Navigation of Diabetes Through Pregnancy

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Advancements in Diabetes Webinar

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Disclosures

- I have no disclosures

OBJECTIVES

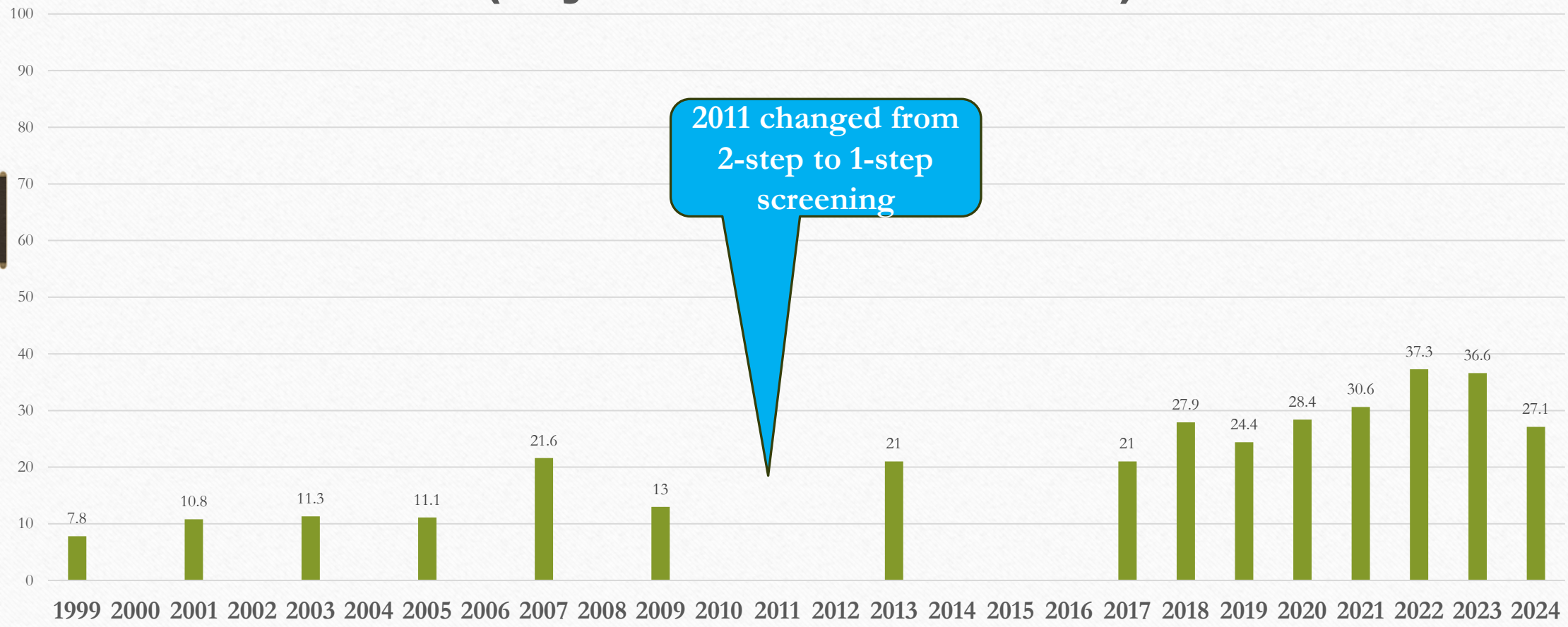
- **As a result of completing this training, participants will be able to:**
  - Examine the etiology, risk factors and prevalence of diabetes in pregnancy
  - Identify evidence-based strategies for the management of diabetes during pregnancy to support healthy maternal and fetal outcomes
  - Determine the appropriate indications for the use of advanced glucose monitoring and insulin pumps in pregnant individuals

Navajo Area Diabetes Mellitus in Pregnancy Screening and Management Guidelines

(Established 11/12/2025)

- Evidence based, best practice guidelines for management of diabetes in pregnancy
- Goal of standardizing care across the Navajo Nation
- High burden of disease

1999-2024: % of Diabetes in Pregnancy in Navajo Area (in years data is available)



Diabetes in Pregnancy (DIP)

- Pre-Existing Diabetes
  - -Type 1
  - -Type 2
- Gestational Diabetes
  - -GDM A1: Diet controlled
  - -GDM A2: Diet and medication controlled
- Rates of all types of DIP have been increasing significantly worldwide in the last 2 generations.
- DIP is one of the most common morbidities complicating pregnancy.

