Diabetes and Pregnancy

CDE Exam Preparation

April 2019

Presented by Wendy Graham RD CDE

Mentor

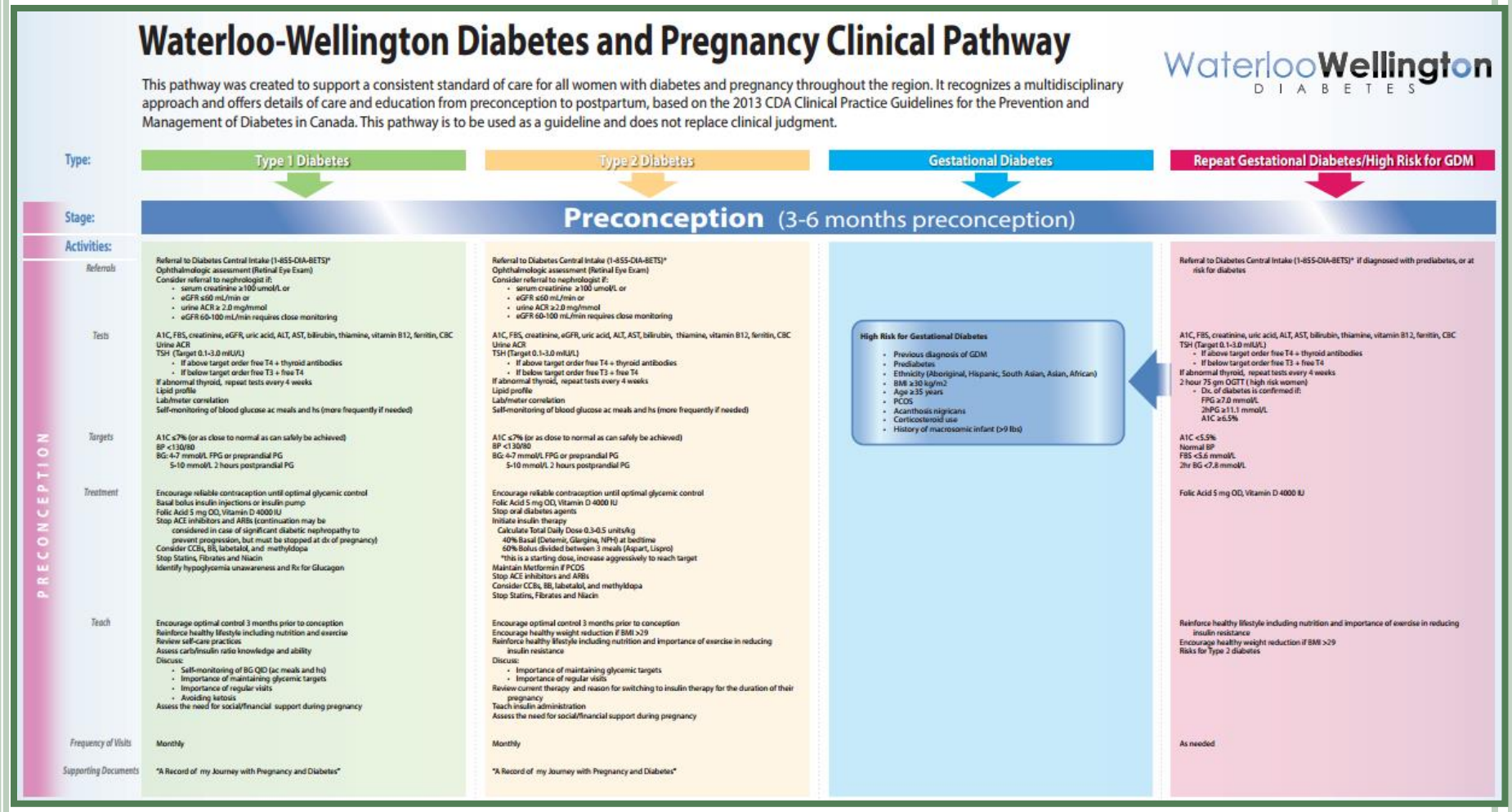
OBJECTIVES

- 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

Clinical Practice Guidelines 2018
CDE Competencies 2018

Guidelines.diabetes.ca

WATERLOO WELLINGTON DIABETES PATHWAY



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.

