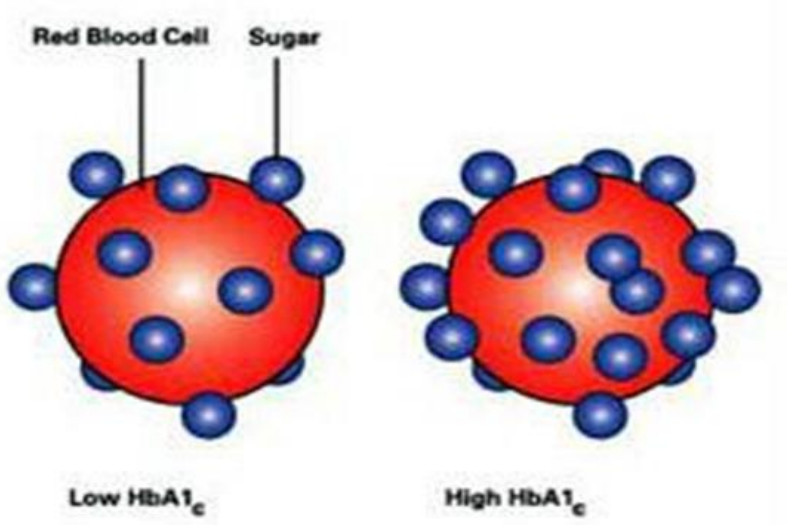
- **Fasting** and Pre-prandial <95
- **One hour postprandial <140**
  - Two hour postprandial <120

- **Type 1 DM-** 7-8x daily testing, Fasting, Pre-meal, Post-meal, and HS, occasional 0300
- **Hospitalized patients** admitted for glucose control: 7-8x daily
- 3AM if nighttime hypoglycemia is a problem

Avoid blood sugars less than 70

Diabetes Management: Monitoring

- **Hemoglobin A1c**
  - Assess every trimester during pregnancy
  - **Pregnancy goal is A1C <6 %**
  - If A1c is elevated in first trimester, patient may have undiagnosed diabetes



Diabetes Education is Important!

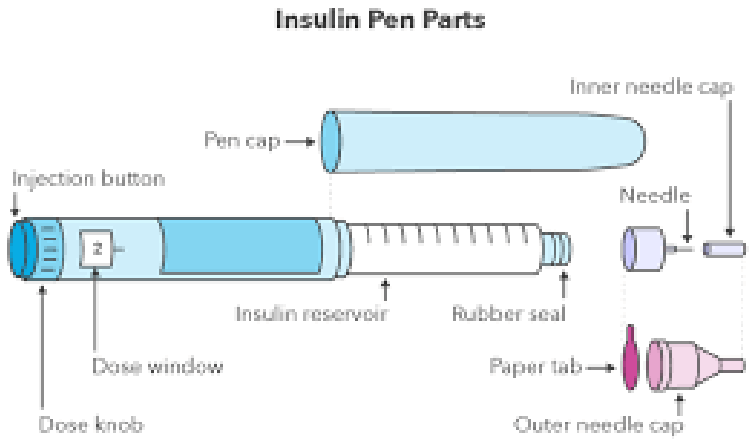
- Any pregnant patient who has diabetes or develops GDM should have outpatient diabetes education.
- When hospitalized, if available, a diabetes educator can reinforce outpatient education.

Diabetes Management: What happens if you don't eat carbs?

