GETTING OFF THE ROLLERCOASTER

No Limits with Type 1 Diabetes Conference, Vancouver, BC -- September 23, 2019

Fine Tuning your Diabetes Balance

Before you begin ask yourself some of these important practice questions

1. Do I pre-bolus 15 minutes (BG within target range) to 30 minutes (outside target range) before eating?

2. Do I practice good site rotation?
   - Are you aware of the all the injection/infusion set site options and the newest rotation schedules based on the researched/recommended FIT guidelines? Prevent lipohypertrophy as it can have long term effects http://fit4diabetes.com/files/2314/8777/6632/FIT_Recommendations_3rd_Edition_2017.pdf

3. When did I last change my insulin cartridge?
   - Do you change/dispose of your insulin bottle/cartridge every 28 days (whether it is finished or not)
   - Has it been too hot? Use FRIO products to keep insulin cool and prevent insulin degradation

4. Do I routinely adjust my management if I exercise to prevent low or high BGs?
   - Did you know there are consensus guidelines and strategies on how to support people with T1D manage both aerobic and anaerobic exercise/activities?

     Exercise resources:
     - https://excarbs.com/
     - Consensus paper available online*: Exercise management in type 1 diabetes: a consensus statement*
     - Riddell, Michael. *Getting Pumped ! A diabetes and exercise guide for active individuals with Type 1* diabetes. 2016

5. Are my high BGs due to overtreating my low BGs? Are my low BGs due to *rage bolusing*?

6. Before making changes, ask yourself if it is an additional basal dose/profile you need?
   - Weekday versus weekend or shift work or premenstrual.
   - Print out the report and use a highlighter to separate and asses whether it's needed

7. When did I last check my basal insulin and/or all my settings?
   - Does fine tuning your management seem like too much work? Do you have resources to help you?

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Evaluating your settings

Always remember that diabetes subscribes to the philosophy that "on any given day, anything can happen".

- We cannot make a change based on a single day or event.
- Pattern analysis is what allows us to play diabetes detective but there ISN'T always a pattern to be found!

Basic Starting Guidelines

Ideally, this will be a time free of unusual activity (not Christmas holidays) or illness, high-fat foods, hypoglycemia*

Order of evaluation:

Get rid of hypoglycemia (patterns) first, then:

1. Basal /Background Insulin
   - ☑ Starting with overnight first
2. Carb ratio
   - ☑ Before and after meal effect
3. Insulin Sensitivity Factor (ISF)/Correction Factor
4. Active Insulin Time/IOB/BOB

Starting with your Basal insulin

MDI (Using long acting basal insulin? i.e. Basaglar or Lantus insulin)

Goal: Target morning BG without low or high BG overnight

1. Test Bedtime ….4 hours after dinner (do not eat after dinner) and within reasonable range
2. Have no bedtime snack
3. Test midnight
4. Test 0200-0300
5. Test 0700

Insulin pump

Goal: When basal rates are set properly, the BG should not fluctuate up or down more than 2.0 mmol/L

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Starting Notes:

- Assess basal rates on days that are free of exercise, stress, illness, alcohol, high fat meals, hypoglycemia and when not premenstrual…
- Check in 4-6-hour time blocks
- Do not eat or drink except water (no protein, coffee, etc.)
- Check BG every 1-2 hours and keep good records (**NOTE**: if available the use of CGM is helpful)
- Change basal rates by 10-20% or 0.025-0.1 unit increments several hours (2-4 hours) preceding the start of the rise or fall of the blood/sensor glucose level
- i.e. if the BG rises > 2.0 mmol at 6 a.m., consider increasing 3 a.m. basal rate

Evaluating your Carb Ratio

Goal:

1. Keep the BG rise between 2.2-4.4 mmol 2 hours after taking meal
2. Expect BG within target at 4 hours

Starting Notes

- No recent lows, excess stress, or exercise
- Pre-bolus 15 minutes before eating (consider longer if BG higher)
- Eat a low-fat meal when you know the exact carb count (ie. Salter scale, measure, Lean Cuisine)
- Test at meal, 2 hours after meal, and 4 hours after meal
- Adjust by 1-2 g at a time (based on total daily dose ~ 10%)

Evaluating Correction Bolus/Insulin Sensitivity Factor (ISF)

Goal:

1. BG should return to target 4-5 hours LATER without hypoglycemia

Starting Notes:

- Is your target within clinical practice guidelines? Do you know how your pump calculates?
- Calculate using the 100Rule to see where it is as a baseline

  100 Rule: 100 divided by TDD (Total Daily Dose)

- If correction boluses are over 8-9% of TDD, consider moving ½ of the correction amount to the basal or carb bolus
- Is your IOB/DIA/Active insulin time safe

