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Diabetes Education for the CDU APN

2016

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Diabetes: Classification

1. **Type I Diabetes**: abrupt onset, due to beta-cell destruction, usually leading to absolute insulin deficiency
2. **Type II Diabetes**: due to a progressive defect in insulin secretion as well as insulin resistance and unrestrained hepatic glucose production
3. **Specific types due to other causes**: genetic defects in beta-cell function or insulin action, diseases of the pancreas such as cystic fibrosis, and drug/chemical induced such as tx of HIV/AIDS, COPD or after organ transplant
4. **Gestational diabetes (GDM):** diagnosed during pregnancy that is not clearly overt diabetes

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Diagnosis

1. HgA1C >6.5%

   (5.7-6.4% = prediabetes)

1. Fasting plasma glucose (FBG) >126
2. Two-hour plasma glucose >200 during an oral glucose tolerance test (OGTT)
3. “Classic symptoms” of hyperglycemia or hyperglycemic crisis with random plasma glucose >200

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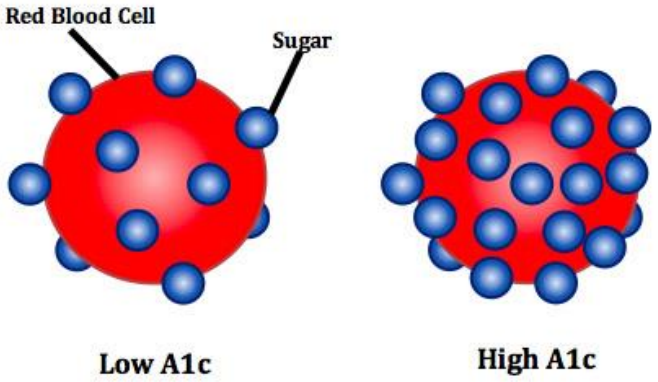
HgA1C

- Average plasma glucose concentration over prolonged periods of time
- 60-90 days
- Normal 4.0-5.7
- Goal is < 7.0
- Gestational goal < 6.0
- Affected by blood transfusions



HgA1C	5	6	7	8	9	10	11	12	13	14
Estimated Average Blood Sugar	97	126	154	183	212	249	269	298	326	355

Treatment: Oral Medications

- Use oral meds caution in the inpatient
  - Changing renal function and potential use of contrast dye are contraindications to glucophage (metformin) use- angiogram, CT
  - Changes in diet and caloric intake can lead to an increase in hypoglycemic episodes when sulfonylureas are used- NPO, TPN, TF
  - Oral medications may need to be held while in the hospital. Notify the provider if patient is NPO or has elevated creatinine.

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GLYCEMIC CONTROL ALGORITHM

LIFESTYLE THERAPY
(Including Medically Assisted Weight Loss)

Entry A1C < 7.5%

MONOTHERAPY*

- ✓ Metformin
- ✓ GLP-1 RA
- ✓ SGLT-2i
- ✓ DPP-4i
- ! TZD
- ✓ AGi
- ! SU/GLN

If not at goal in 3 months proceed to Dual Therapy

Entry A1C ≥ 7.5%

DUAL THERAPY*

MET or other 1st-line agent +

- ✓ GLP-1 RA
- ✓ SGLT-2i
- ✓ DPP-4i
- ! TZD
- ! Basal Insulin
- ✓ Colesevelam
- ✓ Bromocriptine QR
- ✓ AGi
- ! SU/GLN

If not at goal in 3 months proceed to Triple Therapy

TRIPLE THERAPY*

MET or other 1st-line agent + 2nd-line agent +

- ✓ GLP-1 RA
- ✓ SGLT-2i
- ! TZD
- ! Basal insulin
- ✓ DPP-4i
- ✓ Colesevelam
- ✓ Bromocriptine QR
- ✓ AGi
- ! SU/GLN

If not at goal in 3 months proceed to or intensify insulin therapy

Entry A1C > 9.0%

SYMPTOMS

NO	YES
DUAL Therapy OR TRIPLE Therapy	INSULIN ± Other Agents

ADD OR INTENSIFY INSULIN

Refer to Insulin Algorithm

LEGEND

- ✓ Few adverse events and/or possible benefits
- ! Use with caution

* Order of medications represents a suggested hierarchy of usage; length of line reflects strength of recommendation

PROGRESSION OF DISEASE

Common Oral Antidiabetics

Oral Class/ Main Action	Names(s)	Daily Dose Range	Considerations
Biguanides *Decrease hepatic glucose output. ADA recommends start at diagnosis of type II.*	Metformin (Glucophage)	500-2500mg (usually BID with meal)	Do not start if GFR <45. Okay to continue if GFR is >30, STOP if <30. Take caution if, CHF on meds, >80 yrs, binge drinker, liver dz, during IV dye study, illness. Side effects: nausea, B12 deficiency, bloating, diarrhea, Take with meals. Peak steady state 24-48 hours. Lowers A1C 1-2%. FREE at Meijer- otherwise $4
	Entended Releaase-XR (Glucophage XR, Glumetza, Fortamet)	500-2000mg, 500-2000mg, 500-2500 mg (1x daily with dinner)	
Sulfonylureas *Stimulates sustained insulin release*	Glyburide (Micronase, Diabeta) (Glynase)	1.25-20mg, 0.75-12 mg, 0.75-12mg	Can take once or twice daily. Side effects: hypoglycemia (more with glyburide) & weight gain. Eliminated via kidney. Caution in creat > 2. Do not take with bile acid sequestrants. Lowers A1C 1-2% $4
	Glipizide (Glucotrol, Glucotrol XL)	2.5-40mg 2.5-20mg (Take Glucotrol on an empty stomach. Take Glucotrol XL with 1st meal.)	
	Glimeperide (Amaryl)	1-8mg (safest for cards)	
DPP- 4 Inhibitors *"Incretin Enhancers" Prolongs action of gut hormones = increased insulin secretion, delayed gastric empyting*	Sitagliptin (Januvia)	100mg daily (eliminated via kidney) *CrCl 30 to <50 mL/min, approx cr. >1.7 in men and >1.5 in women, 50 mg daily.* *CrCl <30 mL/min, approx cr. >3.0 mg/dL in men and >2.5 in women) or with ESRD requiring HD or PD, 25 mg once daily.*	Needs renal dosing if creatinine elevated. No wt gain or hypoglycemia. Side effects: nasopharyngitis, HA, URI. Report signs of pancreatitis. $$ Lowers A1C 0.6-0.8%
	Saxagliptin (Onglyza)	Up to 5mg daily (2.5mg for renal patients- elimnated via kidney & feces)	
	Linagliptin (Tradjenta)	5mg daily (eliminated via feces)	
	Alogliptin (Nesina)	25mg once daily (eliminated via kidney)	

