Carbohydrate Counting for Insulin Pump Therapy

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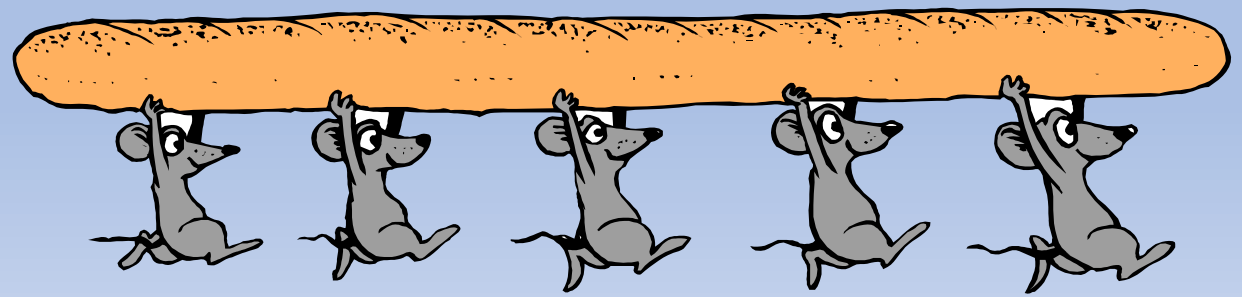


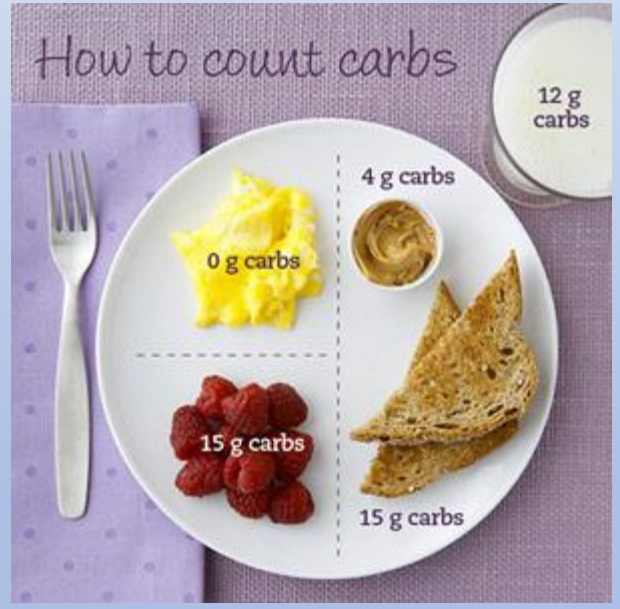
Session Plan

- Recap on key principles of carbohydrate counting and insulin dose adjustment.
- Assessment of bolus ratios on a pump.
- What are the advantages of using a pump, the extra considerations which can be made.
- How to to use advanced bolus features.

Dietary Advantages of Insulin Pumps

- Account for CHO loads in small snacks
- Manage variable BG responses to variable glycaemic effect of foods.
- Account for less significant CHO sources e.g. Vegetables
- Manage exercise effects without eating lots more CHO
- Avoid overeating to compensate for hypoglycaemia
- Enjoy eating out/takeaway foods with better BG levels
- Avoid feelings of guilt when eating ‘forbidden’ ‘sweet’ foods

Do you know how to count carbohydrate?



How much Carbohydrate in these?

1 Pint

500ml Sports drink

60g Mars Bar

individual Xmas Pudd

Chocolate Éclair

Tin Cannellini Beans

100g dry pasta

Medium Banana

Meringue nest

Steps

- Identify foods containing carbohydrate
- Calculate TOTAL carbohydrate content of meal/snack
- Calculate insulin dose required according to a ratio
- Consider factors that may influence blood glucose response (e.g. fat, glycaemic index)
- Consider pre-meal blood glucose
- Adjust insulin dose, amount/duration (use advisor!)
- Eat and give insulin bolus
- Record blood glucose response (pre & post meal)

Resources

Whole Milk
Serving Size 8 fl oz (240mL)
Servings Per Container 2

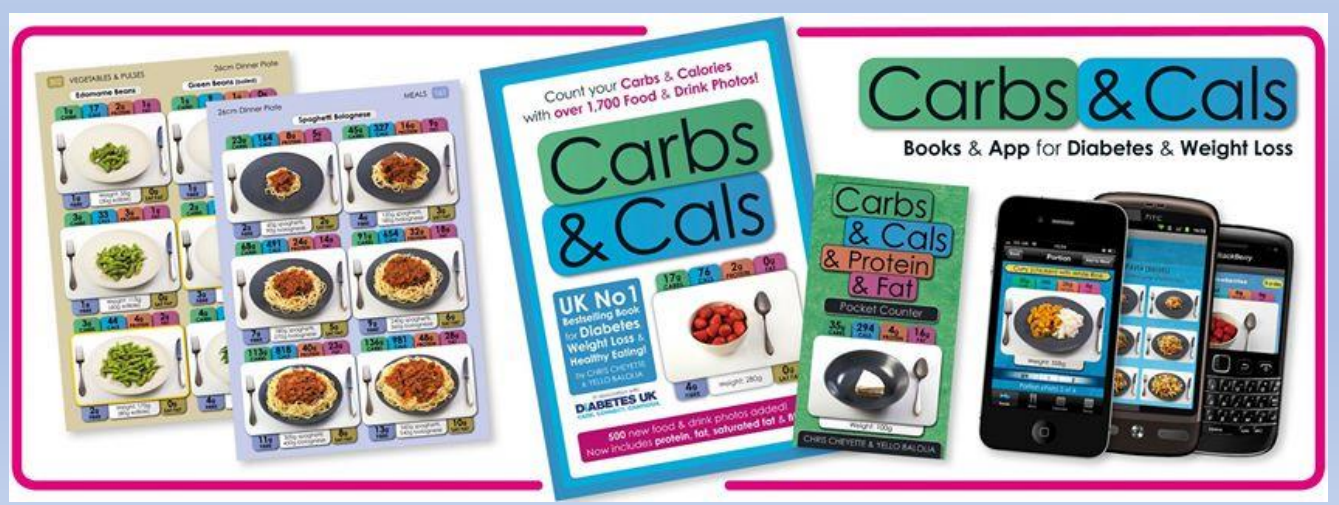
Amount Per Serving	
Calories 150	Calories from Fat 70
	% Daily Value*
Total Fat 8g	12%
Saturated Fat 5g	25%
Cholesterol 35mg	12%
Sodium 125mg	5%
Total Carbohydrate 12g	4%
Dietary Fiber 0g	0%
Sugars 11g	
Protein 8g	