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References

1) Argento, Nicholas. Presentation on Practical Clinical Application of Continuous Glucose Monitoring, Montreal, February 2015.
2) Scheiner, Gary. Practical Continuous Glucose Monitoring. 1st ed. Alexandria, VA: American Diabetes Association, 2015. Page 3, 36.
3) Scheiner, Gary. Think Like A Pancreas, 2011 p181
4) Walsh, John. Pumping Insulin (Fifth Edition); 2013 (Sixth Edition) 2016.
5) Walsh, J. et al. "Confusion Regarding Duration of Insulin Action: A Potential Source for Major Insulin Dose Errors by Bolus Calculators." Journal of Diabetes Science and Technology 8.1 (2014): 170-78.

Resource Examples for guiding you through the process

Time frames and directions	When to check BG
Overnight: 1. Eat an early dinner and take your usual meal bolus. 2. Eat a predictable meal with a known number of carbohydrate grams. 3. Choose a low-fat dinner. 4. Do not eat after dinner. 5. Begin the evaluation about 4 hours after dinner if your BG is in a reasonable range.	☐ 4 hours after dinner ☐ Bedtime ☐ Midnight ☐ 2-3 am ☐ Upon waking
Morning time: 1. Begin the evaluation if your BG is in a reasonable range. 2. Skip breakfast. 3. Do not eat or drink until lunch.	☐ Every 1-2 hours upon waking until lunch
Afternoon time: 1. Begin the evaluation if your BG is in a reasonable range 4 hours after breakfast. 2. Skip lunch. 3. Do not eat or drink until supper.	☐ 4 hours after breakfast ☐ Every 1-2 hours until dinner
Evening time: 1. Begin the evaluation if your BG is in a reasonable range 4 hours after lunch. 2. Skip dinner. 3. End the evaluation at bedtime and have a snack if desired (bolus as usual for your snack).	☐ 4 hours after lunch ☐ Every 1-2 hours until bedtime

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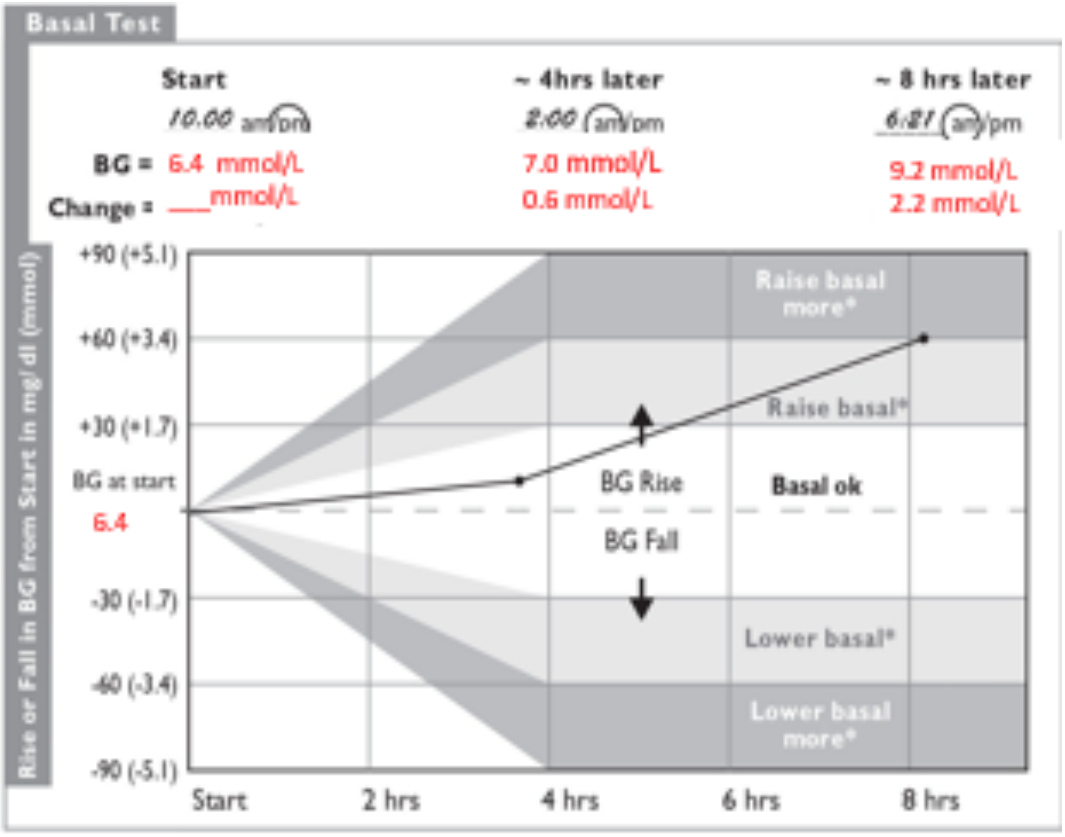

