



Advanced Level
Pattern Management Gone Crazy – Part II

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Pattern Management Gone Crazy

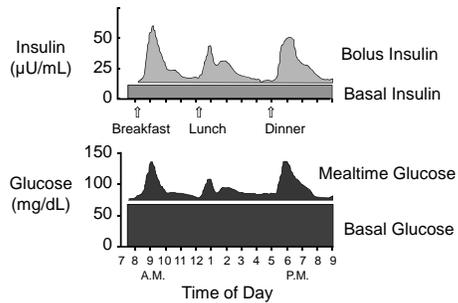
- ▶ Incorporating national guidelines into practice
- ▶ Explore the importance of patient assessment in determining a realistic dosing strategy.
- ▶ Discuss strategies to initiate and modify insulin therapy with a focus on safety.
- ▶ List strategies on adjusting bolus and basal insulin to achieve glucose control.
- ▶ Glucose patterns and adjustment strategies

Pattern Management –AKA

How to think like a pancreas



Physiologic Insulin Secretion: 24-Hour Profile



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Poll question 1

- ▶ Which of the following are bolus insulins?
 - a. Lantus, Levemir
 - b. Novolog, Humalog, NPH
 - c. Reg, Novolog, Afrezza
 - d. Insulin pens
 - e. not sure



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Insulin Action Teams

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



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Insulin Efficacy

- ▶ How is the effectiveness of bolus insulin determined?
 - ▶ 2 hour post meal (if you can get it)
 - ▶ Target < 180
 - ▶ Before next meal blood glucose
 - ▶ Target 80-130

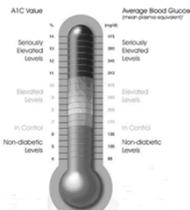
- ▶ How is the effectiveness of basal insulin determined?
 - ▶ Fasting blood glucose
 - ▶ Target 80-130



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Glycemic Targets

- ▶ **Adult non pregnant A1c goals**
 - ▶ **A1c < 7%** - a reasonable goal for adults.
 - ▶ **A1c < 6.5%** - may be appropriate for those without significant risk of hypoglycemia or other adverse effects of treatment.
 - ▶ **A1c < 8%** - may be appropriate for patients with history of hypoglycemia, limited life expectancy, or those with longstanding diabetes and vascular complications.



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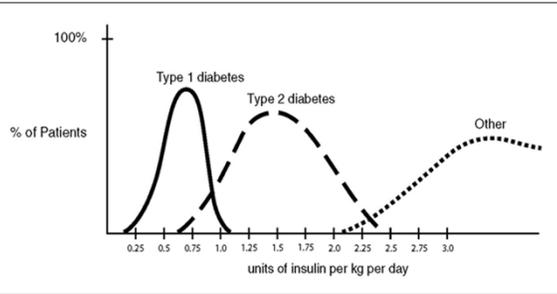
Approach Depends on Patient

- Insulin dosing is relative to body weight
- Kidney function
- Other meds
- Activity level
- Social support
- Goals of care
- Patients ability



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Insulin Dosing Type 1 & 2



U-500 Insulin: When More With Less Yields Success: *Diabetes Spectrum* March 20, 2009 vol. 22 no. 2 116-122



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Poll question 2

- ▶ What best describes inhaled insulin?
 - a. Liquid insulin that is aerosolized.
 - b. Powdered long acting insulin.
 - c. Insulin that is inhaled via a pipe.
 - d. Regular insulin in powdered form.



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Afrezza – Inhaled Insulin – Approved 2014 – Type 1 or 2

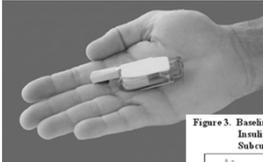
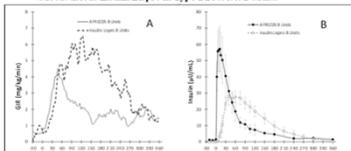


Figure 3. Baseline-Corrected Glucose Infusion Rate (A) and Baseline-Corrected Serum Insulin Concentrations (B) after Administration of AFREZZA or Subcutaneous Insulin Lispro in Type 1 Diabetes Patients*



* Despite the faster absorption of insulin (PK) from Afrezza, the onset of activity (D) was comparable to standard lispro.