Gestational Diabetes Mellitus (GDM)

- Development of carbohydrate intolerance during pregnancy
- Due to insufficient pancreatic beta-cell ability to overcome the increased insulin resistance associated with pregnancy, particularly in the late second and third trimester
- Due to the production of diabetogenic hormones by the placenta such as growth hormone, placental lactogen, corticotropin-releasing hormone, prolactin and progesterone
- This helps ensure adequate supply of nutrients to the fetus
- The prevalence of GDM is directly proportional to the prevalence of Type 2 DM in the given population
- Approximately 86% of DIP is GDM

Maternal and Fetal Risks of DIP

Risks are proportional to the degree of hyperglycemia and whether diabetes is gestational or pre-gestational

- Fetal/neonatal risks
  - Congenital malformations, particularly cardiac and neurologic
  - Macrosomia/large for gestational age (LGA) with resulting increased risk of shoulder dystocia and birth injury
  - Hypoglycemia
  - Hyperbilirubinemia
  - Respiratory Distress Syndrome (RDS)
  - Stillbirth
  - Childhood obesity, hypertension, T2DM, neurodevelopmental disorders such as ADHD and autism spectrum

Maternal and Fetal Risks of DIP

Risks are proportional to the degree of hyperglycemia and whether diabetes is gestational or pre-gestational

- Maternal risks include:
  - Gestational hypertension and pre-eclampsia
  - Cesarean section
  - If GDM, up to 60-70% chance of developing Type 2 DM over the next 20-30 years
  - Increased incidence of cardiovascular disease and onset at an earlier age
  - Lactation complications
  - Progression of diabetic retinopathy and or nephropathy in pre-existing diabetes

Screening and Diagnostic Procedures

When to screen, who to screen, & why

- It is recommended that all women without pre-existing diabetes or an existing diagnosis of gestational diabetes be screened for gestational diabetes at 24-28 weeks gestation
- There is no universally accepted standard regarding screening for or diagnosis of GDM
- Areas of controversy include:
  - Screening for overt diabetes in early pregnancy
  - Screening for gestational diabetes in early pregnancy
  - Treatment of GDM in early pregnancy
  - How to screen for and diagnose GDM

Screening for Overt Diabetes in Early Pregnancy

- Rates of Type 1 and Type 2 DM are rising worldwide
- It is estimated that 30% of women age 18-44 in the United States have some degree of abnormal glucose metabolism
- Many people with DM are unaware of their condition
- Therefore, the IADPSG, ACOG and the ADA suggests that women with risk factors for Type 2 DM are screened at the first prenatal visit

Risk Factors for Type 2 Diabetes per ACOG and the ADA

- GDM in prior pregnancy
- BMI >25 kg/m2 plus one or more of the following
- First degree relative with diabetes
- High risk race/ancestry (Native American)
- History of cardiovascular disease, hypertension, HDL <35 mg/dL and/or triglyceride level >250 mg/dL
- Polycystic Ovarian syndrome (PCOS)
- Physical inactivity
- Obesity
- A1c ≥ 5.7, impaired glucose tolerance, impaired fasting glucose
- Age ≥ 35 years
- Other high-risk groups (such as HIV, high risk medications)

