DIABETES AND PREGNANCY
CDE Exam Preparation
April 2019
Presented by Wendy Graham RD CDE
Mentor
OBJECTIVES

- Describe targets for blood glucose in pregnancy
- Discuss the risks to baby if blood glucose is elevated
- Discuss Gestational Diabetes
  - Risk Factors
  - Screening and Diagnosis
  - Complications
  - Management
- Discuss preconception care for women with Type 1 or Type 2 diabetes
- Describe treatment through the pregnancy with preexisting diabetes
# Waterloo Wellington Diabetes and Pregnancy Clinical Pathway

This pathway was created to support a consistent standard of care for all women with diabetes and pregnancy throughout the region. It recognizes a multidisciplinary approach and offers details of care and education from preconception to postpartum, based on the 2013 CDA Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada. This pathway is to be used as a guideline and does not replace clinical judgment.

## Preconception (3-6 months preconception)

### Type 1 Diabetes
- Refer to Diabetes Central (0-161-94-DEC-BC-30)
- Optimally controlled glucose levels (HbA1c ≤7%)
- Notify obstetrician at 12 weeks
- Monitor for gestational diabetes
- Glucose monitoring every 1-2 weeks
- Anti-hypertensives (ACE inhibitors)
- Monitor for hypoglycemia
- Weight gain of 1-2 kg
- Self-monitoring of blood glucose
- Nutritional counseling

### Type 2 Diabetes
- Refer to Diabetes Central (0-161-94-DEC-BC-30)
- Optimally controlled glucose levels (HbA1c ≤7%)
- Notify obstetrician at 12 weeks
- Monitor for gestational diabetes
- Glucose monitoring every 1-2 weeks
- Anti-hypertensives (ACE inhibitors)
- Monitor for hypoglycemia
- Weight gain of 1-2 kg
- Self-monitoring of blood glucose
- Nutritional counseling

### Gestational Diabetes
- Refer to Diabetes Central (0-161-94-DEC-BC-30)
- Optimally controlled glucose levels (HbA1c ≤7%)
- Notify obstetrician at 12 weeks
- Monitor for gestational diabetes
- Glucose monitoring every 1-2 weeks
- Anti-hypertensives (ACE inhibitors)
- Monitor for hypoglycemia
- Weight gain of 1-2 kg
- Self-monitoring of blood glucose
- Nutritional counseling

### High Risk for Gestational Diabetes
- Pregnancy diagnosis of GDM
- Fetal macrosomia
- Gestational diabetes (Hispanic, South Asian, Asian, African)
- Age ≥30 years
- BMI ≥30 kg/m²
- History of macrosomic infant
- History of fetal macrosomia

## References
- Diabetes Central (0-161-94-DEC-BC-30)
- National Diabetes Surveillance System (NDSS)
Items that are “Good to Know” for the exam.
# Target Blood Glucose

<table>
<thead>
<tr>
<th>Testing Times</th>
<th>Target</th>
</tr>
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<tbody>
<tr>
<td>Fasting</td>
<td>&lt; 5.3</td>
</tr>
<tr>
<td>One hour after meal</td>
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<tr>
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2018 Clinical Practice Guidelines
**TARGET A1c**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Preconception</td>
<td>&lt; 7.0 or below if safe</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>≤ 6.5</td>
</tr>
<tr>
<td></td>
<td>≤ 6.1 if safe</td>
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2018 Clinical Practice Guidelines
**TARGET BLOOD GLUCOSE**

| During Labour | 4 - 7 mmol/L |
### Target Blood Sugar

| Hypoglycemia- on Insulin | < 3.7 mmol/L |

2018 Clinical Practice Guidelines
RISK TO BABY TYPE 1 OR TYPE 2

- Congenital Malformation
- Stillbirth
- Macrosomia
- Perinatal Mortality
- Morbidity
- Hypoglycemia
- Jaundice
- Obesity in later life
RISK TO BABY GESTATIONAL DIABETES

- Large for gestational age (macrosomia)
- Trauma
  - Shoulder dystocia
- Hypoglycemia
- Respiratory Distress
- Jaundice
- Obesity later in life
GESTATIONAL DIABETES : RISK FACTORS

- Age
- Obesity
- Ethnicity
- PCOS
- Family History of Type 2
- Family History of large babies (i.e. >9 lbs)
GESTATIONAL DIABETES: SCREENING AND DIAGNOSIS

Two Methods in the Clinical Practice Guidelines

- 1 Step (75 g)
- 2 Step (50 g, 75 g)

Controversy
Gestational Diabetes: 1 Step

24 to 28 weeks
75 g oral glucose tolerance test

FBS $\geq 5.1$
1 hr $\geq 10.0$
2 hr $\geq 8.5$

Preferred method recommended in Waterloo Wellington
**GESTATIONAL DIABETES: 2 STEP**