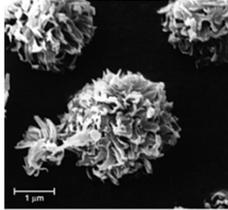
Only studied in adults over 18
Not indicated for pregnancy, while breastfeeding



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Steps, Cost, Terms

- ▶ 1st step – FDA approved. Will take time to produce, market and distribute
- ▶ Pricing –similar pricing as pens ~ \$300 a month
- ▶ Afrezza is regular human insulin in powder form using Technosphere technology.
- ▶ Referred to as TI in papers – “Technosphere Insulin”



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Afrezza Dosing and Considerations

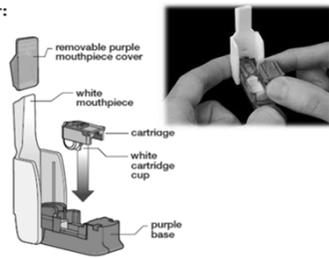
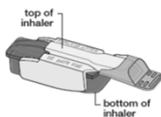
- ▶ Bolus regular insulin – inhaled before meals
- ▶ Dosing: 4 and 8 unit cartridges
 - ▶ Convert with 1:1 ratio to existing insulin dose
- ▶ Lung function test before start (FEV1)
 - ▶ Not for pts w/ chronic lung issues
 - ▶ Asthma, COPD, history of lung cancer, smokers
 - ▶ Can cause acute bronchospasm – Black box warning
- ▶ Side effects:
 - ▶ Hypoglycemia, sore throat, cough
 - ▶ Less hypoglycemia than injected insulin



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Afrezza Inhaler

Know your AFREZZA[®] inhaler:



Replace inhaler every 15 days –
Do not wash



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If you cannot find your injected dose in the chart below, you must talk to a healthcare provider before using AFREZZA®.

Afrezza – Combos to get right dose

To switch from injected mealtime insulin to AFREZZA®...

Find your injected insulin dose in the chart.

| Injected Mealtime Insulin Dose | AFREZZA® Dose | # of 4 unit (blue) cartridges needed | # of 8 unit (green) cartridges needed |
|--------------------------------|---------------|--------------------------------------|---------------------------------------|
| up to 4 units | 4 units | 1 | 0 |
| 5-8 units | 8 units | 0 | 1 |
| 9-12 units | 12 units | 1 | 1 |
| 13-16 units | 16 units | 2 | 0 |
| 17-20 units | 20 units | 2 | 1 |
| 21-24 units | 24 units | 3 | 0 |

Example: If you need to take 12 units of AFREZZA® you can use...
1 blue (4 unit) cartridge + 1 green (8 unit) cartridge

Find the correct dose of AFREZZA®.




Sample situations - Pt on....

- ▶ 7 units Humalog at meals, 20 u Lantus at hs
- ▶ 5 units regular break, dinner, 10 units detemir
- ▶ 10 units aspart at meals, 30 Lantus
- ▶ Carb counts – 1:15 .. Had 75 gms
 - ▶ Type 1
 - ▶ Type 2
 - ▶ BG before meal 67
 - ▶ BG before meal 170





Sample situations - Pt on....

- ▶ 7 units Humalog at meals, 20 u Lantus at hs
 - ▶ Type 1 or 2 - 8 units Afrezza.
BG 67 – reduce to 4 units? BG 170 – 8 units ok
- ▶ 5 units regular break, dinner, 10 units detemir
 - ▶ Type 1 – 4 units, Type 2 - 8 units?
 - ▶ BG 67 – 4 units. BG 170 – Type 1, 4 units. Type 2, 8 units?
- ▶ 10 units aspart at meals, 30 Lantus
 - ▶ Type 1, 8 or 12 units? Type 2, 12 units.
 - ▶ BG 170 – 12 units both. BG 67, 8 units both
- ▶ BG 140 - Carb counts – 1:15 .. Had 75 gms carb
 - ▶ Type 1, 4 units (ck in 2 hrs, give more?). Type 2, 8 units?




