

# Common Mishaps and Pitfalls in the Inpatient Management of Diabetes

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**Long Island Jewish Medical Center**  
Northwell Health®

# Disclosures

Nothing to Disclose

# Objectives

**At the completion of this activity, pharmacists will be able to**

- Identify an appropriate insulin conversion regimen for patients admitted to the inpatient setting
- Recognize appropriate insulin management strategies for common inpatient scenarios
- Discuss appropriate and inappropriate uses of patient devices (continuous glucose monitors and insulin pumps)

# Objectives

**At the completion of this activity, pharmacy technicians will be able to**

- Describe how pharmacy technicians can play a role in medication reconciliation on admission
- Identify patients with diabetes who would benefit from pharmacy intervention
- Recognize patients wearing diabetes devices

# Abbreviations

EMR: electronic medical record

AMS: altered mental status

T1DM: type 1 diabetes

T2DM: type 2 diabetes

Hrs: hours

PO: by mouth

TDD: total daily dose

qHS: every night at bedtime

mL: milliliter

BID: twice daily

D50W: dextrose 50% in water

IVP: intravenous push

kG: kilogram

BG: blood glucose

DKA: diabetic ketoacidosis

e.g.: for example

HHS: hyperosmolar hyperglycemic state

TID: three times a day

AC: before meals

dL: deciliter

ESRD: end-stage renal disease

HD: hemodialysis

s/p: status post

A&O: alert & oriented

POC: point of care

FS: fingerstick

CDE: certified diabetes educator

D5W: dextrose 5% in water

RN: registered nurse

SQ: subcutaneous

D10W: dextrose 10% in water

AKI: acute kidney injury

CKD: chronic kidney disease

EGD: esophagogastro-duodenoscopy

NPO: nothing by mouth

A1c: hemoglobin A1c

MRI: magnetic resonance imaging

CT scan: computerized tomography scan

FYI: for your information

IT: information technology

ICU: intensive care unit

ADA: American Diabetes Association

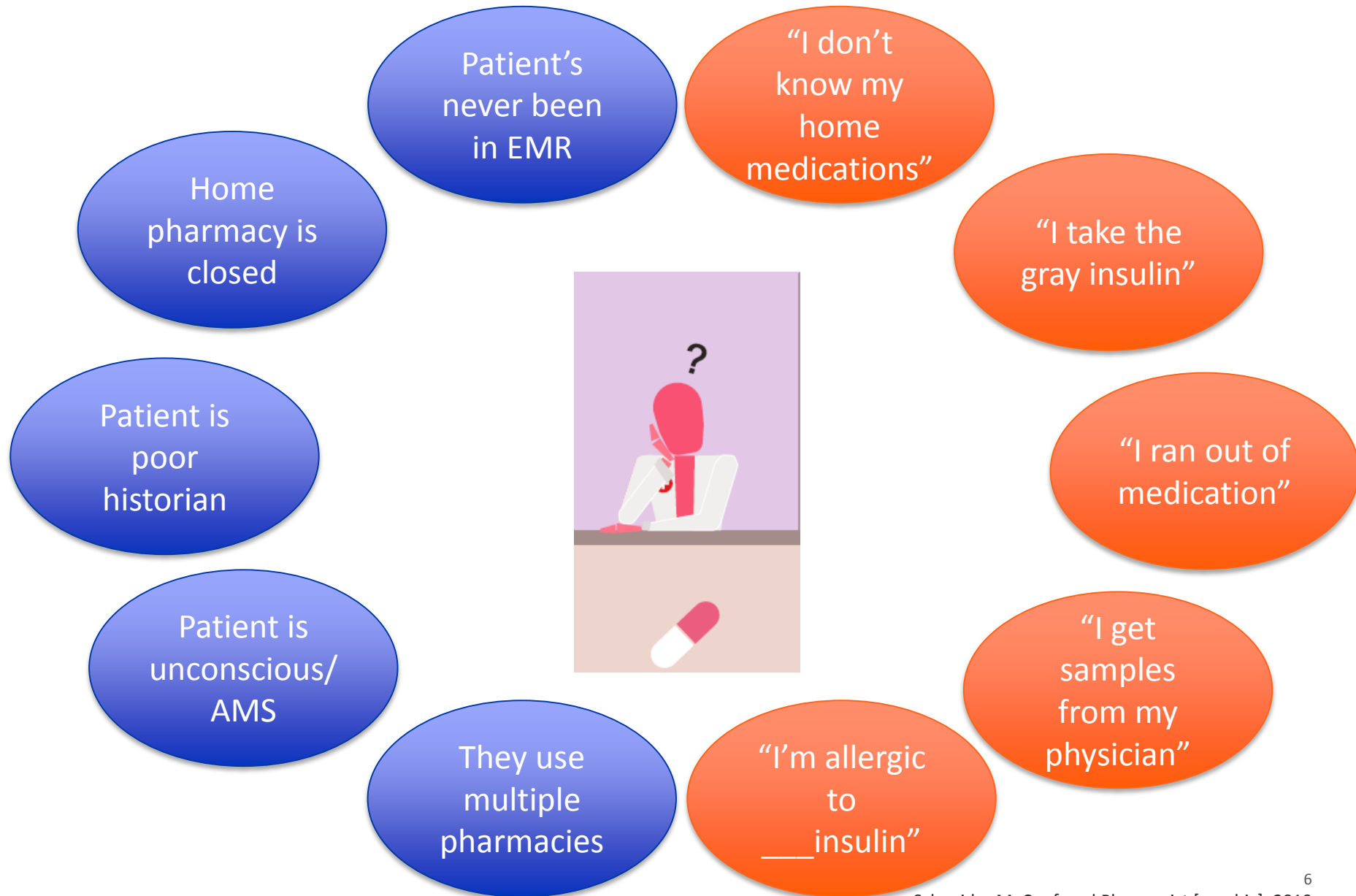
AACE: American Association of Clinical Endocrinologists

MD: medical doctor

OR: operating room

G: gram

# A patient with diabetes is admitted to the hospital...



# Medication Reconciliation

- Who is doing medication reconciliations at your institutions?
  - **Physicians**
  - **Residents**
  - **Mid-level providers**
  - **Nurses**
  - **Pharmacists**
  - **Pharmacy technicians**
  - **Pharmacy interns**
  - **Pharmacy residents**
- Is medication reconciliation being confirmed with 2 or more sources?
  - **Patient/family**
  - **Pharmacy**
  - **Actual medication containers**
  - **Previous admission or discharge**
  - **Medication list**
  - **Patient's physician(s)**
- Is there continuing education/updates for medication history providers regarding new medications?

# Background: Medication Reconciliation

- Pharmacy team conducted medication reconciliation within 24 hrs of admission for patients followed by the Endocrinology service (74% of patients had diabetes)
- Pharmacist classified any difference between medication history and inpatient admission orders as an intended or unintended discrepancy
  - If the physician corrected an unintentional discrepancy, it was considered to be a medication error

Results	Patients with diabetes (N = 671)	Patients without diabetes (N = 233)	p-value
Medication errors on admission	<b>22.1%</b> (n = 148)	12.0%	p < 0.005
Potentially serious medication errors*	<b>33.8%</b> (n = 50)	7.1%	p < 0.005

\*Classified by consensus panel using National Coordinating Council for Medication Error Reporting and Prevention Index - Serious may cause harm or extend hospital stay.



# Background: Medication Reconciliation

- Using the same pool of patients from previous slide, this study looked at medication errors on hospital admission in patients with Type 1 and Type 2 diabetes (N = 671)
- Prevalence of medication errors on admission
  - Patients with Type 1 Diabetes (n = 163) : **21.5%**
  - Patients with Type 2 Diabetes (n = 508) : **22.2%**
- After adjusting for age and number of treatments, patients with Type 1 diabetes had about a **two-fold** higher odds of having medication errors and potential serious errors on admission compared with those with Type 2 diabetes

# Basic Rules of Thumb

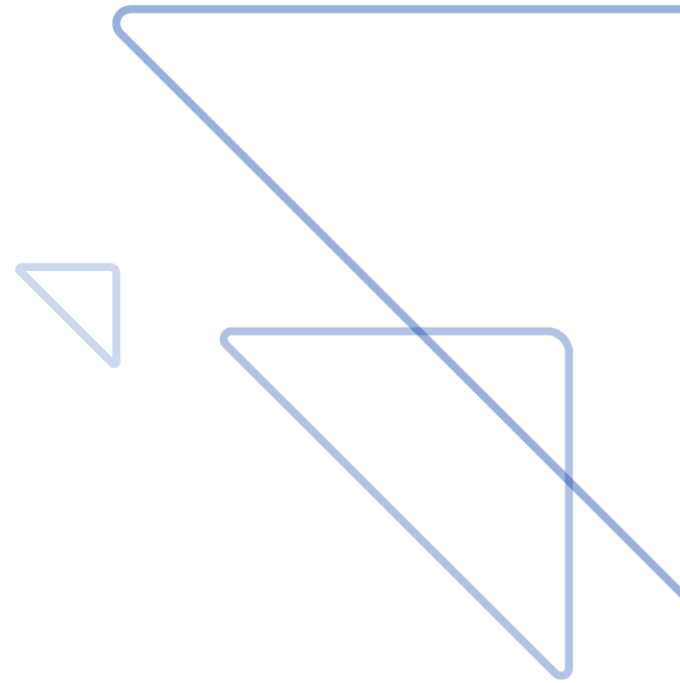
## After a medication reconciliation is completed for a patient, what should we think about before starting inpatient orders?

