Insulin Pump – Tune up

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Most Common problems

- Delayed boluses – high post meal BG
- Too many basal rates (over and understeering)
- Inaccurate CHO bolus / CHO counting
- Lack of meaningful monitoring data – no pump/meter/sensor downloads
- Reactive pumping vs proactive pumping (alternately pumping gas and brakes)
- Infusion site failures

Steps To Control – Delayed Boluses

- Bolus 15 to 30 min before meals when able
  - A simple fix to lower high post-meal BGs
  - If you’re not sure how much you will eat – give half the bolus and add the balance after the meal

Steps To Control – Too many Basals: “Oversteering”

How Many Basal Rates Do You Need?

Number of basal rates used per day from self-reports of hundreds of pumpers at insulin-pumpers.org
When a basal is changed, it takes 3-5 hrs to have its full effect.*
Using more than 5 basals may have little benefit.


Basal Tips – Avoid Oversteering

- Basals usually make up 45 to 65% of TDD
- Basal rates should be similar, such as between 0.5 to 0.7, or 1.0 to 1.4 u/hr
- Adjust basal rates in small steps (usually 0.025 to 0.1 u/hr)
  - 3 to 5 hours before see full effect
Steps To Control – Inaccurate Boluses

- Use a CHO counting resource
  - CalorieKing, MyFitnessPal
- Know portion sizes
  - Measure portions onto plate when home
- Calculate a CHO ratio based on your total daily dose of insulin (TDD)
  - CarbF = \(2.6 \times \text{weight} / \text{TDD}\)

APP Study – Carb Factors are Often Incorrect\(^1,2\)

CarbFs from 400 pumps were not evenly distributed.

People like “magic” numbers – 5, 10, 15, and 20 g/unit.

Use formulas to derive accurate pump settings –> better than WAG!\(^2\)

Many people use “magic” numbers as CarbFs!

APP Study – Use your TDD to Check Pump Settings\(^1\)

\[
\text{CarbF} = 2.6 \times \frac{\text{Wt(lbs)}}{\text{TDD}}
\]

Example: 2.6 x 160 (lbs) / 40 = 10.4

Or \(\text{CarbF} = 500 / \text{TDD}\)

Example: 500 / 40 = 12.5

Help Your Health Care Provider – Bring Meaningful Data

- Check glucose 6 x a day or wear a CGM
  - Pre and 2 hours post meals
- Download and bring your records
- Use the bolus calculator for all boluses and override when needed
- Don’t over-treat lows with carbs nor highs with insulin
- Know when to change your pump settings

Help Your Health Care Provider – Bring Meaningful Data

“Pumping gas and brakes”

- Look for repeat patterns – correct patterns rather than reacting and making same mistake over and over again

Size Up the Problem

- If it ain’t broke, don’t fix it!
- Mild – tweak pump settings or lifestyle
- Moderate – For patterns, use pattern management. Otherwise calculate new TDD and retune pump settings
- Severe – Reset TDD to an improved TDD (iTDD) and select new settings from this iTDD to correct the problem

\(^2\) J. Walsh, D. Wroblewski, and TS Bailey: Insulin Pump Settings – A Major Source For Insulin Dose Errors, Diabetes Technology Meeting 2007
Stop Frequent Lows First

- You cannot tell how much excess insulin there is!
- Start with a 5% or 10% reduction in the TDD
- Compare the current TDD to an “ideal” TDD for weight.
  - Divide weight (lbs) by 4 to see what TDD you would use if you have an average sensitivity to insulin

**Example:** Someone who weighs 160 lbs would be expected to have a TDD of 40 units (160/4 = 40).

Then Stop Frequent Highs

When your average BG is high with few lows:

Raise TDD by 1% for each 6 mg/dl drop desired in average BG, or 5% for each 1.0% drop in A1c

**Example:** Amy’s avg TDD is 40 u/day. Her average meter BG is 205 mg/dl with few lows. Her goal BG (average) is 145 mg/dl:

\[
\begin{align*}
205 \text{ mg/dl} & - 145 \text{ mg/dl} = 60 \text{ mg/dl} \\
60 \text{ mg/dl} & \div 6 \text{ mg/dl} = 10\% \text{ rise needed in TDD} \\
40 \text{ units} & \times 1.10 = 44 \text{ units}
\end{align*}
\]

Infusion Sets – The Achilles Heel Of Pumps

Survey of 1142 pumpers in 40 German diabetes clinics

- 54% reported an increase in glycemia for unknown reasons until their infusion set is changed
- 19% reported kinking, 12% had leakage, 12% air bubbles, and 33% had other issues
- 36% used auto-insertion devices – 72% of them reported that the device failed to work ~10% of the time

**Infusion Set Solutions**

- Anchor the infusion line with tape
- Review site prep and insertion technique with clinician or trainer
- Insert set by hand
- Switch to a different brand of infusion set

Tapes: Transpore, Micropore, Durapore, Hypafix
Duration Of Insulin Action
Accurate boluses require an accurate DIA

<table>
<thead>
<tr>
<th>Glucose-lowering Activity</th>
<th>DIA Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>! Hidden insulin stacking</td>
<td>4 hrs</td>
</tr>
<tr>
<td>&quot;Unexplained&quot; lows</td>
<td>6 hrs</td>
</tr>
<tr>
<td>Errors in adjustments of basal rates, carb factors, and correction factors</td>
<td>2 hrs</td>
</tr>
<tr>
<td>Or just ignoring your “smart” pump’s advice</td>
<td>0 hrs</td>
</tr>
</tbody>
</table>

Set DIA for real action time: 4.5 to 6 hrs.
Don’t change your DIA to fix control problems

Don’t Select a Short DIA

Connectivity
Get ready – the next big wave in diabetes devices and care!
Gadgets + Interfaces + Intelligence
Eventually, easier for everyone

Life Is Easier When You Know More!
PI5 on Kindle, i-Pad, and Nook – $16.99
Slides at www.diabetesnet.com/diabetes-resources/diabetes-presentations
Books at www.diabetesnet.com/dmall/ or 800-988-4772

Questions and Answers