24 to 28 weeks

50 g oral glucose tolerance test

1 hr pc 7.8 - 11.0

Follow by 75 g glucose tolerance test

FBS > 5.3
1 hr > 10.6
2 hr > 9.0

1 hr > 11.0

GDM

Screening
GESTATIONAL DIABETES: TREATMENT

- Diet
- Blood Glucose monitoring
- Exercise
- Ketone testing?
- Medication (as required)
  - Insulin
  - Metformin
  - Glyburide
Gestational Diabetes: Diet

- 3 meals/ 3 snacks/day
- Bedtime snack is important
- Control the amount of Carbohydrate at meals
- Adequate protein and nutrients for pregnancy
- Low Glycemic Index
GESTATIONAL DIABETES: MONITORING

Diet Controlled
- Fasting
- 1 or 2 hours after each meal

Using Insulin
- Fasting/ac meals
- 1 or 2 hours after meals

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GESTATIONAL DIABETES: EXERCISE

Walking after meals
GESTATIONAL DIABETES: MEDICATION

Insulin – 1st choice
  o No upper limit
  o Safe

Oral Medications
  o Metformin 2nd choice
  o Glyburide only if not able to use insulin and/or metformin
GESTATIONAL DIABETES: COMPLICATIONS TO MOTHER

- Polyhydramnios
- Fluid retention
  - Hypertension
  - Preeclampsia
- Difficult delivery
- Trauma
- Caesarian section
- Infection
Post Partum

Birth Control
Breastfeeding

75 g OGTT 6 weeks – 6 months

Next Pregnancy
- Screened early in next pregnancy
- Risk of Type 2
PREGNANCY WITH PREEXISTING DIABETES
PRECONCEPTION CARE: TYPE 1 & TYPE 2

All women with Type 1 and Type 2 should receive education and preconception care.

- Optimize blood sugars
- Assess complications - eyes, kidneys, heart
- Review medications
- Begin folic acid supplements
PRECONCEPTION CARE: TYPE 1 & TYPE 2

Blood sugars A1c $\leq 7\%$ ; $\leq 6.5$ if safe

Reduces risk of:

- Stillbirth
- Congenital malformations
- Preeclampsia
- Progression of retinopathy

Folic acid supplements 1mg 3 months preconception up to 12 weeks

- Neural tube defects
PRECONCEPTION CARE: TYPE 1 & TYPE 2

Hyperglycemia
- Teratogenic to the fetus
- *Increased birth weight*
- *Increased risk of obesity*
- *Post delivery hypoglycemia of infant*
- *Increased incidence jaundice/respiratory distress*
PRECONCEPTION CARE: TYPE 1 & TYPE 2

Hypertension

40-50% in women with diabetes

- Type 1 – increased risk of pre-eclampsia
- Type 2 – chronic hypertension

Teratogens: ACE/ARB

Substitute with effective antihypertensives, calcium channel blockers, beta blockers

e.g. labatolol/aldomet
PRECONCEPTION CARE: TYPE 1 & TYPE 2

Hyperlipidemia
- Medications are teratogens

Retinopathy
- Eye exam prior to pregnancy and in 1st trimester and as required each trimester
- With 1 year post partum
- Retinopathy worsens during pregnancy
TYPE 1 TREATMENT
**TYPE 1**

1st Trimester
- Insulin requirements are decreased
- Risk of hypoglycemia is highest
- Hypoglycemia unawareness
- Partner should be taught glucagon
- Risk for other autoimmune disorders
  - hypothyroidism

**Risk for severe hypoglycemia in 1st trimester especially when asleep**
**Type 1**

2\textsuperscript{nd} Trimester
- Risk of hypoglycemia until 16 weeks
- Insulin requirements go up 1.5 - 2 times
- Frequent monitoring and insulin adjustment
- Fetal monitoring
- Start ASA 81 mg

3\textsuperscript{rd} Trimester
- Frequent monitoring and insulin adjustment
- Fetal monitoring
  - Ultrasound, non stress test, kick counts
Complication to Mother type 1

- Spontaneous abortion
- Hypoglycemia/ketoacidosis
- Polyhydramnios
- Infections
- Hypertension
- Pre-eclampsia
- Preterm labour
- Caesarian section
- Progression of complications
TYPE 2

- Older
- Heavier
- PCOS
- Taking oral medications
- Likely to have hypertension, hyperlipidemia

Less likely to have preconception care for diabetes
**Type 2**

1\(^{st}\) Trimester
- Monitoring and initiation of Insulin
- Discontinuation of oral medications
  - ACE, ARB, statins