WaterlooWellington DIABETES

Type: Type 1 Diabetes | Type 2 Diabetes | Gestational Diabetes | Repeat Gestational Diabetes/High Risk for GDM

Stage: Preconception (3-6 months preconception)

Activities:

PRECONCEPTION

Referrals

Type 1 Diabetes
Referral to Diabetes Central Intake (1-855-DIA-BETS)*
Ophthalmologic assessment (Retinal Eye Exam)
Consider referral to nephrologist if:
- serum creatinine ≥100 umol/L or
- eGFR ≤60 mL/min or
- urine ACR ≥ 2.0 mg/mmol
- eGFR 60-100 mL/min requires close monitoring

Type 2 Diabetes
Referral to Diabetes Central Intake (1-855-DIA-BETS)*
Ophthalmologic assessment (Retinal Eye Exam)
Consider referral to nephrologist if:
- serum creatinine ≥100 umol/L or
- eGFR ≤60 mL/min or
- urine ACR ≥2.0 mg/mmol
- eGFR 60-100 mL/min requires close monitoring

Gestational Diabetes
High Risk for Gestational Diabetes
- Previous diagnosis of GDM
- Prediabetes
- Ethnicity (Aboriginal, Hispanic, South Asian, Asian, African)
- BMI ≥30 kg/m2
- Age ≥35 years
- PCOS
- Acanthosis nigricans
- Corticosteroid use
- History of macrosomic infant (>9 lbs)

Repeat Gestational Diabetes/High Risk for GDM
Referral to Diabetes Central Intake (1-855-DIA-BETS)* if diagnosed with prediabetes, or at risk for diabetes

Tests

Type 1 Diabetes
A1C, FBS, creatinine, eGFR, uric acid, ALT, AST, bilirubin, thiamine, vitamin B12, ferritin, CBC
Urine ACR
TSH (Target 0.1-3.0 mIU/L)
- If above target order free T4 + thyroid antibodies
- If below target order free T3 + free T4

If abnormal thyroid, repeat tests every 4 weeks
Lipid profile
Lab/meter correlation
Self-monitoring of blood glucose ac meals and hs (more frequently if needed)

Type 2 Diabetes
A1C, FBS, creatinine, eGFR, uric acid, ALT, AST, bilirubin, thiamine, vitamin B12, ferritin, CBC
Urine ACR
TSH (Target 0.1-3.0 mIU/L)
- If above target order free T4 + thyroid antibodies
- If below target order free T3 + free T4

If abnormal thyroid, repeat tests every 4 weeks
Lipid profile
Lab/meter correlation
Self-monitoring of blood glucose ac meals and hs (more frequently if needed)

Repeat Gestational Diabetes/High Risk for GDM
A1C, FBS, creatinine, uric acid, ALT, AST, bilirubin, thiamine, vitamin B12, ferritin, CBC
TSH (Target 0.1-3.0 mIU/L)
- If above target order free T4 + thyroid antibodies
- If below target order free T3 + free T4

If abnormal thyroid, repeat tests every 4 weeks
2 hour 75 gm OGTT (high risk women)
- Dx. of diabetes is confirmed if:
  FPG ≥7.0 mmol/L
  2hPG ≥11.1 mmol/L
  A1C ≥6.5%

Targets

Type 1 Diabetes
A1C ≤7% (or as close to normal as can safely be achieved)
BP <130/80
BG: 4-7 mmol/L FPG or preprandial PG
5-10 mmol/L 2 hours postprandial PG

Type 2 Diabetes
A1C ≤7% (or as close to normal as can safely be achieved)
BP <130/80
BG: 4-7 mmol/L FPG or preprandial PG
5-10 mmol/L 2 hours postprandial PG

Repeat Gestational Diabetes/High Risk for GDM
A1C <5.9%
Normal BP
FBS <5.6 mmol/L
2hr BG <7.8 mmol/L

Treatment

Type 1 Diabetes
Encourage reliable contraception until optimal glycemic control
Basal bolus insulin injections or insulin pump
Folic Acid 5 mg OD, Vitamin D 4000 IU
Stop ACE inhibitors and ARBs (continuation may be considered in case of significant diabetic nephropathy to prevent progression, but must be stopped at dx of pregnancy)
Consider CCBs, BB, labetalol, and methyldopa
Stop Statins, Fibrates and Niacin
Identify hypoglycemia unawareness and Rx for Glucagon

