Insulin Pump – Tune up

TCOYD San Diego 2014
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Most Common problems

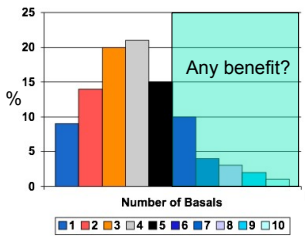
- Delayed boluses – high post meal BG
- Too many basal rates (over and understeering)
- Inaccurate CHO bolus / CHO counting
- Lack of meaningful monitoring data – no pump/meter/sensor downloads
- Reactive pumping vs proactive pumping (alternately pumping gas and brakes)
- Infusion site failures

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.

* Heinemann L, Nosek L, Kapitza C, et. al. Changes in basal insulin infusion: time until a change in metabolic effect is induced in patients with type 1 diabetes. Diabetes Care. 2009;32(8):1437–1439.

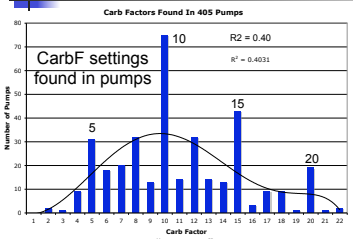
Basal Tips – Avoid Oversteering

- 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 x weight) / 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!

Many people use "magic" numbers as CarbFs!

1. J Walsh, R Roberts, T Bailey: J Diab Science & Technology 2010, Vol 4, #5, Sept 2010
2. J. Walsh, D. Wroblewski, and TS Bailey: Insulin Pump Settings – A Major Source For Insulin Dose Errors, Diabetes Technology Meeting 2007

APP Study – Use your TDD to Check Pump Settings[1]

CarbF = 2.6 x $\frac{\text{Wt(lbs)}}{\text{TDD}}$

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

Or CarbF = 500 / TDD

Example: 500 / 40 = 12.5

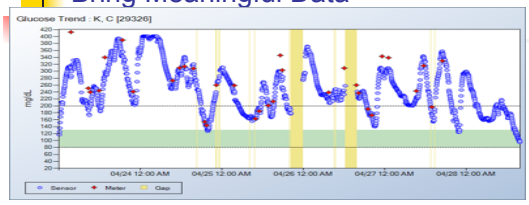
[1]J Walsh, R Roberts, T Bailey: J Diab Science & Technology 2010, Vol 4, #5, Sept 2010

Or use Pump Settings Tool to compare current to "ideal" settings at www.diabetesnet.com/diabetes_tools/pumpsettings/

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

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

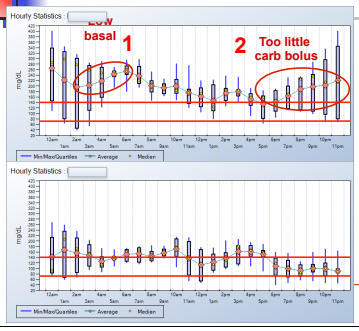
Example: Amy's avg TDD is 40 u/day. Her average meter BG is 205 mg/dl with few lows. Her goal BG (average) is 145 mg/dl:

205 mg/dl – 145 mg/dl = 60 mg/dl

60 mg/dl ÷ 6 mg/dl = 10% rise needed in TDD

40 units x 1.10 = 44 units

TDD Before & After An Adjustment



Start TDD = 36 u

- Raised basal by 0.05 u/hr all day (+1.2 u/day)
- Lowered carb factor from 1u/13g to 1u/12g (+1.8 u/day)

End TDD = 39 u

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

Gabriele and Lutz Heinemann: Reality of insulin pump treatment in Germany: Results from a survey with 1142 patients treated in 40 specialized practices. Abstract # 2013 ADA Meeting. winDiab, Scientific Institute of the Specialized Diabetes Practices, Düsseldorf, Germany

Is Your Infusion Set A Problem?

- Do sites often "go bad"?
- Do you have "scarring" or "poor absorption"?
- Often have 2 or more unexplained highs in a row?
- Do correction boluses sometimes not work?
- Have high BGs (often 8-32 hrs) until set is changed?

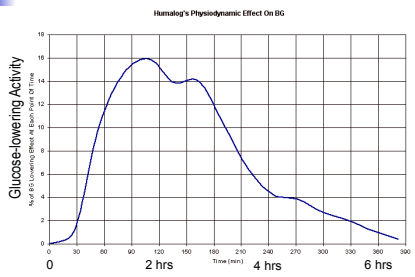
Infusion Set Solutions

- 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



Don't Select a Short DIA

A short DIA hides BOB and leads to:

- Hidden insulin stacking
- "Unexplained" lows
- Errors in adjustments of basal rates, carb factors, and correction factors
- Or just ignoring your "smart" pump's advice

Set DIA for real action time: 4.5 to 6 hrs.

Don't change your DIA to fix control problems

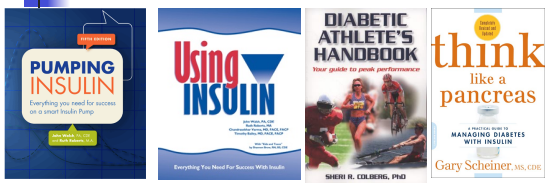
Connectivity

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!



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