Pattern Management



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Poll Question - 3

- ▶ When looking at glucose patterns, which problem do you fix first?
 - a. Hyperglycemia
 - b. Hypoglycemia
 - c. non-compliance
 - d. legible writing
 - e. not sure



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Pattern Management

- ▶ Safety 1st!! - Evaluate 3 day patterns
- ▶ **Hypo:** eval 1st and fix:
 - ▶ If possible, decrease medication dose
 - ▶ Timing of meals, exercise, medications
- ▶ **Hyperglycemia:** evaluate 2nd
 - ▶ Identify patterns
 - ▶ Before increase insulin, make sure not missing something (carbs, exercise, omission)



Case Study



- ▶ 68 yr old, avid walker
- ▶ BMI 24, Weighs 90kg
- ▶ A1c – 9.6%, BG 270s during day for past mos
- ▶ Insulin – 40 units Lantus
- ▶ Oral Meds: glyburide, metformin
 - ▶ What medication changes?
 - ▶ What insulin changes?
 - ▶ Big insurance copay



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Type 2, 90kg – A1c 9.6% Pt on Metformin, Glyburide- Max dose- Lantus started

| | Break | Lunch | Dinner | HS |
|------|-------|-------|--------|----------------|
| Mo 1 | 190s | | | 298 10uLan |
| Mo 2 | 180s | | | 233 20uLan |
| Mo 3 | 160s | | | 216 30uLan |
| Mo 4 | 130s | 278 | 184 | 209 40u Lan |



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Next Step - Insulin



- ▶ Add GLP1 Agonist? No
- ▶ Add a SGLT-2 Inhibitor? no
- ▶ DPP-IV? No due to \$\$
- ▶ Stop Glyburide (not indicated if on insulin. Increase risk for hypo and mortality)
- ▶ Need to improve insulin therapy
 - ▶ Look at eating patterns
 - ▶ Refer to RD, Education
 - ▶ Great support system



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Cost Per Vial in Northern CA

| Per vial cost | Walmart | Walgreens | Costco |
|-----------------|---------|-----------|--------|
| Regular Insulin | \$25* | \$92 | \$99 |
| NPH | \$25* | \$92 | \$99 |
| 70/30 | \$25* | \$92 | \$101 |
| Humalog | \$200 | \$220 | \$178 |
| Novolog | \$197 | \$217 | \$178 |
| Apidra | \$180 | \$246 | \$178 |
| Levemir | \$300 | \$300 | \$300 |
| Lantus | \$226 | \$221 | \$206 |



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Food diary – Finding Largest Meal

- ▶ Breakfast
 - ▶ Big bowl of oatmeal with walnuts, banana, coffee
- ▶ Lunch
 - ▶ Sandwich and piece of fruit
 - ▶ A few cookies around 3pm
- ▶ Dinner
 - ▶ Big salad, BBQ meat, dinner roll, glass of wine
- ▶ Late night snacking
 - ▶ Peanut butter on celery, nuts, cheese



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Poll Question 4

- ▶ Which is his largest meal from a carb perspective?
- ▶ A. Breakfast
- ▶ B. Lunch
- ▶ C. Dinner
- ▶ D. Breakfast or Lunch



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Pt on Metformin, Lantus 40
Type 2, 90kg – A1c 9.6%

| | Break | Lunch | Dinner | HS |
|------|--------------|-------|--------|-----------------|
| Wk 1 | 130s 4u R | 190 | 160 | 180 40uLan |
| Wk 2 | 120s 5u R | 170 | 160 | 170 40uLan |
| Wk 3 | 100s 6 uR | 150 | 160 | 170s 40uLan |
| Wk 4 | 80s 7uR | 130s | 160s | 160s 35u Lan |



Diabetes Education SERVICES

Intensive Diabetes Therapy Insulin Dosing Strategy

50/50 Rule

▶ 0.5-1.0 units/kg day
(.5 units/kg most common)

- ▶ Basal = 50% of total
 - Glargine Q day
 - NPH or Detemir BID

- Bolus = 50% of total
 - usually divided into 3 meals

Example

▶ Wt 90kg x 0.5 = 45 units of insulin/day

- ▶ Basal dose: 23 units
 - Glargine 23 units Q day
 - NPH/Detemir 12u BID

- ▶ Bolus dose: 22 units
 - ▶ 7 units NovoLog, Apidra, Reg, Humalog each meal



Diabetes Education SERVICES

Pt on Metformin, Lantus 40
Type 2, 90kg – A1c 7.6%

| | Break | Lunch | Dinner | HS |
|------|--------------|------------|--------|-----------------|
| Wk 1 | 130s 7u R | 130 4uR | 130 | 160 25uLan |
| Wk 2 | 120s 7u R | 120 4uR | 130 | 150 25uLan |
| Wk 3 | 100s 7 uR | 110 4uR | 120s | 140s 25uLan |
| Wk 4 | 100s 7uR | 110 4uR | 120s | 140s 25u Lan |



