Getting Glucose to GOAL In the Hospital - Frontline Nursing Training

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President, Diabetes Educational Services
www.DiabetesEd.net

Objectives:
- Discuss the importance of inpatient glucose control.
- Describe the goals of care
- Describe basal bolus insulin therapy
- Discuss appropriate insulin therapy considerations for a variety of situations.

Glucose Management and Hospitalized Patients

In hospitalized patients with critical illness, hyperglycemia is a signal that warrants our attention.
Hospitals and Hyperglycemia
What’s the Big Deal?

- Hyperglycemia is associated with increased morbidity and mortality in hospital settings.
- Acute Myocardial Infarction
- Stroke
- Cardiac Surgery
- Infection
- Longer lengths of stay

Stress response and hyperglycemia

- Decreased WBC’s
- Catabolism
- Abnormal inflammatory response
- Endothelial cell dysfunction
- Increased clotting, blood viscosity
- Tissue breakdown
- Inflammatory changes
- Increased blood pressure, pulse

Leads to: Longer lengths of stay, complications, death

Diabetes Care, v. 27, #2, Feb 2004

Hyperglycemia*: A Common Comorbidity in Medical-Surgical Patients in a Community Hospital

- 62% Normoglycemia
- 12% Known Diabetes
- 26% New Hyperglycemia

n = 2,020

* Hyperglycemia: Fasting BG ≥ 126 mg/dl or Random BG ≥ 200 mg/dl X 2

Umpierrez et al
Effect of Hyperglycemia on Hospital Mortality

*P<.01 compared with normoglycemia and known diabetes.


Blood Glucose Above Normal = Trouble

- Pre Diabetes
  - Fasting Glucose = 100-125mg/dl
  - A1c 5.7 – 6.4%

- Diabetes
  - Fasting Glucose = 126 mg/dl +
  - Random Glucose = 200 mg/dl +
  - A1c 6.5% +

Any blood glucose above 140 requires treatment

Umpierrez et al

A1c and Estimated Avg Glucose (eAG) 2008

<table>
<thead>
<tr>
<th>A1c (%)</th>
<th>eAG</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>97</td>
</tr>
<tr>
<td>6</td>
<td>126</td>
</tr>
<tr>
<td>7</td>
<td>154</td>
</tr>
<tr>
<td>8</td>
<td>183</td>
</tr>
<tr>
<td>9</td>
<td>212</td>
</tr>
<tr>
<td>10</td>
<td>240</td>
</tr>
<tr>
<td>11</td>
<td>269</td>
</tr>
<tr>
<td>12</td>
<td>298</td>
</tr>
</tbody>
</table>

\[ eAG = 28.7 \times A1c - 46.7 \sim 29 \text{ pts per 1%} \]

Order teaching tool kit free at diabetes.org

Diabetes Care: 31, #8, August 2008

Translating the A1c Assay Into Estimated Average Glucose Values - ADAG Study

Diabetes Care: 31, #8, August 2008
Recommendations for Managing Patients With Diabetes in the Hospital Setting

Antihyperglycemic Therapy
- Insulin Recommended
- Oral DM Meds Not Generally Recommended
- IV Insulin
  - Critically ill patients in the ICU
- SC Insulin
  - Non-critically ill patients

Management of Hyperglycemia and Diabetes
- Non-ICU
  - Basal/bolus therapy (MDI)
    - NPH and Regular insulin
    - Long-acting and rapid-acting insulin
    - Premixed insulin
- ICU and Critical Care
  - Insulin Drips
  - Basal/Bolus

ADA/AACE Goals and Treatments For Hospitalized Patients
- Critically Ill pts
  - Start insulin therapy no later than BG 180
  - Once insulin started, glucose goal 140-180
  - Insulin drip preferred treatment
- Non Critically Ill patients
  - Blood glucose goals:
    - Premeal <140
    - Post meal <180
  - Basal/bolus Insulin preferred treatment

Consensus: Inpt Hyperglycemia, Endocr Pract. 2009;15 (No.4)
Insulin – the Ultimate Hormone Replacement Therapy

