Pregnancy and Diabetes

Healthy Babies and Healthy Moms

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Disclosures

No relevant conflicts of interest to disclose

Objectives

- Discuss the care of the mother who has Gestational Diabetes
- Identify two diet or lifestyle changes that will help with the nutritional management of diabetes in pregnancy
- Restate how to manage the more complex treatment of diabetes in pregnancy using insulin

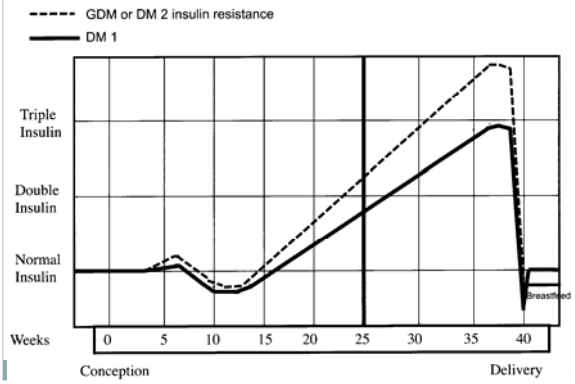
Your practice?

- Do you work with Gestational Diabetes?
- Pre Diabetes or type 2 diabetes and pregnancy?
- Type 1 diabetes and pregnancy?
- Topics you would like us to discuss?

What is gestational diabetes?

- Glucose intolerance with onset or first recognition during pregnancy
- May be diabetes in "evolution"
- Second and third trimester insulin needs increase due to:
  - Existing chronic insulin resistance
  - Effect of placental hormones.
  - Increased hepatic glucose production
  - Inability of pancreas to meet insulin demand

Insulin Requirement During Pregnancy



Prevalence

- Observed in 2-10% of all pregnancies
- More prevalent in obese women, women with family history of diabetes, Hispanic/Latino , African Americans, Native Americans and Pacific Islanders
- Immediately after pregnancy 5-10% are found to have diabetes (usually type 2)
- 35-60% will develop type 2 diabetes in the next 10-20 years
- 2 of 3 will have again in future pregnancies

U.S. Department of Health and Human Services, National Diabetes Statistics, 2011

When to screen?

Risk assessment at first prenatal visit

Low Risk	High Risk
< 25 yrs.	Severe obesity
Normal weight	Prior GDM
Ethnic group	Prior LGA baby
No DM in 1st degree	Presence of glucosuria
No hx of abnormal GTT	PCOS
No hx of poor OB outcome	Strong fm hx DM
Must have all criteria	Test right away

Average risk: test at 24-28 weeks.

American Diabetes Association Practice Guidelines 2014.

Now you can do either!!

"One Step"	"Two Step"
75-g OGTT	50-g GLT (non-fasting)
Measure fasting,	Measure at 1h
1h and 2h	If 1h ≥ 140 mg/dl *
24-28 weeks	DO: 100-g GTT
Fast of 8 hr.	Measure fasting, 1h,
	2h and 3h
IADPSG consensus	NIH consensus

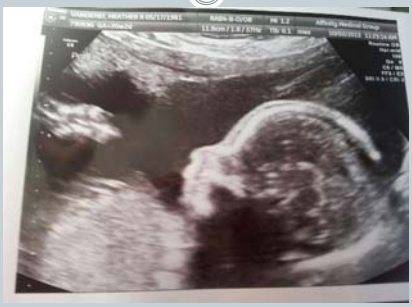
* ACOG recommends a lower threshold of 135 mg/dl in high-risk ethnic minorities with higher prevalence of GDM
ADA Clinical Practice Recommendations 2014

Diagnosis of GDM

"One Step"	"Two Step"
Fasting: ≥ 92 mg/dl	Fasting: ≥ 95 mg/dl
1h: ≥ 180 mg/dl	1h: ≥ 180 mg/dl
2h: ≥ 153 mg/dl	2h: ≥ 155 mg/dl
	3h: ≥ 140 mg/dl
One abnormal	Two abnormal

