

Gestational Diabetes: Journey for a Healthy Mother & Baby

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Gestational Diabetes

- Gestational diabetes (GDM) occurs in 1-14% of pregnant women, with population-specific variations
- Using most conservative estimates, GDM affects 1 in 20 pregnant women
- Incidence of GDM is increasing



Gestational Diabetes

- Gestational diabetes is diabetes first diagnosed in 2nd or 3rd trimester of pregnancy that is not clearly preexisting type 1 or type 2 DM. (ADA)
- Most women with GDM have chronic β -cell dysfunction.
- Majority of women with GDM have chronic insulin resistance.
- GDM is increasingly viewed as a stage in the evolution of diabetes.
- ~50% of GDM could be prevented with reduction of overweight and obesity



Insulin Requirement During Pregnancy



Diagnosis of Gestational Diabetes

- Risk assessment at first prenatal visit
- Screen in first trimester or at first prenatal visit if high risk:
 - Personal history of GDM
 - Marked obesity
 - Glycosuria
 - First degree relative with DM
 - Previous large baby (>9#)
 - PCOS
 - High risk race/ethnicity
 - Prior stillbirth
- If first trimester result is abnormal, consider possibility of pre-gestational DM – check HbA1c



Diagnosis of Gestational Diabetes

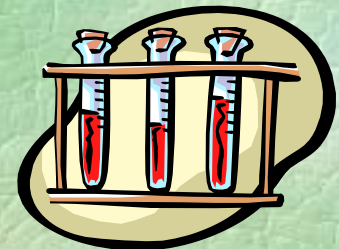
- If first trimester result is normal, rescreen at 24-28 weeks
- Screen avg risk women at 24-28 weeks
- Screening methods
 - Two step: 1-hour GTT followed by 3-hour GTT (Carpenter & Coustan criteria; ACOG, ADA)
 - One step: 2-hour GTT (ADA, AACE)



Diagnosis of Gestational Diabetes

2 Step Method

- 1-hour 50 gram GTT (non-fasting)
- If 1-hour GTT is > 130 , 135 or 140 mg/dl, proceed to 3-hour 100-gram GTT
 - Threshold >140 mg/dl identifies $\sim 80\%$ of women with GDM
 - Threshold >130 mg/dl identifies $\sim 90\%$ of women with GDM



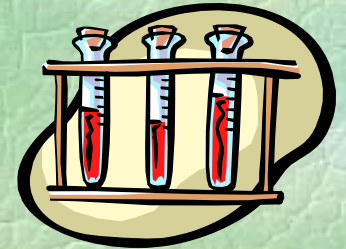
Diagnosis of Gestational Diabetes

2 Step Method

- 3-hour 100 gram GTT
- 2 or more values must be met or exceeded for diagnosis of GDM

Carpenter & Coustan

FBS	95 mg/dl
1-hour	180 mg/dl
2-hour	155 mg/dl
3-hour	140 mg/dl



GDM Diagnostic Criteria Carpenter & Coustan

- Established >30 years ago (1982)
- Chosen to identify women at high risk for development of diabetes after pregnancy
- Derived from criteria for non-pregnant adults
- Not designed to identify pregnancies with increased risk for adverse perinatal outcome
- Not based on research of outcomes for fetus/neonate/child
- Different standards in U.S. and rest of world
- Still the sole method supported by ACOG

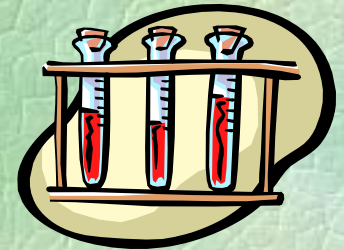
“New” Recommendations for GDM Diagnosis (2011)

- Based on HAPO (Hyperglycemia & Adverse Pregnancy Outcome) trial
- First prenatal visit
 - Measure FPG, HbA1c or random glucose on high-risk women to check for preexisting type 2 DM
 - If results indicate overt diabetes, treat as preexisting diabetes
 - If results not diagnostic for overt diabetes
 - FPG ≥ 92 but < 126 → diagnose as GDM
 - FPG < 92 → test for GDM at 24-28 weeks with 75-gram OGTT