Objectives:
• Discuss the actions of different insulins
• Describe using pattern management as an insulin adjustment tool

The Miracle of Insulin

Patient J.L., December 15, 1922
February 15, 1923

Type 1 in Hospital

43 yr old admitted to evaluate angina.
Morning blood sugar is 142.
You walk in with his insulin dose.
The patient says, “I will bottom out if I take that much insulin.”
“That dose won’t touch my blood sugar”

What do you say?
**Life Study – Mrs. Jones**

Mrs. Jones is 62 years old, a little heavy and complains of feeling tired and urinating several times a night. She is admitted with a urinary tract infection. Her WBC is 12.3, glucose 237. She is hypertensive with a history of gestational diabetes. No ketones in urine.

- What risk factors and signs of diabetes does she have?
- What type of diabetes does she have?

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**Life Study – Mrs. Jones**

- How would we manage her BG in hospital?

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**Physiologic Insulin Secretion: 24-Hour Profile**

- Insulin (µIU/mL)
- Glucose (mg/dL)
- Bolus Insulin
- Basal Insulin
- Mealtime Glucose
- Basal Glucose

---
Insulin Action Teams

- **Bolus:** lowers after meal glucose levels
  - Rapid Acting
    - Aspart, Lispro, Glulisine
  - Short Acting
    - Regular
- **Basal:** controls glucose between meals, hs
  - Intermediate
  - NPH
  - Long Acting
    - Detemir (Levemir)
    - Glargine (Lantus)

Bolus Insulins
(½ of total daily dose ÷ meals)

<table>
<thead>
<tr>
<th>Name</th>
<th>Onset</th>
<th>Peak Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lispro (Humalog)</td>
<td>5-15 min</td>
<td>0.5 -1.5 hrs</td>
</tr>
<tr>
<td>Aspart (NovoLog)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glulisine (Apidra)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular</td>
<td>30 -60 min</td>
<td>2 - 3 hrs</td>
</tr>
</tbody>
</table>

Bolus Insulin Summary

- Regular, Novolog, Humalog, Apidra,
- Starts working fast (15-30 mins)
- Gets out fast (3-6 hours)
- Post meal BG reflects effectiveness
- Should comprise about ½ total daily dose
- Covers food or hyperglycemia.
  - 1 unit
    - Covers ≈ 10 -15 gms of carb
    - Lowers BG ≈ 30 – 50 points
Bolus Insulin Timing

- How is the effectiveness of bolus insulin determined?
  - Before next meal blood glucose
- Inpt Glucose goals (ADA) – may be modified by provider/pt
  - 1-2 hours post meal <180
  - Before next meal – 70 - 140

Bolus Basics

- Carbohydrate/Prandial Coverage
  - Match the insulin to the carbohydrates
  - 1 unit for 15 gms - Common starting point
  - Usual meal 45 – 60gms = 3-4 units insulin
- Correction Bolus - targets hyperglycemia
  - 1 unit for every 30-50 points over target
- Adjust ratios depending on sensor and response

Now What?

- Nurse had an emergency and pt already ate lunch?
- Nurse administered insulin and pt only ate a few bites of turkey and drank non sugar tea?
- You just gave 3 units of Novolog and patient needs to go to OR NOW!
Now that we covered food, what about BG > 150?

That’s where the Correction Bolus comes into play.

### Usual Correction Bolus
Rapid/Fast Acting Insulin (1 unit: 50 mg/dl > 150)

<table>
<thead>
<tr>
<th>Blood Glucose Range (mg/dl)</th>
<th>Correction Bolus (units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 or less</td>
<td>Treat for Hypo, hold dose</td>
</tr>
<tr>
<td>71-150</td>
<td>0 units</td>
</tr>
<tr>
<td>151-200</td>
<td>1 unit</td>
</tr>
<tr>
<td>201-250</td>
<td>2 units</td>
</tr>
<tr>
<td>251-300</td>
<td>3 units</td>
</tr>
<tr>
<td>301-350</td>
<td>4 units</td>
</tr>
<tr>
<td>351-400</td>
<td>5 units</td>
</tr>
</tbody>
</table>