Why are we concerned? Organogenesis

Why are we concerned? Growth of fetus



Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) study

- 6 yr international study
- Approximately 25,000 pregnant women
- Studied association of various levels of glucose intolerance during the 3rd trimester on risk of adverse outcomes of the baby
- Macrosomia—strong association (4-6 times)
- Hyperinsulinemia-strong association (10 times) from low to high in range
- C-section-weak association
- Hypoglycemia-weak association

New Findings in gestational diabetes-the HAPO study, Metzger, et al Diabetes Voice, May 2009. Volume 54. Special Issue

Future concerns

Long term risk to infant

- SGA or LGA higher risk for obesity
- Development of diabetes
- Development of hypertension
- Development of heart disease

Target Blood Glucose in Pregnancy

	Fasting	1 hour	2 hour
ACOG	<95	130-140	<120
ADA	<105	<155	<130
ACE	60-90	<120	
Joslin	<100	<130	
Sweet Suc.	65-100	110-135	<120
Ours	<90-95	<130-140	<120

Treatment

1. Food management
2. Exercise
3. Blood glucose monitoring
4. Medication (if needed)
5. Education on impact of diagnosis on future health of self and family

Advantages of using oral agents

- Ease of use
- Patient satisfaction
- Provider is not the “bad guy” (no injections)
- Cost

Concerns regarding use of oral agents

- Lack FDA approval
- Lack of ADA and ACOG approval
- Delay in treatment, if oral agent fails
- Potential affect of medication on unborn child

- Added testing 32-40 weeks with classification change from A1 to A2 (NST, AFI, US)

Classification of medication in pregnancy

- **CATEGORY A**
  Controlled studies in humans have demonstrated no fetal risks. There are few category A drugs. Examples include prenatal vitamins, but not massive dosages of vitamins.
- **CATEGORY B**
  Animal studies indicate no fetal risks, but there are no human studies; or adverse effects have been demonstrated in animals, but not in well-controlled human studies.
- **CATEGORY C**
  There are either no adequate studies, either animal or human, or there are adverse fetal effects in animal studies but no available human data. Many medications pregnant women use fall into this category.

Sulfonylureas

Glyburide

Stimulates pancreas to produce more insulin
Category B
Does not cross placenta
Is not excreted in breast milk
Major side effect-hypoglycemia**

Glyburide

- Dose
  0.625 to 20 mg per day
  Maximum dose 20 mg/day

Old thinking	New thinking
Absorption-1 hr	Absorption-2-4 hours
Peak-4 hr	Peak-2.75 hr
Detectable levels 24hrs.	Administer 1 hr pre-meal
Half-life- 10 hrs	Half-life 2-4 hrs
	May be given more than bid
	HS dosing can be effective in controlling fasting values

Diabetes Care. July 2007. Vol 30. Supplement 2.

Glyburide vs. insulin

- **A Comparison of Glyburide and Insulin in Women with Gestational Diabetes Mellitus**
- *Conclusion:* In women with gestational diabetes, glyburide is a clinically effective alternative to insulin

Oded Langer, M.D., Deborah L. Conway, M.D., Michael D. Berkus, M.D., Elly M.-J. Xenakis, M.D., and Olga Gonzales, R.N.
therapy.

New England Journal of Medicine. Volume 343. 1134-1138. Oct 19,2000.

Glyburide

Other studies (5) since 2000.

1) Failure rate is 20% in most clinical populations
More likely to fail in patients with fasting glucose levels >115 mg/dl

2) The rate of neonatal hypoglycemia/ hyperbilirubinemia is possibly increased with the use of glyburide compared with insulin

3) Mean maternal fasting and postprandial glucose values appear to be lower with glyburide treatment.

Glyburide for the treatment of Gestational Diabetes, Diabetes Care. July 2007. Vol. 40 Supplement 2.