Type 2 Diabetes
Encourage reliable contraception until optimal glycemic control
Folic Acid 5 mg OD, Vitamin D 4000 IU
Stop oral diabetes agents
Initiate insulin therapy
Calculate Total Daily Dose 0.3-0.5 units/kg
40% Basal (Determir, Glargine, NPH) at bedtime
60% Bolus divided between 3 meals (Aspart, Lispro)
*this is a starting dose, increase aggressively to reach target
Maintain Metformin if PCOS
Stop ACE inhibitors and ARBs
Consider CCBs, BB, labetalol, and methyldopa
Stop Statins, Fibrates and Niacin

Repeat Gestational Diabetes/High Risk for GDM
Folic Acid 5 mg OD, Vitamin D 4000 IU

Teach

Type 1 Diabetes
Encourage optimal control 3 months prior to conception
Reinforce healthy lifestyle including nutrition and exercise
Review self-care practices
Assess carb/insulin ratio knowledge and ability
Discuss:
- Self-monitoring of BG QID (ac meals and hs)
- Importance of maintaining glycemic targets
- Importance of regular visits
- Avoiding ketosis

Assess the need for social/financial support during pregnancy

Type 2 Diabetes
Encourage optimal control 3 months prior to conception
Encourage healthy weight reduction if BMI >29
Reinforce healthy lifestyle including nutrition and importance of exercise in reducing insulin resistance
Discuss:
- Importance of maintaining glycemic targets
- Importance of regular visits

Review current therapy and reason for switching to insulin therapy for the duration of their pregnancy
Teach insulin administration
Assess the need for social/financial support during pregnancy

Repeat Gestational Diabetes/High Risk for GDM
Reinforce healthy lifestyle including nutrition and importance of exercise in reducing insulin resistance
Encourage healthy weight reduction if BMI >29
Risks for Type 2 diabetes

Frequency of Visits

Type 1 Diabetes Monthly

Type 2 Diabetes Monthly

Repeat Gestational Diabetes/High Risk for GDM As needed

Supporting Documents

Type 1 Diabetes "A Record of my Journey with Pregnancy and Diabetes"

Type 2 Diabetes "A Record of my Journey with Pregnancy and Diabetes"

Items that are “Good to Know” for the exam.

TARGET BLOOD GLUCOSE

Testing Times	Target
Fasting	< 5.3
One hour after meal	< 7.8
Two hour after meal	< 6.7

2018 Clinical Practice Guidelines

TARGET A1C

Preconception	< 7.0 or below if safe
Pregnancy	≤ 6.5
	≤ 6.1 if safe

TARGET BLOOD GLUCOSE

During Labour	4 -7 mmol/L

2018 Clinical Practice Guidelines

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 (ie. >9 lbs)