- Do they have Type 1 or Type 2 Diabetes (T1DM or T2DM)?
- Is the home regimen appropriate?
- Are they actually taking these documented doses?
- What is their PO status inpatient?
- Is their home diet uncontrolled?
- Does the patient need pharmacist counseling or intervention?

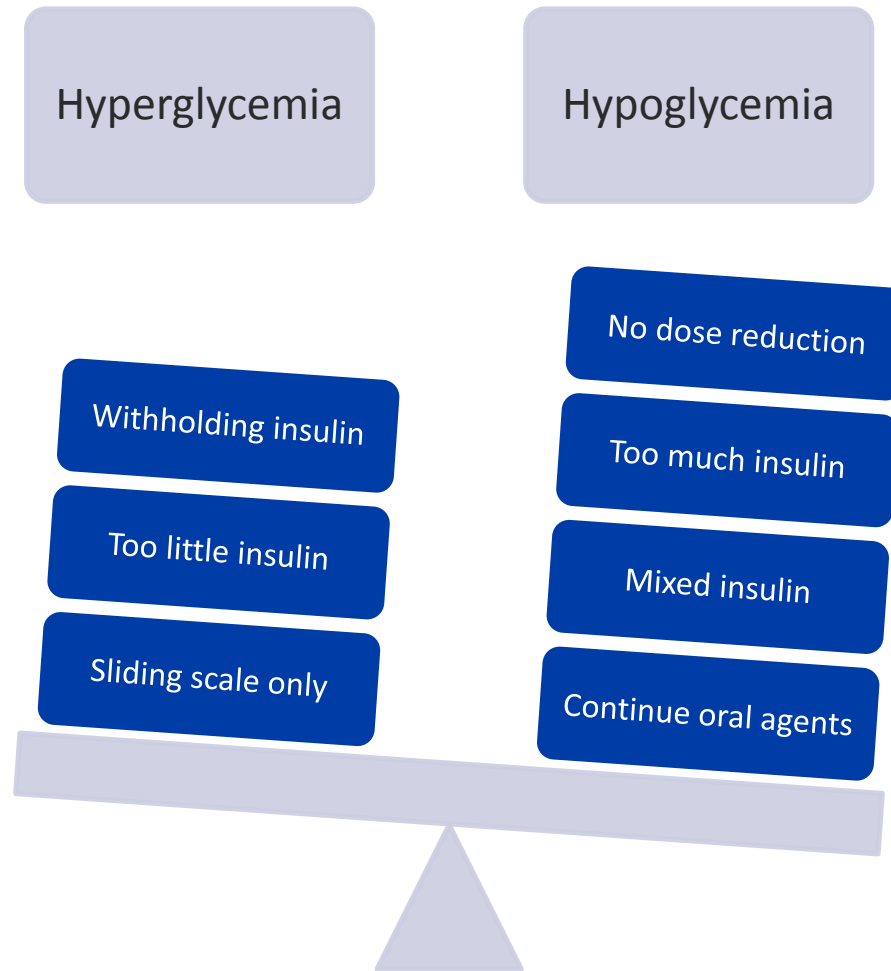


**Never make  
assumptions**

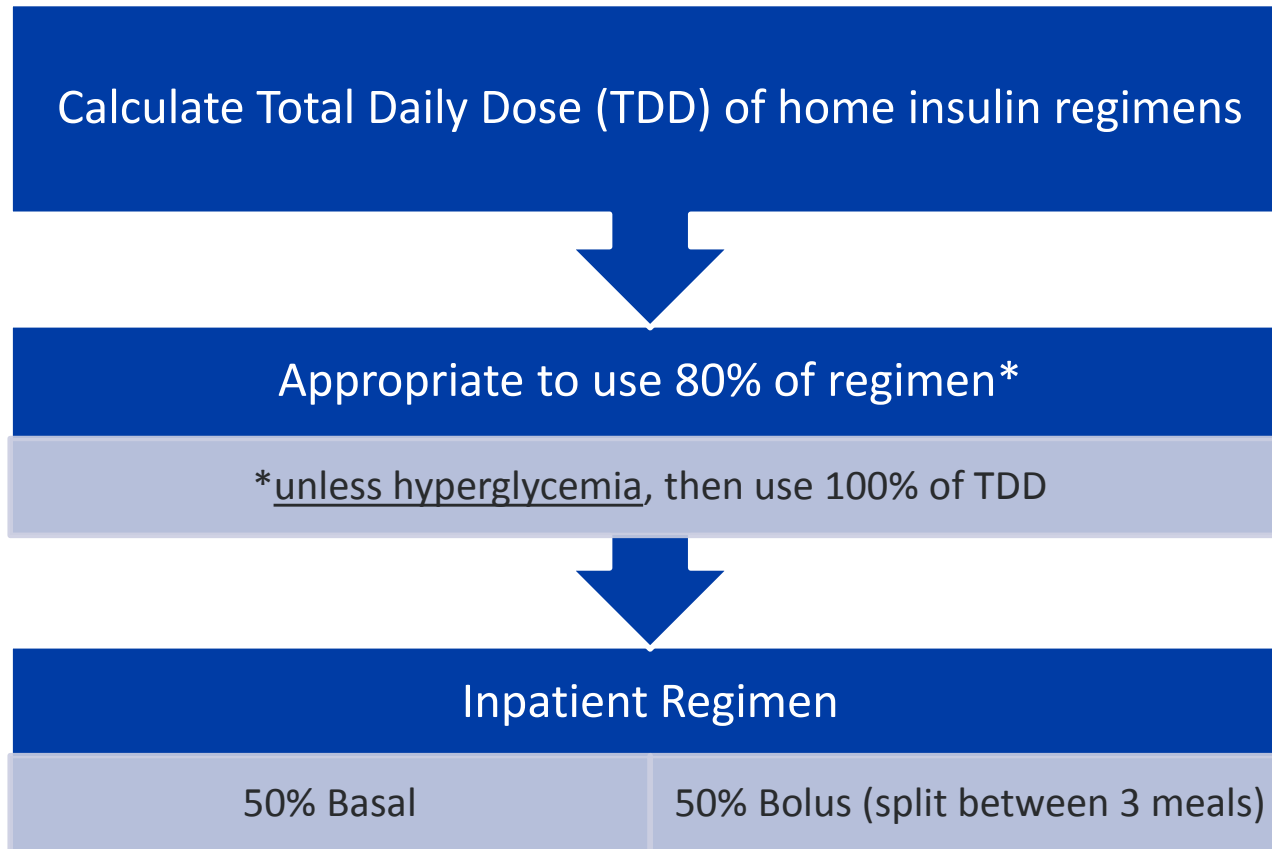
# Insulin Conversion on Admission



# Mishaps with Insulin Conversion on Admission



# Using a Home Insulin Regimen



# Disclaimer

- The following conversions come from primary literature, as well as package inserts, Lexicomp®, Pharmacist Letter for outpatient conversions
- It is usually appropriate to dose reduce (~20%) while the patient is hospitalized (unless hyperglycemic)

# Basal Insulins

\*\*\*\*\*Basal insulin should never be held in patients with T1DM\*\*\*\*\*

**Withholding basal insulin can lead to DKA in T1DM**



Outpatient Regimen		Inpatient Conversion to Lantus® (insulin glargine)
Insulin glargine	Basaglar® 100 units/mL	1:1
	Toujeo® 300 units/mL	<b>use 80% TDD</b>
Insulin detemir	Levemir® 100 units/mL	1:1
Insulin degludec	Tresiba® 100 or 200 units/mL	1:1