Biguanides

Metformin

- Inhibition of hepatic glucose production
- Improves tissue sensitivity to insulin
- Category B
- Crosses the placenta
- Excreted in breast milk

Metformin

- Dose 500-2500 mg per day
- Absorption
  - Maximum concentration in 7-8 hours
  - Stable concentrations in 24-48 hrs.

Take with food

Metformin vs insulin

- Australian New Zealand Clinical Trials Registry number, 12605000311651.
- *Conclusions:* In women with gestational diabetes mellitus, metformin (alone or with supplemental insulin) is not associated with increased perinatal complications as compared with insulin. The women preferred metformin to insulin treatment.

New England Journal of Medicine. Volume 350:2003-2015. May 8,2008

Cornerstone of treatment: Nutrition and Exercise

Nutrition for Healthy Babies and Healthy Moms

Susan R. Wang, MS, RD, CD, CDE
Maternal Fetal Medicine, EvergreenHealth, Kirkland, WA

Nutrition – Diabetes in Pregnancy

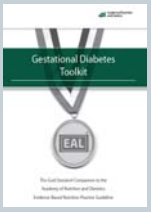
- **Nutrition Assessment**
- **Nutrition Intervention**
- **Nutrition Monitoring and Evaluation**

Adjustments for Diabetes in Pregnancy
Assume that you know about carb counting
1 carb choice=15 gm of carb
& basic concept Glycemic Index

Academy of Nutrition & Dietetics (AND) GDM Nutrition Guidelines

- Frame work that helps make health care decisions
- Not intended to overrule professional judgment
- Does not establish or specify particular standards of care
- May improve care and outcomes

Evidence Analysis Library - EAL



Application
Good teaching & counseling skills
- Patient Centered
- Individualized
- Staged or stepped
- Readiness to Learn
- Build on success

Compare to what we do in our clinic.

Nutrition Therapy for Diabetes & Pregnancy

Overall Goals

- Adequate nutrition for pregnancy
- Decreased pregnancy discomforts
- Appropriate weight gain - absence of ketones
- Healthy babies without adverse outcomes
- Good glucose control -normoglycemia
  - Individualized meal plan
    - Try to maintain pleasure and social aspects of eating
  - Setting up/starting good lifetime habits.

Institute of Medicine Nutrient Recommendations for Pregnancy

Promotes adequate nutrition for pregnancy

- Energy: +340 cal/day 2nd trimester
  +452 cal/day 3rd trimester
- Carbohydrate: 175 grams/day
- Fiber: 28 grams/day
- Protein: 1.1 grams/kg/day
- Fat 20-35% calories per day
- Fluid : 8-10 cups/day to prevent dehydration

Nutrition Assessment

Food Intake, Physical Activity and Medications

- **Food recall/history**
  - Ethnic foods –religious restictions
  - Food preferences
  - Work & eating schedule
  - Who does the cooking
  - Eating out
  - Vegetarian, gluten free, lactose intolerance, allergies, etc.
  - ??? Eating disorders???
  - Herbs & supplements
  - Previous diets
- **Activity**
- **Finances- WIC, etc**
- **Medications –diabetes, thyroid**

Nutrition Assessment

Assess BMI and weight

- **Weight history – (past diets, surgery)**
- **Pre-pregnancy BMI**
- **Weight gain**
  - Amount
  - Distribution

Recommended Weight Gain

- Calculate pre-pregnancy BMI

Pregnancy Weight Gain Guidelines
Institute of Medicine's Recommendations

Pre-pregnancy BMI*	Total Weight Gain	2nd and 3rd Tri. lbs./week	2nd and 3rd Tri. lbs./month	Twins
<18.5	28–40 lbs.	1–1.3 lbs. /week	4–6 lbs./month	No guidelines
18.5–24.9	25–35 lbs.	0.8–1 lb. week	4 lbs./month	37–54 lbs.
25.0–29.9	15–25 lbs.	0.5–0.7 lb./week	2 lbs./month	31–50 lbs.
≥30.0	11–20 lbs.	0.4–0.5 lb./week	1.5–2 lbs./month	25–42 lbs.