“New” GDM Diagnostic Criteria

- 2-hour 75 gram GTT (fasting)
- 1 value met or exceeded to make GDM diagnosis

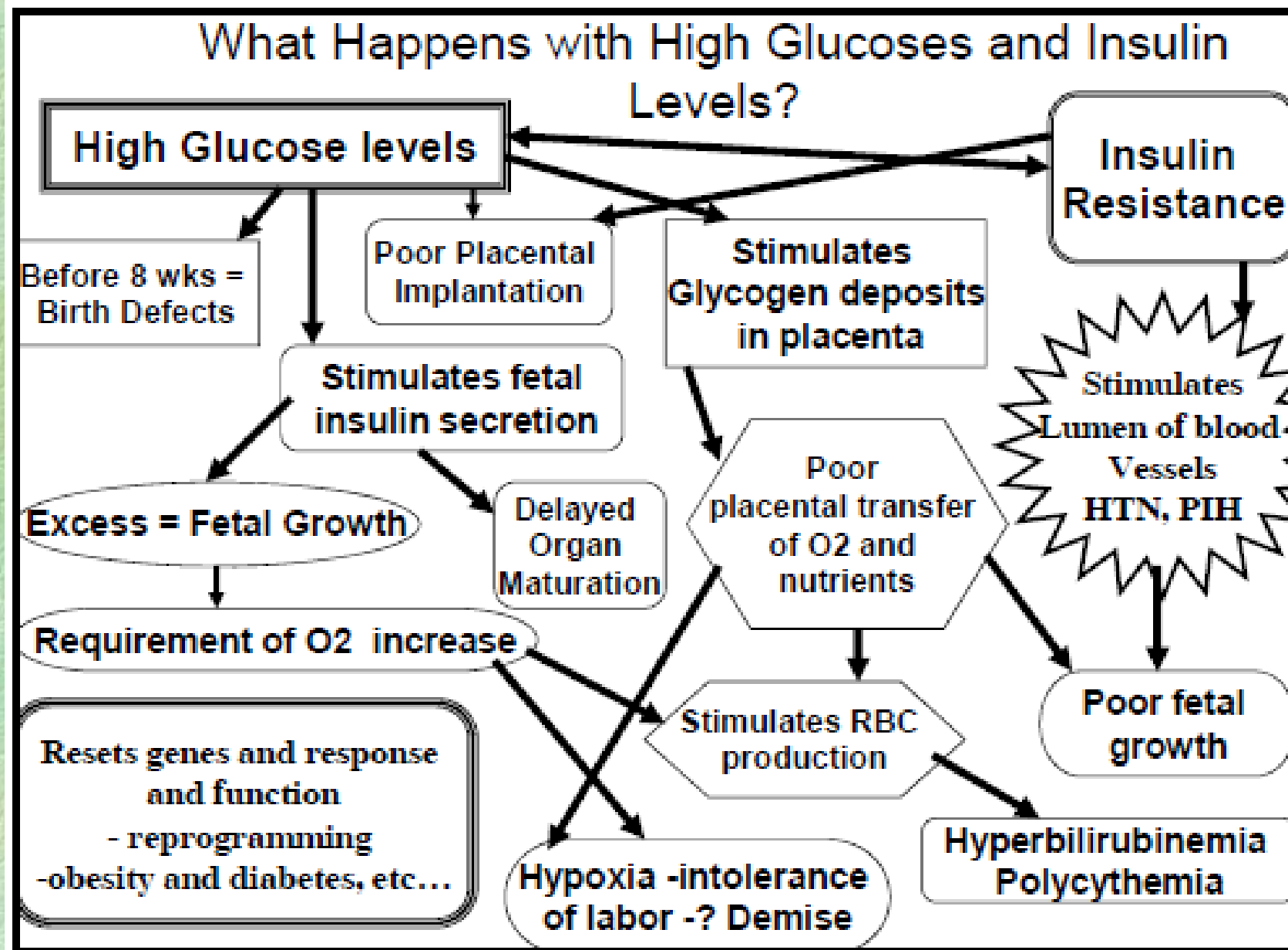
FBS	92 mg/dl
1-hour	180 mg/dl
2-hour	153 mg/dl