➤ E.g., Patient is on Toujeo® 40 units qHS at home → Lantus 32 units qHS inpatient

➤ Levemir® 10 units twice daily → Lantus® 20 units once daily

**may need to dose reduce (to account for inpatient variability)**

# Basal Insulins: Intermediate-acting (continued)

Outpatient Regimen (NPH insulin)		Inpatient Conversion to Lantus® (insulin glargine)
HumuLIN® N 100 units/mL	Once daily NPH 	1:1
NovoLIN® N 100 units/mL	Twice daily NPH 	use 80% TDD and convert to insulin glargine once daily

- Twice daily NPH: Humulin® N 20 units **BID** → insulin glargine 32 units qHS
- NPH has variable pharmacokinetics (peak 4 – 12 hrs and duration 14 – 24 hrs)
  - Dose reduction lessens chance of hypoglycemia

may need to dose  
reduce (to account for  
inpatient variability)



# Rapid-Acting Insulins

Outpatient Regimen		Inpatient Conversion to Humalog® (insulin lispro)	Inpatient Conversion to Novolog® (insulin aspart)
Insulin glulisine	Apidra® 100 units/mL →	1:1	1:1
Insulin lispro	Admelog® 100 units/mL →	1:1	1:1
	Humalog® 100 or 200 units/mL →		
Insulin aspart	Novolog® 100 units/mL →	1:1	1:1
	Fiasp® 100 units/mL →		
	Afrezza® inhaled insulin →	1:1	1:1

- Make sure rapid-acting insulin is three times a day before meals plus corrective scale insulin

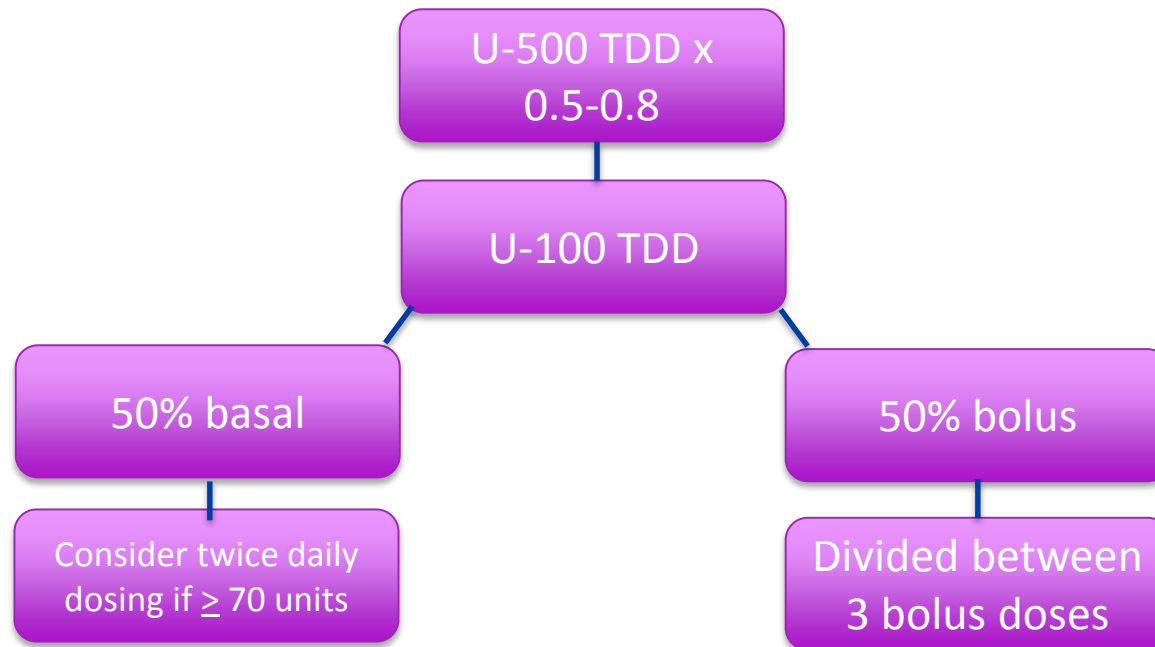
# Regular Insulin

Outpatient Regimen (Regular Human Insulin)	Inpatient Conversion to Humalog® (insulin lispro)	Inpatient Conversion to Novolog® (insulin aspart)
Humulin® R 100 units/mL Novolin® R 100 units/mL	1:1	1:1

- FYI - Uses for regular insulin inpatient
  - Hyperkalemia: IV Push ( $\pm$  25 grams dextrose or 50 mL D50W, if BG < 250 mG/mL)
  - Insulin drip (DKA or HHS): IVP bolus [0.1 units/kg] + infusion [0.1units/kg/hr]

# Concentrated Regular Insulin (Humulin® R U-500)

- **Endocrine consult** (if your institution has inpatient team)
- Some institutions have policies in place and allow for inpatient Humulin® R U-500
  - Given 30 minutes prior to meals (two or three times daily)
  - Nurses **MUST** use U-500 insulin syringe with Humulin R U-500 vial
    - **Otherwise, can give 5 TIMES the dose with U-100 syringe**
- Conversion to basal/bolus is as follows:



# Mixed Insulin

Outpatient Regimen		Inpatient Regimen
Rapid-acting + Intermediate-acting insulin	HumaLOG® Mix 75/25, HumaLOG® Mix 50/50, NovoLOG® Mix 70/30 Ryzodeg® 70/30 (usually BID dosing)	1. TDD home regimen x 0.8 ↓ 50% basal + 50% bolus
Short-acting + Intermediate-acting insulin	NovoLIN® 70/30, HumuLIN® 70/30 (usually BID dosing)	2. Use % of each component to convert inpatient e.g., 70% = basal, 30% = bolus

- Typically don't use mixed insulin inpatient (higher risk of hypoglycemia (2 peaks), more variable pharmacokinetics, harder to adjust dose, patient's appetite or PO status may change)
- Eg., Humulin® 70/30: 30 units before breakfast and 15 units before dinner



TDD:  $45 \times 0.8 = 36$  units → insulin glargine 18 units qHS + insulin lispro 6 units TID AC

# Summary

Upon medication reconciliation, you notice . . .		
Insulin-specific	Patient-specific	
Inappropriate regimen	Uncontrolled sugars (hypo- or hyperglycemic)	Other comorbidities preventing optimal care (blind, tremors, alcoholism, dementia)
Confusing regimen	Patient is confused (medically or regarding diabetes)	Non-adherent/poor follow-up
Unaffordable regimen	Lost insurance (regimen no longer feasible)	Multiple readmissions

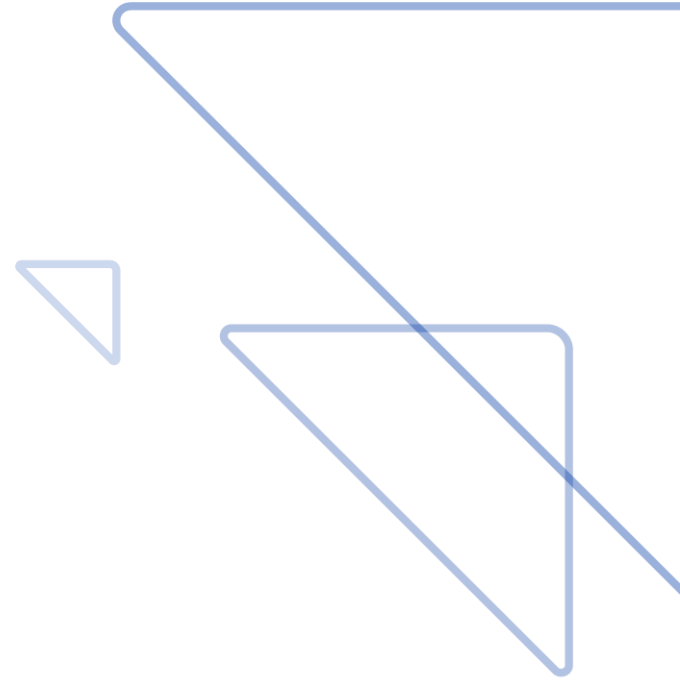
- Role of technician to raise concerns/questions/red flags to pharmacist
- Role of pharmacist to help with inpatient insulin conversion (first), education for diabetes and medications, and to assist with prior authorizations and affordable or alternative insulin for discharge