* To find your pre-pregnancy body mass index (BMI), go to www.ahlbisupport.com/bmi/bmicalc.htm

Controversies about BMI > 40 Excess weight gain inc. risk LGA BW, macrosomia, & gest HTN

If Weight loss, why?
- **Often a little when changing from high to lower carb diet**

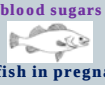
J Clin Endocrinol Metab. 2014 Jan;99(1):212-9. doi: 10.1210/jc.2013-2684. Epub 2013 Dec 20. **ATLANTIC-DIP: excessive gestational weight gain and pregnancy outcomes in women with gestational or pregestational diabetes mellitus.** Egan AM, et al.

Nutrition Intervention for GDM
Adapted from AND's Gestational Diabetes Tool Kit

- **Caloric Intake**
  - **Normal and Underweight Women**
    - appropriate weight gain, the Dietary Reference Intakes (DRI)
  - **Overweight/Obese Women with GDM**
    - modest energy restriction to slow weight gain (~ 70% DRI) without ketosis
- **Carbohydrate Intake**
  - **IOM – 175 gm of carb per day minimum**
  - **Less than 45 % of calories to prevent hyperglycemia**
  - **Consider Distribution**
  - **Not enough evidence for Glycemic Index and fiber**

Nutrition Intervention for GDM
Adapted from AND's Gestational Diabetes Tool Kit

- **Protein & fat**
  - **Adequate based on DRIs – usually okay except vegans**
  - **Limited evidence - my comment:**
    - **Often recommended to eat with carbohydrates**
      - **Seems to help moderate blood sugars**
      - **Adds satiety**
      - **Twins need more**


  - **Healthy fats – careful with fish in pregnancy/lactation**
- **Generally the same as for pregnancy**
  - **Vitamin and Mineral Supplementation- including calcium, iron, etc. - supplement to prevent deficiencies**
  - **Use of Non-Nutritive Sweeteners -very limited research**
  - **Listeria precautions**

Popular GDM Nutrition Guidelines

Popular Guidelines	Evidence	Our practice
Lower Glycemic index	Limited and mixed*	Use the basic idea but not numbers Sticky rice>white rice>br rice >quinoa/cracked wheat/legumes
High fiber over refined carbs	Limited Adeq Intake= 28gm for preg	Encouraged – high fiber Discourage white flour products or rice flour products
No fruit/milk/yogurt in AM (Sweet Success + others)	None found	Often do better than bread And much better than cereal
No juice/sugary beverages	None found	No sugary drinks & us*ually* no juice – (less satiety, too much) Check milk/tea/coffee

*Louie JC, Brand-Miller JC, Markovic TP,Ross GP, Moses RG. Glycemic index and pregnancy: a systematic literature review. J Nutr Metab 2010;2010:282464

More recent studies.

Different types of dietary advice for women with gestational diabetes mellitus.
Han S[1], Cochrane Database Syst Rev. 2013 Mar 28;3:CD009275. doi:10.1002/14651858.CD009275.pub2.

A randomized controlled clinical trial investigating the effect of DASH diet on insulin resistance, inflammation, and oxidative stress in gestational diabetes. Asemi ,et al Nutrition. 2013 Apr;29(4):619-24. doi: 10.1016/j.nut.2012.11.020.

A Higher-Complex Carbohydrate Diet in Gestational Diabetes Achieves Glucose Targets and Lowers Postprandial Lipids: A Randomized Crossover Study.
Diabetes Care. 2014 Mar 4.
[Epub ahead of print] Hernandez TL[1],et al.

Our clinic practice in a NUTSHELL

Eating Carbohydrates:

- The right amount
  - Carb counting - choices or grams
  - Not too much at one time but adequate
- The right type
  - Mostly higher fiber/lower Glycemic index type carbs
- At the right time
  - Eat every 2-4 hours while awake
  - Include a complete bedtime snack if not eating within 1 ½ hr of going to bed.