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Treatment: Insulin

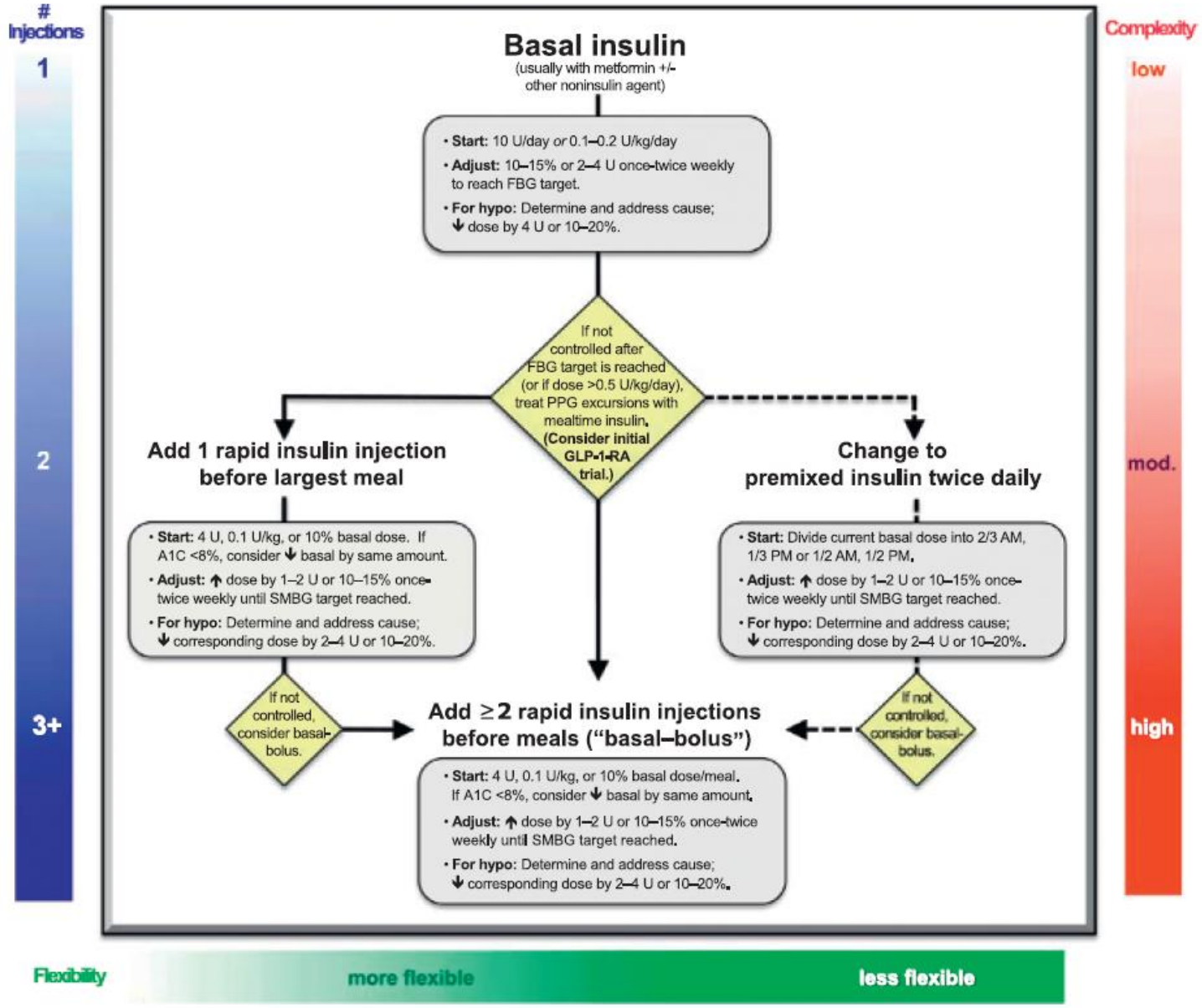
Insulin Therapy Name	Administration	Onset, Peak	Duration	Considerations
Rapid Acting				
Lispro Humalog **Aspart** Novolog **Glulisine** Apidra	Usually given 2-4 times/day **To be given no more than 15 minutes before meal**	Onset 5 – 15 minutes Peaks 30-90 minutes after administration	<5 hours	Do not give unless pt is ready to eat immediately after administration ***Do not give IV.*** Used in insulin pumps
Short Acting				
Regular Humulin R Novolin R	Usually given 2 times/day Give 30 minutes before meals	30-60 minutes onset 2-3 hr peak	5-8 hours	May be given IV When mixing, draw up Regular insulin first
Combination Effect				
Intermediate + Rapid 70/30 50/50 75/25 **Intermediate + Short** 50/50 70/30	Mixtures of NPH & Humalog/ Novolog Usually given 2 times/day Mixtures of NPH & Regular Usually given 2 times/day	5-15 minute onset Dual Peaks 30-60 minute onset Dual Peaks	10-16 hours 10-16 hours	Numbers in name give percentage of insulin (70% NPH, etc.) Cloudy appearance Give before meals

NPH, 70/30 and Regular insulin are $25/vial from Wal-Mart only (Relion brand)

Treatment: Insulin

Insulin Therapy Name	Administration	Onset, Peak	Duration	Considerations
Intermediate Acting				
NPH Humulin N Novolin N	Usually given 1-2 times/day (Can be prescribed 3 times/day, before meals)	2-4 hour onset 4-10 hour peak	10-16 hr	Cloudy When mixing, draw up Regular followed by NPH
Long Acting insulin				
Glargine Lantus **Detemir** Levemir, Basiglar **Tresiba, Toujeo**	Given 1-2 times/day Both are usually given daily at Bedtime **In general, this basal insulin is never held.** If patient is NPO, dose continues or is decreased.	Onset 2-4 hours No Peak Onset 3-8 Hours No Peak Provides constant concentration over 24 hr	20-24 hours 6-24 hours	Watch for hypoglycemia at any time May cause irritation at injection site (Lantus) **DO NOT mix with other insulin**
Humulin R Unit-500				
	Given 1-4 times per day To be given no more than 30 minutes before meal	Onset 30-60 minutes Peak 2-3 hours	5-8 hours	For patients requiring >200 units of insulin/day Divide prescribed dose (actual units of Humulin R U-500) by 5 = unit markings on a U-100 syringe Drawn up by pharmacy

Insulin Initiation Recommendations



ADA 2016 Standards of Care

Case Study: Humulin R U-500

You are admitting a patient from the ED. He has a BMI of 35.8. He is a type 2 diabetic. You are doing his medication rec. He tells you he takes U-500 insulin 25 units TID. He has orders for U-500 25 units TID. You are concerned because;

a. The TDD is 75 units which is not typical for U-500
b. You think that the patient may mean he draws up U-500 in an insulin syringe to the 25 unit mark which means he actually is taking 125 units TID
c. You are concerned that he will eat less on a carb restricted diet in the hospital than he does at home and will become hypoglycemic
d. a and b
e. All of the above

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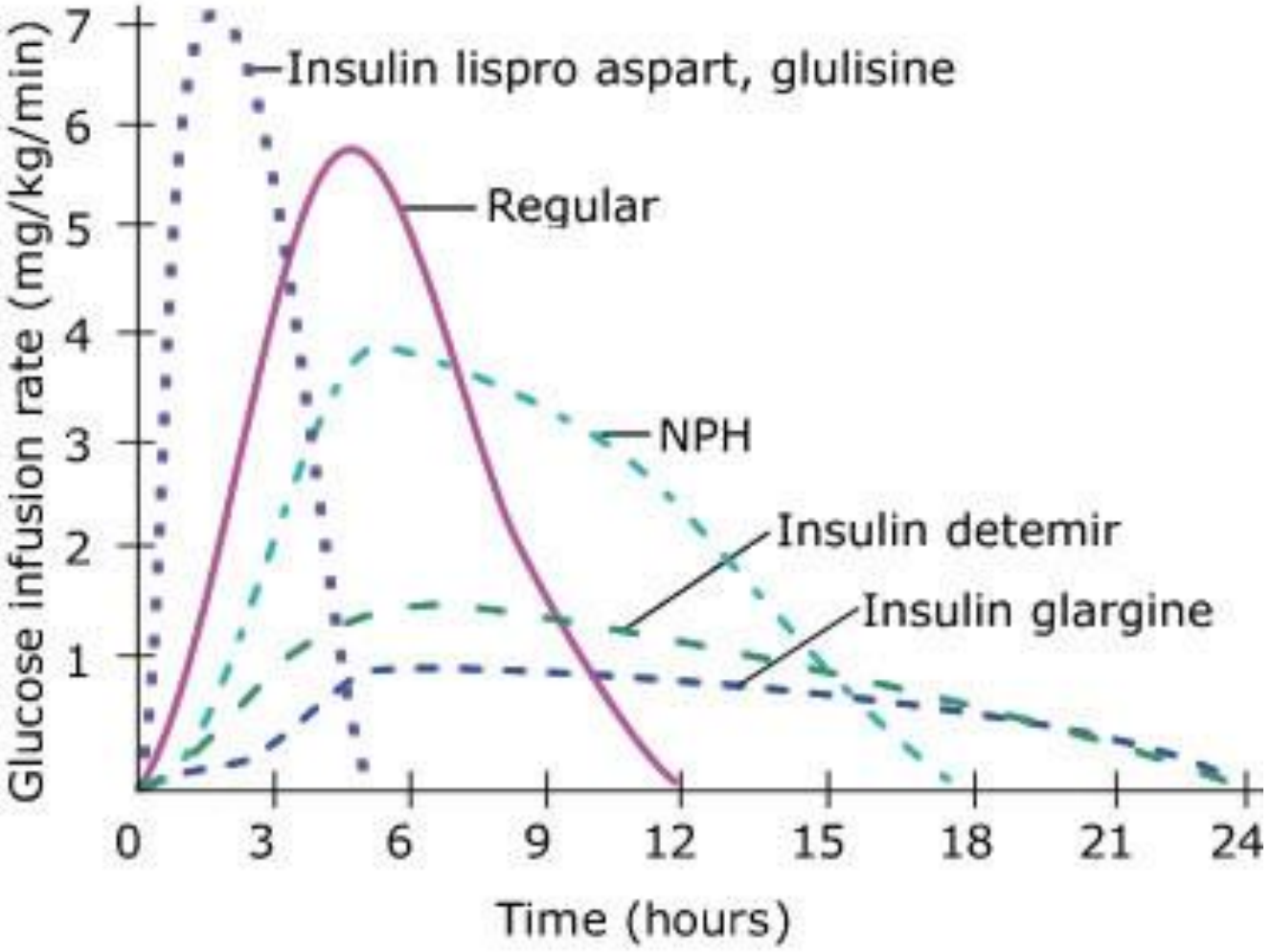
Activity Profiles of Different Types of Insulin