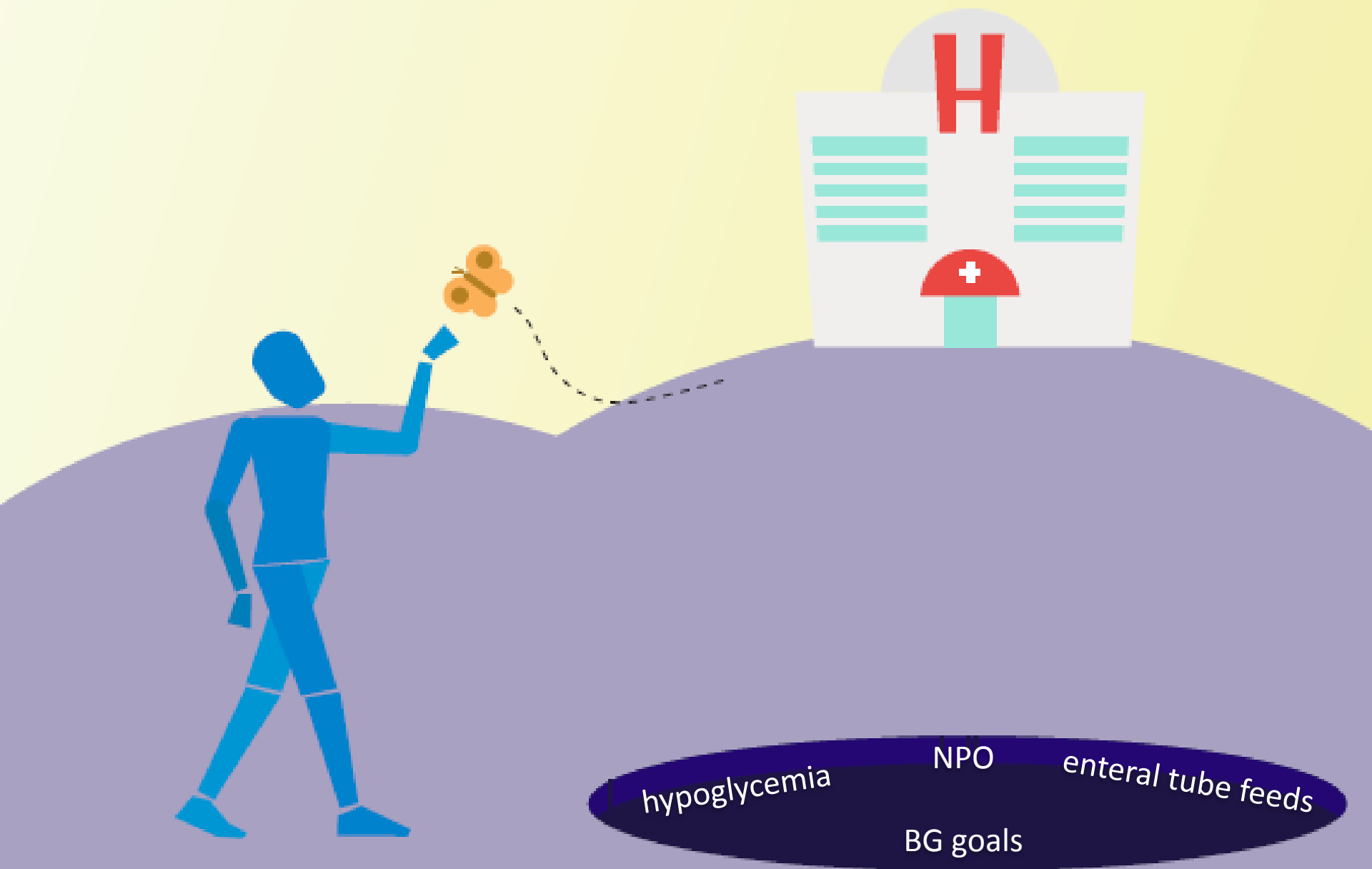
# Question #1

PB is admitted to the hospital for a COPD exacerbation. The pharmacy technician completes the medication history and determines the patient is adherent in taking NovoLog® Mix 70/30 FlexPen® 20 units before breakfast and Basaglar® 20 units qHS. A1c is 8.5 % and current BG 154 mG/dL. The admitting team asks the pharmacist for help determining an appropriate insulin conversion strategy. What do you recommend for inpatient use?

- A. NovoLog® Mix 70/30 vial 20 units before breakfast and insulin glargine 20 units qHS
- B. Use TDD x 0.8 and recommend insulin glargine 16 units qHS, insulin lispro 5 units TID AC, and low correction sliding scale
- C. Use 100% of TDD and recommend insulin glargine 20 units qHS and insulin lispro 7 units TID AC
- D. Use corrective sliding scale insulin TID AC and qHS only

# Appropriate insulin management strategies for common inpatient scenarios







# Inpatient Hypoglycemia

33 yo M with brittle T1DM, ESRD on HD, s/p amputation. He is hypoglycemic at bedtime, BG is 67 mG/dL. He is A&Ox3, consistent carbohydrate/RENAL diet, and is currently asymptomatic. What do you do?



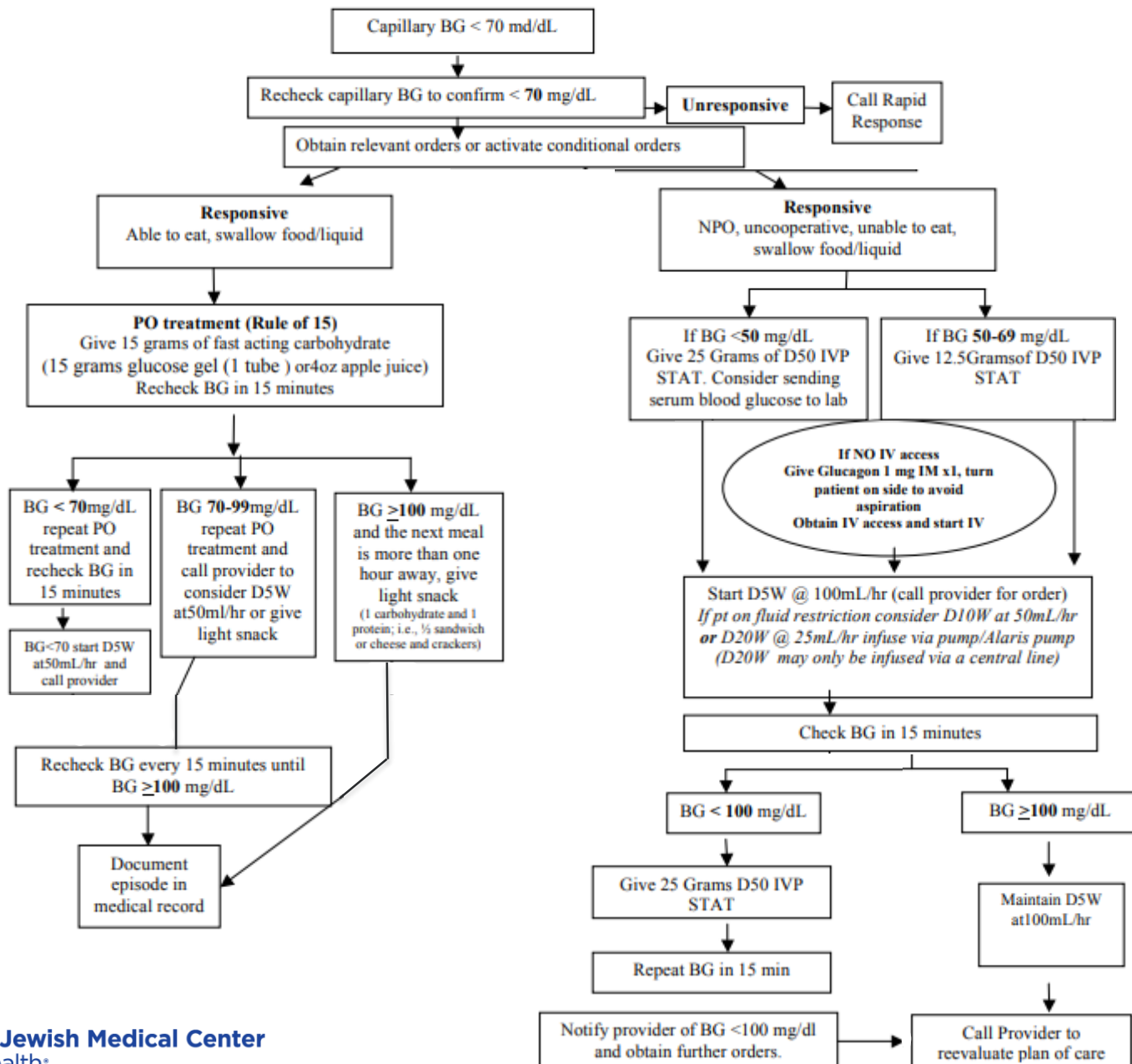
To be continued

# Inpatient Hypoglycemia

- Level 1 hypoglycemia is blood sugar **less than 70 mG/dL**
- Level 2 hypoglycemia is < 54 mG/dL
  - Neuroglycopenic symptoms occur and immediate assistance required
- Level 3 hypoglycemia is a severe event with altered mental and/or physical functioning requiring assistance
- Institutions should have a hypoglycemia prevention and management protocol