Specifics Individualized

***"Solid* protein" at each meal & snack** (usually unlimited)
Unlimited non-starchy vegetables
Adequate healthy eating and hydration for pregnancy

GDM nutrition topics....

- Teach carb counting- gm or choices –>meal plan
- Quality carbs- higher fiber /lower GI
- Label reading
  - Can subtract ½ of the fiber
  - Very important with yogurt, alternative milks (soy, almond, coconut, etc)
- Sample meal plans- meal/snack ideas
- Eating out
- Shopping
- Resources – handouts, websites, apps, etc.
  - Sweet Success http://www.cdappsweetsuccess.org/Professionals/CDAPPSweetSuccessGuidelinesforCare.aspx
- Recording keeping/logs

Distribution of Carbohydrates for GDM

Goal: Minimum Goal of 175 gm carb per day distributed in 3 meal & 3 +snacks
Most don't count the carb in nonstarchy vegetables or mostly protein foods

	Common	Sweet Success *	Our clinic - core
Breakfast	30-45 gm No fruit or milk	15 gm + protein No fruit, yogurt, milk	30 gm + protein *Usually no cold cereal*
Snack	15-30 gm	15-30 gm + protein	15-20 gm +protein
Lunch	45-60 gm	45 gm + protein/veg Not both milk & fruit	45 gm + protein
Snack	15-30 gm	15-30 gm + protein	15-20 gm + protein
Dinner	45-60 gm	45 gm + protein/veg Not both milk & fruit	45 gm + protein
Snack	15-30gm	15-30 gm + protein	15-30 + protein

* Adapted: from http://www.cdph.ca.gov/programs/NutiritionandPhysicalActivity/Documents/MO-NUPA-MyPlateforGestationalDiabetes.pdf

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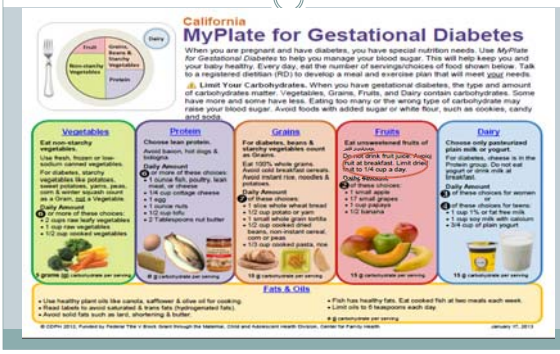
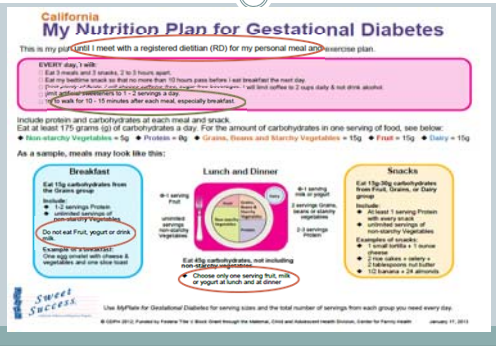


http://www.cdph.ca.gov/programs/NutiritionandPhysicalActivity/Documents/MO-NUPA-MyPlateforGestationalDiabetes.pdf



What does that look like?

We give lots of Examples....

Not all perfect... Make this realistic

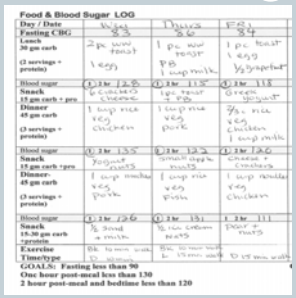
Special situations:
- Multiples
- Gastric surgery