2\(^{nd}\) Trimester
- Insulin requirements will increase
- Frequent monitoring and insulin adjustment
- Monitoring of blood pressure
- Fetal monitoring
- Start ASA 81 mg

3\(^{rd}\) Trimester
- Frequent monitoring and insulin adjustment
- Fetal monitoring
  - Ultrasound, Non stress test, kick counts
TYPE 1 & 2 DIABETES AND PREGNANCY

Management

- Monitoring 6-8 times/day
- Insulin at all meals/sometimes snacks
- Frequent appointments

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Geraldine is newly-diagnosed with type 2 diabetes, A1c 8.4%. She has been started on metformin 500 mg bid and empagliflozin 25 mg. During your initial interview she shares that she and her husband are trying to have a baby. What would your 1st concern be around this topic?

a) She should lose weight before trying to conceive
b) She should take a prenatal vitamin with folic acid
c) She should use some type of contraception until her A1c is 7% or below
d) She should not have children as they might also have diabetes
SAMPLE QUESTION # 1

Geraldine is newly diagnosed with type 2 diabetes, A1c 8.4%. She has been started on metformin 500 mg bid and empagliflozin 25 mg. During your initial interview she shares that she and her husband are trying to have a baby. What would your 1st concern be around this topic.

a) She should lose weight before trying to conceive
b) She should take a prenatal vitamin with folic acid

✓ She should use some type of contraception until her A1c is 7% or below
d) She should not have children as they might also have diabetes
SAMPLE QUESTION #2

Karina has been diagnosed with gestational diabetes. Her father has type 2 diabetes and feels she is testing too often.

How often should Karina be testing her blood glucose?

a) Twice per day at different times
b) Fasting and 1 hour after meals
c) Before all meals and at bedtime
d) Before and after 1 meal a day, rotating between meals.
SAMPLE QUESTION #2

Karina has been diagnosed with gestational diabetes. Her father has type 2 diabetes and feels she is testing too often.

How often should Karina be testing her blood glucose.

a) Twice per day at different times

✓ Fasting and 1 hour after meals

b) Before all meals and at bedtime

d) Before and after 1 meal a day, rotating between meals.
SAMPLE QUESTION

The recommended amount of folic acid for a woman with type 1 diabetes who is trying to conceive is:

a) 1 mg
b) 3 mg
c) 5 mg
d) 0.9mg
SAMPLE QUESTION

The recommended amount of folic acid for a woman with type 1 diabetes who is trying to conceive is:

- a) 1 mg
- b) 3 mg
- c) 5 mg
- d) 0.9mg
Questions

Contact me at: wendyg@langs.org

Check out information at: waterloowellingtondiabetes.ca
DKA and Hyperosmolar Hyperglycemic State
Hyperglycemia

- Describe Diabetic Ketoacidosis (DKA)
- Describe Hyperglycemic Hyperosmolar State (HHS)
- Compare the differences in these two hyperglycemia emergencies and the appropriate treatment
Pathogenesis of Diabetic Ketoacidosis

- Volume depletion, Dehydration
- Osmotic diuresis

Muscle
- Glucose
- Protein
- Amino acids (alanine and others)
- Ketones

Liver
- Glucose
- Glycogen
- GLUCONEOGENESIS
- Ketones
- Metabolic acidosis

Adipose tissue
- Adipose tissue
- FFA
- TRIGLYCERIDES
- GLYCEROL
- Ketones

PGI₂ + PGE₂
- Decreased vascular resistance
- Nausea
- Vomiting
- Abdominal pain
Diabetic Ketoacidosis

Characteristics

- Ketones positive
- Anion Gap > 12 (High)
- Blood Sugar ≥ 14 (High)
- Bicarbonate < 15 (Low)
- PH < 7.3 (Low)
- Sodium Normal or Low
- Potassium Normal, Low, High

Pregnant women in DKA present with lower glucose levels than non-pregnant women

Monitor every 2 hours until fluid and acidosis is corrected (electrolytes, creatinine, osmolality, fluid balance, glucose)

SGLT2 use
Diabetic Ketoacidosis

Characteristics/ Symptoms

• Quick Less 24 hours
• Polyuria, polyphagia, polydipsia
• Kussmaul respiration
• Nausea and Vomiting
• Tachycardia
• Hypotension
• Leg cramps
• Abdominal pain
• Decreased Extracellular volume (ECFV)
• Weakness, weight loss
• Physical symptoms of dehydration
Diabetic Ketoacidosis

Causes

- Newly Diagnosed Type 1
- Insulin Omission
- Infection
- MI
- Trauma
- Cardiac Surgery
- Eating Disorders (20% recurrent)
- Pump Failure
- Thyrotoxicosis
- Cocaine, atypical antipsychotics, interferon
- Flu
Hyperosmolar Hyperglycemic State (HHS)