Vitamin A 6% • Vitamin C 4%
Calcium 30% • Iron 0% • Vitamin D 25%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

My Fitness Pal



Assessment of Skills

SECTION TWO

Carbohydrate (CHO) Counting

Please tick the correct answer/s

1. On a scale of 0 - 10 (0 being very unconfident and 10 being very confident) how confident are you at calculating carbohydrate in everyday foods that you eat?

Circle on the scale

0 (very unconfident) 1 2 3 4 5 6 7 8 9 10 (very confident)

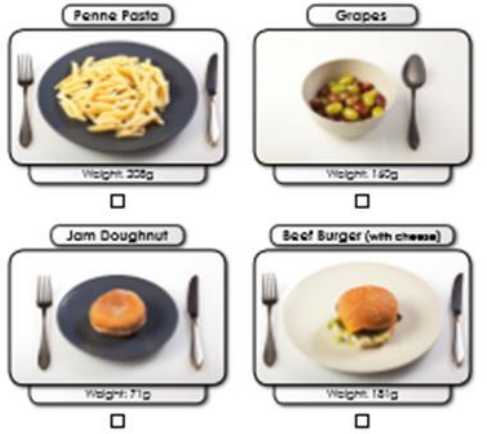
2. Which of these foods contain carbohydrate, meaning that you would need to count them when taking insulin?

Choose all that apply

- ☐ Pasta
- ☐ Rice
- ☐ Chicken
- ☐ Eggs
- ☐ Cornflakes
- ☐ Cream
- ☐ Nuts
- ☐ Tomato
- ☐ Bread
- ☐ Cheese
- ☐ Milk

