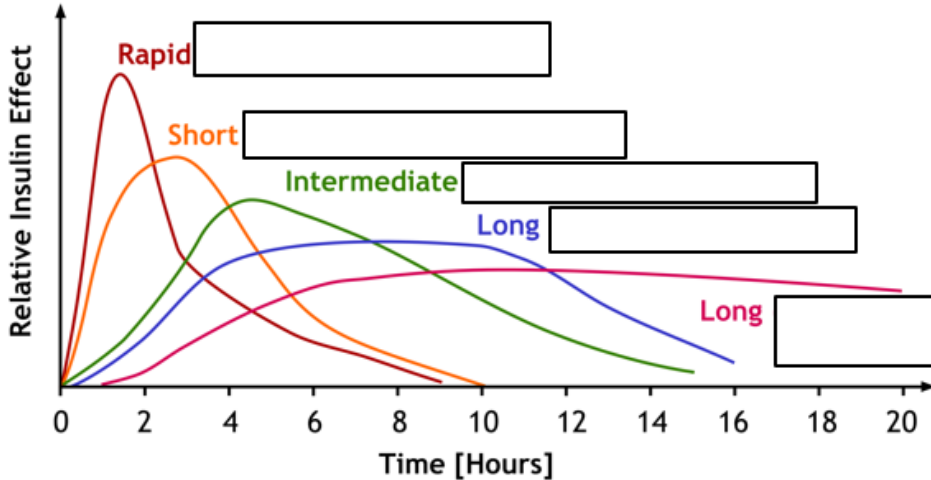


**Academic Half Day – Diabetes
Learner Worksheet
7/16/2023**

While you get settled in, fill out the form below matching types of insulin to their duration of action. Also indicate which insulins are appropriate for use as basal vs bolus insulin.



Case 1

Mr. Shugar is a 56yo M who presents to the ED with redness and pain of his left leg for the past 3 days after scraping his ankle accidentally while working on his car. Two days ago, he went to urgent care and received antibiotics. Since then, the redness has worsened despite taking the medication as directed. Yesterday, he developed a fever to 101F, so he decided to come to the ED.

PMHx:

HTN
COPD
Hasn't been to a doctor in a long time

Meds:

HCTZ 25mg qd
ASA 81mg qd
Cephalexin 500mg tid

Social Hx: smokes 1ppd, no EtOH, works as mechanic

Physical Exam:

VS: T 101.4; HR 90; BP 128/76; RR 14; SpO2 97% room air; Wt: 220lb (100kg); BMI 35
GEN: Overall well appearing, no acute distress, obese
CV: Normal S1, S2 with regular rate and rhythm. No murmurs
PULM: Lungs clear to auscultation b/l
EXT: Erythema and warmth of the L lateral lower extremity streaking towards knee. No fluctuance. Tender to palpation only in the area of erythema/warmth. No edema.

ED workup:

Na 135, K 4.2, CL 102, CO2 22, BUN 14, Cr 1.1, glucose 240
WBC 11.2, Hgb 13.2, Hct 39.2, Platelets 354
CRP 4.6, ESR 32

Doppler US: negative for DVT

X-ray Left Tib/Fib: negative for fracture, soft tissue swelling noted

1. You notice the patient is hyperglycemic on his renal panel. What other questions would you like to ask him? What factors may contribute to hyperglycemia in this patient?

2. Does Mr. Shugar have diabetes? How do you diagnose diabetes?

The patient tells you that he's never been told he has high blood sugars, but diabetes is prevalent in his family. And now that you mention it, he does urinate pretty frequently. But he reassures you that he drinks tries to stay hydrated and mitigates his thirst by drinking at least 4-5 cans of soda each day.

3. What is the next step in the evaluation of his hyperglycemia? What do you include in your inpatient admission orders?

You finish your admission orders, H&P, and start the patient on Vancomycin for cellulitis that did not improve with Keflex. On Hospital day 2, as you pre-chart on Mr. Shugar, you note the following labs:

HbA1c: 8.6
POC glucose: 5pm - 242
 9pm - 274
 6am - 210

You tell Mr. Shugar that he has likely has diabetes and that you will need to treat his elevated blood sugars. He is anxious and has a lot of questions.

4. How do you treat inpatient hyperglycemia? What medications do you use? What do you do next?

5. But what if Mr. Shugar was already on metformin 1000mg bid at home for his diabetes and had never been on insulin before?

