Case Studies: Initiation and Optimization of Insulin Therapy

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UCSF
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When to Start Insulin?

• Insulinopenia:
  DM1, LADA, DM2 failed other medications, s/p Pancreatectomy, Cystic Fibrosis, Other

• Co-morbid conditions:
  – Renal Failure
  – Cirrhosis
  – CHF
  – Pregnancy
  – Steroid Rx
# Comparison of Human Insulins and Insulin Analogs

<table>
<thead>
<tr>
<th>Insulin Preparations</th>
<th>Onset of Action</th>
<th>Peak (hr)</th>
<th>Duration of Action (hr)</th>
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Insulin Replacement Dose Calculation for DM

Total Daily Insulin \((predicted)\): 
\(~0.55\) units/Kg 
(or \(\text{Wgt in lb} \div 4\))

50% TDI = Basal
50% TDI = Bolus

- CHO coverage = 1 unit/ 10-15 g CHO
- Correction coverage = 1 unit/ 50 mg/dl

Typical type 1, c-peptide negative TDI = \(~0.3-0.6\) U/Kg
Typical type 2 TDI = \(~0.3-0.8\) U/Kg
Insulin Dose Calculation DM

Dose range varies, for example:

Very Insulin Sensitive (newly dx type 1 or LADA, renal failure, s/p pancreatectomy):

TDI = 0.1-0.2 u/Kg; 1 u/ 25-40 gCHO; 1 u/100 mg/dl

Very Insulin Resistant (Hi BMI, lipodystrophic type 2, steroid Rx, pregnant):

TDI = 0.8-1.2++ u/kg; 1 u/ 3-6 gCHO; 1 u/ 15-30mg/dl

Adolescents:

TDI = 0.7-1.0 u/kg; 1 u/ 6-10 gCHO; 1 u/ 22-30mg/dl
Formulas to Calculate Insulin Regimens

**Total Daily Insulin Dose (TDI)**

TDI = Weight in lbs ÷ 4 = Weight in Kg X .55  
*(TDI = 160 lbs ÷ 4 = 40 U/day)*

**Total Basal**

Total Basal = 0.5 X TDI  
*(ex. 40 U x 0.5 = 20 U Basal Insulin)*

**Rule of “500”: Carbohydrate Bolus**

500 ÷ TDI = 1 U insulin/ xx g CHO  
*(ex. 500 ÷40 U = 1 U insulin/ 12 g CHO)*

**Rule of “1800”: Hi BG Correction**

1800 ÷ TDI = 1 U insulin/ xx mg/dl  
*(ex. 1800 ÷ 40 U = 1 U insulin/ 45 mg/dl)*
Cases/Senarios:

**Insulin initiation**
- Newly Dx DM
- Chronic Renal Insufficiency

**Optimize insulin therapy**
- Established DM
- Over-correcting Hi BG
- Exercise & Diurnal glucose patterns
- Delayed gastric emptying
Newly Diagnosed DM1

25 yo Male
Presents with fatigue, polys, 10 lb weight loss, leg cramps
Drinking a lot of juice, regular soda, and water

PE: HT 6’1”, Wgt 176 lbs (80 Kg), No infection

Random glucose = 457 mg/dl, small urine ketones,
Bicarb=28 mMol/L, A1c=12.2 %
( Autoimmune markers sent -
+ GAD Antibodies -14.9, + ICA 512-21.3 )
Newly Diagnosed DM1

Issues
• Hyperglycemic but not ketotic
  (still has endogenous insulin production)
• Consuming excess sugar

Management
• Start insulin as an outpatient
• Counseled on diet and need to avoid high carbohydrate foods
Initiation of Insulin Rx

Dose Calculation in Non Acutely Ill Individuals:

• Start Conservatively

• Use a fraction (1/5th to 1/2) of total predicted need depending upon assessment of insulin sensitivity
Newly Diagnosed DM1

**Insulin Dose Calculation**

For a non-ketotic newly diagnosed DM1 with endogenous insulin production

*Total Daily Dose range: 0.1-0.2 units/Kg*

For this individual:

\[ TDI = 0.1-0.2 \times 80 \text{ Kg} = 8 \text{ to } 16 \text{ units daily} \]
Newly Diagnosed DM1