### Basal Insulins
(½ of total daily dose)

<table>
<thead>
<tr>
<th></th>
<th>Intermediate Acting</th>
<th>Peak Action</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPH</td>
<td>4-10 hrs</td>
<td>10-16</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Long Acting</th>
<th>Peak Action</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detemir (Levemir)</td>
<td>No peak</td>
<td>6 - 24 hrs</td>
<td></td>
</tr>
<tr>
<td>Glargine (Lantus)</td>
<td>No peak</td>
<td>20 - 24 hrs</td>
<td></td>
</tr>
</tbody>
</table>

Fasting BG reflects efficacy of basal
Basal Insulin Summary

- NPH, Levemir, Lantus
- Covers in between meals, through night
- Starts working slow (4 hours)
- Stays in long (12-24 hours)
  - NPH 12 hrs
  - Levemir, Lantus 20-24 hrs
- Fasting blood glucose reflects effectiveness

Combination SQ Insulin

<table>
<thead>
<tr>
<th>Insulin Type</th>
<th>Onset</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humalog Mix</td>
<td>5-15 min</td>
<td>10-16 hrs</td>
</tr>
<tr>
<td>75/25: 75% NPL, 25% lispro</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50/50: 50% NPL, 50% lispro</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NovoLog Mix</td>
<td>5-15 min</td>
<td>10-16 hrs</td>
</tr>
<tr>
<td>70/30: 70% NPA, 30% aspart</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPH + Reg Combo</td>
<td>30 – 60 min</td>
<td>10-16 hrs</td>
</tr>
<tr>
<td>70/30: 70%N /30%R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50/50: 50%N /50%R</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Considerations:
- Pre-mixed, difficult to fine tune therapy

Insulin Therapy Components

- Basal insulin – long acting insulin covers between meals and through night
- Prandial or meal insulin – a bolus insulin that covers food, IV dextrose, enteral nutrition, TPN or other nutritional supplements
- Correction insulin – bolus insulin dosed to correct for hyperglycemia that occurs despite use of basal and nutritional insulin
- Usually given before meals w/ prandial insulin
How Much Insulin Does a Patient Need?

- It depends, based on:
  - Body weight
  - Overwt, normal wt, or thin
  - Frail, elderly
  - Eating status
    - Normal, poor intake or NPO
  - Renal or hepatic insufficiency
  - Type of Diabetes
  - Current meds; steroids, insulin, oral dm agents
  - Infected or Septic

Initiating Insulin in Hospital

1. Stop oral agents - Obtain patient wt in kg
2. Calculate total daily dose (TDD) as 0.3-0.7 units per kg/day
3. Choose the dosing schedule
   - 50% of TDD as basal insulin
   - 50% of TDD as prandial or nutritional insulin
4. Use Correction Insulin for BG above goal
   - Adjust according to results of BGSH
   - Adjust dose for NPO status or changes in clinical status

Provider Assessments

- Nutritional Status
  - Eating, NPO, or Bolus Tube Feeds
  - TPN or Continuous Tube Feeds

- Insulin Sensitivity
  - Resistant
  - Sensitive
  - Usual/Moderate
Patients that require intermittent insulin are grouped together. This includes orders that are appropriate for NPO patients.

Patients that have a continuous supply of nutrition are grouped together.

Using the New Insulin Power Plans:

<table>
<thead>
<tr>
<th>Insulin Sensitivity</th>
<th>Total Daily Dose of Insulin</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>SENSITIVE</td>
<td>&lt; 40 units/day, frail, thin, elderly, eating &lt; 50%, with hepatic or renal insufficiency (CrCl &lt; 30 ml/min)</td>
<td></td>
</tr>
<tr>
<td>MODERATE/USUAL</td>
<td>40-80 units/day, average wt, good PO intake, DM Type 1</td>
<td></td>
</tr>
<tr>
<td>RESISTANT</td>
<td>&gt; 80 units/day, obese, on steroids, or septic</td>
<td></td>
</tr>
</tbody>
</table>

Determining Sensitivity: 

Set dose to patient’s weight, and the sensitivities or disease states.
Mrs. Jones is 62 years old, a little heavy and complains of feeling tired and urinating several times a night. She is admitted with a urinary tract infection. Her WBC is 12.3, glucose 237. She is hypertensive with a history of gestational diabetes. No ketones in urine. A1c 8.9%

What insulin dose would we start Mrs. Jones on?