Implications of 2011 GDM Diagnostic Criteria

- More women dx with GDM, perhaps 2-3x more
- In HAPO trial, 16% of women met at least one of dx criteria
- Potential to “medicalize” pregnancy
- New criteria reflect risk of perinatal harm, not mother’s future risk of DM, so should lead to better neonatal outcomes
- Convenience, compliance, cost & outcomes are considerations in selection of diagnostic method
- Data are inconsistent & more study is needed

Gestational Diabetes



Maternal Complications with GDM

- Polyhydramnios
- Preterm labor
- Infections – vaginal, bladder & kidney
- Preeclampsia
- Increased c-section rate
- Increased risk for type 2 diabetes - up to 7-fold ↑ risk 5-10 years after delivery



Fetal Complications with GDM

- Macrosomia or IUGR
- Delayed lung maturation → RDS
- Labor and delivery trauma
- Hypoglycemia
- Hyperbilirubinemia
- Polycythemia
- Hypocalcemia
- Stillbirth



Complications for Children of Women with GDM

- Increased risk of
 - Obesity
 - Glucose intolerance
 - Diabetes
- All can occur in childhood, late adolescence and young adulthood



Treatment Goals for GDM

- Minimize fetal hyperinsulinemia
- Minimize maternal and fetal complications
- Baby < 4000 g or <90th percentile for gestational age
- Appropriate maternal weight gain
- Optimal maternal and fetal nutrition

Goals for Glucose Control Gestational Diabetes

- Fasting (lack of universal agreement)
 - ≤ 95 mg/dl ADA, ACOG, AACE
 - < 90 mg/dl California Db & Pregnancy Program (Lois Jovanovic, MD)
 - 60-95 if AC $< 75^{\text{th}}$ % Joslin Diabetes Center
60-79 if AC $\geq 75^{\text{th}}$ %
- HAPO study: FPG 100-105 mg/dl associated with risk of macrosomia five-fold greater than FPG < 75 mg/dl

Goals for Glucose Control Gestational Diabetes

- 1-hour PP <140 mg/dl
- 2-hour PP <120 mg/dl
- Fasting glucose >105 mg/dl associated with increased risk of intrauterine death during last 4-8 weeks gestation
- Never discontinue SBGM w/ GDM, as glucose intolerance increases as pregnancy progresses



GDM Glucose Goals

Compared to Nondiabetic Pregnant Women

- 2011 literature review (mean glucose values in nondiabetic pregnant women, 12 studies, 255 women)
 - Fasting 71 +/- 8 mg/dl
 - 1 hour pp 109 +/- 13 mg/dl
 - 2 hour pp 99 +/- 10 mg/dl
- If two std deviations added to means above
 - FBS 87 mg/dl
 - 1 hour 135 mg/dl
 - 2 hour 119 mg/dl



Reference: Up To Date

Gestational Diabetes Education

VISIT 1 – Inform/reassure

- Baby will not be born with diabetes
- No increased risk for birth defects
- Nothing mother did to cause GDM
- Increased risk for type 2 diabetes later in life
- Good control is essential for a healthy outcome!