3. Which of these foods contains the most carbohydrate.

Choose one answer



☐ ☐ ☐ ☐

Food images by Carbs & Cals www.carbsandcals.com

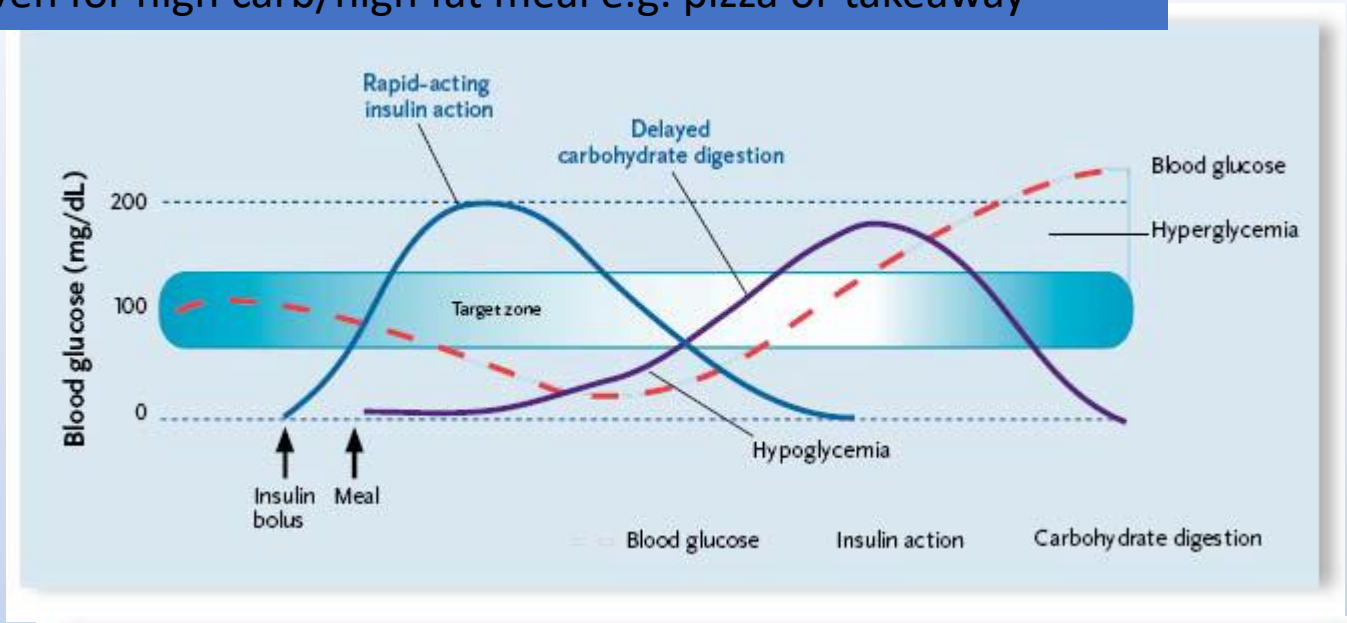
Adjusting Bolus Ratio

- Adjust insulin units or carbohydrate grams?
- Case studies

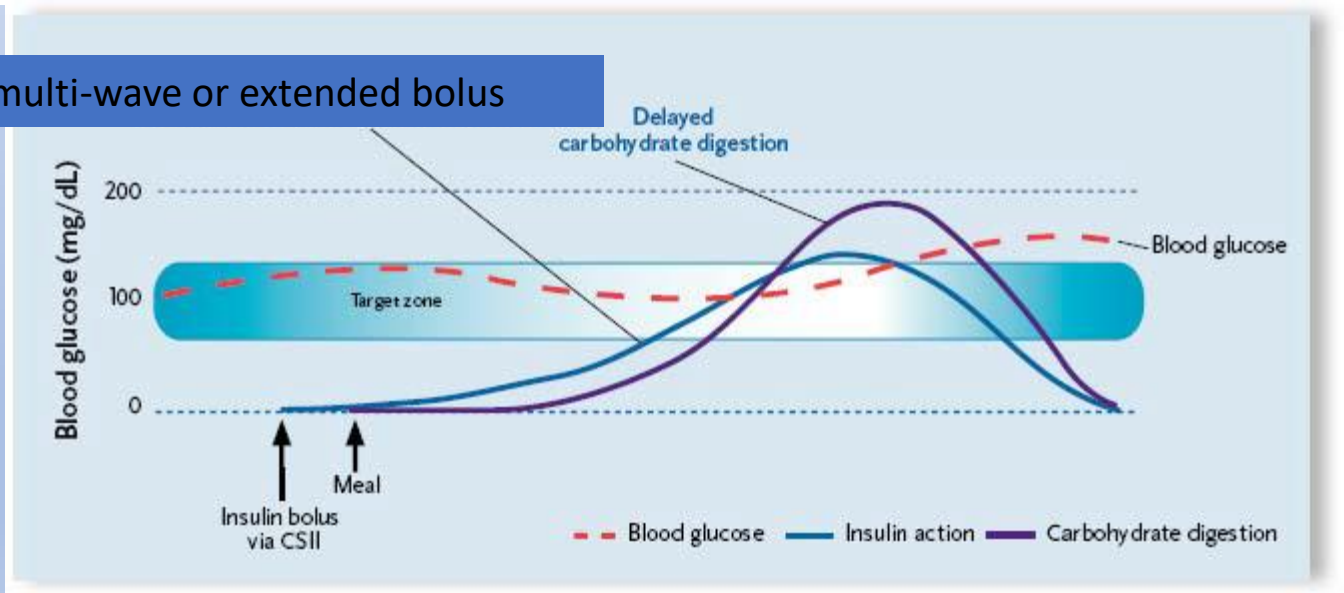
Advanced bolus options

- Adjust speed of standard bolus dose
- Set lag time (pre set up to 1 hour before eating)
- Extended / Square Wave bolus
- Multi Wave / Dual Wave bolus

Standard bolus given for high carb/high fat meal e.g. pizza or takeaway



Bolus given as multi-wave or extended bolus

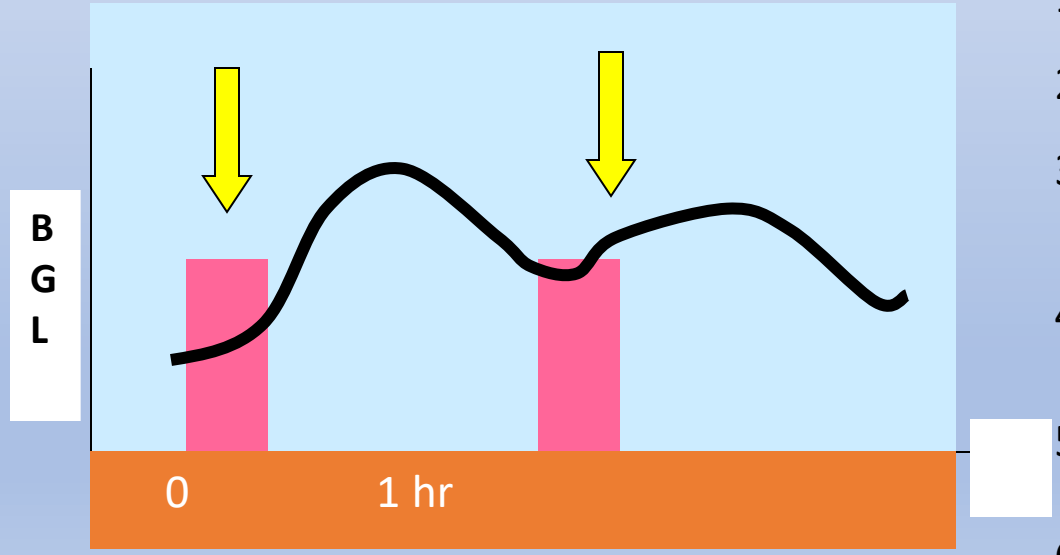


AACE Diabetes Mellitus Guidelines. *Endocr Pract. 2007;13(suppl 1):3-68.*

Split / Bolus

For large carbohydrate meals or multiple courses.

More than 6 unit bolus



1. Calculate total bolus
2. Divide dose (50/50, 70/30),
3. Give first dose at start of meal,
4. Second dose 15-60 mins later
5. Or give separate boluses with separate courses, assessing CHO content of each course separately.

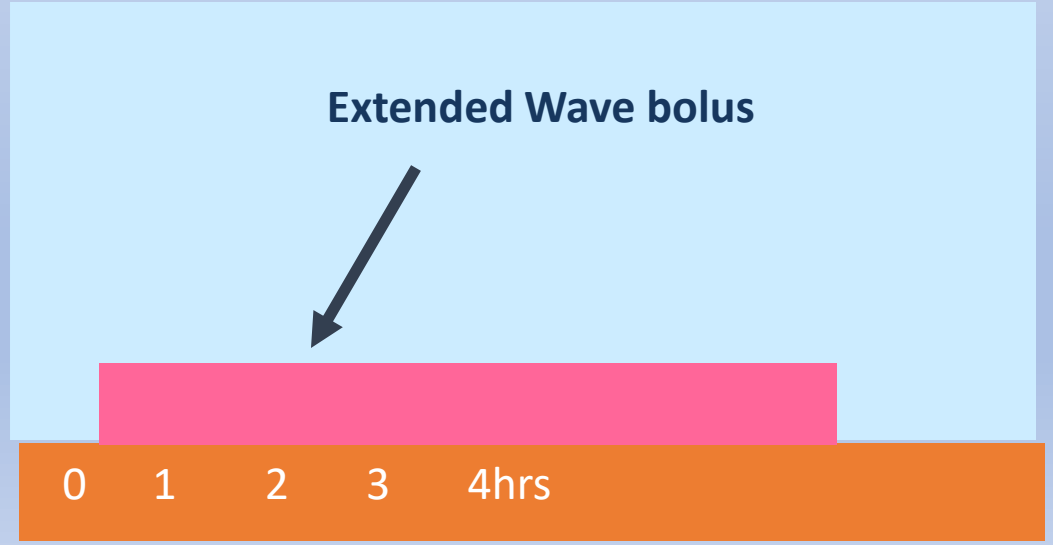
Extended/Square Wave

- Total dose spread out over the meal and digestive process.
- Whole dose programmed to be delivered evenly for 15 mins-8+ hours.
- Can be stopped and standard boluses given on top