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**Intensive Diabetes Therapy
Insulin Dosing Strategy**

50/50 Rule

▶ 0.3-1.0 units/kg day
(.5 units/kg most common)

▶ Basal = 50% of total
 ● Glargine Q day
 ● NPH or Detemir BID

● Bolus = 50% of total
 ● usually divided into 3 meals

Example – You Try

▶ Wt 80 kg x 0.5 = ____ units of insulin/day

▶ Basal dose: ____ units
 ● Glargine ____ units QD
 ● NPH/Detemir ____ BID

▶ Bolus dose: ____ units
 ____ units NovoLog, Apidra
 Humalog each meal



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Poll Question - 5

- ▶ What is the bolus dose each meal?
- a. 5 units
 - b. 8 units
 - c. 6-7 units
 - d. Not sure



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**Intensive Diabetes Therapy
Insulin Dosing Strategy**

50/50 Rule

▶ 0.3-1.0 units/kg day

▶ Basal = 50% of total
 ● Glargine Q day
 ● NPH or Detemir BID

● Bolus = 50% of total
 ● usually divided into 3 meals

Example – You Try

▶ Wt 80kg x 0.5 = 40 units of insulin/day

▶ Basal dose: 20 units
 ● Glargine 20 units HS or
 ● NPH/Detemir 10u BID

▶ Bolus dose: 20 units
 ▶ 6-7 NovoLog, Apidra
 Humalog Reg w/meal



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Nancy - 78 yr old on 4 injections a day

- ▶ A1c 9.3%, BMI 27 – Wt 70kg
- ▶ BG levels consistently above 200
- ▶ Checks BG 3-4 xs a day, keeps log.
- ▶ Pt starting to have dementia, husband primary care giver
- ▶ Insulin dose:
 - ▶ 5 units Apidra at each meal
 - ▶ 6 units Lantus at bedtime



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Based on Body Wt of 70 kg

- ▶ Calculate insulin needs
 - ▶ $70 \times 0.5 = 35$ units a day
 - ▶ $\frac{1}{2}$ Basal = 18 units
 - ▶ $\frac{1}{2}$ bolus = 17 / 3 meals – 6 break 6 lunch 5 dinner
- ▶ Other issues
 - ▶ In am, pt injects insulin at 6am and eats at 8am
 - ▶ Rest of day, pt takes insulin after meals
 - ▶ Husband needs to assist with all BG checks, logs and insulin administration
 - ▶ Husband tells you, BG is often above 200 and I don't know how to adjust insulin. MD just says to increase.



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Assessment

- ▶ Given situation, is this a realistic plan or is it too intensive?
- ▶ Keep things safe and don't make too many changes at once.
- ▶ Pt's husband needs framework to adjust insulin based on BG levels.
- ▶ When leaving, husband mentions that the Apidra and Lantus are very expensive. They are having difficulty affording it.
- ▶ Husband is getting tired.



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Plan

- ▶ What A1c and BG targets are realistic?
 - ▶ A1c < 8% (now 9.3%).. Want to drop BG by 40 points
 - ▶ BG premeal 100-140, post meal <180
- ▶ Keep checking BG 3-4 times a day
- ▶ Give Apidra 5 units plus supplemental scale BEFORE each meal
- ▶ TIE – Test, Inject and Eat within 5 mins of injecting insulin
- ▶ Continue 6 units Lantus at night
- ▶ Call with glucose results in one week



Apidra Scale

| Blood Sugar | Add Insulin Apidra |
|--------------|-----------------------------------|
| less than 70 | No insulin. Eat sugary food |
| 70 - 150 | No added insulin |
| 150 - 200 | Add 1 unit |
| 201 - 250 | Add 2 units |
| 251 - 300 | Add 3 units |
| 301 - 350 | Add 4 units |
| 350 - 400 | Add 5 units |
| 400 + | Add 6 units |
| 500 + | 7 units - 60 to ER or call Doctor |