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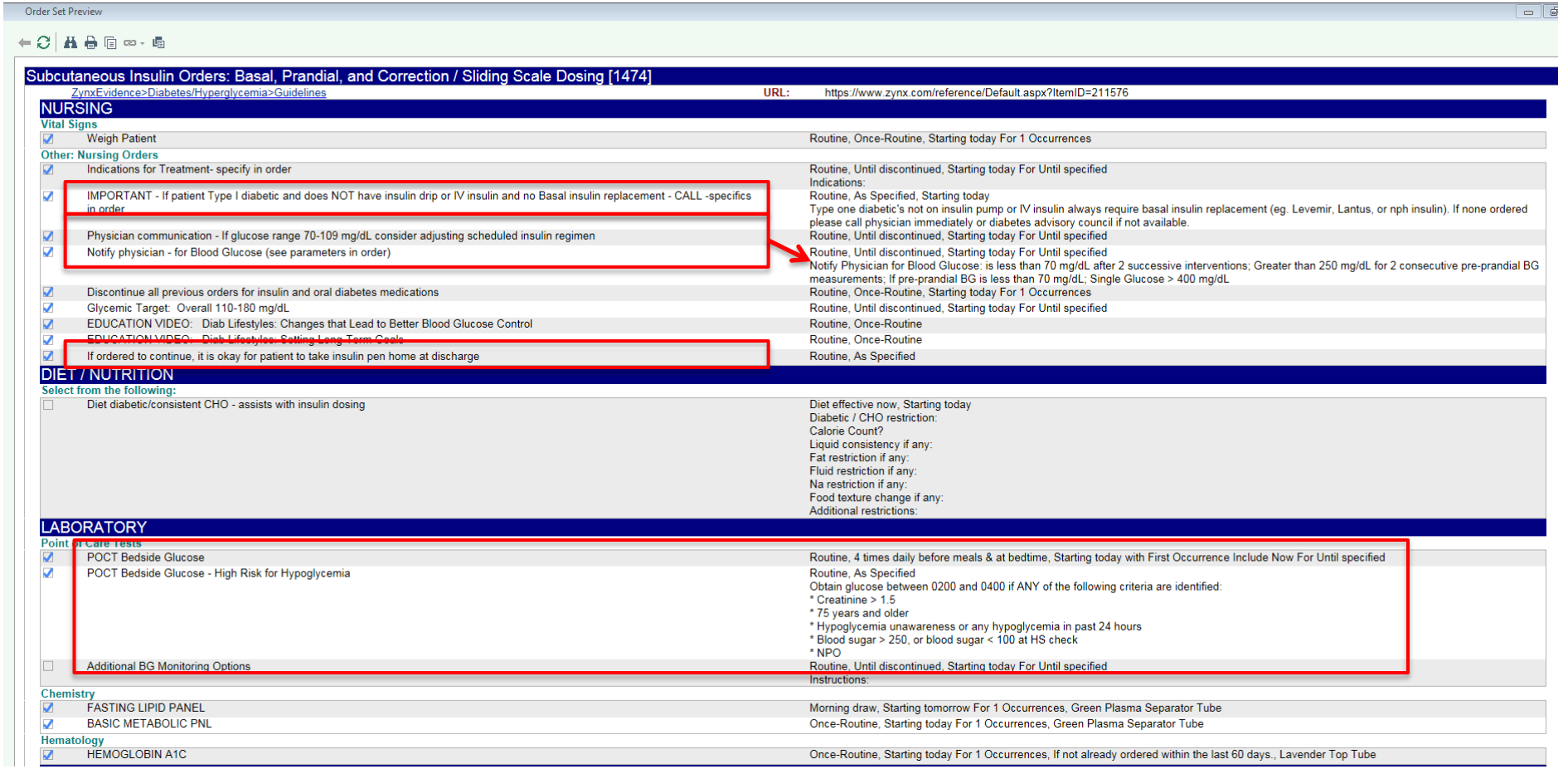
Basal Bolus Orderset



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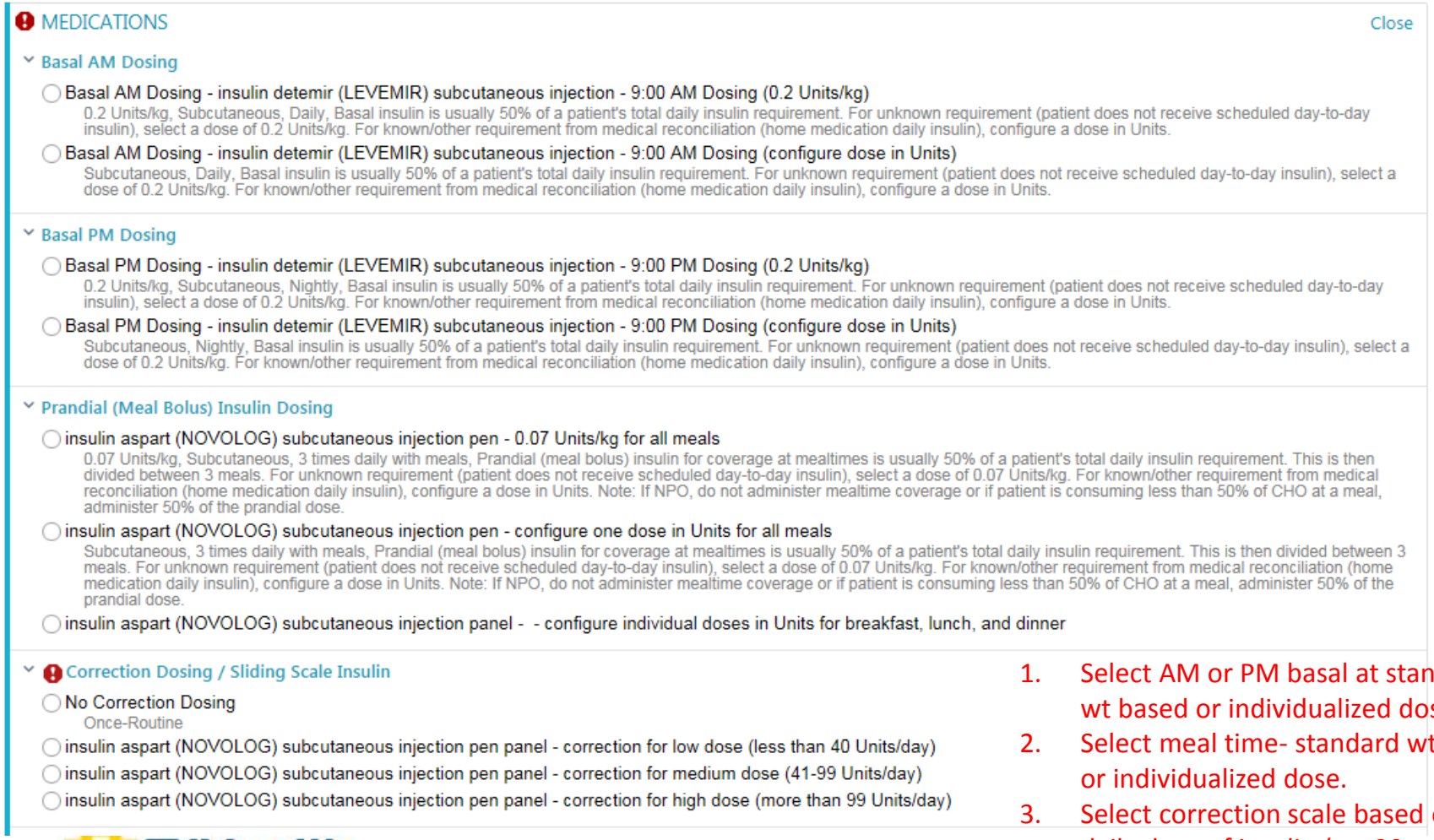
Basal Bolus Orderset



1. Select AM or PM basal at standard wt based or individualized dose
2. Select meal time- standard wt based or individualized dose.
3. Select correction scale based on total daily dose of insulin (ex: 30 units of basal + 30 units novolog = moderate scale)