Walsh, John "Pumping Insulin" 6th Edition

Pumping Tips and Tricks

1. Avoid suspending/removing your pump for long periods
    - Even short-term interruption as little as 30-60 minutes can cause blood glucose levels to rise and remain elevated for hours after insulin interruption

2. Use Temp Basal
    - Longer than usual car rides or a plane trip
    - Illness including colds, infection, dental work/surgery, outpatient or inpatient surgery
    - Stress/hormonal changes (if a second basal pattern isn't already established)

3. Be quicker with your hyperglycemia management
   If blood glucose is 14mmol/L or higher
    1) Take a correction bolus by pump
    2) Check BG again in 1-2 hours for decrease
    3) If still 14mmol/L or higher still
    4) Check for ketones!
    5) Take correction bolus by syringe or pen

6) Change infusion set and reservoir and insulin
7) Check BG again every 2 hours until stable

Fluids (Hydration) can make the difference in recovery and DKA prevention

- If unexplainable High→ Check ketones first before treating with pump correction

If Ketones positive (+) go directly to step 5 and don't forget to add the extra insulin for ketones if needed. There is an excellent reference on doing this here: www.bcchildrens.ca/endocrinology-diabetes-site/documents/pumpdka.pdf

CGM:

Time in Target is important but remember to check time spent BELOW target

- Recommendation: ≤ 4-5% below target [1,2] Aim for no values below 3.1mmol/L[1] 1% = 15 min per day
- Therefore, 11% x 15min = 165 minutes (Almost 3 hours!)
- Research shows that progression from mild or moderate to severe hypoglycemia has more to do with the length of time spent in a hypoglycemic range than how low the glucose level becomes.[1]
- By acting on alerts in a consistent and constructive manner, the duration and extent of glucose excursions can be minimized.[2]

Helpful books:

1) *Brown, Adam. Bright Spots & Landmines: The Diabetes Guide I Wish Someone Had Handed Me*. 2017 – Upbeat and accessible book full of tips and tricks for achieving better time in range.

2) Lewis, Dana. *Automated Insulin Delivery: How artificial pancreas "closed loop" systems can aid you in living with diabetes.* 2019 – Writing by one of the developers of OpenAPS, this book explains how closed systems work and how to dial in settings to use them effectively.

3) Ponder, Stephen. *How to manage type 1 diabetes in a modern world.* 2016 – A book for dynamically managing blood sugars with a CGM.

4) Scheiner, Gary. *Think Like A Pancreas.* 2011. – This is considered by many as THE GUIDE for understanding Type 1 Diabetes and how to manage it.

5) Schneider, Gary. *The Ultimate Guide to Accurate Carb Counting: Featuring the Tools and Techniques Used by the Experts.* 2006 – A helpful resource for finding out everything from carb calculation factors to the glycemic indexes of hundreds of foods.

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6) Walsh, John. *Pumping Insulin, Sixth Edition*. 2016 – THE GUIDE for using an insulin pump.

Other helpful resources:

https://autotuneweb.azurewebsites.net/ Autotune website (in combination with Nightscout website and a willingness to diligently log carbs and insulin if not using Loop or OpenAPS) can analyse blood sugar levels over multiple days and make recommendations for adjusting basal, carb ratios, and ISF.

Diabetes:M app – has a fat, protein and carbohydrate calculator

Diatribe has helpful information on the "42 factors" that effect diabetes management and how to respond to them here: https://diatribe.org/42factors

https://diabetesdistress.org/ -- Has an online quiz to help people assess their level of diabetes distress using the "diabetes distress scale"

https://excarbs.com/ - Helpful website for managing exercise with T1D

https://ichallengediabetes.org/ -- Organization that seeks to empower people with diabetes by bringing them together to do activities, such as hikes and multi-day outdoor adventures.

Figwee Visual Food Diary app (iPhone only) – AN app that helps people "SWAG" carbs by visually representing different portion sizes for the food on a plate.

https://loopkit.github.io/loopdocs/ -- Information on how to build a DIY closed-loop system (Loop). (See also Looped Facebook group)

http://www.nightscout.info/ -- information on how to build a Nightscout website for robust reports and integration with lots of cool DIY technology. (See also CGM in the Cloud Facebook group.)

https://openaps.org/ -- Information on how to build another kind of DIY closed-loop system (OpenAPS). (See also Looped Facebook group)

https://youngandt1.com/ -- Social group for young adults with T1D in the Lower Mainland (also on Facebook)