Insulin Dose - Mrs. Jones

- Moderate
  - Why?
    - Average weight, good oral intake

Basal/ Bolus Insulin Dosing Strategy

50/50 Rule
- 0.3-1.0 units/kg day
- Basal = 50% of total
  - Glargine at HS
  - NPH or Detemir BID
- Bolus = 50% of total
  - usually divided into 3 meals

Example
- Wt 50kg x 0.5 = 25 units of insulin/day
- Basal dose: 13 units
  - Glargine 13 units at HS
  - NPH/Detemir 6u BID
- Bolus dose: 12 units
  - 4 units NovoLog, Apidra
  - Humalog each meal
Basal/ Bolus Insulin
Dosing Strategy 0.5u/ kg

50/50 Rule
- 0.3-1.0 units/kg day
- Basal = 50% of total
  - Glargine at HS
  - NPH or Detemir BID
- Bolus = 50% of total
  - usually divided into 3 meals

Example - You Try
- Wt 60 kg x 0.5 = ___ units of insulin/day
- Basal dose: ____ units
  - Glargine ____ units HS
  - NPH/Detemir ____ BID
- Bolus dose: ____ units
  - ____ units NovoLog, Apidra
  - Humalog each meal

Example - You Try
- Wt 60 kg x 0.5 = 30 units of insulin/day
- Basal dose: 15 units
  - Glargine 15 units HS
  - NPH/Detemir 7 BID
- Bolus dose: 15 units
  - 5 units NovoLog, Apidra
  - Humalog, Reg each meal

PowerPlan Insulin Calculator
Basal Insulin- Lantus

The insulin calculator will pop up when you click on the type of insulin to order. It is based on the fact that you will give ½ as basal and the other ½ as prandial/nutritional.
Calculating Prandial Dose

Next is the Prandial bolus dose, the insulin calculator pre-populates the expected amount. The weight must be filled in to calculate doses, if it is not you can enter it here.

Correctional Scale

Next choose the correctional you want to add to the scheduled insulin. This one is for patients that are eating, and has HS dose. This scale is for the patients that are on continuous feeding, TDN or tube feeding.

How it Looks on MAR

The insulin doses will appear on the MAR. Correctional scale is in box below. Best Practice is to discontinue all oral anti-diabetic medications while in hospital except for short LOS patients.
Custom Scale
You can still 'add to phase' the order for the insulin sliding scale tool (with the calculator) if you want to build a customized correctional scale.

Usual Correction Bolus
Rapid/Fast Acting Insulin

<table>
<thead>
<tr>
<th>Range</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 or less</td>
<td>Treat for hypo, hold dose</td>
</tr>
<tr>
<td>71-150 mg/dl</td>
<td>0 units</td>
</tr>
<tr>
<td>151-200 mg/dl</td>
<td>1 unit</td>
</tr>
<tr>
<td>201-250 mg/dl</td>
<td>4 units</td>
</tr>
<tr>
<td>251-300 mg/dl</td>
<td>6 units</td>
</tr>
<tr>
<td>301-350 mg/dl</td>
<td>8 units</td>
</tr>
<tr>
<td>351-400 mg/dl</td>
<td>10 units</td>
</tr>
</tbody>
</table>

Mrs. Jones - Pattern
5 unit meal bolus + Correction
15 unit Lantus hs

<table>
<thead>
<tr>
<th>Day</th>
<th>Break</th>
<th>Lunch</th>
<th>Dinner</th>
<th>HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>admit</td>
<td>219</td>
<td>243</td>
<td>219</td>
</tr>
<tr>
<td>Day 2</td>
<td>129</td>
<td>197</td>
<td>184</td>
<td>195 - NPO</td>
</tr>
<tr>
<td>Day 3</td>
<td>67</td>
<td>gone</td>
<td>119 clear liquids</td>
<td>104</td>
</tr>
<tr>
<td>Day 4</td>
<td>73</td>
<td>81</td>
<td>119</td>
<td>d/c</td>
</tr>
</tbody>
</table>
Preparation for Surgery