Neuroglycopenic	Autonomic (neurogenic)
<ul style="list-style-type: none"><li>• confusion</li><li>• weakness or fatigue</li><li>• severe cognitive failure</li><li>• seizure</li><li>• coma</li></ul>	<ul style="list-style-type: none"><li>• tremulousness</li><li>• palpitations</li><li>• anxiety</li><li>• sweating</li><li>• hunger</li></ul>

## ADULT HYPOGLYCEMIA PROCEDURE



# Determining WHY Hypoglycemia Happened

- If a patient experiences BG <70 mG/dL, their treatment regimen needs to be reviewed because it is a predictive factor for Level 3 hypoglycemic event

Here are some questions you should think about/ask in determining **WHY** hypoglycemia occurred:

- Was the pre-meal insulin given too soon and the meal was delayed?
- Was the pre-meal insulin given and the patient was taken to a test?
- Was an old fingerstick number used and too much correction insulin given?
- Was the pre-meal insulin given and the patient was nauseous or didn't eat?
- Is the patient's diet much more controlled inpatient, therefore they need less than their home insulin requirements?
- Is the patient on too much insulin or concomitant oral hypoglycemics?
- Was corticosteroid dose decreased suddenly?

# Troubleshooting Hypoglycemia Scenarios

- Was the pre-meal insulin given too soon and the meal was delayed?
- Was the pre-meal insulin given and the patient was taken to a test?
- Was an old fingerstick number used and too much correction insulin given?

Educate team members that POC testing should be immediately before meals for most accurate FS reading. Pre-meal  $\pm$  correction insulin should be given when the meal is in front of the patient and they plan on eating.

- Was the pre-meal insulin given and the patient was nauseous or didn't eat?

If the patient has variable appetite, you can educate team members to wait to administer pre-meal insulin until the patient has started to eat or they eat  $\geq 50\%$  of the meal. Always check with team/Endocrine depending on particular situation.

- Is the patient's diet much more controlled inpatient, therefore they need less than their home insulin requirements?

Patient may need education from pharmacist, nutritionist, and/or CDE

- Is the patient on too much insulin or concomitant oral hypoglycemics?
- Was corticosteroid dose decreased suddenly?

Stop oral hypoglycemic agents inpatient and dose adjust insulin

# Patients Who Are NPO

- **Don't hold basal insulin!!!**
  - Use same dose if BG uncontrolled
  - Use about 80% of dose if BG well controlled
- **Do hold standing pre-meal insulin (e.g., Humalog®)**
- **Don't hold correction scale insulin (e.g., Humalog®)**
- **If they become hypoglycemia . . .**
  - Remember, nothing by mouth!
  - Can give D50W or glucagon 1 mG x 1
  - Can start D5W drip
  - Prevention is key! Recommend reducing basal insulin by ~20% the night before planned procedures
  - If the patient's BG is uncontrolled ( $\geq 250$  mG/dL), can keep same dose of basal insulin

## Question #2

33 yo M with brittle DM1, ESRD on HD, s/p amputation. He is hypoglycemic at bedtime, BG is 67 mG/dL. He is A&Ox3, consistent carbohydrate/RENAL diet, and is currently asymptomatic. What do you do?

- A. Nothing - patient is asymptomatic
- B. Correct with 15 grams carbohydrates, recheck fingerstick in 15 minutes
- C. Correct with 1 ampule of D50W
- D. Correct with 30 grams carbohydrates, recheck fingerstick in 1 hour

## Follow-Up Question

Same patient - His blood glucose has been corrected, and it is 103 mG/dL fifteen minutes later. Insulin glargine (Lantus®) 8 Units SQ qHS is ordered. What would you recommend given his episode of hypoglycemia and T1DM?

- A. ~~Hold Lantus® - Patient was hypoglycemic, more insulin will cause further hypoglycemia plus it's a small dose~~
- B. Give full dose, the order is clear
- C. Discuss with provider and RN that the patient has T1DM, so you would recommend giving ~20% dose reduction of Lantus tonight.
- D. Give 50% of dose



# When to Start Insulin Inpatient (Non-Critically Ill)

- If a patient with **T2DM** is treated with non-insulin therapy at home (diet only, orals, non-insulin injectable) . . .

## Diet ordered

- Use caution if continuing outpatient oral antidiabetic agents
- POC before meals and at bedtime
- Start sliding scale insulin
  - Not recommended to be used alone!
- If two or more BG > 180 mG/dL, add basal ± bolus insulin with corrective scale
  - Premixed vs. basal/bolus insulin - similar glycemic control but **increased** hypoglycemia

## NPO

- Discontinue outpatient non-insulin medications
- POC q4-6h
- Start sliding scale insulin
- If BG > 180 mG/dL, add basal insulin with corrective scale

Starting insulin inpatient doesn't necessarily mean a patient needs to go home on it

# Starting Insulin Inpatient (Non-Critically Ill)

## TDD

- 0.2 - 0.3 units/kg/day: elderly, renal failure, insulin naïve, insulin sensitive (thin)
- 0.4 units/kg/day: average patient
- 0.5 – 0.6 units/kg/day: obese, insulin resistant, grossly uncontrolled
- 50% basal:50% bolus (split between 3 meals)

## Basal

0.1 – 0.2 units/kg/day

## Correctional scale

(starting at BG  $\geq$  150 mg/dL)

- Low scale
- Moderate scale

# Inpatient Blood Glucose Goals

- Majority of critically ill and non-critically ill BG goal: **140 – 180 mG/dL**
  - ✓ Can have less stringent goals for terminally ill, severe comorbidities, or with less nursing oversight (e.g., rehab facility)
  - ✓ Can have more stringent goals for select patients
- However, increased rates of **severe hypoglycemia and mortality** with strict inpatient BG control
- Surgical patients: goal < 180 mG/dL was associated with lower mortality and stroke (vs. < 200 mG/dL)
  - No additional benefit and more hypoglycemia where goal < 140 mG/dL

# Troubleshooting Inpatient Hyperglycemia

- Is the patient ordered for the correct diet (consistent carbohydrate diet)?
- Is the patient eating outside food/juices/sodas?
- Is the patient on insulin sliding scale only?
- Was the patient started on corticosteroids? How long will the patient be on steroids?
- Is the patient receiving enteral or parenteral nutrition?

# Special Inpatient Populations

## Patient on Enteral Tube Feeds

- Hyperglycemia may affect ~30% of patients receiving enteral nutrition
- Type of feeding: continuous, bolus, or nocturnal ± oral nutrition

### Continuous Feeds

- Basal/bolus
  - 50% basal (once daily glargine or twice daily NPH)
  - 50% bolus (q4 hrs – rapid acting insulin, or q6 hrs – regular insulin)
- NPH q6h

### Bolus Feeds

- Basal/bolus → ensure bolus insulin + correction timed before bolus feeds
  - Basal 40%: bolus 60%

### Nocturnal (cycled enteral feeds)

- NPH qHS + corrective scale insulin

***Concern with long-acting basal insulin because if feeds are held or stopped, can lead to hypoglycemia → consider D10W IV @ 50 mL/hr (and check BG q3h)***

# Special Inpatient Populations

## Corticosteroids

- Can cause severe hyperglycemia, especially prandial glucose
- Prednisone once daily peaks in 4 to 8 hours → NPH once daily may be used
- Long-acting steroids (dexamethasone) or greater frequency steroids → Long-acting insulin
- Adjust pre-meal and correction insulin accordingly

## Gastroparesis

- Can be challenging due to nausea and vomiting → can give pre-meal dose after eating or once 50% meal consumed