After One Week

Blood Sugar Log

| Date | Goal: <input type="checkbox"/> Breakfast | Goal: <input type="checkbox"/> Afternoon | Goal: <input type="checkbox"/> Dinner | Goal: <input type="checkbox"/> Bedtime |
|------|--|--|---------------------------------------|--|
| 2/17 | | 260 5u | | |
| 2/18 | 219 7u | 241 6u | 257 8u | Lantus |
| 2/19 | 166 6u | 355 10 | 155 6u | 141 |
| 2/20 | 257 8u | 425 11 | 290 8 | 220 |
| 2/21 | 289 8u | 220 7u | 325 9u | 131 |
| 2/22 | 239 7u | 254 8u | 290 8u | 220 |
| 2/23 | 203 6u | 203 7u | 187 6u | 140 |
| 2/24 | 247 7u | 198 6u | | |



Recommendations

- ▶ Increase Apidra to 6 units at breakfast and lunch.
- ▶ Increase Lantus to 8 units at hs
- ▶ Check back in one week
- ▶ Consider changing to 70/30 insulin
- ▶ Calculating 70/30
 - ▶ Add up TOTAL insulin she takes a day ~ 30 units
 - ▶ Compare to weight calculation $70 \times 0.5 = 35$ units/day
 - ▶ Start conservative – 30 units
 - ▶ 2/3 am 20 units (14 basal + 6 bolus)
 - ▶ 1/3 before dinner 10 units (7 basal +3 bolus)
 - ▶ Gradually increase to get to target



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Poll question 6

What best describes 70/30 insulin?

- A. 70 percent bolus, 30 percent basal
- ▶ B. 70 percent analog, 30 percent bolus
- ▶ C. 70 percent basal, 30 percent aerosolized
- ▶ D. 70 percent basal, 30 percent bolus
- ▶ E. Not sure



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Combo Sub-Q Insulin

| Insulin Type | Onset | Peak |
|---|---------------|-------------|
| Humalog Mix 75/25: 75% NPL, 25% lispro 50/50: 50% NPL, 50% lispro | 0.25 - 0.5 hr | 0.5-6.5 hrs |
| NovoLog Mix 70/30: 70% NPA, 30% aspart | 0.25 - 0.5 hr | 1 – 4 hrs |
| NPH + Reg Combo 70/30: 70%N /30%R 50/50: 50%N /50%R | 0.5 – 1.0 hr | 2 - 16 hrs |

Considerations:

- Pre-mixed, difficult to fine tune therapy



Diabetes Education SERVICES

Type 1 for 30 Years – On injections Lantus and Humalog



- ▶ Rob weighs 80kg, BMI 23
- ▶ Insulin dosing
 - ▶ Lantus 22 units AM
 - ▶ Humalog
 - ▶ Before breakfast 9-14 units
 - ▶ Lunch 2-4 units
 - ▶ Dinner 2-6 units
 - ▶ Bedtime 1-2 units if > 200
- 2. Not keeping any type of log
- 3. Not counting carbs – just ballparking
- 4. A1c 6.7 – no Endo



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Type 1 for 30 Years – 80kg



- ▶ Based on wt, dose of insulin?
- ▶ Total daily dose -80 x 0.5 = 40 units/day
 - ▶ Basal dose 50% = 20 units a day
 - ▶ Bolus dose 50% = 20 units/3 meals = 7 + 6 + 6
 - ▶ Current dose (total = 26) "Adjusted"
 - ▶ 14 breakfast 10 units
 - ▶ 4 lunch 4 units
 - ▶ 4-6 dinner 4 units

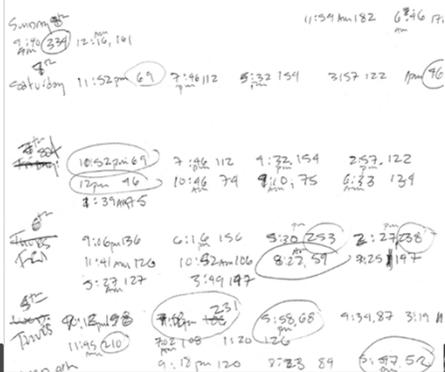
1. Adjusts insulin down if active at work
2. Starts to feel hypo around 60-70
3. Doesn't always have snacks



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Plan – Keep BG log for 1 week Prevent Hypos as much as possible

Day before appt, wife got results off of meter and wrote them down. Wife also circled numbers she was concerned about.