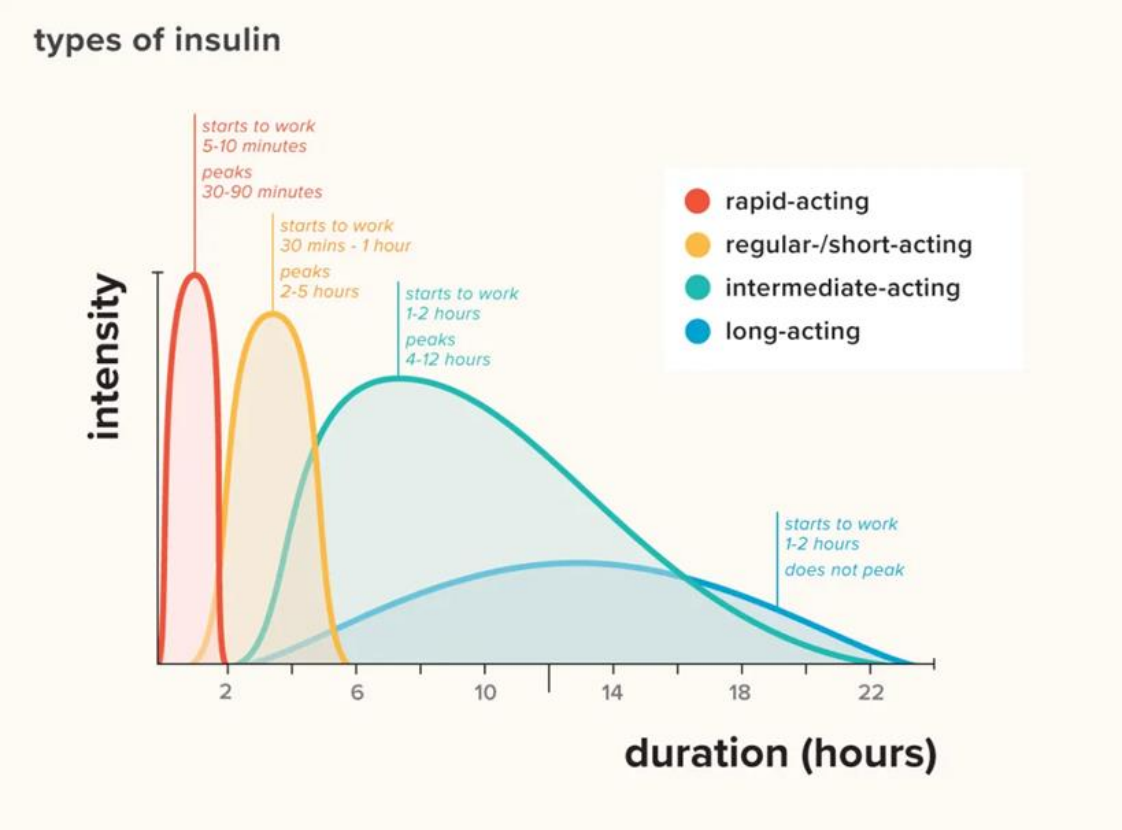
- Possible ketosis
- Constipation
- Quick weight loss
- Lack of energy
- Decreased consumption of fruits and vegetables
- May interfere with insulin sensitivity (no improvement in BG control)
- No studies on low carb diets/pregnancy

WHAT TO DO WHEN DIET ISN'T ENOUGH?

Insulin Treatment in Pregnancy



Insulin Treatment in Pregnancy



Intrapartum Management

Intrapartum Management: GDM

- Diet Controlled
  - BG on admission and every 2 hours
  - Carb controlled diets
  - IV: LR with D5 piggyback prn BG <100 mg/dl

- Insulin-requiring
  - BG on admission and every 2 hours
  - Insulin not usually needed in active labor
  - Insulin drip if BG >110 mg/dl

Intrapartum Management: Type 1 or Type 2 DM

- Target BG 70-110 mg/dl (best 110)
- Insulin infusion or insulin pump (if allowed)
- IV fluids (maintain LR, Kcal needed or BG <100 mg/dl: dextrose IV)
- Check BG on admission and every hour
- NPO or carb free liquids

Intrapartum Management: Insulin Drip Protocol

ORDERED DATE	ORDERED TIME	GOAL BLOOD GLUCOSE 75 mg/dL – 120 mg/dL		NOTED BY/ TIME DATE AND SIGNATURE
		Initial Order	**START PROTOCOL** **This protocol is NOT for treatment of diabetic ketoacidosis or hyperosmolar coma**	
		IV	Primary IV infusion: D10W at 30 ml/hr UNLESS patient is on Total Parenteral Nutrition (TPN) with Dextrose 10% or greater OR on enteral feedings (continuous carbohydrate ie tube feedings). Secondary IV infusion: 100units of regular insulin/100ml NS The dextrose infusion must be continued for at least 2 hours after insulin is discontinued. ALL IVPB'S IN NORMAL SALINE IF COMPATIBLE.	
		Insulin	Start **INITIAL INSULIN INFUSION RATE** (100 units Regular Insulin/100 mL 0.9% Sodium Chloride): **Blood Glucose (mg/dL) Initial Insulin Infusion Rate** ▪ 75 - 150 = 1 unit IV push then 1 unit per hour ▪ 151- 250 = 2 units IV push then 2 units per hour ▪ 251- 350 = 3 units IV push then 3 units per hour ▪ Above 350 = 4 units IV push then 4 units per hour **ADJUSTING INSULIN INFUSION RATE AFTER INITIAL RATE HAS BEGUN**: ▪ Choose Adjustment Table 1, 2 or 3 based on last insulin infusion rate before adjustment. ▪ Determine the last BS result and locate it in the first column. ▪ Determine the current BS and locate that in the row across the top. ▪ Determine the rate of change at the intersection of the row and column. ▪ Minimum infusion rate is 0.5units/hour even if the calculated rate is less. ▪ If insulin drip is STOPPED for one (1) hour or more, check BS and restart using Initial Insulin Infusion (as above) For insulin infusion rates >8 units/h, do not exceed, where indicated, the (MAXIMUM INFUSION) rates in table 3.	
			Use Glucometer values only for insulin protocol. (Levels that need lab confirmation must still be obtained for linearity)	