Gestational Diabetes Education

VISIT 1 – Initial education

- Explanation of GDM
- GDM risk factors
- Fetal complications of hyperglycemia
- Maternal complications of hyperglycemia
- Goal glucose range
- Importance of working with healthcare team to achieve a healthy outcome



Gestational Diabetes Education

VISIT 1

- Treatment regimen
 - Healthy eating – RD experienced in GDM care
 - Activity
 - Glucose monitoring (QID – fasting and 1-hour postprandial)
 - Ketone testing (first thing daily)
 - Insulin/oral agent if needed
- Fetal movement counting (daily)



Gestational Diabetes Nutrition Education

■ Goals

- Adequate maternal and fetal nutrition
- Appropriate maternal weight gain
- Maintain glucoses within target range
- Avoid urine ketones (w/ adequate carb intake)

■ Approaches

- Constant carbohydrate
- Carbohydrate counting
- Healthy eating/plate method
- Use whatever works!



Gestational Diabetes Nutrition Education

- GDM patient population reality check
 - Many women are overweight prior to pregnancy
 - Unhealthy eating habits
 - Minimal cooking skills or desire to learn
 - “I’m eating for 2”
 - “I’m pregnant and can give in to all my cravings”
 - “I haven’t made any changes, and see....my blood sugars are fine”
 - “This is too hard/overwhelming”
 - Unwilling to make changes for baby’s health



Gestational Diabetes Nutrition Education

- GDM Nutrition Guidelines
 - Eat 3 meals and 2-3 snacks
 - Do not go more than 4-5 hours without food
 - Eat at regular times each day
 - Eat a bedtime snack every night – just as important as medication
 - Limit intake of sugar and sweets
 - Focus on healthy grains, vegetables, proteins and fruit



Gestational Diabetes Nutrition Education

- GDM – Foods to **AVOID**
 - Regular soda, juice, fruit drinks/punch, lemonade, Hi-C, Sunny D
 - Pastries, Pop Tarts, Toaster Strudels, donuts, rolls
 - Cereal for breakfast
 - Ramen noodles, Chinese foods, sticky rice
 - Pancakes, French toast
 - Bagels
 - Fried/heavily breaded foods



Gestational Diabetes Nutrition Education

- Suggested meal plan

Breakfast	30 grams + protein
Snack	15 grams
Lunch	45-60 grams
Snack	15-30 grams
Supper	45-60 grams
Snack	15-30 grams + protein

- Keep food records

- Paper
- Apps



Gestational Diabetes Nutrition Education

Real food records

10:15 a.m.	1 egg	71 grams
	2 pieces bread	
	Pepsi 12 oz (regular)	
11:00 a.m.	3 cups popcorn	15 grams
2:30 p.m.	Cheese burger	45-60 grams
	Cheese balls w/ ranch dressing	
7:00 p.m.	Cheese burger	45 grams
	6 French fries	
	Iced tea	
HS	2 ice cream bars	22 grams

What recommendations would you make?

Gestational Diabetes Nutrition Education

- Special populations
 - Post gastric bypass
 - History of or present eating disorder
 - Hyperemesis
- Always customize to:
 - Schedule – shift work, etc
 - Culture
 - Other medical issues – celiac, anemia
- Encourage breast feeding



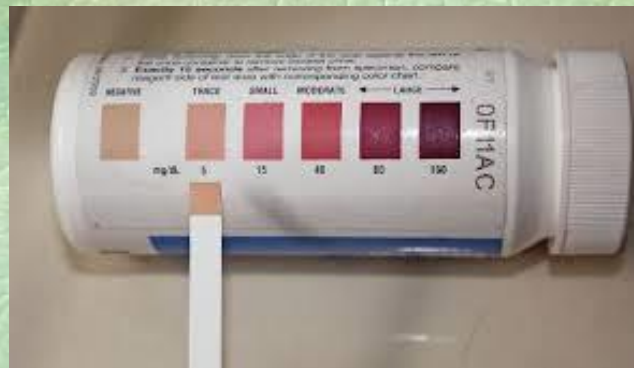
Gestational Diabetes Activity Guidelines

- Activity benefits
 - Glucose control
 - Improves fitness for labor, delivery & postpartum
- 30 minutes most days of the week
 - Divided into 10/10/10 or 15/15 minutes
 - Low level aerobic, stretching, etc
- Always follow provider recommendations or restrictions
- Use activity to control pp glucoses