PMD RECOMMENDATIONS:
• Started insulin as outpatient
  Rx: 5 Lantus at bedtime
  1-5 units Novolog before meals
• Instructed in SBGM
• Counseled to avoid juice, sodas, and sugary foods
Newly Diagnosed DM1

Blood glucose levels normalized, but was developing hypoglycemia

Came to UCSF for consultation:
## Newly Dx DM1 Glucose Profile

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<th>Pre-Breakfast BG</th>
<th>Post-Breakfast BG</th>
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<th>Post-Lunch BG</th>
<th>Pre-Supper BG</th>
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… CHO restricted  
( usually~ 30-50g CHO/meal)
Newly Dx DM1

Assessment:
Newly diagnosed DM1 hypoglycemic on current insulin doses

Management
Reduce Lantus dose to 3 units at bedtime
Reduce prandial rapid acting insulin to:
  1 unit per 40-50 g CHO
  (1 U/70-80 gCHO when exercising)
Reduce Hi BG correction to:
  ½ a unit to cover every 50 mg/dl over 120 mg/dl
Encourage patient to liberalize CHO intake
Newly Dx DM1

*Teaching Point:*
Don’t “Over Treat” with Insulin

The presence of endogenous insulin production = decreased need for exogenous insulin replacement
Case #1- DM2 – Requiring insulin because of renal failure

58 yo female
DM2 Dx ~10 yrs
   Rx: Glyburide 10 mg BID, Metformin 1 g BID
   Minimal SBGM, Occasional Hypo Sx

ROS: HTN, Dyslipdemia, CAD with stent placement x2, Obesity, ESRD

PE: HT 5’1”, Wgt 239 lbs (109 Kg), BMI=43
   Neuropathy, Nephropathy, Retinopathy
Labs: A1c=7.3 %, Cr=3.8, proteinuria
Case #1-DM2 – Requiring insulin because of renal failure

**Issues**
- End stage renal disease –
  - ineligible for oral agents
  - needs insulin Rx
  - Prolonged insulin half-life = lower dose requirement
- Insulin resistant – BMI=43

**Management**
- Begin regular SBGM, refer for Diabetes Education
- Refer to Renal Practice
- Start insulin
Case #1-DM2 – Requiring insulin because of renal failure

**Insulin Dose Calculation**

Renal failure, dose *should* be less than usual

*But*

With a very high BMI, dose may be more than usual

For this individual:

Estimated TDI = 0.1-1.2 x 109 Kg =

11 to 131 units/day (more or less)
Common Medical Practice

**Insulin Initiation Dose for DM2**

10 units of a long acting insulin (glargine, detemir, NPH) @ bedtime

Titrate dose q 2-3 day

? oral agents

Add pre-meal rapid acting insulin as needed

What is best for this patient?

Ripsin C. Amer Fam Physic 79:29, 2009; NHS Diabetes Insulin Initiation, 2005
Ira B Hirsch. Medscape General Medicine Nov.16, 2006
Case #1-DM2 – Requiring insulin because of renal failure

1st Visit

- Glyburide, Metformin discontinued,
- Glargine started in a dose of 4 units q AM
  - started with such a low dose to allow glyburide washout
  - gave glargine in AM because of prolonged half life of insulin in renal insufficiency and renal failure
Case #1-DM2 – Requiring insulin because of renal failure

**Follow Up Visits**
- Followed q 1-3 days for glargine dose titration
- Novolog sliding scale added before meals

**Final dose:**
- Glargine: 20 units AM, 11 units PM
- Novolog: Sliding Scale 3-7 units before meals

Renal, obesity adjusted TDI ~ 45 units/day (0.4 U/Kg)

Patient to attend Education Program to switch to intensive therapy
Case #2- DM2 – Requiring insulin because of renal failure

83 yo male
DM2 Dx ~14 yrs
  Rx: Prandin 0.5 mg before meals
  SBGM – 80-100 mg/dl before meals
  150-250 mg/dl post meals
  Occasional Hypo Sx

ROS: HTN, Dyslipdemia, CAD, ESRD

PE: HT 5’6 1/2”, Wgt 147 lbs (66 Kg), BMI=23
  Neuropathy, Nephropathy, Retinopathy
Labs: A1c=5.8 %, Cr=2.7, proteinuria 2.7g/d
Case #2-DM2 – Requiring insulin because of renal failure