Navajo Area Guidelines for Screening in Early Pregnancy

- Because being Native American is a strong risk factor for Type 2 DM and prevalence is so high in the population, we recommend all women be screened at their initial prenatal visit for overt diabetes
- Screening is done with an A1c drawn with other prenatal labs
- If A1c is <5.8%, 1-step or 2-step screening is recommended at 24-28 weeks gestation
- If A1c >6.4%, individual is considered to have overt diabetes and managed accordingly
- If A1c is 5.8-6.4%, we recommend an early 75 gm GTT
- This is an area of controversy

Early GDM Screening

- The value of detecting and treating mildly impaired glucose tolerance in early pregnancy has not been established in randomized clinical trials
- Approximately 25% of pregnant people with A1c 5.8-6.4% will be diagnosed with GDM when screened later in pregnancy
- If GTT (1-step or 2-step) is negative, individual should be rescreened at 24-28 weeks
- If GTT is diagnostic of GDM, we treat them per our GDM guidelines

Detection and treatment of early gestational diabetes mellitus:

A systematic review and meta-analysis of randomized control trials.

(Amer J of Ob and Gyn. 2025 Nov)

- Systematic review and meta-analysis of articles addressing early gestational diabetes mellitus
- 7 articles met eligibility criteria with a total of 30,791 participants
- Studies used 2 strategies
  - Universal screening with treatment vs. usual care of women with a diagnosis of early GDM
  - Risk-factor based screening with treatment vs. usual care
- Primary criteria: GDM, cesarean section, preterm birth, macrosomia
- Secondary criteria: 5 additional maternal and 12 fetal-neonatal

Findings

- In studies with universal screening, comparing treatment vs. usual care, treatment showed more drug treatment, less maternal weight gain and lower rates of RDS
- In studies comparing different population-based (risk based) strategies, higher rates of GDM in screened population with lower rate of primary cesarean section in treated group but higher rates of GHTN and preeclampsia
- Quality of evidence was rated as low/very low
- Conclusion: detection and treatment of early GDM does not offer indisputable benefits either in treated women or at the population level. More studies are needed.

2 Step Screening

Perform a 50 gm Glucose Load Test (GLT), non-fasting

- If GLT test abnormal, proceed with 100 gm Glucose Tolerance Test (GTT)
- But…ideal cutoff for the 50 gm GLT has not been established, so any of the criteria can be used, but should be used consistently
- A cutoff of 130, 135 and 140 mg/dL have been used for the 50 gm GLT
- In the Navajo Area DIP Guidelines, if using the 2-step approach, we recommend a 140 mg/dL threshold due to lower false positive rate and improved positive predictive value, though lower sensitivity

Diagnostic criteria for GDM Using 2 Step Method

Status	Plasma Glucose for 100 gm OGTT in mg/dL per Carpenter-Coustan (ACOG)	Plasma Glucose for 100 gm OGTT in mg/dL per National Diabetes Data Group
Fasting	95	105
1 hr	180	190
2 hr	155	165
3 hr	140	145
Needed for diagnosis	2 abnormal values	2 abnormal values

1 Step Screening

- Perform after at least an 8 hour fast
- A fasting, 1 hr and 2 hr plasma glucose level is obtained

Status	Plasma Glucose cutoff in mg/dL
Fasting	≥ 92
1 hr	≥ 180
2 hr	≥ 153

1 Step Screening

This is where things start to get more controversial…

- The 1 step screening approach has been shown to double the rate of DIP diagnosis
- Studies have shown no to only modest improvement in outcome using the 1 step approach with an increased rate of neonatal NICU admission and hypoglycemia
- Whether this is due to increased surveillance of the newborn is unclear
- Long term data on cardio-metabolic outcomes of mother and child are lacking

1 Step Screening

So why utilize the 1 step method?