- Try to schedule surgery in am, resume meds/insulin when eating and stable.
- Oral medications: In am, hold all diabetes oral medications
- Basal Insulin: Night before
  - type 2s, give 50% of usual am basal dose for
  - type 1s give up to 100% of basal dose.
- Bolus insulin: may need mild insulin bolus coverage for type 1 and type 2's
- Have D5 or D10 IV bags available in case of hypo

BG Running Low?

- Possible Causes
  - Too much insulin
  - Premeal bolus
  - HS basal
  - Glucose toxicity improving
  - Infection improving
  - Stopped/lowered steroids
  - Poor kidney function
  - Skipped meal, poor PO intake
  - Not eating enough carbs

Hypoglycemia Symptoms

- Autonomic
  - Anxiety
  - Palpitations
  - Sweating
  - Tingling
  - Trembling
  - Hypoglycemic Unawareness

- Neuroglycopenia
  - Irritability
  - Drowsiness
  - Dizziness
  - Blurred Vision
  - Difficulty with speech
  - Confusion
  - Feeling faint
BG Too Low? Insulin Adjustment Guidelines

- Before meal Blood glucose < 70?
- Implement hypoglycemia protocol
- Evaluate cause and make needed adjustments
  - Missed meal?
  - Too much insulin?
- Morning blood glucose < 90?
  - Decrease evening Lantus by 10%
- Evaluate trends, provide feedback

---

HS Correction Bolus for ALL levels - Prevents HS Hypo

Rapid/Fast Acting Insulin

<table>
<thead>
<tr>
<th>Less than 70</th>
<th>Treat for hypo, hold dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>71-150 mg/dl</td>
<td>0 units</td>
</tr>
<tr>
<td>151-200 mg/dl</td>
<td>1 unit</td>
</tr>
<tr>
<td>201-250 mg/dl</td>
<td>2 units</td>
</tr>
<tr>
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<td>3 units</td>
</tr>
<tr>
<td>301-350 mg/dl</td>
<td>4 units</td>
</tr>
<tr>
<td>351-400 mg/dl</td>
<td>5 units</td>
</tr>
</tbody>
</table>

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Treatment of Hypoglycemia

- If BG 70 mg/dl or less and pt is eating:
  - 15 gms of carb (gel, glucose tabs)
- If BG 70 mg/dl or less, pt is NOT eating
  - D50 if IV access
  - Glucagon if no IV access
  - Recheck BG every 15 minutes
  - Hold next correction insulin dose
  - Give next meal insulin and Lantus Dose
Mrs. Jones is improved and ready to go home.
What glucose management strategies for home?
Her A1c = 8.9%

Discharge insulin Algorithm

Discharge Treatment

- A1C < 7%
  - Re-start outpatient treatment regimen (Orals and/or insulin)

- A1C 7%-9%
  - Re-start outpatient oral agents and D/C on glargine once daily at 50-80% of hospital dose

- A1C >9%
  - D/C on basal bolus at same hospital dose.
  - Alternative: re-start oral agents and D/C on glargine once daily at 50-80% of hospital dose

Discharge Teaching

- What supplies will she need?
- What top 3 things do we need to teach her?
- What resources can we provide?
- What referrals?
Top 4 Discharge Questions

1. Can patient perform self blood glucose monitoring? Do they need meter?
2. Can pt safely take meds / insulin?
3. Does the pt know how to treat hypo and hyper glycemia?
4. Does the patient know what to do on sick days?

Mr. R has Pneumonia
How Much Insulin Needed?