**Issues**

- End stage renal disease –
  - ineligible for oral agents
  - needs insulin RX
  - Prolonged insulin half-life = lower dose requirement
- Insulin sensitive – BMI = 23
Case #2-DM2 – Requiring insulin because of renal failure

**Insulin Dose Calculation**

For an insulin sensitive DM2 with renal failure, the dose **should be less than usual**

Estimated ESRD adjusted Total Daily Insulin Dose range: \(~0.1-0.2\) units/Kg (more or less)

For this individual:

Estimated TDI = 0.1-0.2 x 66 Kg =

7 to 13 units/day (more or less)
Case #2-DM2 – Requiring insulin because of renal failure

1st Visit

• Prandin discontinued,
• Novolog sliding scale started in a dose of 0-2.5 units at each meal

Started with rapid acting pre-prandial insulin because pre-meal BG were normal/low and the greatest BG rise was after the meal (ie patient has significant endogenous insulin production)
Case #2-DM2 – Requiring insulin because of renal failure

Follow Up Visits
• Followed q few days for Novolog dose titration

Final dose:
Novolog Sliding Scale:
  2-4 units before breakfast & lunch
  1-3 units before supper

ESRD adjusted TDI ~ 7 units/day (0.1 U/Kg)
DM2 – Requiring insulin because of renal failure

*Teaching Points:*

- DM2 patients with renal failure usually need lower total daily doses of insulin (because prolonged half life of the insulin in ESRD predisposes to hypoglycemia)

- Insulin doses accumulate during the day (evening and overnight doses of insulin especially may need to be reduced)
Established DM

*Needing optimization of insulin regimen...*
Established DM2 - Failed Oral Agents, Regular & NPH Insulin

65 yo Male
DM2 Dx 22 yrs- Initially Rx pills, Insulin Since 1998
   NPH: 80 units AM 50 units PM
   Regular: 20 AM 20 PM
   Minimal SBGM, Occasional Hypo Sx at night

ROS: HTN, Dyslipdemia, CAD s/p PTCA, A.Fib + pacemaker, mild COPD

PE: HT 6’4”, Wgt 256 lbs (116 Kg), BMI 31
   Neuropathy, Charcot joint, Retinopathy
Labs: A1c=10.1 %, Autoimmune markers negative
Established DM2 - Failed Oral Agents, Regular & NPH Insulin

**Issues**
- Hyperglycemic, ? Hypoglycemic
- Insulin resistant?
- Treated with high doses of insulin – 170 units/day (~1.4 units/kg)

**Management plan**
- Start regular SBGM
- Attend Diabetes Education Program
- Counseled on diet and not “out eat” the insulin
- Switch to more physiologic insulin: glargine/detemir aspart/lyspro/glulisine
Established DM2 - Failed Oral Agents, Regular & NPH Insulin

**Insulin Dose Calculation**

For a DM2, (estimated) Total Daily Insulin Dose range: ~0.3-0.8 units/Kg or more

For an insulin resistant DM2, (estimated) Daily Insulin Dose range: ~0.8-1.2 U/Kg

For this individual:

$$TDI = 0.3-1.2 \times 116 \text{ Kg} = 35 \text{ to } 139 \text{ units/day}$$
Established DM2 - Failed Oral Agents, Regular & NPH Insulin

1st Visit

- Regular discontinued
- Humalog started in a dose of 1 unit/8-10 g CHO
- NPH decreased to 40 units AM, 20 units HS
- Asked to keep a log of BG, insulin dose, food. SBGM 4-6 x/day
- Counseled on CHO counting

Decision was made to do the transition to insulin analogs, intensive insulin therapy over several visits
| Date | MN | 2 AM | 6 AM | 7 AM | 8 AM | 9 AM | 10 AM | 11 AM | 12 PM | 1 PM | 2 PM | 3 PM | 4 PM | 5 PM | 6 PM | 7 PM | 8 PM | 9 PM | 10 PM | 11 PM |
|------|----|------|------|------|------|------|-------|-------|-------|------|------|------|------|------|------|------|------|-------|-------|
| Glucose mg/dl | 239 | 259 | 191 | 96 | 153 | 139 |
| CHO grams | 80g | 53g | 86g |
| CHO Bolus | 8 H | 7H | 10H |
| Hi BG Bolus | 3H | 2H | 1H |
| Basal Rate | 40N |
| NoNPH |
Established DM2 - Failed Oral Agents, Regular & NPH Insulin