- We do know that the trigger for lifestyle interventions and enhanced screening is often a diagnosis of DIP
- With high rate of Type 2 DM in the population, increased diagnosis of GDM may improve long term maternal outcomes, especially with diet and lifestyle changes and use of Metformin
- This may delay or prevent the development of T2 DM

But…the data for these long-term outcomes is lacking

Hyperglycemia and Pregnancy Outcomes (HAPO) study

- Recommendation for 1 step approach came from the HAPO study
- This study demonstrated a linear response of adverse pregnancy outcomes with advancing degree of hyperglycemia
- 23,316 women from 15 centers, 9 countries
- As a result, the International Association for Diabetes and Pregnancy Study Group (IADSPG), the International Diabetes Federation (IDF) and the World Health Organization (WHO) endorse the 1 step approach.
- Initially the ADA also endorsed the approach, but in 2014 said either approach is acceptable
- ACOG endorses the 2-step approach but 1-step can be considered an acceptable alternative

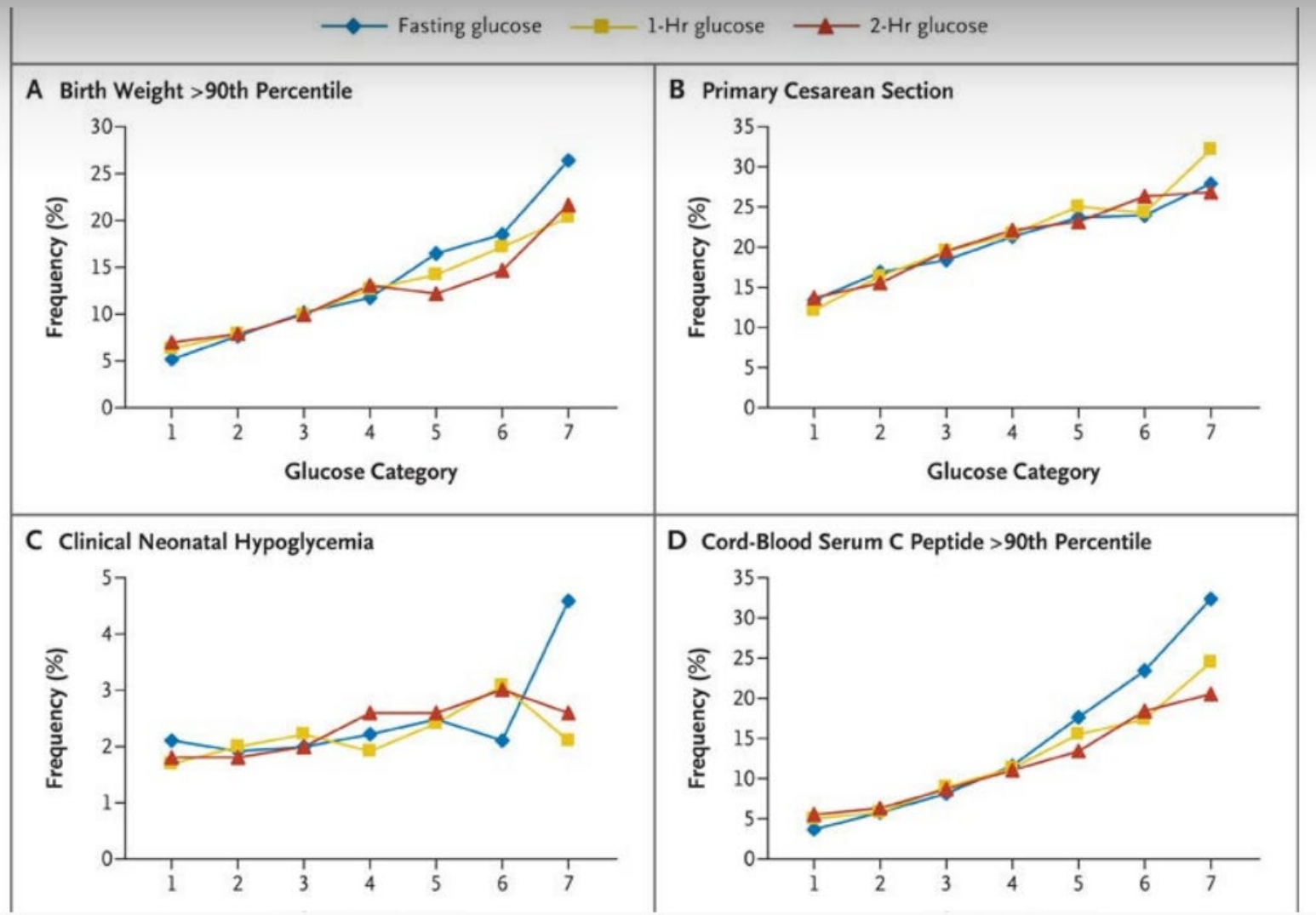
Hyperglycemia & adverse pregnancy outcomes