## Kidney Failure (AKI, ESRD, CKD)

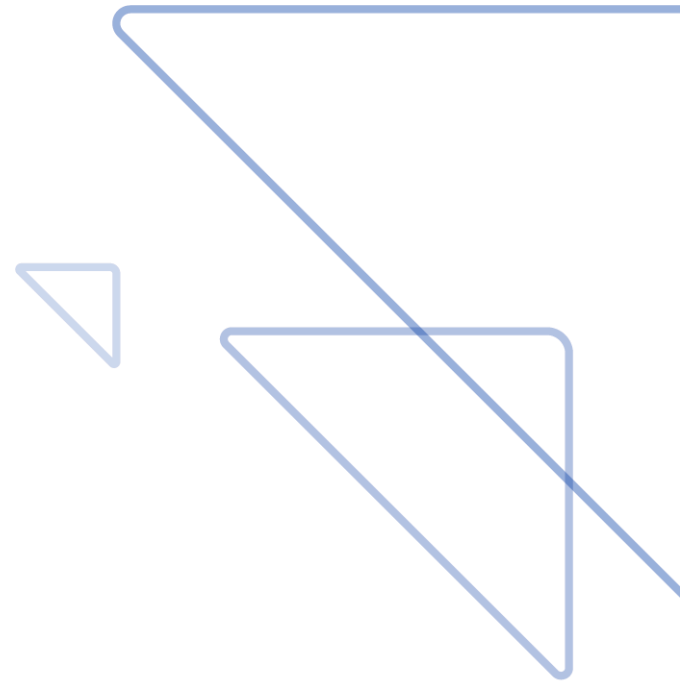
- An elevated creatinine will delay the clearance of insulins
- Must be cautious when making insulin adjustments in patients

## Question #3

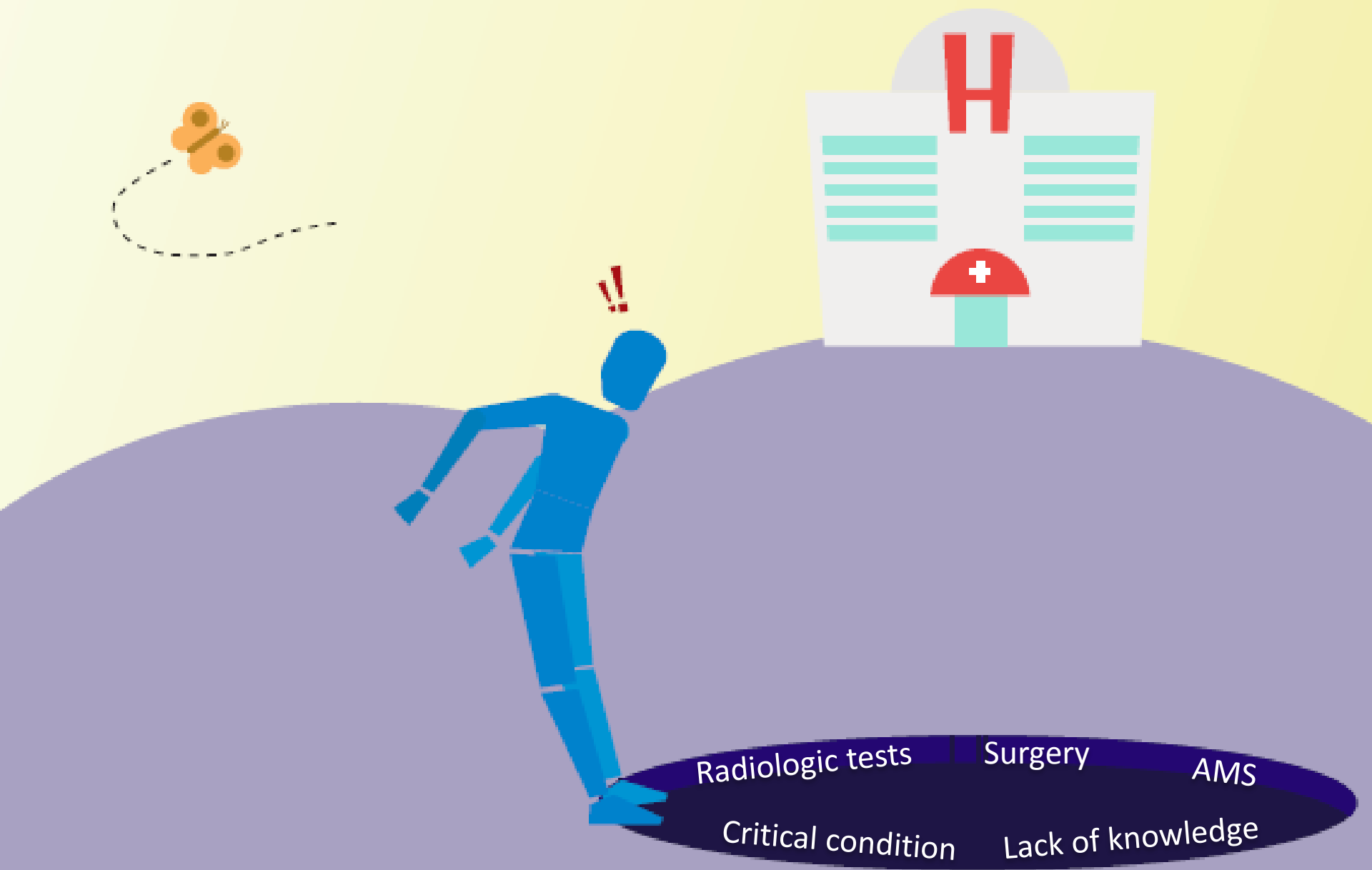
61 yo F with uncontrolled T2DM, A1c 11.0 %. Patient experiencing abdominal pain and is NPO after midnight tonight for EGD. It's dinner time, and FS is 202 mG/dL. She decides she isn't going to eat her meal as she is in too much pain. The bedside nurse calls pharmacy for help. Regarding the insulin orders, you advise the RN to:

- A. Hold the pre-meal and correction scale insulin since she is skipping her meal. Advise RN to get provider order to "hold pre-meal and correction insulin"
- B. Hold the pre-meal insulin but give the correction scale insulin as ordered as FS is elevated. Advise RN to get provider order to "hold pre-meal insulin"
- C. Give the patient her pre-meal insulin as FS is elevated, but hold the correction
- D. Give the patient both the pre-meal insulin and the correction scale insulin

# Continuous Glucose Monitors (CGMs) and Insulin Pumps







# Continuous Glucose Monitors (CGMs)

*Not all inclusive*

**Freestyle  
Libre**



**Dexcom  
G6®**



**Medtronic  
Guardian™  
Connect**



**Senseonics  
Eversense®**



CGM	Receiver	Warm-up Time	Calibration (at home)	Sensor Duration	Transmission
FreeStyle Libre (14-day)	Yes or certain mobile phones	1 hour after scanning	None	14 days	<u>Need to scan</u> - doesn't communicate with reader continuously
Dexcom G6®	Yes or smart device	2 hours after inserting sensor	None	10 days	<u>Continuously sends data</u> - Sensor and transmitter need to be within 20 ft of receiver or smart device
Medtronic (Guardian™ Connect)	None (mobile phone)	2 hours after inserting sensor	q12 hrs (BG needs to be 40 – 400mG/dL)	7 days	<u>Continuously sends data</u> - Transmitter must be 20 ft from phone
Senseonics Eversens®	None (mobile phone)	24 hours after inserting implantable sensor	q12 hrs (BG needs to be 40 - 400 mG/dL)	90 days	<u>Continuously sends data</u> - transmitter must be 25 ft from phone

# Inpatient Use of CGMs

- The previously mentioned CGMS are FDA-approved in outpatient setting only
  - *One CGM approved for inpatient use (GlucoScout®)*
- Several inpatient studies have shown that CGM use vs. POC testing did not improve inpatient glucose control but did detect more hypoglycemic events
- The Endocrine Society recommends against CGMs alone in the ICU or operating room settings, where changing patient conditions may affect CGM accuracy

# Consensus Statement by Diabetes Technology Society

ICU	Non-ICU
<ul style="list-style-type: none"><li>• Most studies looked at accuracy<ul style="list-style-type: none"><li>• Lack of clinical outcomes data</li></ul></li><li>• Need training for staff</li><li>• Need IT to integrate CGM data into EMR</li><li>• If cost prohibitive, defining which patients would benefit</li></ul>	<ul style="list-style-type: none"><li>• Less data compared to ICU</li><li>• Potential advantage is identifying glucose trends and earlier intervention</li></ul>
<b><i>Not enough data to support inpatient CGMs over POC</i></b>	

# Consensus Statement by Diabetes Technology Society

## *Should Home CGMs be continued?*

- Calibration concerns
  - Real-time CGMs should be calibrated twice daily with hospital meter
  - Insulin dosing should not be based solely on CGM data inpatient
  - POC should always be continued and proper documentation of all BG values
- Liability
  - If continued, patients should sign waivers understanding risks and benefits of continued CGM use
  - Any waivers should include contraindications to inpatient use and that providers have the right to remove CGMs
- Need both accuracy and clinical outcomes data during acute inpatient conditions vs. POC
- Consensus
  - Outpatient CGM should be continued inpatient only if the inpatient facility has proper protocols in place for safe use