Gestational Diabetes : Screening and Diagnosis

Two Methods in the Clinical Practice Guidelines

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

Gestational Diabetes: 1 Step

Screening

24 to 28 weeks
75 g oral glucose tolerance test

FBS ≥ 5.1
1 hr ≥ 10.0
2 hr ≥ 8.5

Preferred method recommended in Waterloo Wellington

Gestational Diabetes: 2 Step

24 to 28 weeks

50 g oral glucose tolerance test

GTK

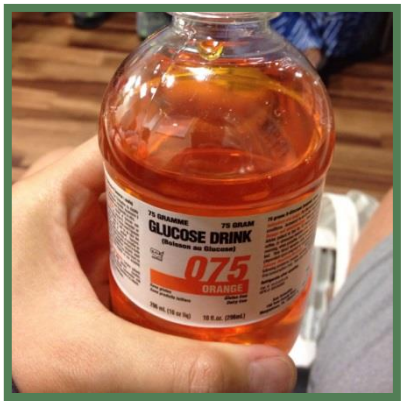
Screening

1 hr pc 7.8 - 11.0

1 hr > 11.0
GDM

Follow by 75 g glucose tolerance test

FBS ≥ 5.3
1 hr ≥ 10.6
2 hr ≥ 9.0

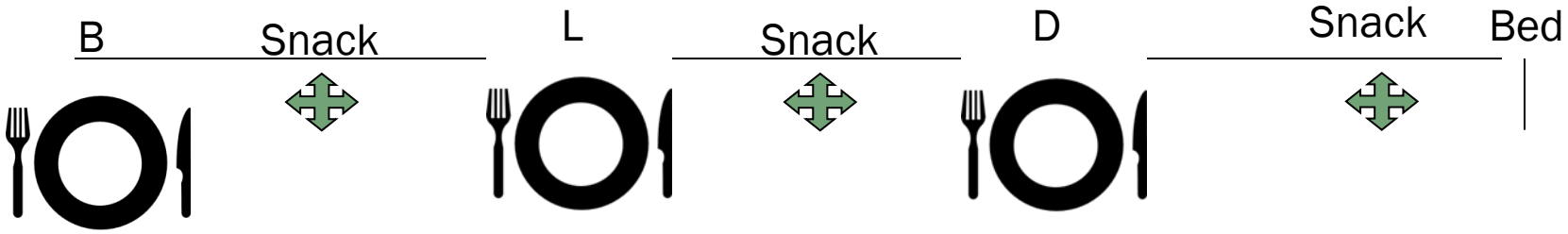


Gestational Diabetes: treatment

- 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

Testing Times	Target
Fasting	< 5.3
One hour after meal	< 7.8
Two hour after meal	< 6.7

Gestational diabetes: Exercise

Walking after meals

Gestational diabetes: Medication

Insulin – 1st choice

- No upper limit
- Safe

Oral Medications

- Metformin 2nd choice
- 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 ≤7% ; ≤ 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 eg. labatolol/aldomet

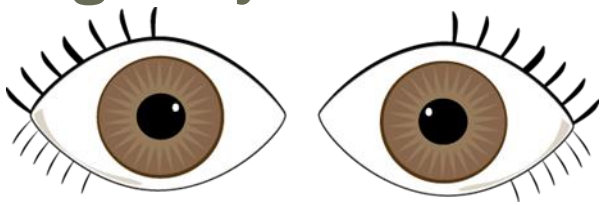
PRECONCEPTION CARE: TYPE 1 & TYPE 2

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

2nd 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

3rd 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

1st Trimester

- Monitoring and initiation of Insulin
- Discontinuation of oral medications
  - ACE, ARB, statins

2nd Trimester

- Insulin requirements will increase
- Frequent monitoring and insulin adjustment
- Monitoring of blood pressure
- Fetal monitoring
- Start ASA 81 mg

3rd 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

Testing Times	Target
Fasting	< 5.3
One hour after meal	< 7.8
Two hour after meal	< 6.7

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
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