New Eng J Med. 2008 May; 358 (19): 1991-2002

Glucose Categories

Cat	FPG	1 hr	2 hr
1	< 75	≤ 105	≤ 90
2	75-79	106-132	91-108
3	80-84	133-155	109-125
4	85-89	156-171	126-139
5	90-94	172-193	140-157
6	95-99	194-211	158-177
7	≥ 100	≥ 212	≥ 178

Frequency of Primary Outcomes across the Glucose Categories.



New Eng J Med. 2021 Mar 11; 384 (10): 895-904

- RCT of 23,792 women at Kaiser Permanente Northwest and Hawaii
- DIP rate with 1-step vs. 2-step approach 16.5 vs 8.5%
- No difference in primary outcomes
- Study limitations
  - 25% assigned to the 1-step group went through the 2-step approach
  - Caregivers were not blinded to screening criteria
  - Different criteria for diagnosis with 2-step approach were used at different sites

1-Step Screening

- The Navajo Area Diabetes in Pregnancy Guidelines acknowledge that either the 1-step or 2-step approach are acceptable and method should be determined by individual facilities and used consistently.
- However, for consistency across Navajo Area, utilization of the 1 step method is strongly encouraged due to the high prevalence of diabetes in the population and available resources for counseling and management.

Management

Goals of Management of DIP

- Achieve physiologic levels of glycemic control
- Provide adequate nutrition for mother and developing fetus
- Avoidance of hypoglycemia

Management Begins Pre-conceptually

Less than 1/3 of women with pre-existing diabetes seek pre-pregnancy counseling and this number is likely significantly lower across Navajo Area, so every encounter should be an opportunity

- Pre-pregnancy screening should include A1c, dental, foot and eye exam, ECG
- Family planning goals
- Medication assessment (i.e. semaglutide, ACE, statin use)
- Nutrition and lifestyle counseling
- Folic acid supplementation (at least 400 mcg/day)
- ORGANOGENESIS OCCURS PRIMARILY AT 5-8 WEEKS OF GESTATION

Diet and Exercise Recommendations

- All pregnant patients with DIP should have medical nutrition therapy integrated into their care
- Goal is to achieve euglycemia while preventing ketosis and providing adequate weight gain for fetal growth and development
- Self Monitoring Blood Glucose (SMBG) should be taught to all pregnant women with GDM and a glucometer and testing supplies supplied
- Frequency of testing should be QID with fasting and 1 or 2 hour post prandial levels checked. In some instances, pre-prandial values should be obtained
- Continuous Blood Glucose Monitors (CGM) are recommended in Type 1 DM and can be helpful with Type 2 DM management as well

Suggested Weight Gain per Institute of Medicine (IOM) 2009

BMI	Recommended Weight Gain
<18.5	28-40 lbs (12.5-18 kg)
18.5-24.9	25-35 lbs (11.5-16 kg)
25-29.9	15-25 lbs (7-11.5 kg)
≥ 30	11-20 lbs (5-9 kg)