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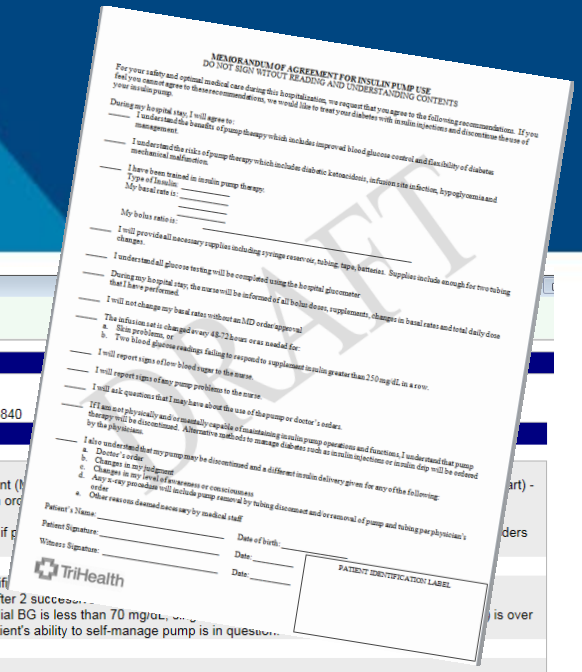
Insulin Pump Orderset


MEMORANDUM OF AGREEMENT FOR INSULIN PUMP USE
DO NOT SIGN WITHOUT READING AND UNDERSTANDING CONTENTS

For your safety and optimal medical care during this hospitalization, we request that you agree to the following recommendations. If you feel you cannot agree to these recommendations, we would like to treat your diabetes with insulin injections and discontinue the use of your insulin pump.

During my hospital stay, I will agree to:

_____ I understand the benefits of pump therapy which include improved blood glucose control and flexibility of diabetes management.

_____ I understand the risks of pump therapy which includes diabetic ketoacidosis, infusion site infection, hyperglycemia and mechanical malfunction.

_____ I have been trained in insulin pump therapy.
Type of Insulin:
My basal rate is:
My bolus ratio is:

_____ I will provide all necessary supplies including syringe reservoir, tubing, tape, batteries. Supplies include enough for two tubing changes.

_____ I understand all glucose testing will be completed using the hospital glucometer

_____ During my hospital stay, the nurse will be informed of all bolus doses, supplements, changes in basal rates and total daily dose that I have performed.

_____ I will not change my basal rates without an MD order/approval

_____ The infusion set is changed every 48-72 hours or as needed for:
a. Skin problems, or
b. Poor blood glucose readings failing to respond to supplement insulin greater than 250 mg/dL in a row.

_____ I will report signs of low blood sugar to the nurse.

_____ I will report signs of any pump problems to the nurse.

_____ I will ask questions that I may have about the use of the pump or doctor's orders.

_____ If I am not physically and/or mentally capable of maintaining insulin pump operations and functions, I understand that pump therapy will be discontinued. Alternative methods to manage diabetes such as insulin injections or insulin drip will be ordered by the physicians.

_____ I also understand that my pump may be discontinued and a different insulin delivery given for any of the following:
a. Doctor's order
b. Changes in my judgment
c. Changes in my level of awareness or consciousness
d. Any x-ray procedure will include pump removal by tubing disconnect and or removal of pump and tubing per physician's order
e. Other reasons deemed necessary by medical staff

Patient's Name: _____ Date of birth: _____
Patient Signature: _____ Date: _____
Witness Signature: _____ Date: _____

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PATIENT IDENTIFICATION LABEL

DRAFT

Order Set Preview

Insulin Pump Orders for Patient Self-Administration [1013]

Current Perspectives on the Use of Continuous Subcutaneous Insulin Infusion in the Acute Care Setting and Overview of Therapy — URL: http://www.ncbi.nlm.nih.gov/pubmed/15137359
Use of Continuous Subcutaneous Insulin Infusion (Insulin Pump) Therapy in the Hospital Setting — URL: http://tde.sagepub.com/content/31/6/849
Zynx evidence based reference — URL: https://zynx.com/Reference/content.aspx?ItemID=190840

NURSING

Nursing

Patient to manage pump according to the ordered parameters	Routine, As Specified, Starting today Print and complete the patient Memorandum of Agreement (M To print MOA-- Go to Order Mgmt > Modify order to open ord If patient refuses to sign or is unable to sign the MOA, or if p and call the provider for alternative therapy.
Glycemic Target overall 110-180 mg/dL unless otherwise stated	Routine, Until discontinued, Starting today
Notify the physician if any one or more of the following occur:	Routine, Until discontinued, Starting today For Until specifi Guidelines: If blood glucose (BG) is less than 70mg/dL after 2 succes consecutive pre-prandial BG measurements.,If pre-prandial BG is less than 70 mg/dL, 200 in the pregnant/OB patient.,If patient refuses or if patient's ability to self-manage pump is in questi
Disconnect insulin pump prior to any radiologic procedures.	Routine, Until discontinued, Starting today
Remove steel needles before MRI procedure	Routine, Until discontinued, Starting today
ALERT: If insulin pump must be suspended for greater than 1 hour for any reason, call the provider for alternative insulin orders	Routine, Until discontinued, Starting today Provider must order alternative one-time dose of rapid acting insulin if the pump is expected to be off > 1 hour.
Nursing to record ALL insulin doses in the MAR	Routine, Until discontinued, Starting today
EDUCATION VIDEO: Diab Lifestyles: Changes that Lead to Better Blood Glucose Control	Routine, Once-Routine
EDUCATION VIDEO: Diab Lifestyles: Setting Long-Term Goals	Routine, Once-Routine
If patient in need of pump refill during admission contact pharmacy for replacement insulin.	Routine, Once-Routine For 1 Occurrences

DIET / NUTRITION

Select from the following:

Diet diabetic/consistent CHO - assists with insulin dosing	Diet effective now, Starting today Diabetic / CHO restriction: Calorie Count? Liquid consistency if any: Fat restriction if any: Fluid restriction if any: Na restriction if any: Food texture change if any: Additional restrictions:

LABORATORY

Point of Care Tests

POCT Bedside Glucose - Must Use Hospital Meter	Routine, 4 times daily before meals & at bedtime, Starting today EXCEPT IF PATIENT NPO , then monitor every 4 hours
POCT Bedside Glucose - High Risk for Hypoglycemia	Routine, As Specified Obtain glucose between 0200 and 0400 if ANY of the following criteria are identified: * Creatinine > 1.5 * 75 years and older * Hypoglycemia unawareness or any hypoglycemia in past 24 hours * Blood sugar > 250, or blood sugar < 100 at HS check * NPO
Hemoglobin A1C - If not already ordered within the last 30 days	Once-Routine, Starting today For 1 Occurrences, Lavender Top Tube