Consider for

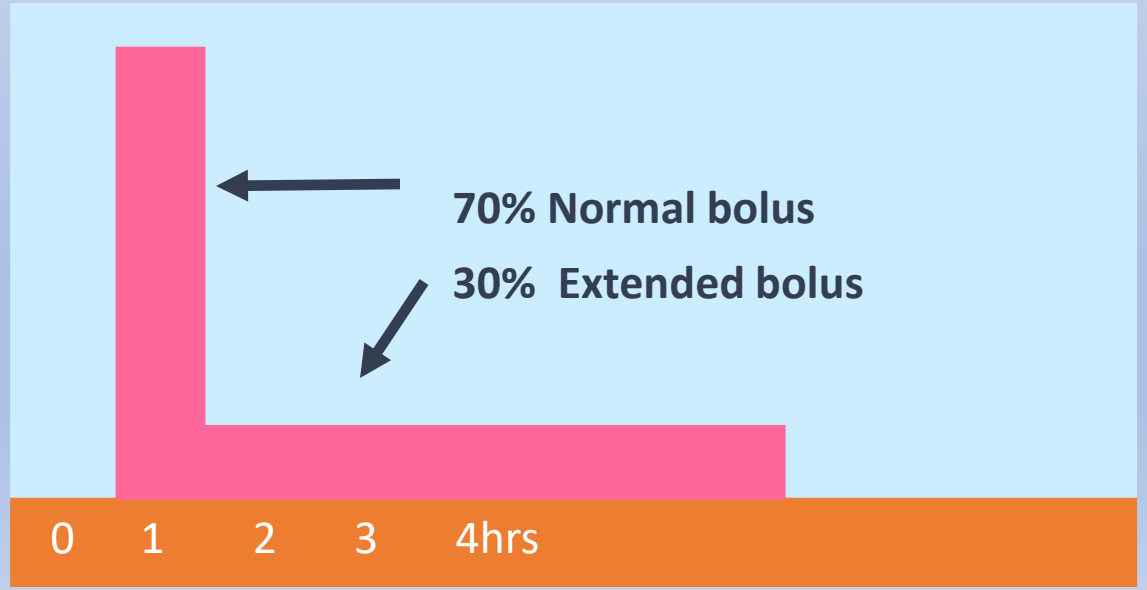
Very high fat or low GI food e.g. dahl, porridge.

Standard bolus doses v big, e.g. with large ratio



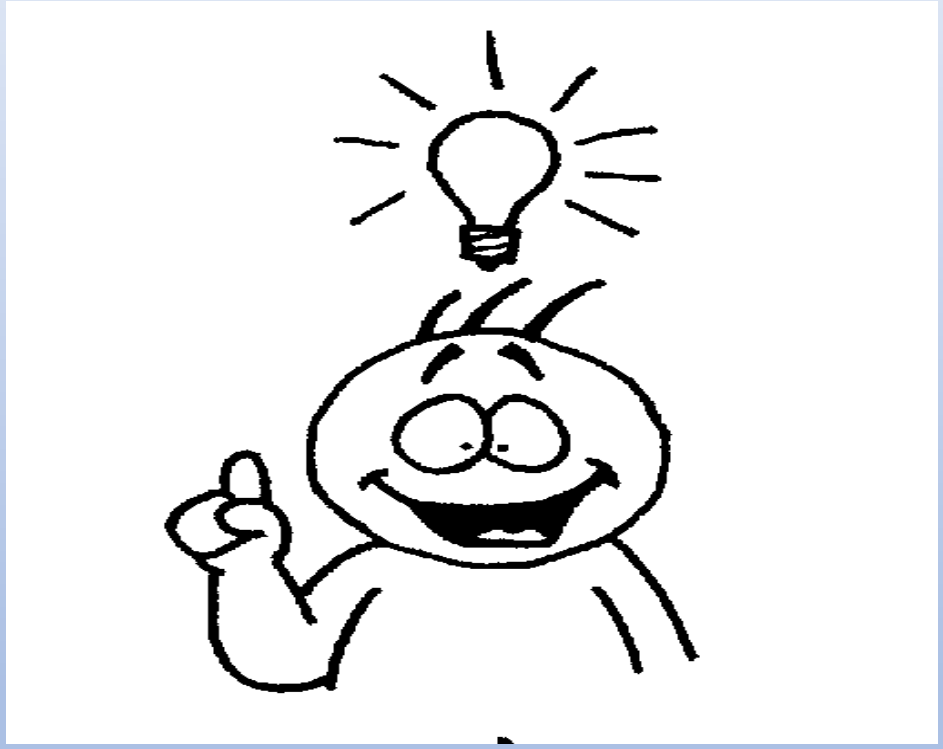
Multi-Wave/Dual-Wave

- Dose split between standard bolus and extended/square wave bolus
- e.g.50% as ‘normal bolus’ followed by 50% as ‘extended bolus’ for curry, pizza, fish and chips, creamy pasta dishes
- Can alter the split, e.g. 30/70, 70/30
- Can stop extended bolus at any time. Can give normal bolus on top of extended bolus.



Which meals / How to set

What are your thoughts?



Glycaemic Index

Glycaemic Index vs Glycaemic Load

Glycaemic Load = Amount of CHO x GI

The Challenges of eating out….

Do Fat and Protein matter?