Distribution of Carbohydrates for GDM

Goal: Minimum Goal of 175 gm carb (11-12 choices) per day
Distributed in 3 meal & 3 + snacks. Eat every 2-3 hours while awake
Mostly don't count the carb in non-starchy vegetables or mostly protein foods
Our clinic - Variations depend on BGs, lifestyle, preferences

	core	Extra snacks	Eating late dinner	Smaller dinner	ETC
Breakfast	2 +pro *no cold cereal*	2 +pro *no cold cereal*	2 +pro *no cold cereal*	2 +pro *no cold cereal*	
Snack	1 + pro	1 + pro	1 + pro	1 + pro	
Snack		1 + pro			
Lunch	3+ pro	3+ pro	3 + pro	3+ pro	
Snack	1+ pro	1+ pro	1 + pro	1+ pro	
Snack		1+ pro	1 + pro	1+ pro	
Snack		0-1+ pro	1 + pro		
Dinner	3+ pro	3+ pro	3 + pro	2 + pro	
Snack	1-2 + pro	1-2 + pro	0-1 + pro	1-2+ pro	

Keeping a food & BG LOG



We look at:
- Blood sugars
- Food - amount & type of carb & protein
- Exercise/activity
- Weight gain

We ask about:
- Generally well-being
- Hunger
- Discomfort
- Challenges
- Other issues

Distribution of Carbohydrates for GDM

Eat every 2-3 hours while awake.. 11-12 choices minimum

Our clinic - Variations depend on BGs, lifestyle, preferences - ADJUSTMENTS

	core	BG Post meals	No problem w/ BGs & Hungry or needs wt gain	ETC
Brkft	2 +pro *no cold cereal*	1+ pro *no cold cereal*	2-3 + pro	
Snack	1 + pro	1 + pro	1 +pro	
Snack		1 + pro		
Lunch	3+ pro	2+ pro/↑veg	3 - 5 + pro *(if bgs okay)*	
Snack	1+ pro	1+ pro	1-2+ pro	
Snack		1+ pro	1-2+ pro	
Snack		0 - 1+ pro		
Dinner	3+ pro	2 + pro/↑veg	3-5 gm + pro *(if bgs okay)*	
Snack	1-2 + pro	1 + pro	1-1-2+ pro	

Don't forget the quality of the carbs....

Encouraging higher fiber/lower Glycemic Index type carbs

Plus protein

Exercise???

Ketone testing

EAL

- ketone testing for insufficient calorie or carbohydrate intake or weight loss.
- 2 of 3 studies re: ketonemia and ketonuria with poor metabolic control during a diabetic pregnancy report a positive association with lower IQ in offspring.

Nutrition Monitoring & Evaluation

Take home PEARLs from our clinic....

Continue to monitor, adjust and individualize

- **Check blood sugars**
  - Generally
  - Specific foods or combinations
  - Specific times
  - Activity
- **Eating adequately**
- **Weight change**
- **Hunger**
- **Ketones??**
- **Preference/variety**

Consider....

- **Quality carbs**
- **Protein- more/ earlier**
- **Flexible meal plan – smaller meals & more snacks**
- **Increased freq exercise**

Nutrition Type 1 & 2 Diabetes

- Often they already know something about carb counting, etc..... But may need fine tuning
- May be on carb/insulin ratios
  - However, most can not tolerate large amounts of carb at one time, especially later on in pregnancy.
  - May or may not need to bolus for snacks
- Insulin resistance changed dramatically throughout the pregnancy and nutrition adjustments to be made
- May have complications:
  - gastroparesis, hypoglycemia unawareness, etc.
- May have morning sickness in the beginning.

Physical activity helps control diabetes

Exercise in GDM

Potential Benefits of Physical Activity

- Shorter active phase of labor
- ↓ incidence of operative delivery
- ↓ physical discomforts of pregnancy
- ↓ stress and anxiety
- Boosts energy
- Helps keep weight gain down
- Improved sleep
- Improve blood glucose levels in GDM

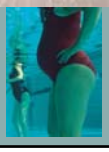
Insulin resistance is decreased and glucose utilization increased—enhanced with pregnancy.

Exercise in GDM

EAL

Physical activity for 30 min/day minimum of 3 X week is needed to aid with improved glycemic control.