Diet and Exercise Recommendations

- Consistent carbohydrates and calories distributed over 3 meals and 2-3 snacks helps reduce post-prandial glucose fluctuations and minimize hypoglycemia
- Though amount of calories and carbohydrates needs to be individualized, a rough guide per the Dietary Reference Intakes (RDI) recommends a minimum of 175 g carbohydrates, 71 g of protein (or 1.1 g/kg/day) and 28 g of fiber
- Studies have shown improved control with complex carbohydrates and low to medium glycemic index diets
- 30 minutes of exercise most days or 150 minutes per week are recommended

Glycemic Goals

- Fasting and post-prandial, sometimes pre-prandial, blood glucose monitoring are recommended
- Glucose goals per ACOG, ADA

Glucose Measurement	Type 1 or Type 2 DM	GMA A2	GDM A1
Fasting	70-95 mg/dL	70-95 mg/dL	<95 mg/dL
1 hr postprandial	110-140 mg/dL	110-140 mg/dL	<140 mg/dL
2 hr postprandial	100-120 mg/dL	100-120 mg/dL	<120 mg/dL

Navajo area uses <90 mg/dL FBS

Medical Management

- Insulin is considered the preferred agent for glucose control in pregnancy. It does not cross the placenta.
- For patients that decline insulin or are unable to safely administer insulin, management with oral agents, namely Metformin or Glyburide, is considered a safe and effective alternative
- Oral agents for management of DIP are not FDA approved and long-term outcome data are inadequate

Insulin

- Multiple insulin regimens exist. In general, a combination of basal and bolus insulin is utilized
- For basal insulin, Glargine or NPH can be utilized
- For rapid acting bolus insulin, Lispro and Aspart are the preferred agents at meal time over regular insulin
- When initiating insulin, a general rule is to begin with 0.7-1.0 units/kg daily divided into basal and bolus insulin. Dose can be titrated based on SBGM results
- Requirements tend to continue to increase through the late 2nd trimester through the 3rd trimester

Insulin

- If euglycemia can be achieved with a multiple dose insulin regimen, then maintain. But if unable to achieve euglycemia, an insulin pump can be utilized in settings where the DIP team has sufficient training and resources for managing insulin pump therapy
- In general, due to the complexity of these patients and pump titration, these patients are co-managed by a Maternal-Fetal Medicine specialist and/or Endocrinologist
- Pump use is recommended in management of Type 1 DM but can be helpful in Type 2 DM

Oral Agents

- Metformin is preferred over Glyburide due to lower incidence of macrosomia and maternal and neonatal hypoglycemia
- Since not FDA approved, shared decision making should be employed with discussion of lack of long-term data
- Usually begin with 500 mg once or twice daily with food
- Increase dose by 500 mg every 3-7 days until euglycemia achieved
- Maximum 2500 mg per day divided into 2-3 doses
- 26-46% of women managed with Metformin will eventually require insulin

Indications for Hospital Admission

- Rarely, hospital admission is required for evaluation and optimization of glycemic control
- Indications include:
  - Poor adherence or persistent hyperglycemia
  - Ketoacidosis
  - Pyelonephritis or other severe infection

Management of GDM A1

- Diet and exercise counseling are the mainstay of treatment
- SBGM goals are FBS <95 (90), 1 hr PP <140, 2 hr PP <120
- Ultrasound
  - Consider early dating ultrasound
  - Anatomy ultrasound at 18-24 weeks
  - Consider growth ultrasound at 35-37 weeks with counseling regarding risks and benefits of cesarean section if EFW >4500 gm
- Fetal surveillance-kick counts starting at 28-32 weeks
- Planned delivery should not be initiated before 39 weeks gestation unless otherwise indicated
- Expectant management up to 40 6/7 may be considered, but fetal testing should be initiated at 40 0/7 weeks gestation

Management of GDM A2

- Medication used to achieve euglycemia if trial of MNT not adequate
- Management or co-management with an Ob/Gyn. MFM consultation can also be considered
- Glycemic goals as previously mentioned
- Ultrasound indications are as previously mentioned
- Once or twice weekly antenatal fetal testing initiated at 32 weeks
- If well controlled, delivery can be managed expectantly until 39 0/7 to 39 6/7 weeks
- Offer c-section if EFW >4500 gm