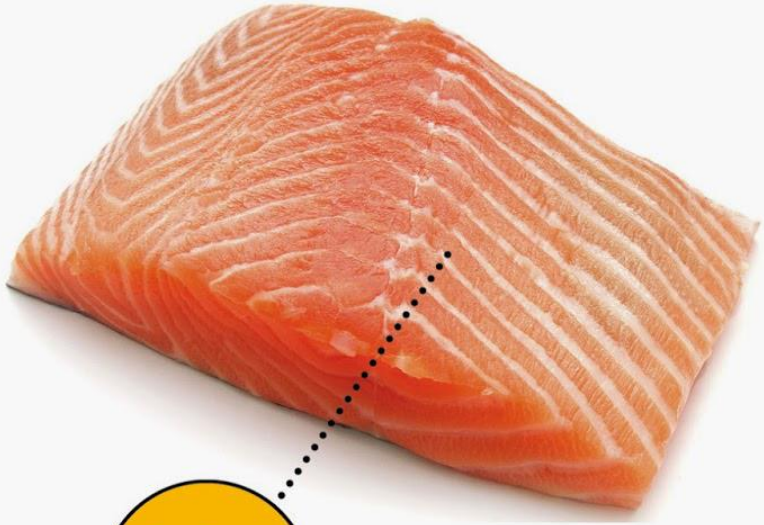
75-100g protein if no CHO eaten
A 10oz steak, 10 eggs!

35g with ~30g CHO

Effect equivalent to 20g CHO but delayed effect ~ 2 hours

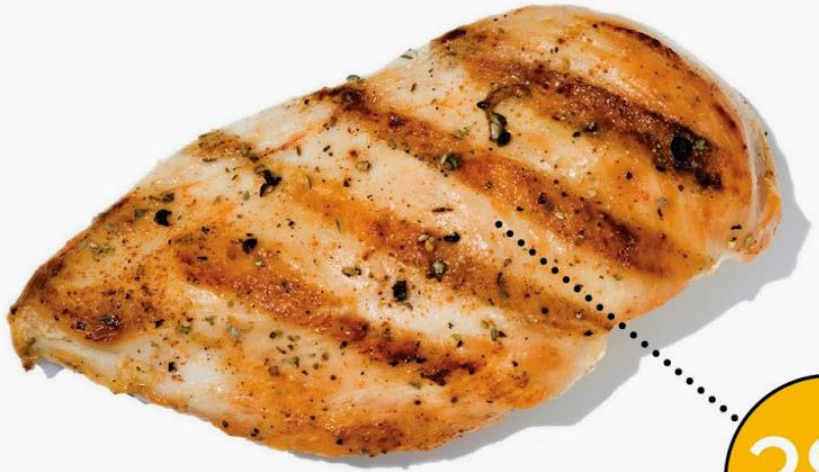
6g

protein per
large egg



22g

protein per 100g
grilled salmon



28g

protein per
100g lean chicken

8g

protein per 50g
cooked lentils

7g

protein per 25g cheese

The Pizza Effect!!

30-60% bigger bolus

- **Impact of Fat, Protein, and Glycemic Index on Postprandial Glucose Control in Type 1 Diabetes: Implications for Intensive Diabetes Management in the Continuous Glucose Monitoring Era**
- Kirstine J. Bel
- Diabetes Care 2015 Jun; 38(6): 1008-1015.

- **Fat and protein counting in type 1 diabetes**
- Elaine Hibbert-Jones
- Practical Diabetes. 33(7):243-248

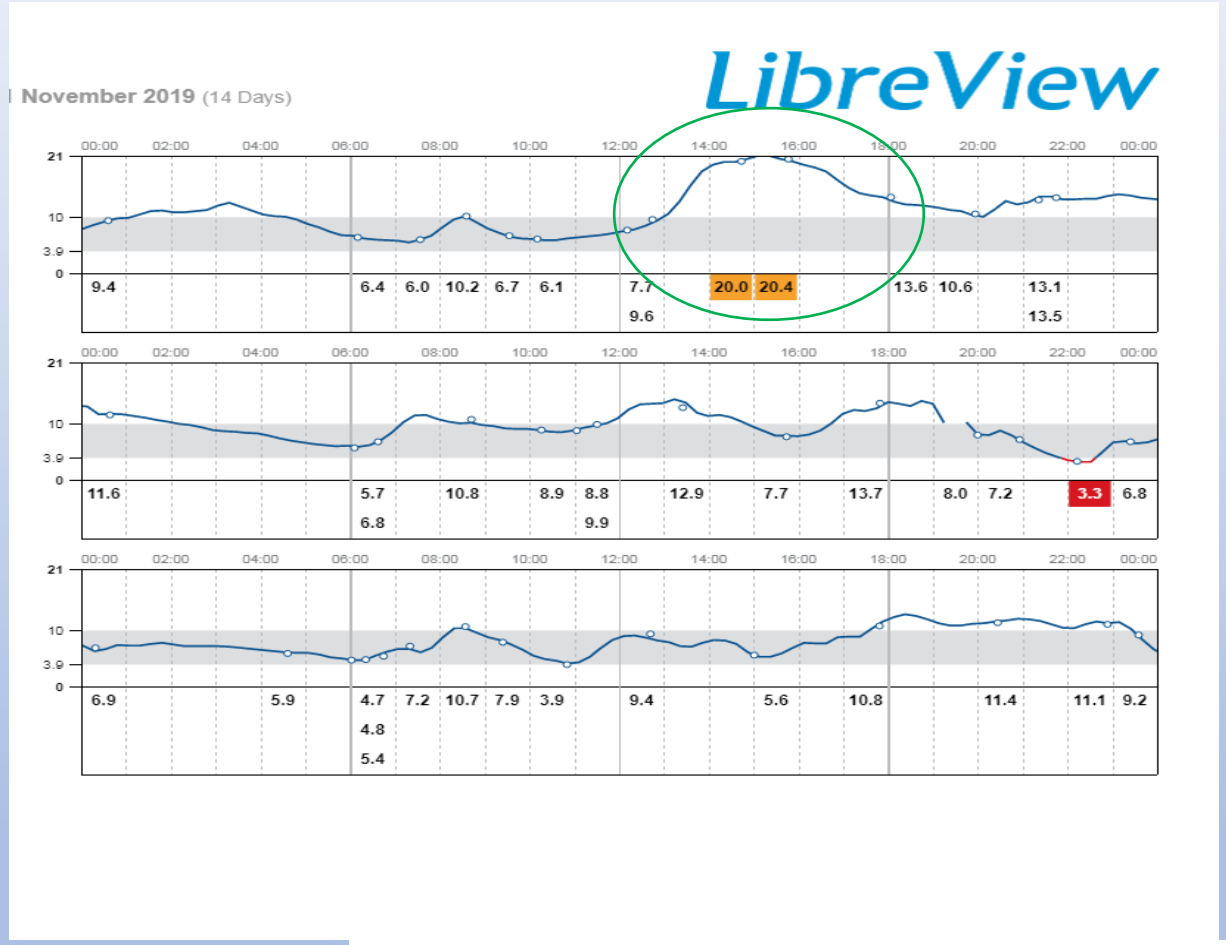
- **Amount and Type of Dietary Far, Postprandial Glycaemia and Insulin Requirements in Type 1 Diabetes: Randomised Within-Subject Trail**