2nd Visit

- NPH discontinued,
- Humalog: 1 unit/8 gCHO
  
  1 unit to drop the BG 40 mg/dl
- Glargine initiated: 20 units AM
  
  6-10 units HS
- Referred to intensive insulin management workshop
Established DM2 - Failed Oral Agents, Regular & NPH Insulin

Attended UCSF Diabetes Teaching Center Workshop

Insulin doses titrated

- Humalog: 1 unit/4-6 gCHO
  - 1 unit to drop the BG 20 mg/dl
- Glargine: 21 units AM, 21 units HS

TDI ~ 90 units/day (~ 0.8 units/Kg)

Patient began to lose weight

18 lbs in 3 months
Established DM2 - Failed Oral Agents, Regular & NPH Insulin

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Overall improved BG on BID glargine and bolus aspart, but fasting, bedtime, 2AM often too high – may need more Hi BG correction at nite
Established DM2 - Failed Oral Agents, Regular & NPH Insulin-
Switched to glargine and aspart

Teaching Point:
DM2 patients usually are insulin resistant

BUT
Don’t fall into the trap of
“Over Treating ”with insulin, getting low BG
and then having to “Feed the Insulin”
Established DM1-poorly controlled

23 yo Female
Concerns: Blood glucose is poorly controlled, she is always high despite increasing her insulin doses
DM1 diagnosed 12 yrs ago (age 11)
Currently Rx CSII, gluten free diet for celiac sprue
(+) Symptomatic low BG with exercise and at night
Bolus: 1 U Lispro/15gCHO; 1 U/45 mg/dl over 120mg/dl
Basal: MN-3AM 0.55 U/h
3AM-6AM 0.6 U/h
6AM-10PM 0.75 U/h
10PM-MN 0.55 U/h
PE: HT 5’9”, Wgt 154 lbs (Kg)
Established DM1-poorly controlled

**Issues**

- Hyper- and Hypo-glycemic
- Appears over insulinized

  Basal rate is set disproportionately high especially daytime-
  - ? Basal rate is covering meals
  - ? Morning resistance because of nocturnal lows and a rebound

  **TDI is ~ 39 U/day**

  **Predicted requirement is ~ 21-42 U/day**

  (Total Daily Dose range: 0.3-0.6 units/Kg)
Established DM1-poorly controlled

..the TDI dose is within range but something doesn’t seem right

Management

• Reduce Basal to 0.55 U/h
• Increase CHO Bolus to 1/10-12gCHO
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</table>
## Established DM1-poorly controlled

<table>
<thead>
<tr>
<th>Date</th>
<th>MN</th>
<th>6 AM</th>
<th>7 AM</th>
<th>8 AM</th>
<th>9 AM</th>
<th>10 AM</th>
<th>11 AM</th>
<th>12 PM</th>
<th>1 PM</th>
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<td>108</td>
<td>132</td>
<td>121</td>
<td>85</td>
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<td>Hi BG Bolus</td>
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<td>0.35/h</td>
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</table>
Established DM1-poorly controlled

_Titrated insulin doses:_

**Bolus:** Meals-Breakfast 1:10-12 g CHO
Lunch 1:12-15 g CHO
Supper 1: 10-12 g CHO
Correction 1:50 mg/dl over 120 mg/dl

**Basal:**

- MN-7AM – 0.5 U/h
- 7AM-11AM 0.35 U/h
- 11AM-6PM 0.3 U/h
- 6PM-9PM 0.35 U/h
- 9PM-MN 0.5 U/h

**TDI =~ 30 units daily (~0.4 U/Kg)**
Established DM1-poorly controlled

*Teaching Points:*
When something doesn’t look right, it probably isn’t…

*Such as:*
• A disproportionately high basal dose relative to bolus doses
  (R/O the basal dose being used to cover the meals)
• Worsening BG control despite increasing doses of insulin
  (R/O cycles of low BG followed by high BG)
Established DM1-poorly controlled

**Teaching Points:**

- Keep an intensive log to problem solve
- Watch for diurnal variations in insulin sensitivity
- The timing of the insulin dose during the day is as important as the total dose
Diurnal Insulin Sensitivity:

Night          | Dawn           | Morning        | Afternoon      | Evening

Resistant     | Inbetween     | Sensitive      |                |      

DM1 with increased insulin sensitivity during the day
Patterns of Diurnal Insulin Sensitivity:

<table>
<thead>
<tr>
<th></th>
<th>Night</th>
<th>Dawn</th>
<th>Morning</th>
<th>Afternoon</th>
<th>Evening</th>
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<tr>
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<td>Inbetween</td>
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<td>Sensitive</td>
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Inbetween

Resistant

Sensitive

Resistant

Inbetween

Sensitive

Resistant

Inbetween

Sensitive

Evening
Patterns of Diurnal Insulin Sensitivity:

Night | Dawn | Morning | Afternoon | Evening

- Resistant
- Inbetween
- Sensitive

Steroid Rx (once daily in AM):
Insulin Resistance from mid morning to evening
Relative insulin sensitivity early AM
Insulin Regimen is OK, Implementation is the problem

*Loss of BG control due to:*

- Over correcting Hi BG
- Exercise
- Delayed gastric emptying
Over-correcting a Hi BG – “Insulin Stacking”

| Date | MN | 6 AM | 7 AM | 8 AM | 9 AM | 10 AM | 11 AM | 12 AM | 1 PM | 2 PM | 3 PM | 4 PM | 5 PM | 6 PM | 7 PM | 8 PM | 9 PM | 10 PM | 11 PM |
|------|----|------|------|------|------|-------|-------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Glucose mg/dl | 128 | 122 | 108 | 285 | 56 | 198 | 220 |
| CHO grams | 62g | 130g? | 30g |
| CHO Bolus | 6.2H | 10.8H |
| Hi BG Bolus | 5H |
| Basal Rate | 0.6/h | 0.5/h | 0.6/h |

**Insulin Regimen with CSII:**

- Bolus 1H/10 gCHO AM
- 1H/12 gCHO Lunch
- 1H/10 gCHO PM
- Correction: 1/40>120 mg/dl

- Bolus MN-7 AM 0.6 U/h
- 7AM-9PM 0.5 U/h
- 9PM-MN 0.6/U/h
Over-correcting a Hi BG – “Insulin Stacking”

A vicious cycle that destabilizes glycemic control
Insulin regimen is OK, Implementation is the problem

**Issues:**
High blood sugar 2 ° miscounting CHO
Low blood sugar 2° to stacking the insulin

- The duration of action of rapid acting insulin is ~4 h
- A high BG corrective bolus given during that 4 hrs needs to be reduced
Insulin regimen is OK, Implementation is the problem

- With MDI @ 1 hr – give \( \approx \frac{1}{4} \) the usual correction
  2 hr – give \( \approx \frac{1}{2} \) the usual correction
  3 hr – give \( \approx \frac{3}{4} \) the usual correction
  4 hr – give the usual correction
- With CSII use the “Insulin On Board” (IOB) feature
Insulin regimen is OK, Implementation is the problem

**Teaching Points:**
Accurate CHO counting is essential
Avoid “stacking” insulin (ie giving excessive Hi BG corrective doses)
**How to control the BG during exercise, increased activity**

<table>
<thead>
<tr>
<th>Date</th>
<th>Glucose mg/dl</th>
<th>CHO grams</th>
<th>CHO Bolus</th>
<th>Hi BG Bolus</th>
<th>Basal Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>MN AM</td>
<td>128</td>
<td>35g</td>
<td>2.9H</td>
<td>6 mile run from 2-3PM</td>
<td>0.5/h</td>
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<tr>
<td>6 AM</td>
<td>112</td>
<td>70g</td>
<td>4.6H</td>
<td>0.35/h</td>
<td>0.35/h</td>
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<tr>
<td>7 AM</td>
<td>98</td>
<td>60g</td>
<td>4.3 H</td>
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<td>0.5/h</td>
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<td>8 AM</td>
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<td>9 AM</td>
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<td>10 AM</td>
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Exercise, increased activity (gardening, walking, shopping, house cleaning, travelling) commonly cause low BG AND a rebound high BG
How to control the BG during exercise, increased activity?

*Take less insulin, eat more CHO*

**Management with CSII**

- Use a temporary basal
  
  Decrease basal by 20-70% or more
- Begin the temporary basal ~ 1 hr before the activity, continue for the duration
- Increase CHO before and during the activity
- Give less insulin (use a higher ratio) to cover CHO at meals eaten just before or after
How to control the BG during exercise, increased activity?