Type 1 for 30 Years – On injections Lantus and Humalog (6 x's a day)



- ▶ Rob weighs 80kg, BMI 23
- ▶ Insulin dosing
 - ▶ Lantus 22 units AM
 - ▶ Humalog
 - ▶ Before breakfast 9-14 units
 - 2 hrs post breakfast 2 more units (based on BG)
 - ▶ Lunch 2-4 units
 - ▶ Dinner 2-6 units
 - 2 hours after lunch, 2-4 more units (based on BG)
 - ▶ Bedtime 1-2 units if > 200

Worried about getting complications



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Plan

- ▶ Keep detailed log for one wk, include insulin dose and carbs eaten
- ▶ Decrease Lantus to 18 units in am
- ▶ Try not to stack humalog (take extra after meal)
- ▶ Try to carb count
 - ▶ Breakfast - 1 unit for every 10gm
 - ▶ Lunch/dinner – 1 unit for every 15 gms
- ▶ When BG < 70, don't wait – treat



Diabetes Education SERVICES

Bolus Basics



- ▶ Carbohydrate/ Prandial Coverage
 - ▶ Match the insulin to the carbohydrates
 - ▶ 1 unit for 10 - 15 gms - Common starting point
- ▶ Correction Bolus - targets hyperglycemia
 - ▶ 1 unit for every 30-50 points over target
- ▶ Adjust ratios depending on sensitivity and response



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Adjusting Bolus and Correction Doses Carbohydrate-to-Insulin Ratio

Based on three questions before meals:



1. How much carbohydrate am I going to eat?
2. What is my insulin dose for this amount of carbohydrate?
3. Should I lower the dose because I plan to be very active or have recently been active?



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Carbohydrate Ratio How does that work?

Rapid/Fast Acting Insulin

▶ Breakfast (70 gms cho)

- ▶ Rice Chex (60 gms)
- ▶ Milk (12 gms)
- ▶ Black coffee

Carb coverage

1 unit for every 10 gms

Blood Glucose 165mg/dl

| Serving Size | Gms CHO | Insulin |
|--------------|------------|---------|
| 1 | 10 gms cho | 1 unit |
| 2 | 20 gms cho | 2 units |
| 3 | 30 gms cho | 3 units |
| 4 | 40 gms cho | 4 units |
| 5 | 50 gms cho | 5 units |
| 6 | 60 gms cho | 6units |
| 7 | 70 gms cho | 7units |