c) 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

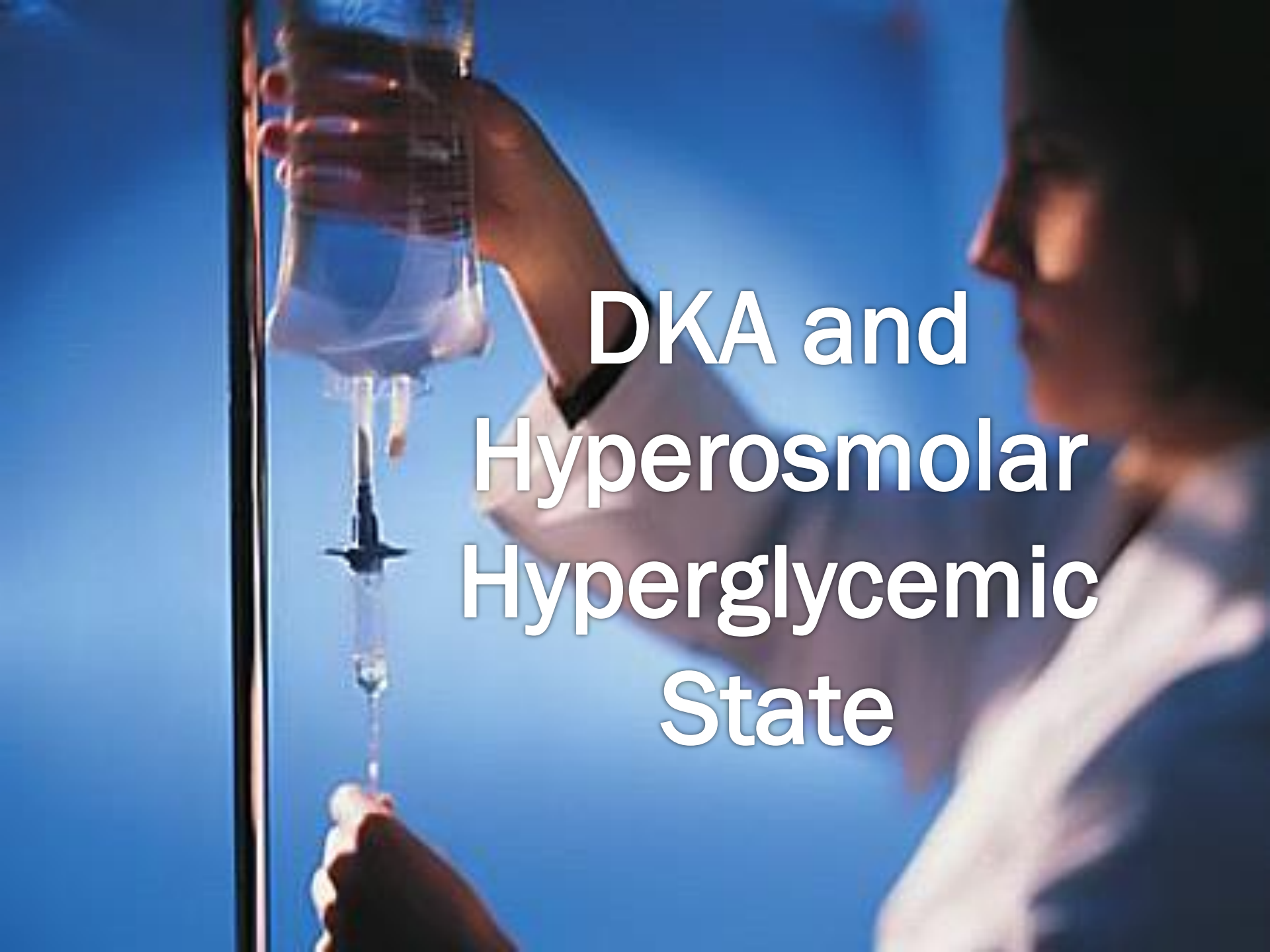
The recommended amount of folic acid for a woman with type 1 diabetes who is trying to conceive is:

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

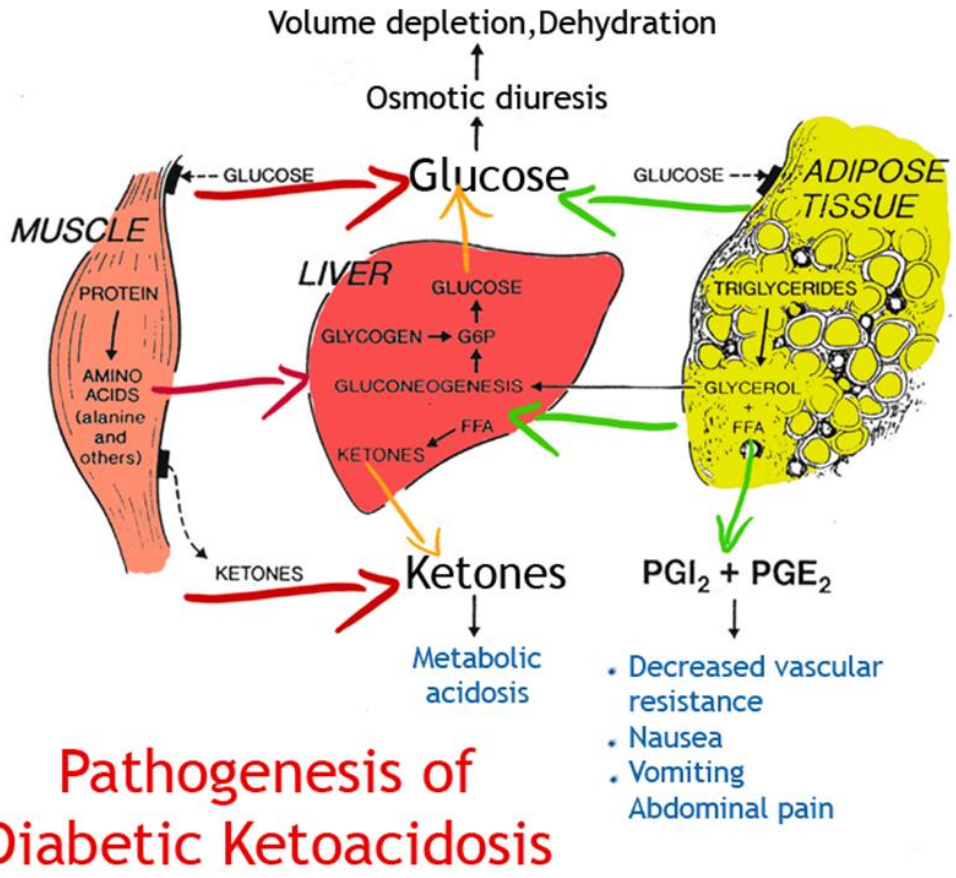


DKA and Hyperosmolar Hyperglycemic State

Hyperglycemia

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

DKA


Volume depletion,Dehydration
Osmotic diuresis
Glucose
GLUCOSE
GLUCOSE
MUSCLE
PROTEIN
AMINO ACIDS (alanine and others)
LIVER
GLUCOSE
GLYCOGEN → G6P
GLUCONEOGENESIS
FFA
KETONES
ADIPOSE TISSUE
TRIGLYCERIDES
GLYCEROL + FFA
KETONES
Ketones
$PGI_2 + PGE_2$
Metabolic acidosis
Decreased vascular resistance
Nausea
Vomiting
Abdominal pain
Pathogenesis of Diabetic Ketoacidosis

Diabetic Ketoacidosis

GTK

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

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

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

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

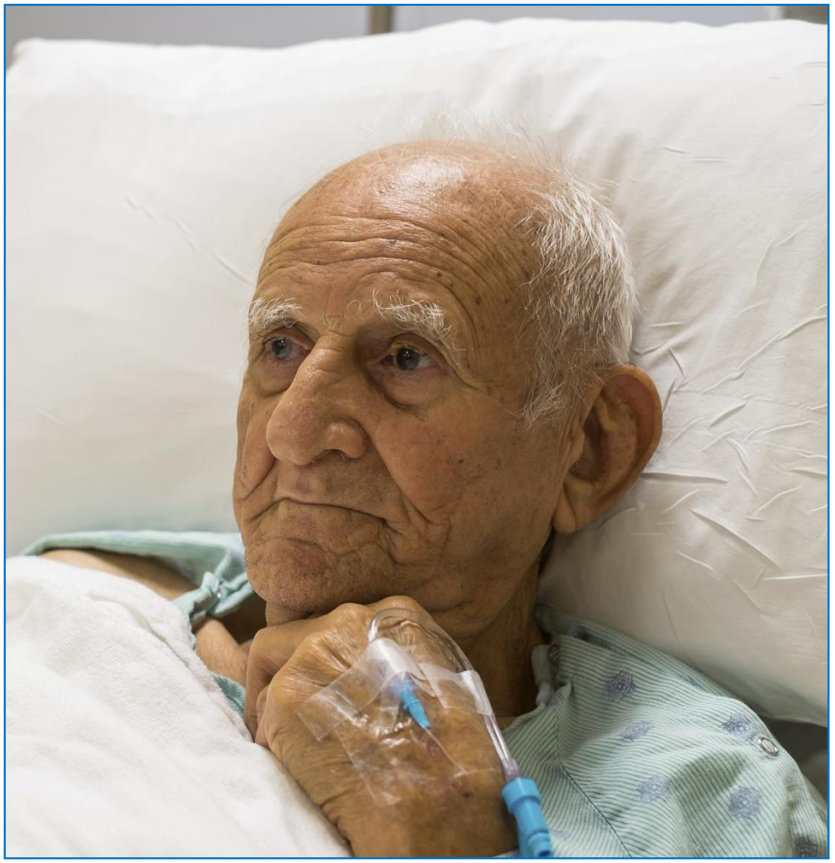
- Dehydration, Marked Decreased Extracellular volume
- Blood Sugar >33
- Osmolatity > 350
- PH > 7.2
- Bicarb >20
- Ketones +/-