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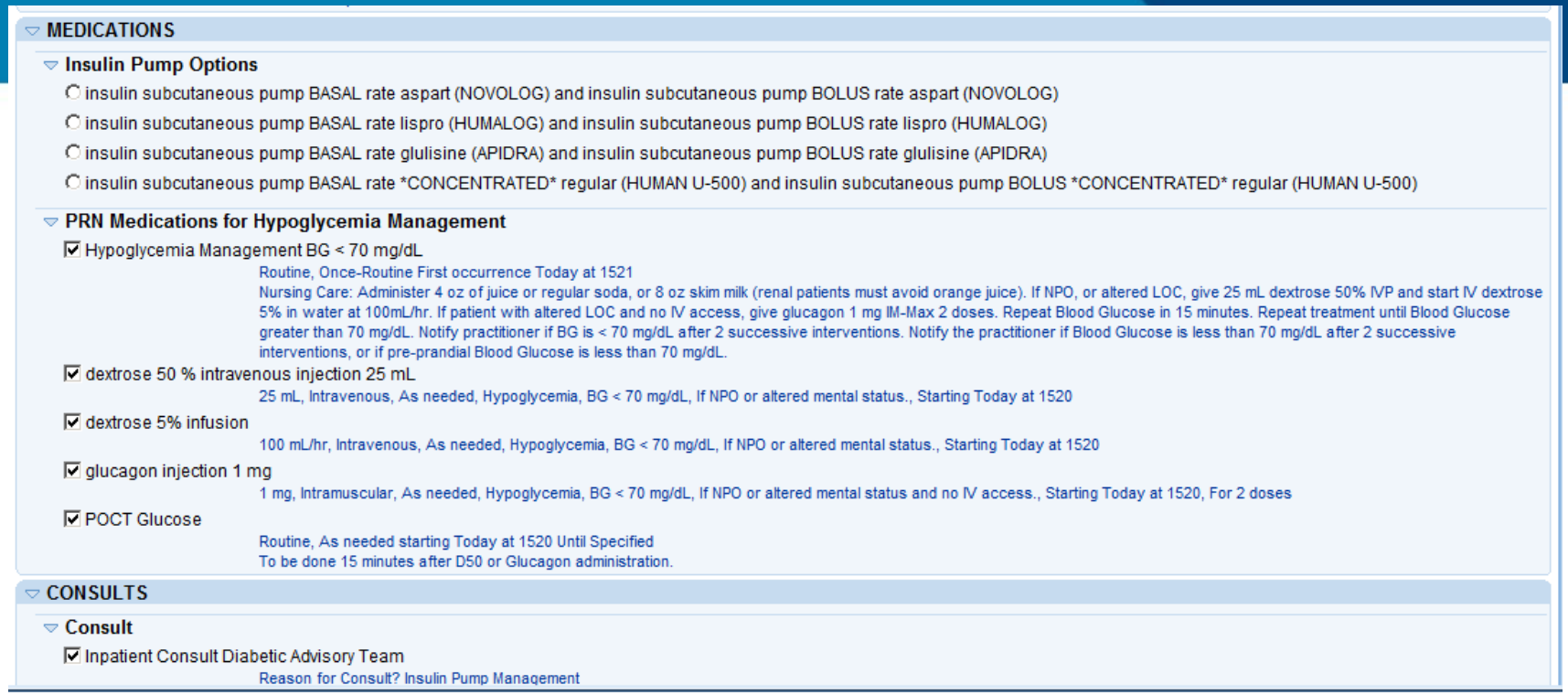

1. Select type of insulin
2. Enter basal rates if known
3. Enter carb ratio and sensitivity if known

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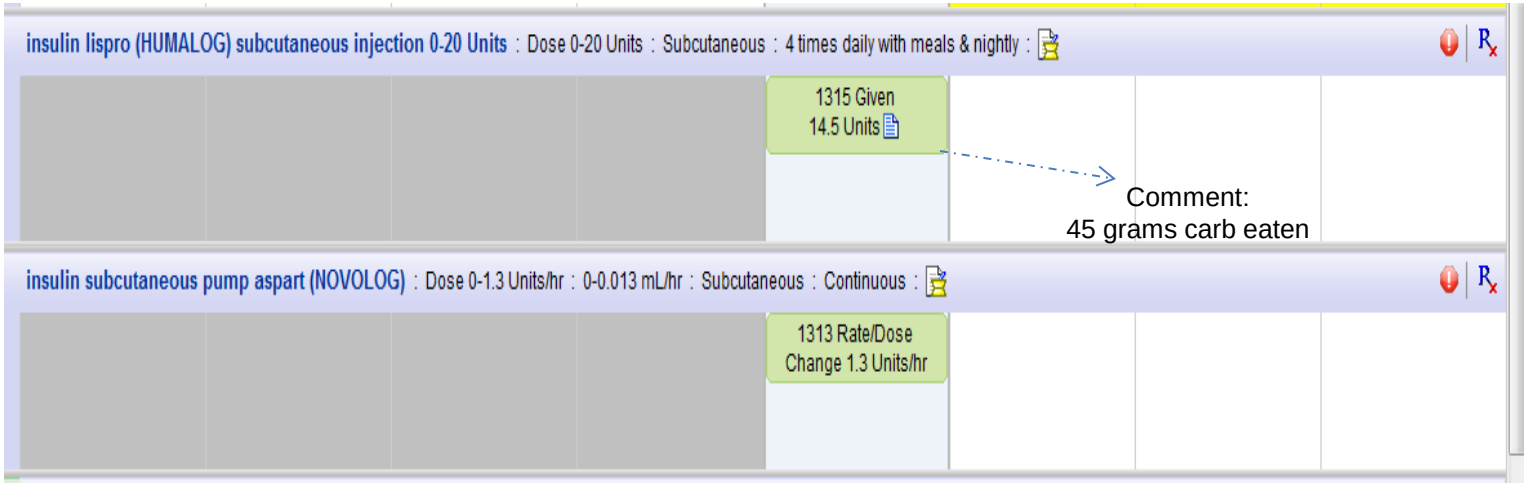
Insulin Pump Documenation

- Med Rec should be completed on admission listing insulin via pump as a home medication
- All glucose testing will be completed using the hospital POC glucometer. Documentation of blood glucose levels, insulin basal rates, insulin boluses, and carbohydrate intake is required in the EPIC flow sheets and MAR.



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When to D/C pump therapy in the hospital

- Patient cognitively impaired or critically ill
- ICU and/or perioperative cardio-pulm surgery
- DKA
- High dose steroids for kidney transplant rejection
- Patient cannot provide supplies (ie infusion sets, etc)
- Pump malfunction

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Converting pump to SQ insulin

- Easy to calculate or view total basal insulin units in pump
- Use basal/bolus insulin orderset
- Use lantus or levemir unit for unit qd or bid
- Use meal bolus (insulin/carb) ratio as documented in pump
    - Choose consistent carb diet and appropriate fixed dose
    - Ex. If 1/15 gm/cho and 60gm diet-choose 4units novolog pre-meals
- Choose closest sliding scale/correction to pump setting

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Case Study-Pump

You receive a patient type 1 diabetic in mild DKA. She uses a pump to control her blood sugar. Her gap is now closed and she tells you she does not have any additional insulin pump sets. You realize:

a. Type 1 diabetics must have basal insulin
b. She will be high risk of returning to DKA
c. Both A & B

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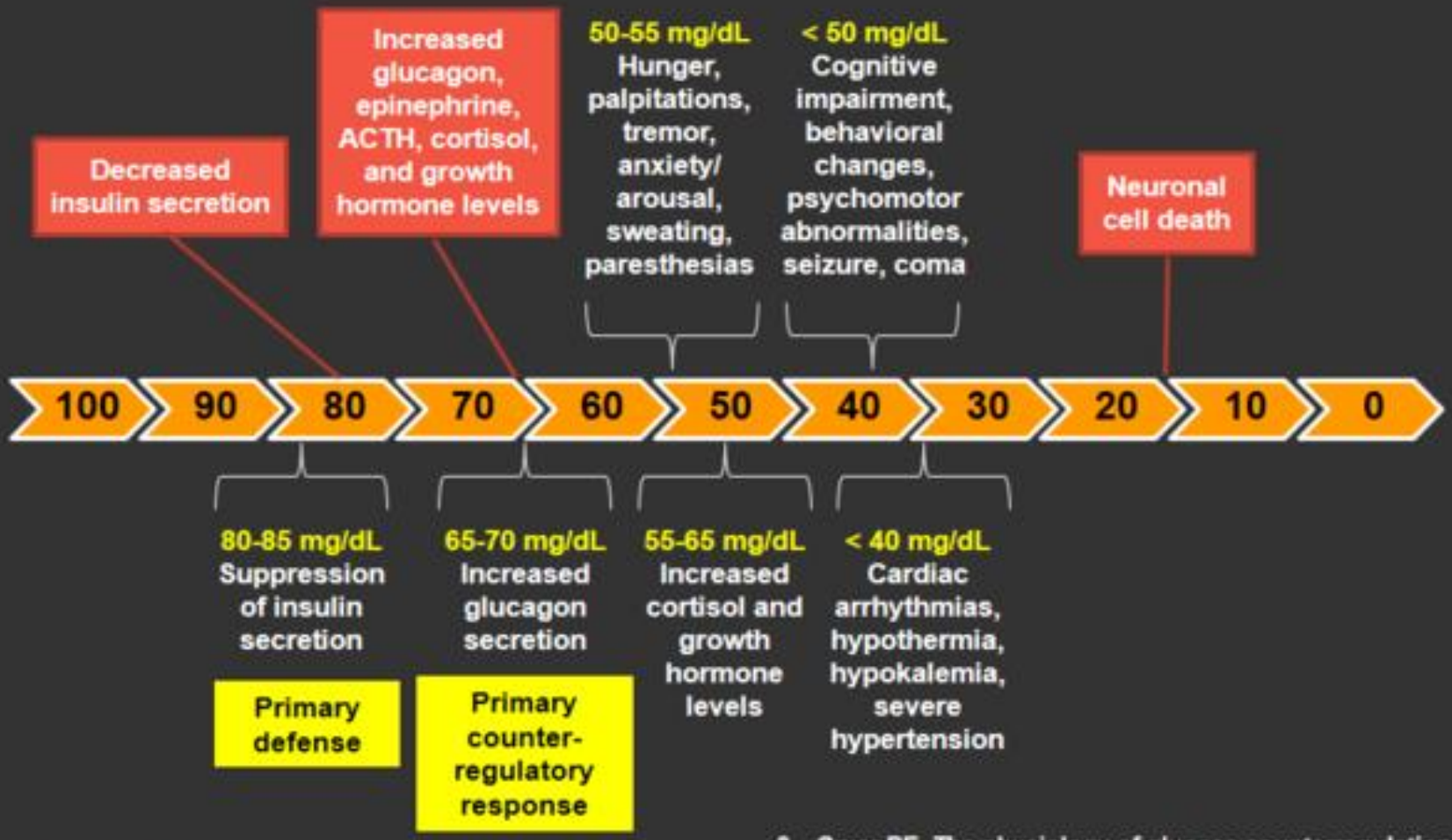
Symptoms and Signs Associated With Progressively Worsening Levels of Hypoglycemia[1-4]



ACTH, adrenocorticotropic hormone.