Take less insulin, eat more CHO

Management with MDI

• Increase CHO before and during the activity
• Give less insulin (use a higher ratio) to cover CHO at meals eaten just before or after
## Snacks for Exercise

**Guidelines to Prevent Low Blood Glucose During Exercise**

**Usual Carbohydrate Requirements For One Hour of Different Activities**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Weight – 100 pounds Suggested</th>
<th>Weight – 150 pounds Snacks in grams</th>
<th>Weight – 200 pounds of Carbohydrate</th>
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<tbody>
<tr>
<td>Badminton</td>
<td>20</td>
<td>30</td>
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<td>Basketball</td>
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<td>65</td>
<td>90</td>
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<tr>
<td>Bowling</td>
<td>15</td>
<td>20</td>
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<tr>
<td>Bicycling 5 mph</td>
<td>15</td>
<td>20</td>
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<tr>
<td>Bicycling 10 mph</td>
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<td>Bicycling 15 mph</td>
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<tr>
<td>Square Dancing - fast</td>
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<td>Disco Dancing</td>
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<td>Fast Step</td>
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<td>45</td>
<td>60</td>
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<tr>
<td>Gardening/Yardwork</td>
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<td>Light</td>
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<td>Raking leaves</td>
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<td>Digging</td>
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<tr>
<td>Chopping wood</td>
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<td>Digging ditches</td>
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<td>Shoveling snow</td>
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<td>Power mower (push)</td>
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<td>Golfing with cart</td>
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<td>Golfing pull cart</td>
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<tr>
<td>Housework riding and yard work</td>
<td>20</td>
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</table>

Adapted: Walsh J, Roberts R
Pumping Insulin
3rd Ed
Torrey Pines Press
2000
How to control the BG during exercise, increased activity

*Teaching Points:*
Increased activity and exercise (most) lowers the blood sugar
*TO PREVENT LOWS*
Reduce the insulin dose
&/or
Increase CHO
How to control the BG during exercise, increased activity

**Teaching Points:**
The ideal exercise regimen:

- Daily
- Same drill
- Same time of day
- Same duration
- Anaerobic followed by aerobic

The more consistent/predictable the exercise, the easier it is to figure out the insulin/CHO coverage - which, in turn, leads to more stable blood glucose levels
How to control the BG during exercise, increased activity

*With the Caveat:*

Vigorous exercise in a poorly controlled (under-insulinized) type 1 diabetic with a high blood sugar (~ over 250 mg/dl) may

*paradoxically increase the blood sugar and the risk of ketosis*

-And the activity should be deferred until the blood sugar comes down
How to control the BG with delayed stomach emptying
(example: eating hi fat foods, gastroparesis, Symlin® Rx)

<table>
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Pizza – 3 Slices
~30g fat
~102g CHO

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Pizza – 3 Slices
~30g fat
~102g CHO
How to control the BG with delayed stomach emptying

Management:

With CSII:
Use an extended “square” wave or dual bolus

With MDI:
Give part of the rapid acting insulin before, and part after the meal
For High Fat Meals:

Start with a 50% immediate:50% extended Dual Bolus*

• < 10 grams of Fat, may not need to extend
• 11-19 grams of Fat, 30 - 1 hr** extended
• 20-29 grams of Fat, 1 – 2** hrs extended
• 30-39 grams of Fat, 2 – 3** hrs extended
• 40> grams of Fat, 3 - 4 hrs or more** extended

* Lower CHO meal, decrease % immediate bolus; Higher CHO meal, increase % immediate bolus or higher CHO meals)

**Less fat, decrease % time of the extended bolus; higher fat, increase % time of the extended bolus

Gloria Yee, Empirical Observations; Jones SM et al.DM Tech & Therap7:233, 2005
Chase, HP et al Diabetic Medicine 19:317, 2002
For High Fat Meals:

High fat and high CHO meals may require more rapid acting insulin to cover the CHO...

(↑ mealtime insulin by ~10-15+%)

Example:
If the customary ratio is 1 unit/15 g CHO
With pizza, use 1 unit/10-12 g CHO
Initiation and Optimization of Insulin therapy

Summary:

• Use estimated insulin requirement formulas as a reference
• Individualize insulin dose
• Patient has to be a partner in the diabetes management:
  - education in diabetic self management strategies
  - intensive logs for problem solving