- Creatinine 1.6
- 76 years old
- Not very hungry
- BMI 22
- Weighs 70kg
- Glucotrol 5mg at home
- A1c 7.2%

Basal/ Bolus Insulin Dosing Strategy 0.3u/ kg

50/ 50 Rule
- 0.3-1.0 units/kg day
- Basal = 50% of total
  - Giargine at HS
  - NPH or Detemir BID
- Bolus = 50% of total
  - divided into 3 meals

Example - You Try
- Wt 70kg x 0.3 = ___ units of insulin/day
- Basal dose: ___ units
  - Giargine ___ units HS or
  - NPH/Detemir ___u BID
- Bolus dose: ___ units
  - ___ NovoLog, Apidra
  - Humalog Reg w/meal
Basal/ Bolus Insulin
Dosing Strategy 0.3u/kg

50/50 Rule
- 0.3-1.0 units/kg day
- Basal = 50% of total
  - Glargine at HS
  - NPH or Detemir BID
- Bolus = 50% of total
  - divided into 3 meals

Example - You Try
- Wt 70kg x 0.3 = 21 units of insulin/day
- Basal dose: 11 units
  - Glargine 11 units HS or
  - NPH/Detemir 5u BID
- Bolus dose: 10 units
  - 3 NovoLog, Apidra
    - Humalog Reg w/meal

Sensitive Correction Bolus
Rapid/ Fast Acting Insulin

<table>
<thead>
<tr>
<th>Blood Sugar (mg/dl)</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 or less</td>
<td>Treat for hypo, hold dose</td>
</tr>
<tr>
<td>71-150 mg/dl</td>
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<tr>
<td>301-350 mg/dl</td>
<td>4 units</td>
</tr>
<tr>
<td>351-400 mg/dl</td>
<td>6 units</td>
</tr>
</tbody>
</table>

3 days poor intake, pt started on Tube Feeding

- If on continuous tube feeding, how would this change his insulin regimen?
- If on intermittent tube feeding, how would this change his insulin regimen?
- If patients tube feeding is interrupted, what precautions would you take?
Continuous enteral nutrition (EN)
- Basal insulin: 50% of daily dose twice daily
- Prandial bolus insulin: 50% given q6h

Cycled enteral nutrition
- Combination basal/bolus insulin (ie 70/30) given at the start of each tube feeding
- Bolus insulin administered q4 to 6 hours for duration of EN administration
- Correctional insulin given for BG above goal

Bolus enteral nutrition
- Rapid acting analog or short acting insulin given prior to each bolus

---

Mr. R - Pattern
3 unit meal bolus + Correction
11u Lantus hs

<table>
<thead>
<tr>
<th></th>
<th>Break</th>
<th>Lunch</th>
<th>Dinner</th>
<th>HS</th>
</tr>
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<tbody>
<tr>
<td>Day 1</td>
<td>admit</td>
<td>381</td>
<td>198</td>
<td></td>
</tr>
<tr>
<td>Day 2</td>
<td>98</td>
<td>127</td>
<td>69</td>
<td>98</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RN Held Lantus</td>
<td></td>
</tr>
<tr>
<td>Day 3</td>
<td>137</td>
<td>67</td>
<td>72 tube feeding 4 times a day</td>
<td>207</td>
</tr>
<tr>
<td>Day 6</td>
<td>142</td>
<td>129 NG Tube pulled</td>
<td>Pt feels funny</td>
<td>BG 63</td>
</tr>
</tbody>
</table>

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Discharge insulin Algorithm

<table>
<thead>
<tr>
<th>Discharge Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1C &lt; 7%</td>
</tr>
<tr>
<td>Re-start outpatient treatment regimen (Orals and/or insulin)</td>
</tr>
<tr>
<td></td>
</tr>
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<td>A1C 7%-9%</td>
</tr>
<tr>
<td>Re-start outpatient oral agents and D/C on glargine once daily at 50-80% of hospital dose</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>A1C &gt;9%</td>
</tr>
<tr>
<td>D/C on basal bolus at same hospital dose.</td>
</tr>
<tr>
<td>Alternative: re-start oral agents and D/C on glargine once daily at 50-80% of hospital dose</td>
</tr>
</tbody>
</table>

Umpierrez et al
Mr. R after 9 days feeling better. Eating again, regaining strength. DC today.