1. Moghissi E, et al. *Endocr Pract.* 2013;19:526-535.
2. Tsujimoto T, et al. *Diabetes Care.* 2013. [Epub ahead of print].
3. Cryer PE. The physiology of glucose counterregulation. In: *Hypoglycemia in Diabetes: Pathophysiology, Prevalence, and Prevention.* Alexandria, VA: American Diabetes Association; 2009.
4. Cryer PE. *J Clin Invest.* 2007;117:868-870.

Hypoglycemia Treatment Algorithm

Blood Glucose <70

ABLE TO TAKE PO

Administer 15-20g of carb

- Give one of the following: 15-30g glucose gel, 4 glucose tabs, 8oz skim milk, 4oz apple or orange juice (avoid in renal patients), 6 oz "regular" sugar sweetened soda

NPO or altered LOC

Give one of the following:

- If no IV access- Give glucagon 1mg IM- limit 2 times OR
- Give 25ml dextrose 50% (1/2 amp) IV and start IV dextrose 5% in water at 100ml/h- contact MD if patient has concurrent IVF running or is high risk for fluid overload- ie: heart, liver, renal failure

- Recheck blood sugar every 15 minutes until blood sugar is >70mg/dl for two consecutive blood sugar checks.
- If patient responds and can take oral feedings, repeat blood glucose with oral feedings as above every 15 minutes until blood glucose is 70 mg/dl or greater.

- If still <70 after third treatment, individual management is needed. Contact physician and consider Diabetes Advisory Team consult.
- If BG <40, complete incident report. If second BG <40 in 24-48 hours, notify physician and consider consult to Diabetes Advisory Team.
- Document blood glucose level, treatment, and patient response in electronic record.

Glucose Management Orders

Notify MD for blood glucose:

- <70 mg/dl after 2 successive interventions
- >250 mg/dl for 2 consecutive pre-prandial BG measurements
- If pre-prandial BG is <70 mg/dl
- Single BG >400 mg/dl

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Blood Glucose Monitoring

- ACHS for patient eating- FSBS should not be more than 60 minutes old when administering insulin
- Q4H or Q6H for NPO, TPN, TF
- Every 2 hours for SQ DKA protocol
- Hourly on IV insulin infusion protocols

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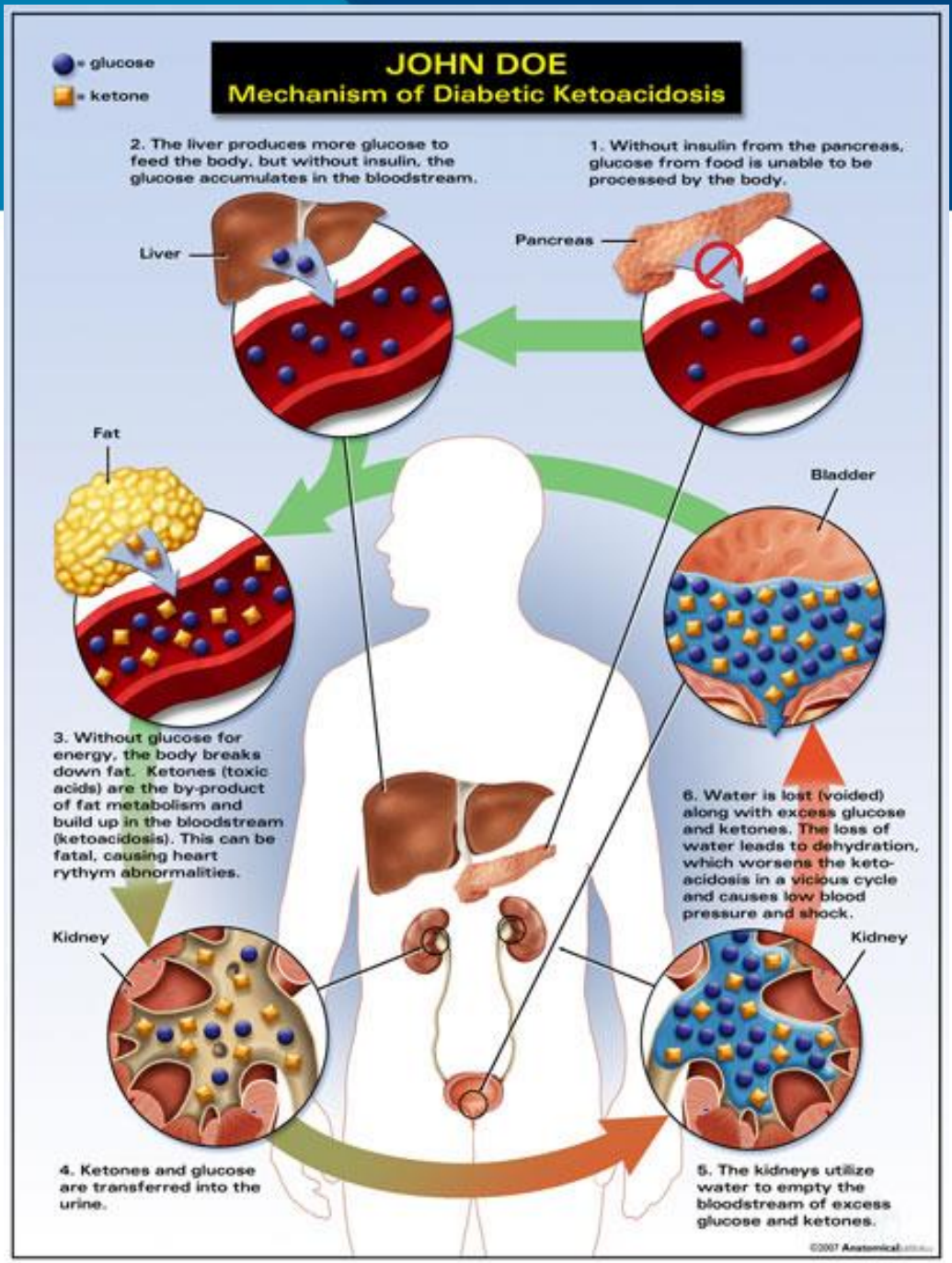
Blood Glucose Monitoring Limitations

- Accurate for FSBS 10-600
- Hematocrit should be between 10–65 %.
- Lipemic samples (triglycerides in excess of 1800 mg/dL)- may produce elevated results.
- Blood concentrations of galactose >15 mg/dL- cause overestimation of blood glucose results.
- Intravenous administration of ascorbic acid which results in blood concentrations of ascorbic acid >3 mg/dL- cause overestimation of blood glucose results.
- If peripheral circulation is impaired, collection of capillary blood from the approved sample sites is not advised as the results might not be a true reflection of the physiological blood glucose level. This may apply in the following circumstances: severe dehydration as a result of DKA or HHNK, hypotension, shock, decompensated heart failure NYHA Class IV, peripheral arterial occlusive disease, or CODES

DKA vs HHS

- **DKA:** the body cannot use glucose as a fuel source because the body has no insulin or not enough insulin, and fat is used instead. By-products of fat breakdown, ketones, build up in the body.
- **HHS:** there is generally enough insulin secretion to prevent exaggerated lipolysis and ketogenesis



Key Factors and Characteristics

- **Infection (e,g., pneumonia, UTI) or other concurrent illness**
- **Omission of insulin or poor adherence to insulin therapy**
- Psychological or behavioral issues (e.g., eating disorders, depression, fear of weight gain)
- Drugs that affect CHO metabolism (e.g., atypical antipsychotics, corticosterioids)
- Restricted water intake (e.g., elderly nursing home residents)
- Drug or ETOH abuse
- Poor baseline glycemic control
- Past history of DKA

Musey VC, et al. *Diabetes Care* 1995;18:483-9.