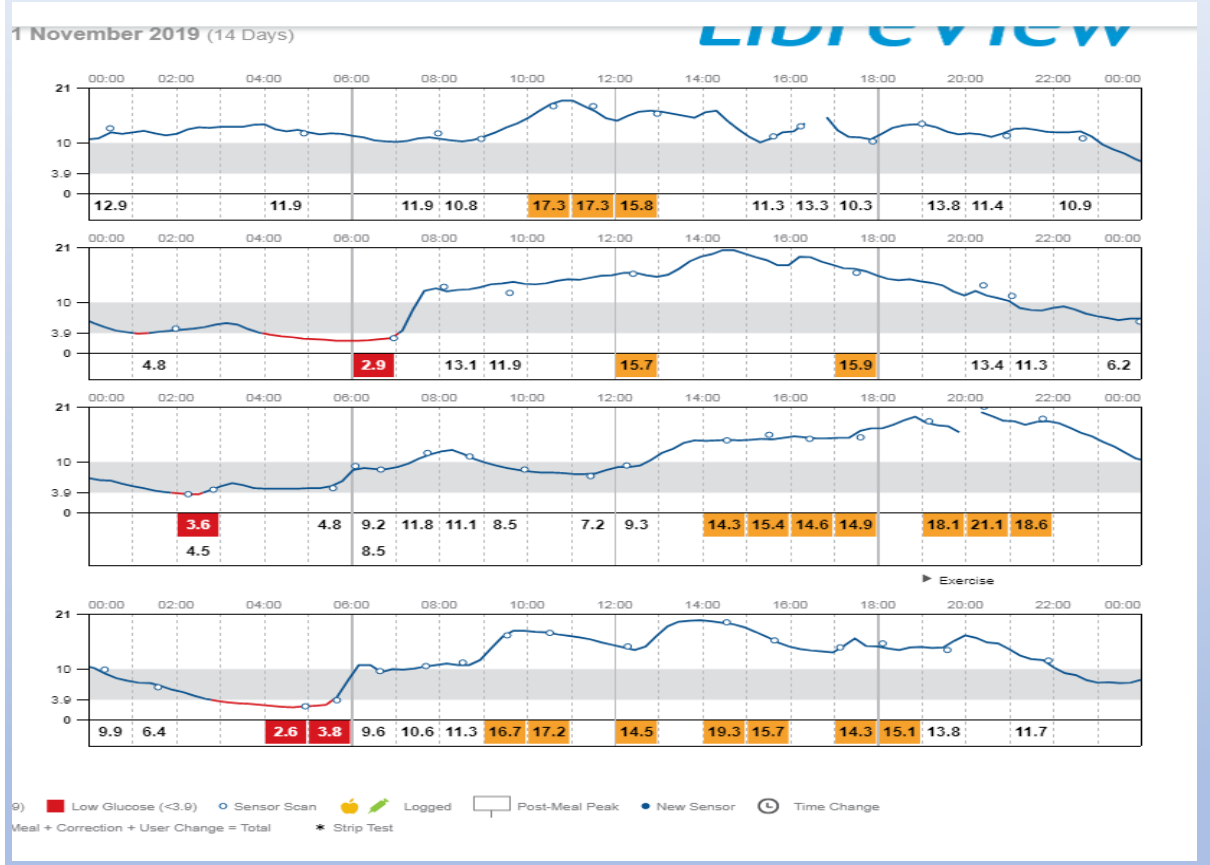
- Diabetes Care August 2019, Bell K, et al.

- 0g,20g,40g,60g Saturated/mono-/poly-unsaturated + 45g CHO(bread)