Gestational Diabetes – Ketone Testing

- Inadequate carbohydrate for mother and fetus overnight → fat breakdown for energy → ketones produced
- Check ketones every AM
- #1 cause of ketones – no HS snack
- Need to experiment with different amounts of carb and protein at HS to alleviate ketones



Gestational Diabetes Education

VISIT 2



- Review glucoses, ketones and food records
- Check meter memory & log book – essential!
- Adjust meal plan & activity as needed
- Schedule third visit if glucoses not in goal range after changes made in meal plan/activity
- Ongoing care plan
 - Weekly contact with Diabetes Education Team
 - FP/OB/CNM/Perinatologist visits as directed
 - Return for further education if insulin needed

Medications for Glucose Control

“Insulin is the first-line agent recommended for treatment of GDM in the U.S. While individual randomized control trials support the efficacy and short-term safety of metformin and glyburide for the treatment of GDM, both agents cross the placenta. Long-term safety data are not available for any oral agent.”

Management of Diabetes in Pregnancy, Diabetes Care, Volume 40, Supplement 1, January 2017, S116.



Insulin Therapy

- Insulin safety in pregnancy
 - Lispro (Humalog) Category B
 - Aspart (NovoLog) Category B
 - Glulisine (Apidra) Category C
 - NPH Category B
 - Glargine (Lantus) Category C
 - Detemir (Levemir) Category B

Insulin Therapy

- Insulin therapy
 - Tailor regimen to glucose pattern
 - Elevated FBS ↪ NPH at HS
 - Elevated post-breakfast ↪ AM Humalog/NovoLog
 - Elevated post-noon ↪ AM NPH or noon Humalog/NovoLog
 - Elevated post-supper ↪ PM Humalog/NovoLog
 - All elevated ↪ NPH with Humalog/NovoLog BID



Insulin Therapy

- Address misconceptions
 - “It will make me sick.”
 - “My grandma got kidney failure after she started on insulin.”
 - “It will hurt the baby.”
- Instruct on insulin administration and hypoglycemia symptoms and treatment
- Evaluate glucoses 1-2 times weekly
- Adjust by 2-4 unit increments until at goal
- Explain to pt that insulin requirements will increase as pregnancy progresses & frequent adjustments are normal



Medications for Glucose Control

- Glyburide

- Concentrations in umbilical cord plasma are ~70% of maternal levels
- May be associated with higher rates of neonatal hypoglycemia and macrosomia than insulin or metformin

- Metformin

- May be associated with lower risk of neonatal hypoglycemia & less maternal weight gain than insulin
- May slightly increase risk of prematurity
- Umbilical cord blood levels are higher than simultaneous maternal levels

- No long-term studies on outcomes in offspring

Medications for Glucose Control

- Situations to consider oral medications in GDM
 - Cognitive issues
 - Compliance concerns
 - Language barrier
 - Needle phobia
 - History of drug abuse
 - Absolute refusal of insulin therapy



Medications for Glucose Control

- Metformin (Pregnancy Category B)
 - Decreases hepatic glucose release & increases insulin sensitivity
 - Often used to treat PCOS
 - Starting dose 500 mg daily to max dose of 2550 mg daily
 - Take with food to minimize GI upset
 - Low risk of hypoglycemia

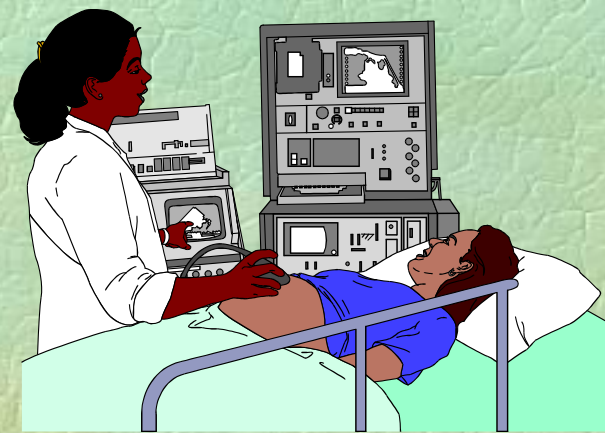


Medications for Glucose Control

- Glyburide (Pregnancy Category C)
 - Stimulates pancreatic insulin secretion
 - Starting dose 2.5 mg daily to BID
 - If insulin sensitive, consider 1.25 mg daily
 - Increase in 2.5 mg increments
 - Max dose = 20 mg daily; rarely effective beyond 10 mg total daily dose
 - Risk of hypoglycemia