| Date | Breakfast | Snack | Lunch | Snack | Dinner |
|-----------|--|------------------|---|--|--|
| 2/11/2015 | 8:00-11:00 18 carbs 75 carbs, long grain rice, apples, banana 300-400 30-40 11:30-1:00 80 grams carbs, cereal tea | physical work | 12:00-1:00 20 carbs chips 2 units Humalog | 3:30-4:00 Candy 200-250 200-250 | 6:00-7:00 20 carbs 2. Humalog, 1000 2. Vanilla Yogurt, 1000 Bike = 6% 1000 |
| 2/12/2015 | 8:00-11:00 18 carbs 75 carbs, long grain rice, apples, banana 300-400 30-40 11:30-1:00 80 grams carbs, cereal tea | physical work | 12:00-1:00 20 carbs chips 2 units Humalog | 3:30-4:00 Candy 200-250 200-250 | 6:00-7:00 20 carbs 2. Humalog, 1000 2. Vanilla Yogurt, 1000 Bike = 6% 1000 |
| 2/13/2015 | 8:00-11:00 18 carbs 75 carbs, long grain rice, apples, banana 300-400 30-40 11:30-1:00 80 grams carbs, cereal tea | physical work | 12:00-1:00 20 carbs chips 2 units Humalog | 3:30-4:00 Candy 200-250 200-250 | 6:00-7:00 20 carbs 2. Humalog, 1000 2. Vanilla Yogurt, 1000 Bike = 6% 1000 |
| 2/14/2015 | 8:00-11:00 18 carbs 75 carbs, long grain rice, apples, banana 300-400 30-40 11:30-1:00 80 grams carbs, cereal tea | physical work | 12:00-1:00 20 carbs chips 2 units Humalog | 3:30-4:00 Candy 200-250 200-250 | 6:00-7:00 20 carbs 2. Humalog, 1000 2. Vanilla Yogurt, 1000 Bike = 6% 1000 |
| 2/15/2015 | 8:00-11:00 18 carbs 75 carbs, long grain rice, apples, banana 300-400 30-40 11:30-1:00 80 grams carbs, cereal tea | physical work | 12:00-1:00 20 carbs chips 2 units Humalog | 3:30-4:00 Candy 200-250 200-250 | 6:00-7:00 20 carbs 2. Humalog, 1000 2. Vanilla Yogurt, 1000 Bike = 6% 1000 |
| 2/16/2015 | 8:00-11:00 18 carbs 75 carbs, long grain rice, apples, banana 300-400 30-40 11:30-1:00 80 grams carbs, cereal tea | physical work | 12:00-1:00 20 carbs chips 2 units Humalog | 3:30-4:00 Candy 200-250 200-250 | 6:00-7:00 20 carbs 2. Humalog, 1000 2. Vanilla Yogurt, 1000 Bike = 6% 1000 |
| 2/17/2015 | 8:00-11:00 18 carbs 75 carbs, long grain rice, apples, banana 300-400 30-40 11:30-1:00 80 grams carbs, cereal tea | physical work | 12:00-1:00 20 carbs chips 2 units Humalog | 3:30-4:00 Candy 200-250 200-250 | 6:00-7:00 20 carbs 2. Humalog, 1000 2. Vanilla Yogurt, 1000 Bike = 6% 1000 |



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Outcomes

- ▶ Keep detailed log for one wk, include insulin dose and carbs eaten - success 
- ▶ Decrease Lantus to 18 units in am - success 
- ▶ Try not to stack humalog, just take before meals and try to carb count – success 
- ▶ Count carbs – some success – Refer to RD
- ▶ When BG < 70, don't wait, treat. Needs work



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Next Steps

- ▶ Put alarm on phone to eat snack at 9am.
- ▶ If drinking, 15gms carb for every drink. May need to decrease insulin coverage (be conservative)
- ▶ Consider insulin pump, CGM and downloading glucose results
- ▶ When BG above 130 premeal, add correction bolus (1700 rule) – 1 unit for every 45 above target
- ▶ Return visit in 3-6 months



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More detailed Insulin Plan – Clarify correction scale



Carb ratio:

- ▶ 1 unit for every 10 gms at breakfast
- ▶ 1 unit for every 15gm at lunch and dinner

Insulin Sensitivity Calculation:

- ▶ **1700 Rule**
 - ▶ $1700 / \text{Total Daily Dose} = \text{insulin sensitivity}$
 - ▶ $1700 / 40 = 43 (42.5)$
 - ▶ 1 unit drops BG 45 points – “Correction”

- ▶ Carb coverage plus correction = total mealtime bolus dose



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Poll question 7

- ▶ If Robs BG is 68 before eating, what is the best insulin adjustment strategy?
- ▶ A. Take bolus insulin ½ hour after eating
- ▶ B. Reduce usual bolus insulin dose by 1 unit
- ▶ C. Eat 30 gms of carb, then eat meal
- ▶ D. Decrease pm basal



Correction Bolus for Rob

Analog Insulin (1 unit:45 mg/dl>130)

| | |
|--------------------|-----------------|
| Less than 70 mg/dl | Subtract 1 unit |
| 70-130 mg/dl | 0 units |
| 130-175 mg/dl | 1 unit |
| 176-220 mg/dl | 2 units |
| 221-265 mg/dl | 3 units |
| 266-310 mg/dl | 4 units |
| 311-356 mg/dl | 5 units |



Adjusting Robs Bolus Insulin With Ratios

Rob plans to eat 70 gms of carbohydrate, BG before breakfast 165.