Management of Pre-gestational DM or Overt DM Diagnosed During this Pregnancy

- Baseline assessment to include
  - Urine protein/creatinine ratio
  - Opthamalogic exam
  - Dental exam
  - Baseline preeclampsia labs
  - Low dose aspirin started at 12-28 weeks (ideally before 16 weeks)
  - Consider ECG
  - Ultrasound as previously mentioned plus
    - Fetal echocardiography after 18 weeks
    - Monthly growth ultrasounds starting at 32 weeks
  - Delivery timing and route as mentioned for GDM A2

Intrapartum Management

- Insulin management during labor: Risk of neonatal hypoglycemia increases with maternal glucose level above 110 mg/dL
- For individuals using insulin or oral medication, they should take their usual dose of long acting and rapid or intermediate acting insulin or Metformin the night before planned delivery
- The morning dose of insulin or oral medication should be withheld or reduced
- IV solution of normal saline or normal saline with 5% dextrose is NPO is administered
- When not in labor or in latent labor, hyperglycemia can be managed with sliding scale regular or short acting insulin

Intrapartum Management

- During active labor, blood glucose levels should be checked hourly.
- Use an IV solution with 5% dextrose to achieve a glucose level of approximately 100 mg/dL
- If glucose levels exceed 110 mg/dL, consider an insulin drip. Multiple regimens exist. Sliding scale insulin could also be considered.

Postpartum Management

- For patients who required insulin or oral agents during pregnancy, post-partum insulin needs decrease by 1/3 to ½ and usually return to pre-pregnancy requirements by 1-2 weeks post-partum
- Breastfeeding should be encouraged
- Family planning and contraception should be addressed
- For women with GDM, glucose tolerance should be evaluated with a 75 gm OGTT at 4-12 weeks post partum
- ACOG and the ADA also support screening at 48 hours post-partum with a 75 gm OGTT during hospitalization. Studies have shown good correlation and a much higher screening rate, though lower sensitivity
- If GDM, screening with an A1c should be done every 1-3 years thereafter
- Transition to a primary provider for ongoing surveillance and management should be facilitated

Cases

Case #1

- 21 yo G1P0, college student and Jujitsu instructor. Pre-pregnancy BMI 28.2
  - A1c at entry to care 5.4%
  - 75 gm OGTT at 24 weeks 102/214/121. 2 abnormal values. GDMA1
  - MNT care initiated with diet and exercise counseling
  - Very compliant, SBGM 3-4x/day
  - Maintained blood glucose in target range >90%
  - SVD at 39 4/7 weeks EGA. Male, 3025 gm (AGA)
  - Baby did well and had no hypoglycemia. Discharged home with mom.

Case #2

- 41 yo G5P4004. History of GDM in her last pregnancy. BMI 48.8
  - A1c at entry to care 5.1%
  - 75 gm OGTT at 26 weeks 108/228/155-3 abnormal values. GDMA1
  - Managed with diet and exercise until 30 3/7 weeks when 22% FBS>90 and only 18% 1 hr post-prandials in target range
  - Started on Lantus 10u qHS. Gradually increased to 14 units with 100% FBS<90
  - Diet changes improved post-prandials to<130
  - Delivered at 38 2/7, SVD male 3490 gm (ADA). Baby had mild hypoglycemia requiring intervention

Case #3

- 36 yo G3P2002. BMI 28.2
  - Initial A1c 5.6%
  - 75 gm OGTT at 28 5/7 wks 94/179/168. 2 abnormal values. GDMA1.
  - At 31 2/7 weeks, 25% FBS>90. All post-prandials at target.
  - Needle phobia so started on Metformin 500 mg qPM
  - At 33 3/7 weeks FBS still about 20% above 90 so Metformin increased to 1000 mg qPM and added a high protein nightly snack
  - 34 2/7 weeks only 5% FBS above target
  - Delivered by SVD at 39 weeks, female, 3081 gm (ADA), no hypoglycemia