Our Clinic



- Any safe exercise or activity is good.
- Start slow
- Exercise/activity after meals for 10-20 min. often improves post meal BGs
- Exercise/activity after dinner sometimes helps FBGs

Any **safe**

- Walking
- Swimming
- Elliptical
- Chores
- Dancing
- Playing w/kids
- Preg yoga
- Preg video
- Wii
- ?? Strength, running??

Avoid:
Contact sports
High impact
High risk of falling

Individualized – *Medication?*

Summary Nutrition & Exercise

- Know the guidelines
- Use your clinic judgment & experience
- Individualize, evaluate & ADJUST

Thank you

Healthy babies and healthy moms

Diabetes and Pregnancy

Physiology and medication management of diabetes and pregnancy

- Pre diabetes
- Type 2 diabetes
- Type 1 diabetes

How to treat Pre Diabetes in Pregnancy?

- Guidelines ?
- Screening for high risk populations (Latino, Native American, Black women, Pacific Inlanders, Increased BMI)
- A1c and profiling from initial OB visit
- Increased profiling as insulin resistance increases at 18 to 20 weeks
- Should you do a GTT at 24 to 28 weeks?
- Many women need medication as pregnancy progresses

Appointments and monitoring for you and your baby

- Ultrasound - to determine viability, correct gestational age, screen for abnormalities, evaluate size of baby, check amount of amniotic fluid
- At 20 weeks – fetal cardiac ultrasound
- Starting at 32 weeks :
  - Twice weekly Non-stress tests
  - Weekly Biophysical Profile (ultra sound and NST to evaluate babies heart rate, breathing, movement, muscle tone, amount of amniotic fluid)

Pre Diabetes

30 % of the population of Washington State have Pre-Diabetes

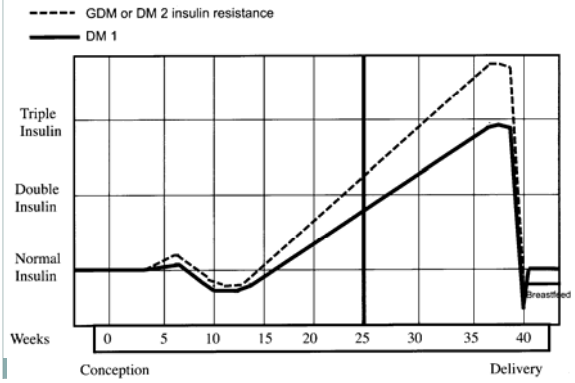
(increased incidence in 20-40 age group)

Fasting 100 – 125

2 hr 140 -200

A1c 5.7%

Insulin Requirement During Pregnancy



Medication Management

ART

AND

SCIENCE

Therapeutic Tool Box for Pregnancy and Diabetes

- Nutrition, physical activity, patient Education
- Glyburide
- Metformin

Therapeutic Tool Box for Pregnancy and Diabetes

Rapid-acting
Aspart (Novolog)
Lispro (Humalog)
Glulisine (Apidra)
Short-acting
Regular
Intermediate acting
NPH
Long-acting
Glargine (Lantus)
Levemir (Detemir)

Give patients information for informed decision as to what medication they want to use in pregnancy

How to start medications

- Pre Diabetes , type 2, or type 1 pts with elevated A1c
  - Due to lack of access to healthcare
  - Due to transition from teenager to adult
  - Due to denial of diabetes

What medications are started based on glucose values and current A1c

How to start medications ?

- **Pre diabetes--** add Metformin then insulin as needed based on glucose patterns
- **Type 2 diabetes--** add Metformin then intermediate or long acting insulin as needed based on glucose patterns. Many times will also need pre meal insulin.