Carb coverage: $70\text{gms} / 10 = 7$ units insulin

Correction Scale - $165 - 130 = 35$ over target - 1 unit

- 7 units bolus insulin to cover carbs in meal
- 1 units bolus insulin to correct to target

Total adjusted dose: 8 units humalog insulin



Adjusting Robs Bolus Insulin With Ratios - You Try

BG before breakfast 175, plans to eat 80 gms of carbohydrate.

___ -130 = ___ over target, ___/45 = ___ units

___ gms / ___ = ___ units ins for carbs

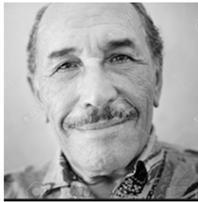
- ___ units insulin to correct for hyperglycemia
- ___ units insulin to cover carbs in meal

Total adjusted dose: ___ units novolog insulin



Diabetes Education SERVICES

Based on Mr R's clinical picture – In hospital How Much Insulin Needed?



- ▶ Creatinine 1.6
- ▶ 76 years old
- ▶ Not very hungry
- ▶ BMI 21
- ▶ Weighs 80kg
- ▶ Glucotrol 5mg at home
- ▶ A1c 7.2%



Diabetes Education SERVICES

Calculate Daily Insulin Needs

▶ Based on unique characteristics of pt, where would you start?

- ▶ Body wt in Kg x _____ = total daily dose
- ▶ May need more or less based on clinical presentation



←—————→
Less 0.3 u/kg 0.5u/kg More 1.0 u/kg

Thin, elderly, ↑ creat Heavy, infection, steroids



Diabetes Education SERVICES

Calculate Insulin Needs Basal/ insulin carb/ correct

- ▶ Body wt in Kg x 0.3
- ▶ 80kg x 0.3 = 24 units daily

- ▶ Basal = 12 units
- ▶ Bolus = 12 units / 3 meals = 4 units each meal
- ▶ What if he is nauseated?



More than 200 units a day?

Medscape



Consider u-500

- ▶ Consider U-500 (5 x's more potent)
 - ▶ 1 unit on U-100 syringe = 5 units insulin
 - ▶ Dosing – take total daily needs and split into two doses
 - ▶ 60% am / 40% pm
 - ▶ 500 units per mL – 20 units a vial = 10,000 units per vial
 - ▶ Costs ~ \$400 per vial
 - ▶ No basal insulin needed, because U-500 has bolus and basal action
 - ▶ Needs careful monitoring/ education

U-500 Insulin: When More With Less Yields Success: *Diabetes Spectrum* March 20, 2009 vol. 22 no. 2 116-122



U-500 Dose

U-100 syringe and TB Syringe

| If this is your dose of Humulin R U-500 | Fill a U-100 insulin syringe up to this marking | Fill a tuberculin syringe up to this marking |
|---|---|--|
| 25 | 5 | 0.05 |
| 50 | 10 | 0.1 |
| 75 | 15 | 0.15 |
| 100 | 20 | 0.2 |
| 125 | 25 | 0.25 |
| 150 | 30 | 0.3 |
| 175 | 35 | 0.35 |
| 200 | 40 | 0.4 |
| 225 | 45 | 0.45 |
| 250 | 50 | 0.5 |
| 275 | 55 | 0.55 |
| 300 | 60 | 0.6 |
| 325 | 65 | 0.65 |
| 350 | 70 | 0.7 |
| 375 | 75 | 0.75 |
| 400 | 80 | 0.8 |
| 425 | 85 | 0.85 |
| 450 | 90 | 0.9 |
| 475 | 95 | 0.95 |
| 500 | 100 | 1.0 |

Convert Pt from u-100 to u-500

- ▶ Pt currently on a total dose of 250 units a day
 - ▶ $250 / 5 = 50$ units a day
 - ▶ 2/3 in am = 30 units u500
 - ▶ 1/3 in pm = 20 units u500
- ▶ Pt currently on a total dose of 300 units a day
 - ▶ $300 / 5 =$
 - ▶ 2/3 in am =
 - ▶ 1/3 in pm =

Poll question 8

- ▶ Pt on 300 units of u-100 insulin a day. Which is an accurate conversion to u-500.
- ▶ A. Take 60 units once daily
- ▶ B. Take 30 units daily
- ▶ C. Take 24 units am and 36 pm
- ▶ D. Take 36 units am and 24 units pm

Thank You



- ▶ Questions?
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