- What glucose mgmt strategy?
- What supplies will he need?
- What top 3 things do we need to teach him?
- What resources and referrals?

Top 4 Discharge Questions

1. Can patient perform self blood glucose monitoring? Do they need meter?
2. Can pt safely take meds / insulin?
3. Does the pt know how to treat hypo and hyper glycemia?
4. Does the patient know what to do on sick days?

How Much Insulin Needed?

Mr. K
- Waistline 46"
- Creat 0.9
- Infected Foot Ulcer
- Asthma
- Meds
  - Metformin
  - Exanetide (ran out)
  - Actos (worried about ankles swelling)
- A1c 10.8%
**Basal/ Bolus Insulin Dosing Strategy 0.7u/ kg**

50/50 Rule
- 0.3-1.0 units/kg/day
- Basal = 50% of total
  - Glargine at HS
  - NPH or Detemir BID
- Bolus = 50% of total
  - divided into 3 meals

**Example - You Try**
- Wt 100 kg x 0.7 = __ units of insulin/day
- Basal dose: ____ units
  - Glargine ____ units HS
  - NPH/Detemir ____ BID
- Bolus dose: ____ units
  - _units NovoLog, Apidra
  - Humalog each meal

**Resistant Correction Bolus**

<table>
<thead>
<tr>
<th>Blood Sugar (mg/dl)</th>
<th>Recommended Dose (units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 or less</td>
<td>Treat for hypo, hold dose</td>
</tr>
<tr>
<td>71-150</td>
<td>0 units</td>
</tr>
<tr>
<td>151-200</td>
<td>3 units</td>
</tr>
<tr>
<td>201-250</td>
<td>6 units</td>
</tr>
<tr>
<td>251-300</td>
<td>9 units</td>
</tr>
<tr>
<td>301-350</td>
<td>12 units</td>
</tr>
<tr>
<td>351-400</td>
<td>15 units</td>
</tr>
</tbody>
</table>
Started on Prednisone
60mg qd for Asthma

- Blood glucose levels running 300-500.

BG Running High?

- Possible Causes
  - Glucose Toxic
  - Infection
  - Started on steroids
  - Physical stress
  - Insulin dose too low

BG Too High? Insulin Adjustment Guidelines

- Meal Blood glucose too high?
  - If BG increases by 50 points from meal A to meal B
  - Increase meal A rapid acting insulin dose by 1 unit
  - Morning blood glucose > 140?
    - Increase evening Lantus by 10% every second day
  - If 2 consecutive BG > 200, call MD
Mr. K BG Levels Too High
Insulin Drip Started

- 100 units insulin in 100 cc NS Bag
- 1 cc = 1 unit of insulin
- Started on Algorithm 2 – at 7.5 units /hr for BG of 347

Discharge insulin Algorithm

Discharge Treatment

<table>
<thead>
<tr>
<th>A1C &lt; 7%</th>
<th>A1C 7%-9%</th>
<th>A1C &gt;9%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-start outpatient treatment regimen (Orals and/or insulin)</td>
<td>Re-start outpatient oral agents and D/C on glargine once daily at 50-80% of hospital dose</td>
<td>D/C on basal bolus at same hospital dose. Alternative: re-start oral agents and D/C on glargine once daily at 50-80% of hospital dose</td>
</tr>
</tbody>
</table>

What Glucose Mgmt Strategy for Discharge?

- Waistline 46”
- Infected Foot Ulcer
- Asthma (on pred)
- Meds
  - Metformin
  - Exenatide (ran out)
  - Actos (worried about ankles swelling)
- A1c 10.8%
MR K. Stable, ready for discharge.

- What is your biggest concern?
- What supplies will he need?
- What top 3 things do we need to teach him?
- What resources and referrals?

Top 4 Discharge Questions

1. Can patient perform self blood glucose monitoring? Do they need meter?
2. Can pt safely take meds / insulin?
3. Does the pt know how to treat hypo and hyper glycemia?
4. Does the patient know what to do on sick days?

Thank You