Can have neurologic presentation, seizures and stroke like symptoms

HHS

Symptoms

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



HHS

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

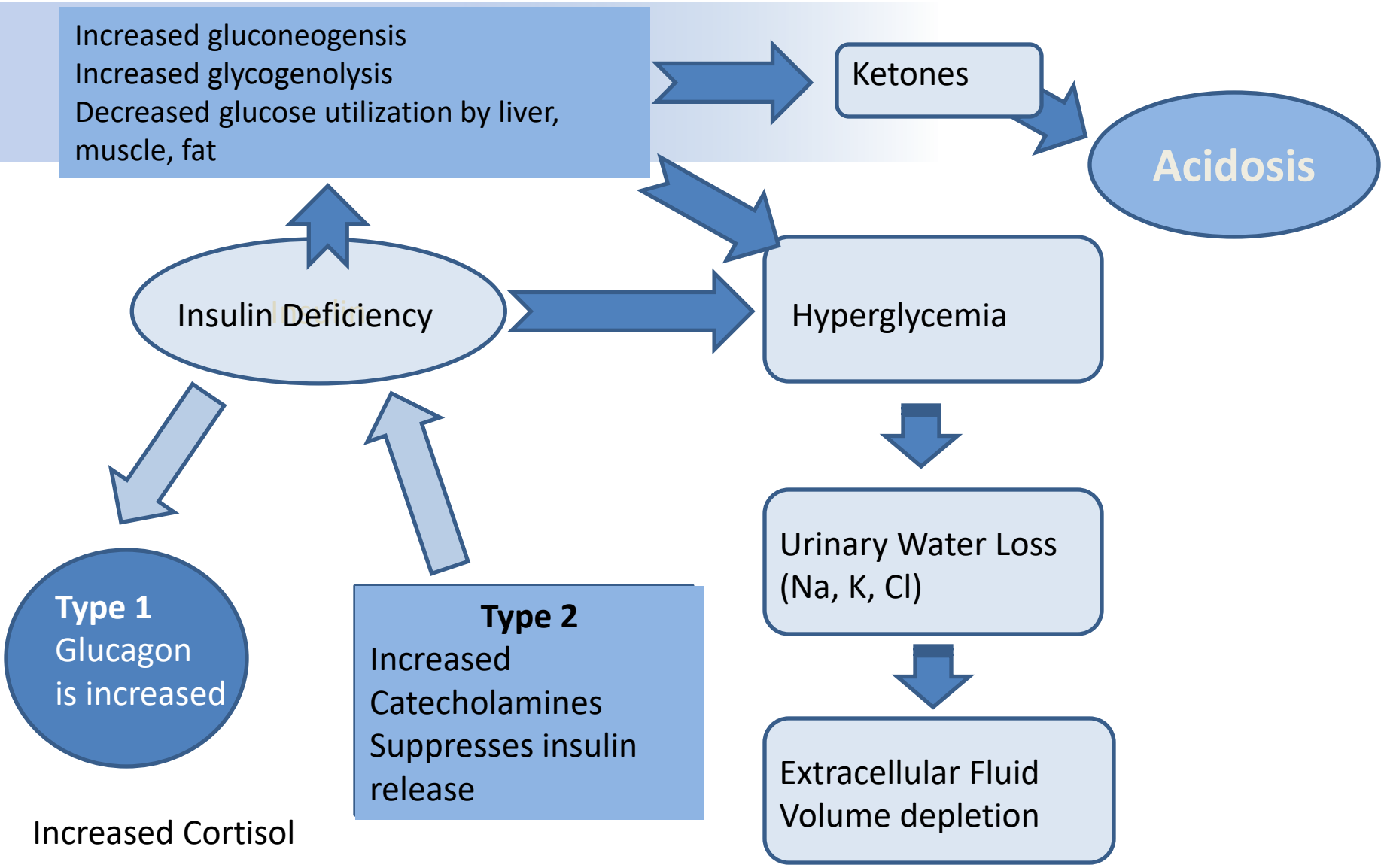
Precipitating factors

	DKA	HHS
Blood Sugar	> 14	>34
Ketones	Positive	+ / -
Osmolality	Normal	> 350
PH	< 7.3	> 7.2 (normal)
Anion gap	increased	normal
Presentation	Rapid	Slower
Characteristics	Weight Loss Vomiting Abdominal pain	Illness Dehydration Stupor
Treatment	Insulin (0.1u/kg/h) Hydration	Hydration Insulin
Mortality	< 1 % (age 20- 49) 16% (over 75)	12- 17 %
Incidence hospital admissions US	4-9 %	< 1 %