What's the difference?

DKA and HHS:
Definitions and Differentiation

Characteristic	DKA	HHS
Patient Age	Younger	Elderly
Diabetes Type	Primarily type 1 DM*	Primarily type 2 DM
Acidosis	Yes (pH <7.3)	Typically no (pH >7.3)
Ketonemia/Ketonuria	Present	Typically no (or mild)
Hyperglycemia	Elevated (>250 mg/dL)	Sig. elevated (>600 mg/dL)
Osmolality	Typically normal	Elevated (>320 mOsm/kg))

** Up to 1/3rd of cases in type 2 diabetes*

Kitabchi AE, et al. *Diabetes Care*. 2009;32:1335-43.
Maletkovic J, Drexler A. *Endocrinol Metab Clin N Am*. 2013;42:677-695.

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Clinical Presentation

DKA

- Abdominal pain, N/V, HA
- Fatigue
- Blurred vision

HHS

- Neurologic deficit due to profound dehydration and hyperosmolarity- Can have fluid deficit of 9-12L
- Weakness, muscle cramping

Patients “look sick” and most require hospitalization

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Lab Presentation

Clinical Presentation (laboratory)

	Mild DKA	Moderate DKA	Severe DKA	HHS
Plasma glucose (mg/dL)	>250	>250	>250	>600
pH	7.25-7.3	7.0-7.24	<7.0	>7.3
Serum bicarbonate (mEq/L)	15-18	10-15	<10	>18
Ketones (urine or serum)	Positive	Positive	Positive	Min. to Neg.
Anion gap	>10	>12	>12	Variable
Osmolality (mOsm/kg)	Variable	Variable	Variable	>320
Mental status	Alert	Alert/Drowsy	Stupor/Coma	Stupor/Coma

Corwell B, et al. *Emerg Med Clin N Am* 2014;32:437-52

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POP QUIZ: Diabetic Ketoacidosis

A 36-year-old female with type 1 diabetes mellitus is admitted to the CDU directly from her physician's office with a diagnosis of diabetic ketoacidosis (DKA). The patient states that she ran out of her insulin and missed one dose of levemir.

Vital signs are: blood pressure, 136/78 mm Hg; heart rate, 126 beats/minute; and respiratory rate, 36 breaths/minute.

Laboratory results are: glucose, 488 mg/dL; sodium, 131 mEq/L; potassium, 5.4 mEq/L; and chloride, 98 mEq/L. CO2 19
A high anion gap is associated with DKA. What is this patient's anion gap?

a. Unable to determine from the information given
b. 9 mEq/L
c. 38 mEq/L
d. 14 mEq/L

Sodium – Chloride – Bicarb = Anion Gap

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POP QUIZ: Diabetic Ketoacidosis

You know that the priority treatment for this patient is to:

a. administer antibiotics to treat the precipitating infection.
b. administer fluids to correct dehydration.
c. consult the clinical dietician.
d. restrict fluid intake.

You understand that this patient requires insulin as part of her initial therapy. You should prepare to administer:

a. continuous I.V. insulin
b. Basal insulin
c. bolus SQ insulin
d. subdermal insulin

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POP QUIZ: Diabetic Ketoacidosis

When should DKA tx protocol end and patient start SQ insulin?

- Anion gap closed
- Bicarb >18
- Tolerating food

***Give basal insulin within 2 hours of last SQ bolus*

The patient has been transitioned to basal/bolus insulin. FSBS is 142. He is now NPO for a procedure. Prandial novolog insulin and moderate correction scale insulin are due at the same time, should both be given?

Prandial is to be given with MEAL only.

Correction scale is to CORRECT current blood sugar.

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POP QUIZ: Diabetic Ketoacidosis

The most likely precipitating factor for this patient's episode of DKA is:

a. an antibiotic used to treat pneumonia.
b. low oxygen saturation related to pneumonia.
c. pneumonia.
d. missing a dose of insulin.

While this patient is receiving bolus insulin, you should:

a. obtain a computed tomography (CT) scan of the brain.
b. monitor arterial blood gas (ABG) levels hourly.
c. check blood glucose levels every 2 hours
d. administer subcutaneous insulin hourly

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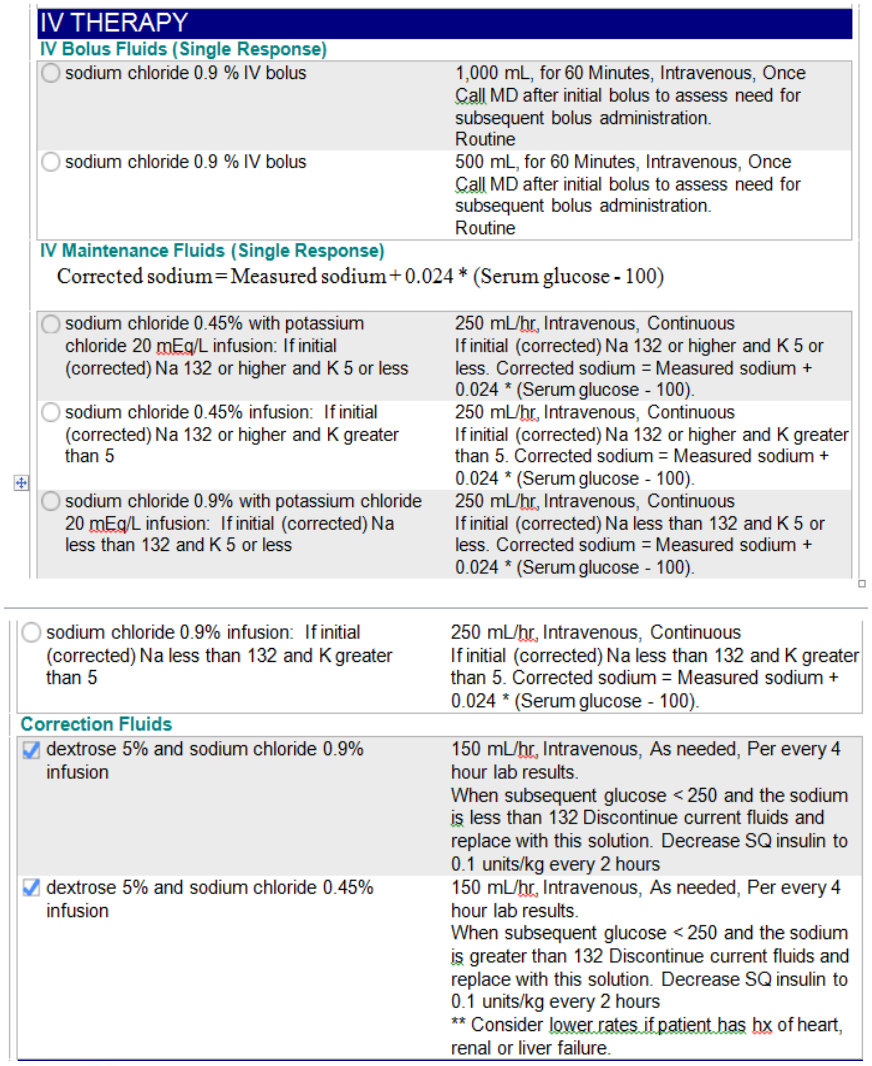
SQ INSULIN DKA PROTOCOL- IVF



IV THERAPY

IV Bolus Fluids (Single Response)

○ sodium chloride 0.9 % IV bolus	1,000 mL, for 60 Minutes, Intravenous, Once Call MD after initial bolus to assess need for subsequent bolus administration. Routine
○ sodium chloride 0.9 % IV bolus	500 mL, for 60 Minutes, Intravenous, Once Call MD after initial bolus to assess need for subsequent bolus administration. Routine

IV Maintenance Fluids (Single Response)

Corrected sodium = Measured sodium + 0.024 * (Serum glucose - 100)

○ sodium chloride 0.45% with potassium chloride 20 mEq/L infusion: If initial (corrected) Na 132 or higher and K 5 or less	250 mL/hr, Intravenous, Continuous If initial (corrected) Na 132 or higher and K 5 or less. Corrected sodium = Measured sodium + 0.024 * (Serum glucose - 100).
○ sodium chloride 0.45% infusion: If initial (corrected) Na 132 or higher and K greater than 5	250 mL/hr, Intravenous, Continuous If initial (corrected) Na 132 or higher and K greater than 5. Corrected sodium = Measured sodium + 0.024 * (Serum glucose - 100).
○ sodium chloride 0.9% with potassium chloride 20 mEq/L infusion: If initial (corrected) Na less than 132 and K 5 or less	250 mL/hr, Intravenous, Continuous If initial (corrected) Na less than 132 and K 5 or less. Corrected sodium = Measured sodium + 0.024 * (Serum glucose - 100).
○ sodium chloride 0.9% infusion: If initial (corrected) Na less than 132 and K greater than 5	250 mL/hr, Intravenous, Continuous If initial (corrected) Na less than 132 and K greater than 5. Corrected sodium = Measured sodium + 0.024 * (Serum glucose - 100).