# Insulin Pumps

*Not all inclusive*

*Rapid-acting insulin is used in insulin pumps. If the pump is discontinued, the patient has a high risk of going into DKA*

Tandem® t-slim

Medtronic  
MiniMed™  
(630G, 670G)

Insulet  
Omnipod®

Valeritas' V-go®

# Combination CGM + Insulin Pump (with tubing)

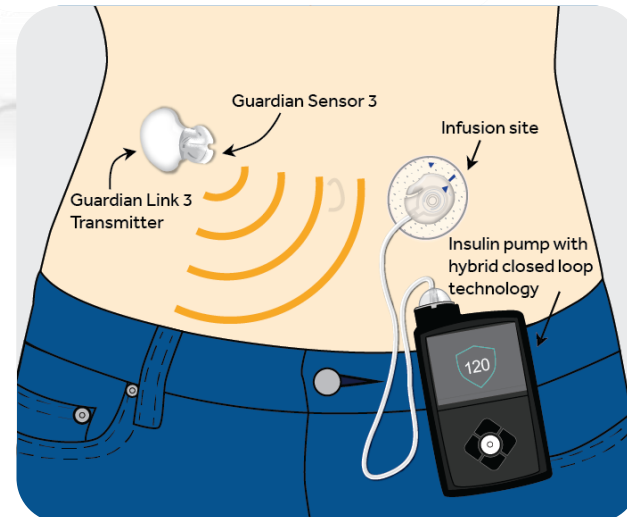
Medtronic  
MiniMed™  
630G  
(±CGM:  
Medtronic  
Guardian™  
Sensor 3)



Medtronic  
MiniMed™  
670G  
(CGM: Medtronic  
Guardian™  
Sensor 3)



Tandem®  
t:slim x2™  
(CGM: Dexcom G6)





# Insulin Pumps (without tubing)

Insulet  
Omnipod®



Valeritas'  
V-go®



# Appropriate Inpatient Use of Insulin Pumps

**ADA and AACE support the use of insulin pumps inpatient provided that . . .**

*Patients are:*

- mentally and physically able
- on relatively stable insulin doses
- well-versed in carbohydrate counting and have adequate oral intake
- understand sick day management

*Hospital staff:*

- Have policies to guide inpatient pump use
- Have staff with expertise in insulin pumps
- Document basal rates and bolus doses

# Inpatient Insulin Pump Requirements

Patient	Nurse (RN)	Provider
<ul style="list-style-type: none"> <li>Self Assessment</li> <li>Sign Attestation forms</li> <li>Capable and competent for using insulin pump</li> <li><b><u>Use hospital meter and insulin (from pharmacy)</u></b></li> <li>Have 3 spare sets of supplies (e.g., infusion set or pod, cartridge and syringe)</li> <li>Change site q2-3 days</li> <li>Report boluses to RN</li> <li>Report carbohydrate intake</li> <li>If pump managed by someone else, must stay in hospital throughout stay</li> </ul>	<ul style="list-style-type: none"> <li>Perform and document POC testing</li> <li>Document the bolus/correction doses given by patient (<b>ASK PATIENT</b>)</li> <li>Check infusion site once per shift/daily</li> <li>Document site change q2-3 days</li> <li>Don't give additional insulin (unless pump is removed and orders are given by MD managing the pt's insulin pump)!</li> <li>If insulin pump is removed, document the disconnection and reconnection</li> </ul>	<ul style="list-style-type: none"> <li>Assess patient's competency &amp; safety to use pump inpatient</li> <li>Endocrine consult <b><u>Inpatient orders</u></b></li> <li>State patient, significant other, parent or legal guardian may manage insulin pump</li> <li>Type of insulin and times</li> <li>Pump type (and 800 #), Basal rate(s), insulin to carb ratio, insulin sensitivity factor, BG targets</li> <li>POC orders and notification parameters</li> </ul>

# Patient Self Assessment Sheet for Personal Insulin Pump

(Recommend completing form with presence of the provider.)

## Current Insulin Pump Settings

Patient Name: \_\_\_\_\_ Physician: \_\_\_\_\_

Actual Weight: \_\_\_\_\_ Age: \_\_\_\_\_

1. Type of Diabetes \_\_\_\_\_

2. How long have you had Diabetes? \_\_\_\_\_

3. How long have you been using an insulin pump? \_\_\_\_\_

4. Pump Manufacturer \_\_\_\_\_ Model and Serial Number (found on back of insulin pump) \_\_\_\_\_

5. Name of Insulin used in pump? \_\_\_\_\_

6. How often do you change your infusion set and site?

a. Date of last set and site change? \_\_\_\_\_

7. Name of person who changes set and site? \_\_\_\_\_

8. Type of infusion set currently in use? \_\_\_\_\_

9. Do you have insulin pump supplies with you? \_\_\_\_\_ If yes, how many days of supplies do you have? \_\_\_\_\_

10. When do you test your own blood glucose? \_\_\_\_\_

11. What type of blood glucose meter do you use? \_\_\_\_\_

12. How often do you experience hypoglycemia (Low blood sugar)? \_\_\_\_\_

13. What is your preferred treatment for hypoglycemia (Low blood sugar)? \_\_\_\_\_

14. When do you check your urine / blood for ketones? \_\_\_\_\_

Method used? \_\_\_\_\_

15. What time was your last insulin bolus? \_\_\_\_\_

16. How many units of insulin did you last bolus? \_\_\_\_\_

### 17. Please list basal rates:

Start Time	Units/Hours
00:00	
01:00	
02:00	
03:00	
04:00	
05:00	
06:00	
07:00	
08:00	
09:00	
10:00	
11:00	
12:00	
1pm (13:00)	
2pm (14:00)	
3pm (15:00)	
4pm (16:00)	
5pm (17:00)	
6pm (18:00)	
7pm (19:00)	
8pm (20:00)	
9pm (21:00)	
10pm (22:00)	
11pm (23:00)	

### 18. List of pre meal bolus insulin/ carbohydrate ratio

Start Time	Ratio(Unit:Gm)
00:00	

### 19. Insulin sensitivity factor / correction factor (How many points does 1 unit of insulin lower your blood sugar?)

Start Time	ISF
00:00	

### 20. Blood Glucose Target

Start Time	BGT(mg/dl)
00:00	

### 21. Active Insulin Time \_\_\_\_\_

### 22. Emergency Contacts:

Physician: \_\_\_\_\_

Phone: \_\_\_\_\_

Responsible Family Member: \_\_\_\_\_

Phone: \_\_\_\_\_

### Patient or Significant Other or Parent or Legal guardian:

Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_

**Allergies:** No Known Allergies

Order:

Insulin Pump

Order ID:

001MDCRVL

Requested By:

Template Name:

Insulin Pump .

Messages:

\*This is a NS-IJ High Alert Medication\*


0.8 (mL/min)

☐ EstimatedResulted -  
09-Jul-2013 08:43

Insulin Type


Route

SubCutaneous 

Route Modifier

Pump 

Frequency

Continuous Pump 

BASAL RATE

Start Time Units/Hour

 :   :  :  :  :  :  :  :  




Time/Priority

Routine 










Stop After (Duration)

INSULIN to CARB RATIO

Start Time Ratio  
(Unit:Gm) :   :  :  :  :  :  :  :  INSULIN SENSITIVITY 

Start Time ISF

 :   :  :  :  :  :  :  :  BLOOD GLUCOSE TAR Start Time BGT  
(mG/dL) :   :  :  :  :  :  :  :  ☐ **insulin aspart (NovoLOG) Pump - SubCutaneous, Continuous Pump***Special Instructions: Insulin aspart (NovoLOG) pump**Administration Instructions: Dispose unused medication in BLACK bin.**This is a Look-alike/Sound-alike Medication***BASAL RATE:***Start Time: 00:00 Rate: 1.1 Units/Hour**Start Time: 05:00 Rate: 1.45 Units/Hour**Start Time: 14:00 Rate: 1.5 Units/Hour**Start Time: 19:30 Rate: 1.3 Units/Hour***INSULIN to CARB RATIO:***Start Time: 00:00 Ratio: 1:9 Unit:Grams***INSULIN SENSITIVITY FACTOR:***Start Time: 00:00 ISF: 1:50***BLOOD GLUCOSE TARGET:***Start Time: 00:00 BGT: 100-120mG/dL*