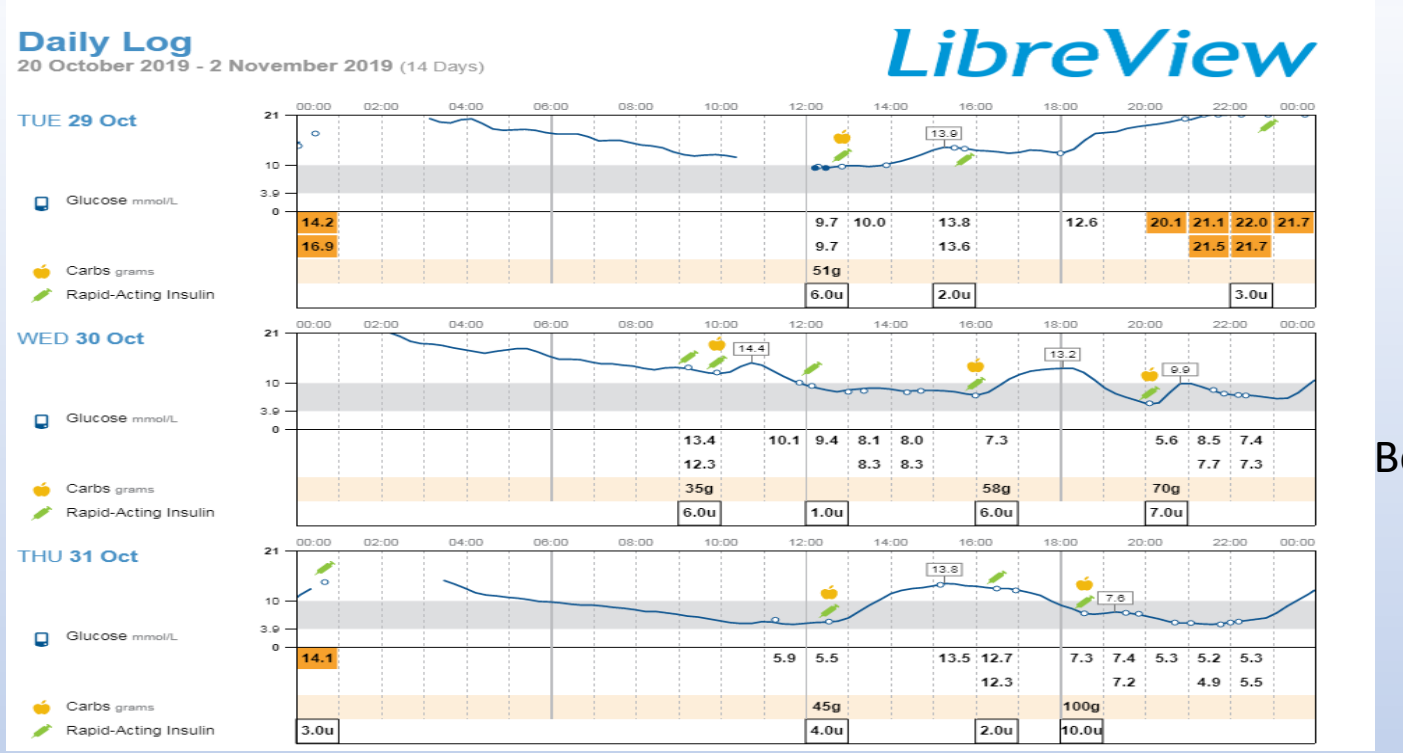
- Dualwave bolus
  - 20g +6% insulin 74/26 over 73mins
  - 40g +6% insulin 63/37% over 75mins
  - 60g +21% insulin, 49/51% over 105mins.

Some Examples

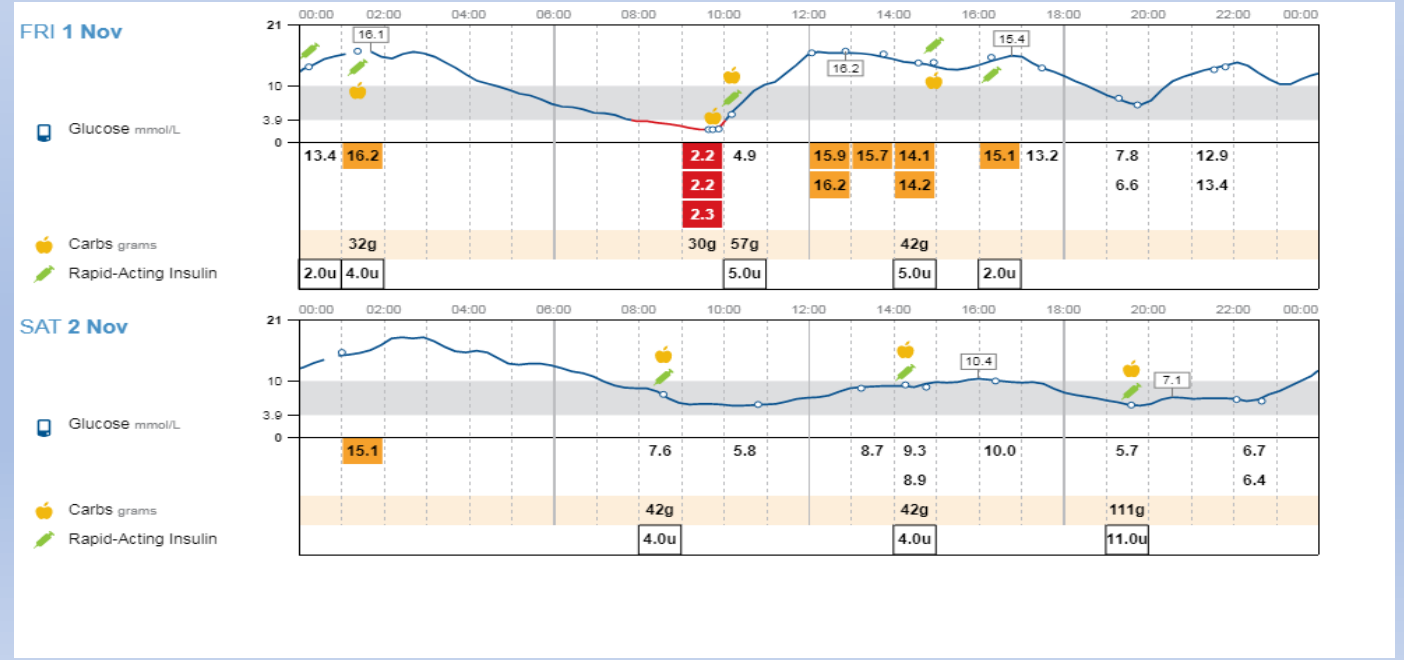




Trend towards lower levels on waking
Periods of hyperglycaemia seem to follow lows
Example of missed bolus