Correction Fluids

☑ dextrose 5% and sodium chloride 0.9% infusion	150 mL/hr, Intravenous, As needed, Per every 4 hour lab results. When subsequent glucose < 250 and the sodium is less than 132 Discontinue current fluids and replace with this solution. Decrease SQ insulin to 0.1 units/kg every 2 hours
☑ dextrose 5% and sodium chloride 0.45% infusion	150 mL/hr, Intravenous, As needed, Per every 4 hour lab results. When subsequent glucose < 250 and the sodium is greater than 132 Discontinue current fluids and replace with this solution. Decrease SQ insulin to 0.1 units/kg every 2 hours ** Consider lower rates if patient has hx of heart, renal or liver failure.

1. Select initial fluid replacement bolus based on degree of dehydration
2. Select maintenance fluids based on Na & K+
3. RN to start correction fluids when FSBS <250. Selected based on Q4H Na from labs.

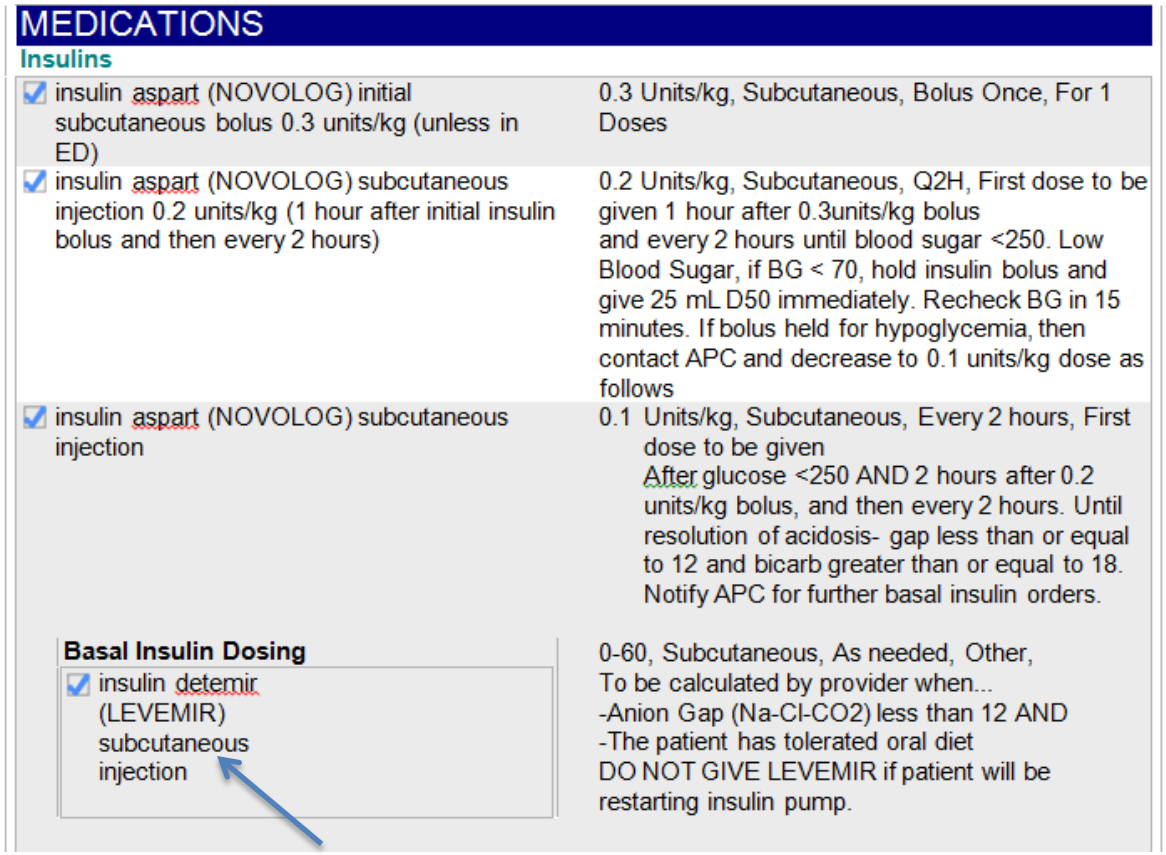
Patients should either be NPO or allowed Clears (no concentrated sweets)

SQ INSULIN DKA PROTOCOL- Labs

- ✓ POC Glucose Q2H then Q4H after transition to basal/bolus insulin
- ✓ BMP Q4H
- ✓ Ionized Ca+ x1
- ✓ Mag & Phos Q8H
- ✓ Serum ketones (unless drawn in ED) and at 4 hours post transition to basal insulin
- ❑ Consider CBC, VBG, UA, cultures, ketones or troponin if needed

FYI: A1Cs take ~24 hours to get results

SQ INSULIN DKA PROTOCOL- Insulin



MEDICATIONS

Insulins

☑ insulin aspart (NOVOLOG) initial subcutaneous bolus 0.3 units/kg (unless in ED)	0.3 Units/kg, Subcutaneous, Bolus Once, For 1 Doses
☑ insulin aspart (NOVOLOG) subcutaneous injection 0.2 units/kg (1 hour after initial insulin bolus and then every 2 hours)	0.2 Units/kg, Subcutaneous, Q2H, First dose to be given 1 hour after 0.3units/kg bolus and every 2 hours until blood sugar <250. Low Blood Sugar, if BG < 70, hold insulin bolus and give 25 mL D50 immediately. Recheck BG in 15 minutes. If bolus held for hypoglycemia, then contact APC and decrease to 0.1 units/kg dose as follows
☑ insulin aspart (NOVOLOG) subcutaneous injection	0.1 Units/kg, Subcutaneous, Every 2 hours, First dose to be given After glucose <250 AND 2 hours after 0.2 units/kg bolus, and then every 2 hours. Until resolution of acidosis- gap less than or equal to 12 and bicarb greater than or equal to 18. Notify APC for further basal insulin orders.
Basal Insulin Dosing ☑ insulin detemir (LEVEMIR) subcutaneous injection	0-60, Subcutaneous, As needed, Other, To be calculated by provider when... -Anion Gap (Na-Cl-CO2) less than 12 AND -The patient has tolerated oral diet DO NOT GIVE LEVEMIR if patient will be restarting insulin pump.

1. Initial bolus at 0.3u/kg x1
2. 0.2u/kg Q2H until FSBS <250
3. Then 0.1u/kg until gap closed and bicarb >18
4. RN to call provider for basal insulin dose- restart home basal dose or restart insulin pump

(electrolyte replacement per standard protocol)

This is a dummy order so that insulin is on the floor when ready to transition and we aren't waiting on pharmacy to send

SQ INSULIN DKA PROTOCOL

☑ Discontinue this protocol when:	Routine, Until discontinued, Starting today Routine, Once-Routine For 1 Occurrences - Anion Gap (Na-Cl-CO2) less than or equal to 12 AND - Serum Bicarb greater than or equal to 18 mEq/L AND - The patient has tolerated oral diet AND - The patient has transitioned to injectable long-acting insulin.
☑ Notify provider if blood sugar drops more than 100mg/dL in 1 hour.	Routine, Until discontinued, Starting today Notify provider if blood sugar drops more than 100mg/dL in 1 hour.
☑ Okay for discharge if blood sugar <250 and no anion gap at 4 hour transition to home basal insulin or insulin pump ☑ Give home basal insulin or restart insulin pump within 2 hours of last SQ novolog bolus	Routine, Until discontinued, Starting today Okay for discharge if blood sugar <250 and negative ketones at 4 hour transition to home basal insulin or insulin pump

TriHealth

Orderset also includes consult to Diabetic Advisory Team:
Elissa 2-5051 and Lindsey 5-5568