6. Could you use sliding scale insulin as main treatment? What about oral agents since he is insulin-naïve?

7. How will you initiate treatment for this insulin-naïve patient? If he weighs 100kg, how much insulin would you start?

8. How would your regimen change if Mr. Shugar was on insulin therapy at home?

9. What are the goals for glycemic control? Why is this important?

You suspect high insulin resistance based on obesity and elevated a1c and choose to start insulin treatment with TDD of 0.5u/kg in the form of lantus 25u qhs, lispro 8u tid with meals, and a low dose SSI with meals. Unfortunately, Mr. Shugar is reporting worsening pain and swelling of his leg, and you notice progression of the erythema of his leg, with increased induration and new fluctuance. You consult general surgery to evaluate the patient for likely abscess formation. Their note is not in by the time you leave, so you sign this out to cross-cover to follow up surgery recommendations.

Hospital Day 3

You are pre-rounding the next morning when night float tells you that surgery left their recommendations late last night to make the patient NPO for OR today. You quickly review Mr. Shugar’s labs:

6am morning labs today:

Renal panel: Na 140 K 4.0 Cl 105 HCO3 23 BUN 25 Cr 1.4 Glucose 140

CBC: WBC 14.4 Hgb 13.1 Hct 39 PLT 345

POC glucose yesterday:

9am - 245

12pm - 194

5pm – 175

9pm - 153

10. Calculate how much insulin the patient received yesterday based on your orders (assume no changes were made to the regimen you ordered because this was not in your sign out). How would you adjust insulin for the next day?

Blood glucose	Low dose SSI (<40units insulin/day)		Medium dose SSI (40-80units insulin/day)		High dose SSI (>80units insulin/day)	
	AC	HS	AC	HS	AC	HS
100-149	0	0	0	0	0	0
150-199	1	0	1	0	2	0
200-249	2	1	3	2	4	2
250-299	3	2	5	3	7	5
300-349	4	3	7	5	10	7
>350	5	4	8	7	12	10

You go see Mr. Shugar and notice that he is sitting on the edge of the bed and does not look well. He says he is feeling dizzy and sweaty, which he thinks he may be nervous due to his upcoming procedure. He says he only had a few bites of his lunch because he was put on a special diet and couldn’t order the burger he usually eats for lunch and that he didn’t eat dinner because the surgeons came by and told him not to.

11. You check a POC glucose and it reads 60. What are risk factors for hypoglycemia in the hospital setting? How do you manage this?

12. What if Mr. Shugar was unresponsive when you found him? What if he lacked IV access?

POC glucose 12pm - 156
 5pm - 168
 9pm - 197

18. How do you feel about Mr. Shugar’s glycemic control? What would you adjust, if anything, in his regimen?

19. Mr. Shugar tells you he is feeling better and is eager to leave the hospital. What medication(s) do you send him home on? What is the appropriate follow up?

20. At his PCP follow-up, you (his new PCP) notice that he has an outside chart you failed to review during admission. It showed he had 2 stents placed for NSTEMI and that he has ischemic cardiomyopathy. Which non-insulin medications should he be started on?

Appendix:

TDD Estimation	Patient Characteristics
0.3 units/kg body weight	<ul style="list-style-type: none"> • Underweight • Older age • Hemodialysis
0.4 units/kg body weight	<ul style="list-style-type: none"> • Normal weight
0.5 units/kg body weight	<ul style="list-style-type: none"> • Overweight
≥ 0.6 units/kg body weight	<ul style="list-style-type: none"> • Obese • Insulin resistant • Glucocorticoids

	DKA			HHS
	Mild (plasma glucose >250 mg/dl)	Moderate (plasma glucose >250 mg/dl)	Severe (plasma glucose >250 mg/dl)	Plasma glucose >600 mg/dl
Arterial pH	7.25–7.30	7.00 to <7.24	<7.00	>7.30
Serum bicarbonate (mEq/l)	15–18	10 to <15	<10	>18
Urine ketone*	Positive	Positive	Positive	Small
Serum ketone*	Positive	Positive	Positive	Small
Effective serum osmolality†	Variable	Variable	Variable	>320 mOsm/kg
Anion gap‡	>10	>12	>12	Variable
Mental status	Alert	Alert/drowsy	Stupor/coma	Stupor/coma

*Nitroprusside reaction method. †Effective serum osmolality: 2[measured Na⁺ (mEq/l)] + glucose (mg/dl)/18. ‡Anion gap: (Na⁺) – [(Cl⁻ + HCO₃⁻) (mEq/l)]. (Data adapted from ref. 13.)