Intrapartum Management: Elective Cesarean Section

- Take usual intermediate acting insulin on the evening prior to delivery
  - Take 80% of dose of long acting insulin in morning based on morning BG

- Measure blood glucose level in OR prior to anesthesia

- Postoperatively use sliding scale
- Check BS q2-4h until oral intake established
- Fasting and 2h postprandial once eating

Diabetes Technology Use During Delivery

- Can be ideal for Type 1 DM management
- **Common guidelines**
  - Alert, oriented, Demonstrate Knowledge
  - Discontinue for decreased cognition
  - Physician orders
  - Non-suicidal
  - Furnish own supplies
  - Remove for surgery, MRI/CT scans/X-rays
  - Possible release form
  - Must not be off pump for >1 hr, risk of DKA
- Continuous glucose monitor: not approved for hospital use, helpful with Type 1/pregnancy, measures glucose in interstitial fluid

Intrapartum Management: Timing of Delivery

- Depends on fetal size and glucose control
  - Usually 37-39 weeks gestation

- Diet controlled, AGA fetus – may be able to deliver at 39-40 weeks

Intrapartum Management: Betamethasone Use in Preterm Labor

- Glucocorticoids (Corticosteroids)
- Increase hepatic glucose production
- Inhibit glucose uptake into muscle
- Affect beta-cell function
  - Day 1: double all insulin (IV or subQ) within 4 hours of injection
  - Day 2: continue increased doses, modify prn
  - Day 3: decrease by 50%, add to original dose
  - Day 4: revert to pre-Betamethosone dose

Intrapartum Management: BG Control During Admission

- Follow Hospital Policy and Procedure
- Use hospital monitor, not patient's
- **Factor's affecting accuracy**: Hematocrit, fluid status, temperature, meds, hypotension, pH, oxygenation, user error

- **Frequency**
  - Before meal, HS (if correcting pre-meal)
  - Before meals, 1-2 hours post-meal, HS
  - Type 1 or 2 may include 3 AM

Postpartum Care: GDM

- **Discontinue insulin (or oral agent) after delivery**
- Blood glucose monitoring for 48 hours
- If fasting blood glucose levels are persistently elevated (>126) after 48 hours, consider restarting insulin or oral hypoglycemic

TESTING

- ACOG recommends a 2 hour (75 g) GTT at 4-12 weeks postpartum for all women with gestational DM, then 1-3 years since pregnancy

- Between 15-70% of women with GDM will develop diabetes later in life

Postpartum Care: Type 1 and Type 2 Diabetes

- **Insulin requirements decline sharply after delivery**
  - (honeymoon period after placental delivery)
- Glycemic goals less stringent:
  - FBG <100, 1 hour PP <150
- Type 2: D/C insulin @ placental delivery, may need SC insulin
- Type 1: convert IV insulin to SC insulin
  - Usually require 40-50% of pregnancy dose
  - Re-initiate pre-pregnancy regimen after delivery
  - Sliding Scale insulin for additional coverage

Breastfeeding: Type 1 and Type 2 Diabetes

- Type 2: assess oral agents
- Insulin safe, Metformin safe in breastfeeding
- Hypoglycemia precautions important, especially with Type 1 (frequent monitoring, may be able to snack with no insulin)
- Good control necessary for milk production

Breastfeeding GDM

- May reduce risk of diabetes in child
- Promotes weight loss (burns 500 kcal/day) while exclusively breastfeeding)
- Lowers BG, may delay need for medication

Conclusions

- Early, aggressive treatment of diabetes during pregnancy is important to improve outcomes (maternal, fetal, neonatal, and possibly lifelong)
- All people caring for the patient with diabetes are responsible for teaching, and altering treatment plan as necessary
- Long term follow up of women who had gestational diabetes is recommended

Questions?