Maternal & Fetal Surveillance



- BPP (biophysical profile) weekly starting @ 32 weeks if on medication
- Growth scan every 4 weeks starting @ 32 weeks; indicators of maternal hyperglycemia:
 - Asymmetrical fetal growth
 - ↑ AC (abdominal circumference)
 - ↑ amniotic fluid
- Review meter/log book at EVERY visit

Postpartum Management

- Monitor for neonatal hypoglycemia (jittery, lethargy, poor feeding, irritability, hypotonia, apnea, cyanosis, seizures)
 - Goal is 3 consecutive baby glucoses >50 mg/dl
 - Treat with frequent feeding & ongoing glucose checks
 - IV glucose/NICU for severe hypoglycemia
- Optional maternal glucose check prior to discharge



Postpartum Follow-up

- OGTT at 4-12 weeks postpartum
 - Recommended over HbA1c
 - HbA1c may be persistently lowered by increased RBC turnover related to pregnancy or blood loss at delivery
 - 75-gram OGTT is more sensitive test than HbA1c
- Test every 1-3 years if OGTT is normal
 - Frequency depends on other risk factors
 - Use HbA1c, FPG or 75-gram OGTT (with non-pregnant goals)



Present & Future Health

- Continue healthy lifestyle habits to reduce risk for type 2 DM & focus on healthy family
 - Healthy eating
 - 30-60 minutes of activity 5 days per week
 - Healthy weight
- Annual glucose screening
- Pre-conception planning and early screening with future pregnancies



Challenges to Optimal GDM Management

- ❖ Finances
- ❖ Poor nutritional habits, meal planning & cooking skills
- ❖ Substance abuse
- ❖ Mental health issues
- ❖ Cultural beliefs, language barrier
- ❖ Questioning health professionals, argue about diagnosis and/or treatment recommendations
- ❖ Lack of desire to make changes
- ❖ Failure to follow up
- ❖ Lack of truthful reporting of glucoses and food intake

Team Approach to Optimal GDM Management

- ✓ Physician, Diabetes Team (RN & RD) & other consultants present a unified message & approach
- ✓ Follow standards for diagnosis and treatment for ALL patients - no bargaining!
- ✓ Don't make assumptions
- ✓ Take time to ask questions
 - What is working well?
 - What changes are you struggling with?
 - What additional resources do you need?
 - Is the health of your baby important to you?

Team Approach to Optimal GDM Management

- ✓ Don't be afraid to point out inconsistencies
- ✓ Refer to other resources
- ✓ “We don't expect you to be perfect, but we do expect you to be honest.”
- ✓ Focus on healthy baby
- ✓ Support when struggling and praise for success



References & Resources

REFERENCES

- American Association of Clinical Endocrinologists and American College of Endocrinology – Clinical Practice Guidelines for Developing a Diabetes Mellitus Comprehensive Care Plan – 2015, www.aace.com.
- American Diabetes Association Standards of Medical Care in Diabetes – 2017, Diabetes Care, Volume 40, Supplement 1.
- California Diabetes and Pregnancy Program (CDAPP), cdappsweetsuccess.org.
- Joslin Diabetes Center and Joslin Clinic Guideline for Detection and Management of Diabetes in Pregnancy, 2016, www.joslin.org

PATIENT EDUCATION RESOURCES

- American Diabetes Association – www.professional.diabetes.org
- International Diabetes Center
- National Diabetes Education Program – www.niddk.nih.gov