DKA vs HHS management

Complete initial evaluation. Check capillary glucose and serum/urine ketones to confirm hyperglycemia and ketonemia/ketonuria. Obtain blood for metabolic profile. Start IV fluids: 1.0 L of 0.9% NaCl per hour.[†]

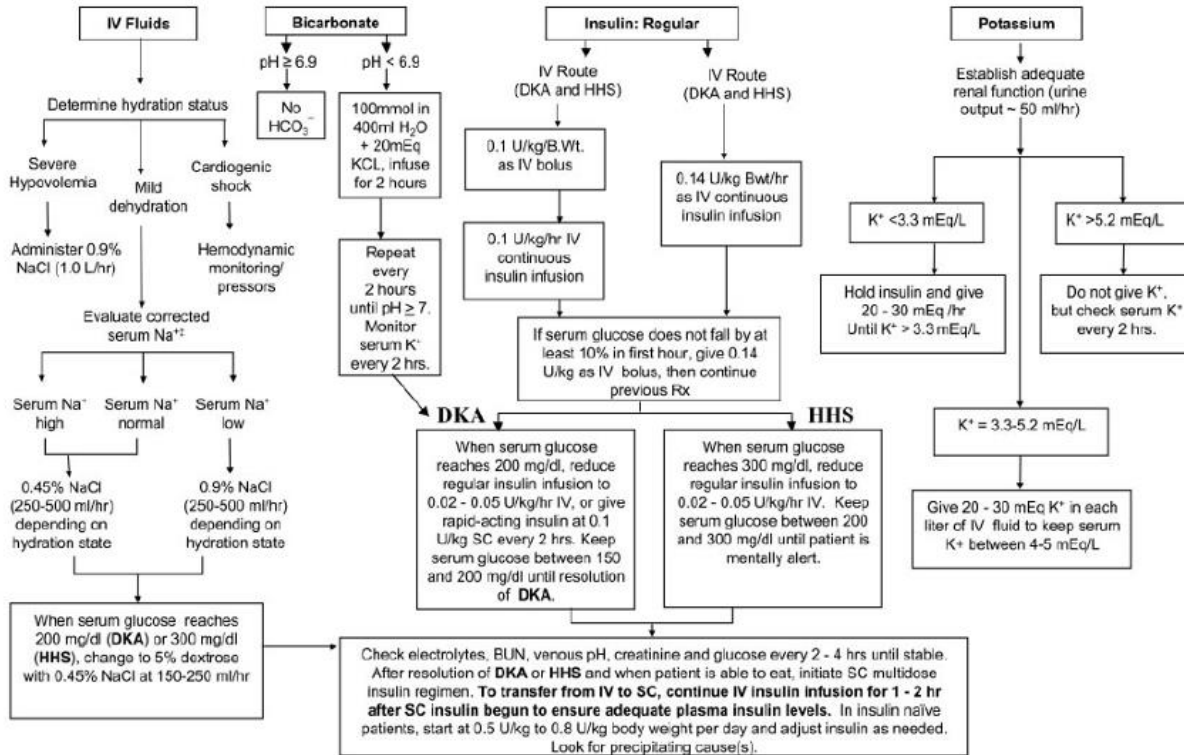


Figure 2—Protocol for management of adult patients with DKA or HHS. DKA diagnostic criteria: blood glucose 250 mg/dl, arterial pH 7.3, bicarbonate 15 mEq/l, and moderate ketonuria or ketonemia. HHS diagnostic criteria: serum glucose >600 mg/dl, arterial pH >7.3, serum bicarbonate >15 mEq/l, and minimal ketonuria and ketonemia. †15–20 ml/kg/h; ‡serum Na should be corrected for hyperglycemia (for each 100 mg/dl glucose 100 mg/dl, add 1.6 mEq to sodium value for corrected serum value). (Adapted from ref. 13.) Bwt, body weight; IV, intravenous; SC, subcutaneous.

Adapted from University of Cincinnati IM AHD Worksheet. 7/15/2023