Medication Management

Calculating 24 hour insulin needs in pregnancy

0 to 12 weeks	0.7 units per kg current weight
13 to 28 weeks	0.8 units per kg current weight
29 to 34 weeks	0.9 units per kg current weight
35 to 40 weeks	1.0 units per kg current weight

Usually decrease these doses by 10-20 % due to outpatient initiation

Medical Management of Pregnancy Complicated by Diabetes (ADA)

Insulin regimes for intensive management during pregnancy

NPH and rapid acting insulin

TDD 1/6 as NPH at breakfast, dinner and HS and 1/6 is Rapid acting pre meal

TDD 2/3 am and 1/3 pm , The 2/3 am TTD is 2/3 NPH and 1/3 rapid acting and 1/3 TTD at pm is ½ rapid at dinner and ½ NPH at HS

Glargine/ Levemir once or twice a day and rapid acting at meals

50% long acting and 50 % rapid acting

Insulin regimes for intensive management during pregnancy

Add insulin as needed based on glucose values (the road map) and action of insulin or oral agent

* Adjust for pattern over several days
* High fasting adjust HS dose of NPH
* High post lunch or pre/post dinner values add or increase am NPH
* Add pre meal insulin
* Add NPH at HS with Glargine for high fasting values

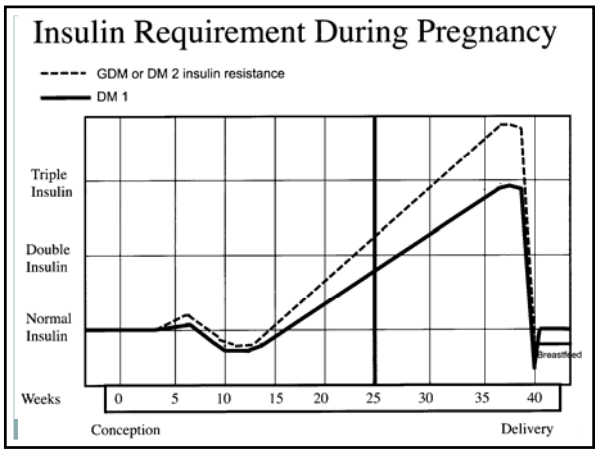
*Add Metformin to insulin – can be very helpful with type 1 patients who have high insulin needs due to increasing insulin resistance in pregnancy

* May need to use u-500 insulin

Medication Management

NO TIME TO LOOSE !!!

- Often now done as outpatient
- Phone , fax, email ,or my chart values every 1-2 days for evaluation and dose adjustments
- Self adjusting with specific guidelines (ie 2 units of NPH at HS every two days until fasting in target)
- Appointment every 1-2 weeks for dose adjustments.



Hypoglycemia risk with tight glucose control

- Test your blood sugar
- 15 grams of carbohydrate every 15 minutes until blood glucose is normal.
- 15 gm fast acting CHO (4oz fruit juice, or regular soda, glucose tablets), to be repeated as needed to raise BS above 70
- If not going to eat within 30 minutes, have a snack

Severe hypoglycemia

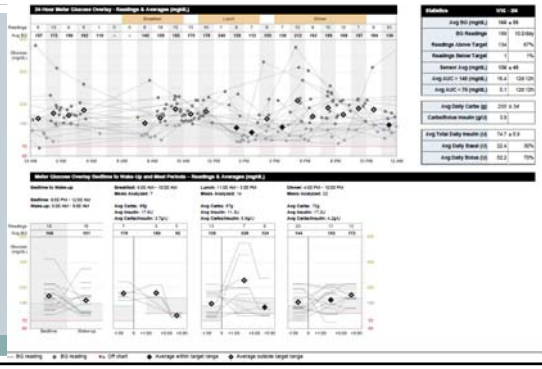
Educate on their current symptoms

- Confusion
- Staggering
- Slurred speech
- Changes in mental state
- Numbness of lips

* Glucagon education for person who will administer glucagon
* Do people you live with know how to test glucose and give an injection? If not, teach them
* May required 911 assistance

Insulin Pump and Continuous Glucose Monitor

Sensor & Meter Overview



Sensor & Meter Overview

Healthy babies and healthy moms