Treatment

DKA	HHS
Fluid resuscitation Avoid Hypokalemia Insulin Avoid rapidly falling serum osmolality Causes	Fluid resuscitation • K • Bicarb • Electrolytes Avoid Hypokalemia Avoid rapidly falling serum osmolality Causes Insulin

Concerns: Cerebral Edema if hyperosmolality is reduced quickly(only 3 mmol/kg/hr)

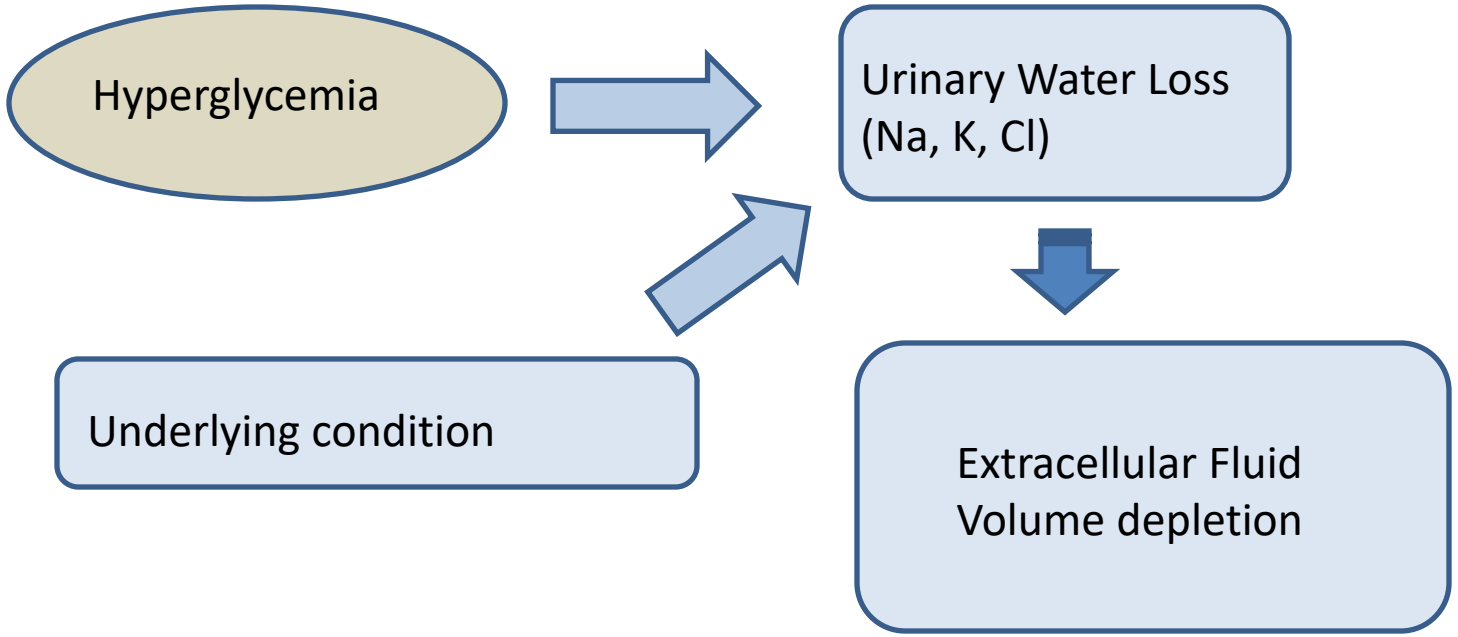


Wendy's attempt to simplify

Diabetic Ketoacidosis

Wendy's attempt to simplify

Hyperosmolar Coma



Insulin is still present but inadequate to control blood glucose, but adequate to prevent formation of ketones.

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?

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

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Questions

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