# Inappropriate Uses of Insulin Pump Inpatient

- Refusal to sign appropriate paperwork
- Change in patient status resulting in ability to self manage pump
  - Altered state of consciousness
  - Altered state of physical function
  - Critical condition (e.g., DKA)
  - Risk for suicide
  - Emotional and behavioral issues interfering with self management
- Patient, parent or legal guardian does not have the capacity to manage the pump
- Patient, parent or legal guardian declines using pump in the hospital
- Other circumstances identified by health care provider
  - Pump malfunction
  - Lack of supplies

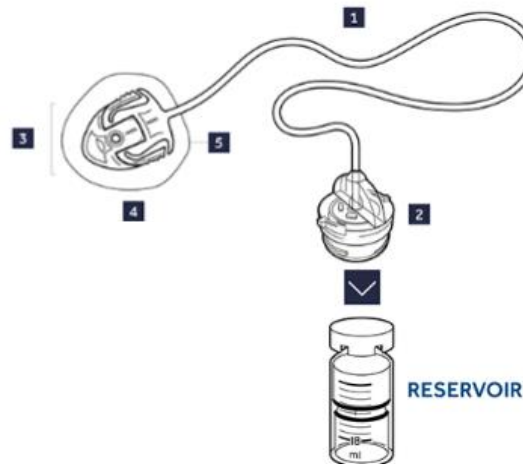
***Alternative insulin needs to be ordered***

# Temporary Disconnection of the Insulin Pump

Insulin pump (and CGM) must be removed for tests such as:

- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>• MRI</li><li>• CT Scan</li><li>• X-Rays</li></ul> | <ul style="list-style-type: none"><li>• Fluoroscopy</li><li>• Electrocautery surgery</li><li>• Diathermy</li></ul> |
|--|--|

- Always check POC before disconnecting
- Pump without tubing (e.g., Omnipod) must be removed prior to above tests
- Pumps with tubing (e.g., Medtronic) the insertion set could stay in place during the above testing but tubing and pump should be removed



***Alternative insulin needs to be ordered if pump will be disconnected for > 1 hour***

# Surgery and Insulin Pumps

- Sobel, et al showed that insulin pump use is safe and effective for elective, same-day surgeries when it is  $\leq 120$  minutes and a peri-operative protocol is followed

## What needs to happen for continued pump use?

Hospital	Patient
<ul style="list-style-type: none"> <li>Perioperative protocol</li> <li>Approval from Anesthesia/surgical team to continue pump</li> <li><u>Documentation is key! (pump use and BG: pre-op, intra-op, and post-op)</u></li> <li>If surgery is lasting more than 1 – 3 hours, recommend removing the insulin pump and providing <b>alternative insulin</b></li> </ul>	<ul style="list-style-type: none"> <li>Continue usual basal rates or adjust per Endocrinologist</li> <li>Day before surgery: replace and fill the pump reservoir</li> <li>Change pump site if surgery is in the abdomen</li> </ul>

## Potential Mishaps

Pump interference from magnets or X-rays intraoperatively	Accidental site displacement (→ <b>DKA</b> )	Lack of staff knowledge
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# How to Transition from Insulin Pump to SQ Insulin

*DKA is likely with pump interruption*

## Basal

- Check pump settings and add total basal insulin in last 24 hours
  - Remember patients usually have multiple basal rates (units/hr)
- Overlap dose of basal insulin with pump by **two hrs before disconnecting**

## Pre-meal

- Insulin:carbohydrate ratio
- E.g., 1 unit insulin: 10 G carbohydrates
- If the patient is eating consistent carbohydrate meals in the hospital (45G/60G/60G), then pre-meal insulin can be between 4 – 6 units before meals

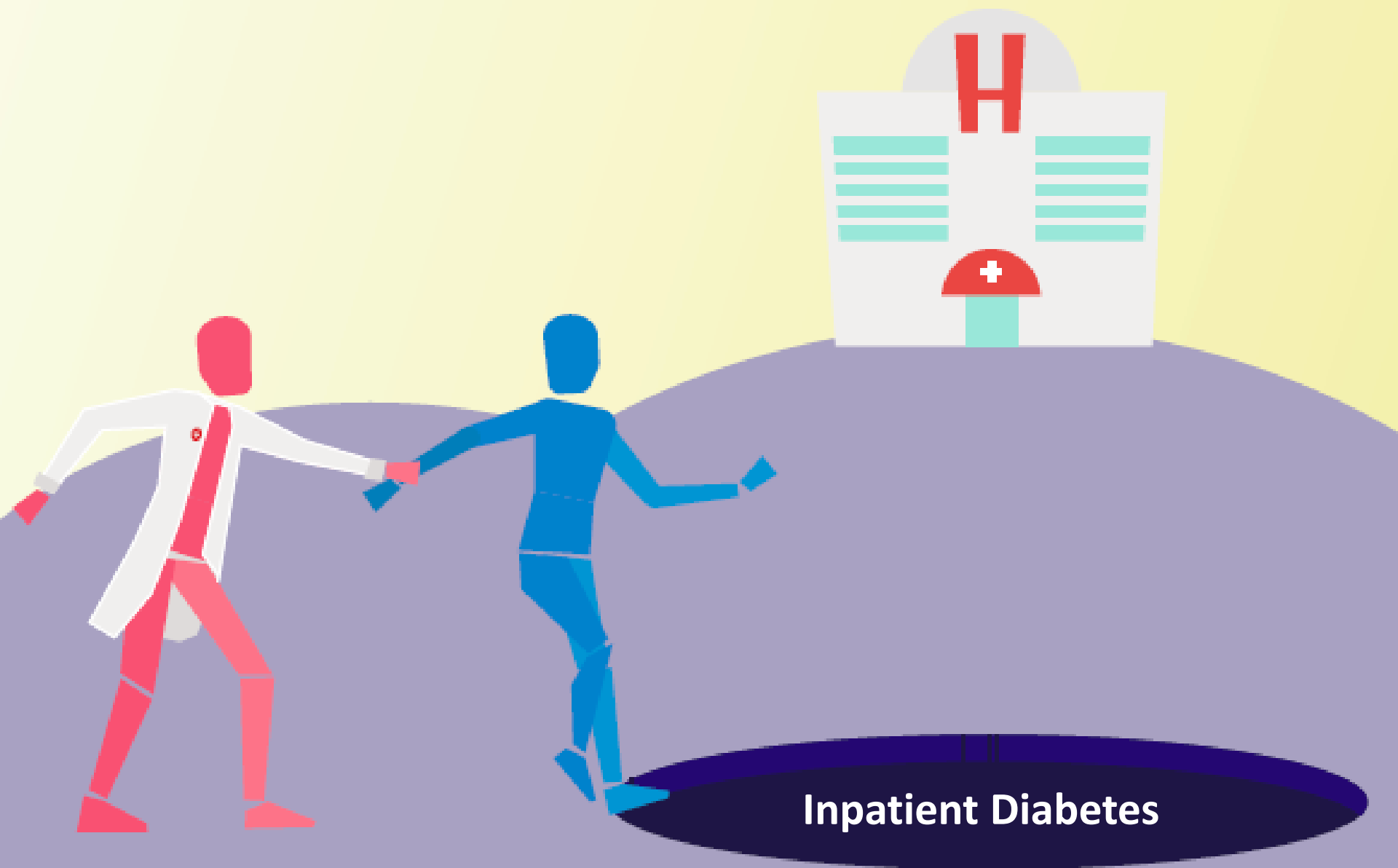
## Correction scale insulin

- Insulin sensitivity (correction) factor (ISF)
- $ISF > 50 \rightarrow$  low dose correction
- $ISF < 25 \rightarrow$  medium dose correction
  - Anything in between, err on the side of caution and use low dose correction
- E.g., ISF 1:45 means 1 unit of rapid-acting insulin will lower BG by 45 mG/dL  $\rightarrow$  low dose correction

## Question #4

The pharmacy technician performs a medication reconciliation on a patient who is A&O x2 due to a suspected gastrointestinal infection. She is currently NPO. The technician notices the patient is wearing an insulin pump and asks the patient about it but the patient is not sure. The technician tells the pharmacist who proceeds to tell the physician. Which of the following is the most appropriate next step?

- A. Have the patient fill out the self-assessment and sign the attestation
- B. Have the provider input orders for the insulin pump
- C. Remove the insulin pump and use correction scale insulin only
- D. Patient cannot manage pump in current health. Check the pump settings. Then, give basal insulin (overlap by two hours before removing pump) + correction scale insulin based on insulin sensitivity factor



## Inpatient Diabetes

# Any Questions?



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