Characteristics

- Dehydration, Marked Decreased Extracellular volume
- Blood Sugar >33
- Osmolatity > 350
- PH > 7.2
- Bicarb >20
- Ketones +/-

Can have neurologic presentation, seizures and stroke like symptoms
Symptoms

- Dry Mouth
- Poor Urine Output
- Sleepy coma
- Stupor
- Increased BUN, Cr
Causes

• Infection 40-60%
• Decreased Fluid intake
• Drugs-glucocorticoids, thiazides, lithium and atypical antipsychotics
• Elderly, chronic care
• Following cardiac surgery
• Illness
**Tests**

Glucose
Electrolytes and anion gap
Creatinine
Osmolality
Blood gases
Serum and urine ketone
  - Beta-hydroxbutyric acid (78%)
  - Acetoacetate (20 %)
  - Acetone( 2%)
Fluid balance

Monitor
Level of consciousness
Precipitating factors
<table>
<thead>
<tr>
<th></th>
<th>DKA</th>
<th>HHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Sugar</td>
<td>&gt; 14</td>
<td>&gt;34</td>
</tr>
<tr>
<td>Ketones</td>
<td>Positive</td>
<td>+ / -</td>
</tr>
<tr>
<td>Osmolality</td>
<td>Normal</td>
<td>&gt; 350</td>
</tr>
<tr>
<td>PH</td>
<td>&lt; 7.3</td>
<td>&gt; 7.2 (normal)</td>
</tr>
<tr>
<td>Anion gap</td>
<td>increased</td>
<td>normal</td>
</tr>
<tr>
<td>Presentation</td>
<td>Rapid</td>
<td>Slower</td>
</tr>
<tr>
<td>Characteristics</td>
<td>Weight Loss</td>
<td>Illness</td>
</tr>
<tr>
<td></td>
<td>Vomiting</td>
<td>Dehydration</td>
</tr>
<tr>
<td></td>
<td>Abdominal pain</td>
<td>Stupor</td>
</tr>
<tr>
<td>Treatment</td>
<td>Insulin (0.1u/kg/h)</td>
<td>Hydration</td>
</tr>
<tr>
<td></td>
<td>Hydration</td>
<td>Insulin</td>
</tr>
<tr>
<td>Mortality</td>
<td>&lt; 1 % (age 20-49)</td>
<td>12-17 %</td>
</tr>
<tr>
<td></td>
<td>16% (over 75)</td>
<td></td>
</tr>
<tr>
<td>Incidence</td>
<td>4-9 %</td>
<td>&lt; 1 %</td>
</tr>
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*hospital admissions US*
## Treatment

<table>
<thead>
<tr>
<th>DKA</th>
<th>HHS</th>
</tr>
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<tbody>
<tr>
<td><strong>Fluid resuscitation</strong></td>
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</tr>
<tr>
<td>Avoid Hypokalemia</td>
<td>• K</td>
</tr>
<tr>
<td>Insulin</td>
<td>• Bicarb</td>
</tr>
<tr>
<td>Avoid rapidly falling serum osmolality</td>
<td>• Electrolytes</td>
</tr>
<tr>
<td>Causes</td>
<td>Avoid Hypokalemia</td>
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<td>Causes</td>
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<tr>
<td></td>
<td>Insulin</td>
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**Concerns:** Cerebral Edema if hyperosmolality is reduced quickly (only 3 mmol/kg/hr)
Wendy’s attempt to simplify Diabetic Ketoacidosis

- Increased gluconeogenesis
- Increased glycogenolysis
- Decreased glucose utilization by liver, muscle, fat

Insulin Deficiency

Type 1
- Glucagon is increased

Type 2
- Increased catecholamines
- Suppresses insulin release

Hyperglycemia

Ketones

Acidosis

Urinary Water Loss (Na, K, Cl)

Extracellular Fluid Volume depletion

Wendy’s attempt to simplify
Insulin is still present but inadequate to control blood glucose, but adequate to prevent formation of ketones.
Judy was brought to hospital by her husband. She has been weak and sleepy for the last 24 hours. She is now complaining of abdominal pain.

What blood tests would you look at to determine if this is DKA or HHS?

a) Blood Glucose, anion gap, urine ketones, bicarbonate
b) Ethanol, salicylate, acetaminophen
c) Insulin levels, blood ketones
d) Blood glucose, anion gap, blood ketones, pH, bicarbonate
Case Study

Judy was brought to hospital by her husband. She has been weak and sleepy for the last 24 hours. She is now complaining of abdominal pain.

What blood tests would you look at to determine if this is DKA or HHS?

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