Case #4

- 25 yo G2P1001. GDM with first pregnancy. C-section for non-reassuring fetal status. Diagnosed with Type 2 DM prior to this pregnancy. Was on no medications. Started prenatal care at PIMC and transferred at 20 weeks. BMI 33.4%. Strong family h/o Type 2 DM.
- A1c at start of pregnancy at 8 weeks was 6.7%. Started on Lantus 10 u qHS and Novolog 15 units TID with meals.
- At time of transfer at 20 weeks, A1c was 5.54%. She had not checked SBGM in 1 month. EFW 86%. No abnormalities on ultrasound.

Case #4 (cont.)

- She returned to clinic in 1 week. FBS 90-100 and 1 hr PPs 140-150. Lantus increased to 15 qHS and Novolog increased to 18 TID
- Not seen again for 6 weeks. Returned at 28 weeks and had titrated up Novolog to 30 u TID. FBS 82-105 and PPs 130-198. Lantus increased to 18u and was instructed to continue titrating up Novolog until in range. She was started on a CGM and a referral was placed to our endocrinologist.
- At 30 weeks her FBS were in range but PPs still elevated to 140-150. Lantus was increased to 20u and she was instructed to titrate up Novolog.

Case #4 (cont.)

- At 32 weeks she was still on Lantus 20u and Novolog 40u TID. She hadn't been using the CGM. Growth was at 74%
- She saw endocrinology at 33 weeks and Novolog was now at 44u. She was having trouble remembering to take her Lantus in the evening, so it was changed to the morning, but doses left unchanged
- 34 weeks FBS 90-100 and having some PP lows so Lantus increased to 25u and Novolog decreased to 40u
- 35 weeks she had self titrated Lantus to 30 units and continued Novolog at 40u. Per CGM, in goal range 92%. EFW at 36 weeks 77%

Case #4 (cont.)

- She remained stable on this regimen with reassuring fetal testing.
- An induction of labor was planned for 39 3/7 weeks EGA.
- She was instructed to take 15 units Lantus the night before and her usual Novolog. The morning of the induction she took no insulin. She did not require insulin in labor.
- She underwent a repeat c-section for non-reassuring FHR tracing and delivered a male, 4085 gm (LGA)
- Baby had no hypoglycemia, but did have elevated bilirubin requiring bili-light therapy.
- Plan was for her to not be on insulin postpartum, continue the CGM and follow up with endocrinology 6 weeks post partum.

Summary of Recommendations

- Hyperglycemia in pregnancy is associated with risks to both the mother and child, including in the fetal, neonatal and later childhood periods
- It is widely accepted that pregnant women with risk factors for diabetes be screened for undiagnosed pre-gestational diabetes at their first prenatal visit
- Screening for and treatment of GDM prior to 20 weeks is controversial and further studies are needed to establish clear benefit
- All pregnant women not previously diagnosed with DM or GDM should be screened for GDM at 24-28 weeks

Summary of Recommendations

- The 1-step or 2-step method can be used for screening for GDM. The best screening method is still unknown.
- Goal is maintenance of euglycemia while providing adequate nutrition for optimal fetal growth and avoidance of hypoglycemia
- This can be achieved with diet and exercise in most cases
- When medication is required, insulin is the drug of choice but Metformin is a safe and effective alternative, though not FDA approved. Continuous Glucose Monitors and insulin pumps can be used in certain circumstances outside of Type 1 DM.
- In labor, glucose levels should be maintained below 110 mg/dL
- Initial postpartum insulin/medication requirements will be significantly reduced

Summary of Recommendations

- Breastfeeding is strongly encouraged
- Family planning and contraception should be addressed
- Long term surveillance of the mother and infant for cardio-metabolic abnormalities and glucose intolerance is recommended

I'm a Sweet Success!