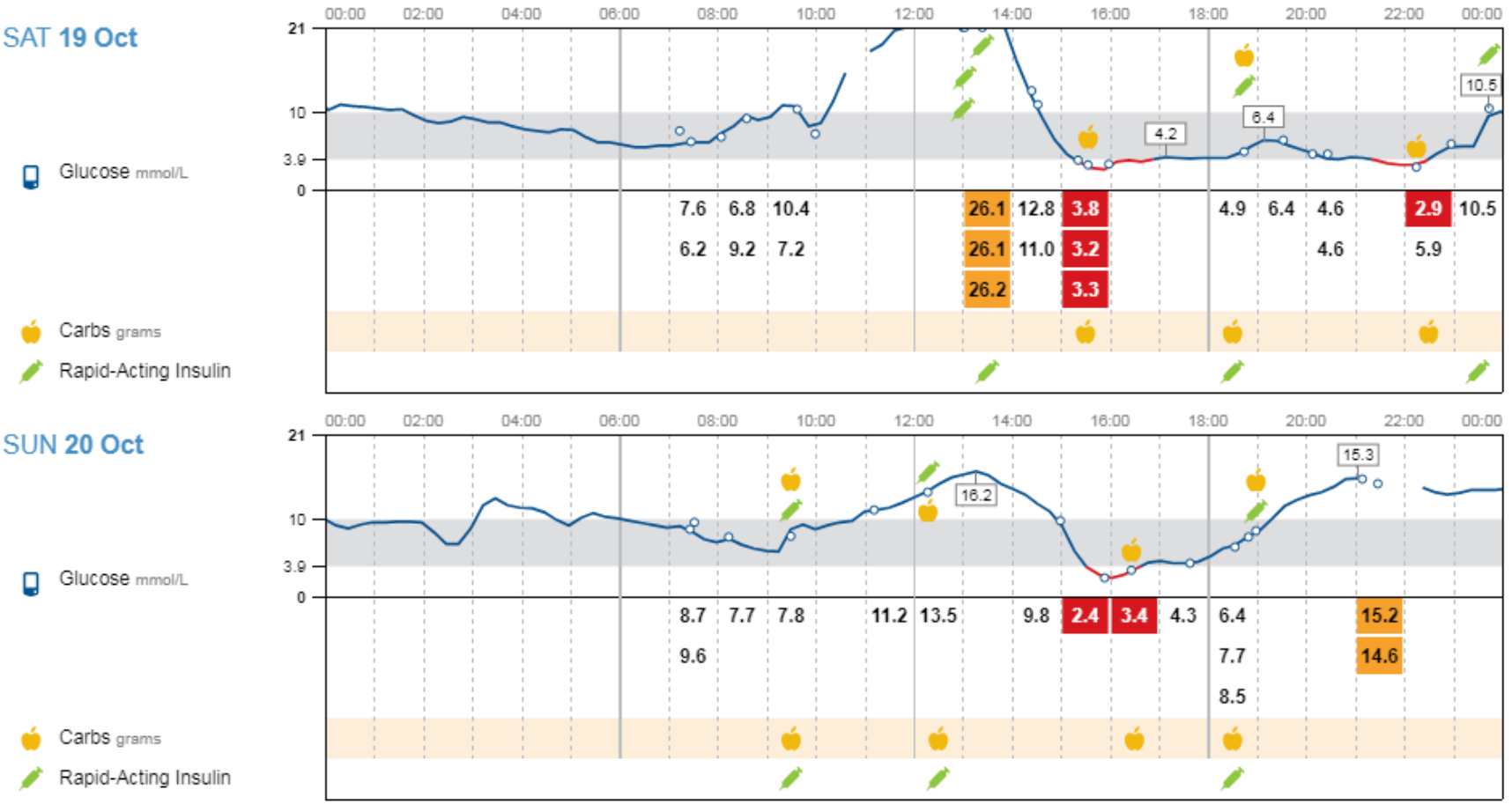
Beer in the evening!



Daily Log

19 October 2019 - 1 November 2019 (14 Days)

LibreView



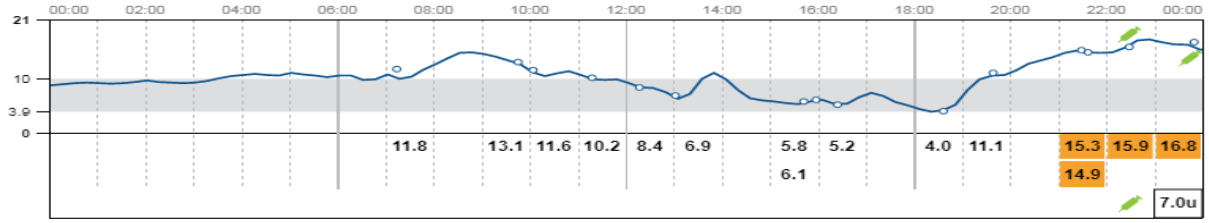
Address timing and meal doses. Avoid over-correcting post prandially.
Some challenges of seeing post meal levels

Daily Log

5 November 2019 - 18 November 2019 (14 Days)

LibreView

THU 14 Nov



Glucose mmol/L

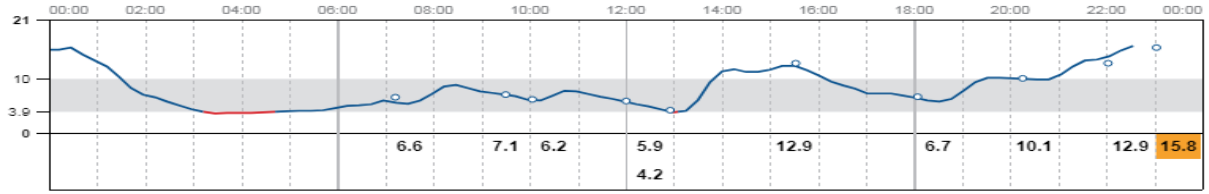
Rapid-Acting Insulin

Notes

Took 5 units

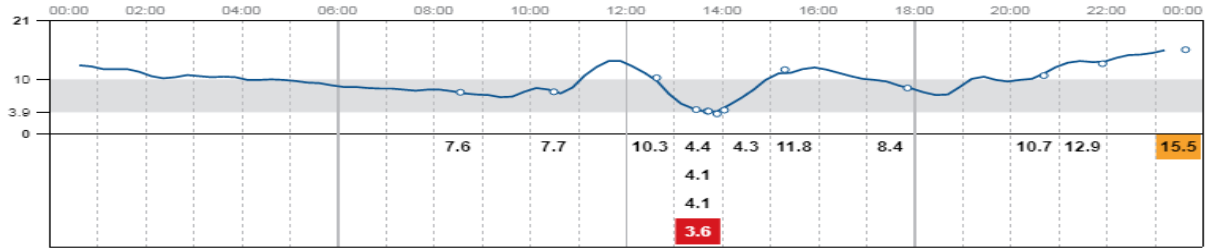
Bs went higher take more units

FRI 15 Nov

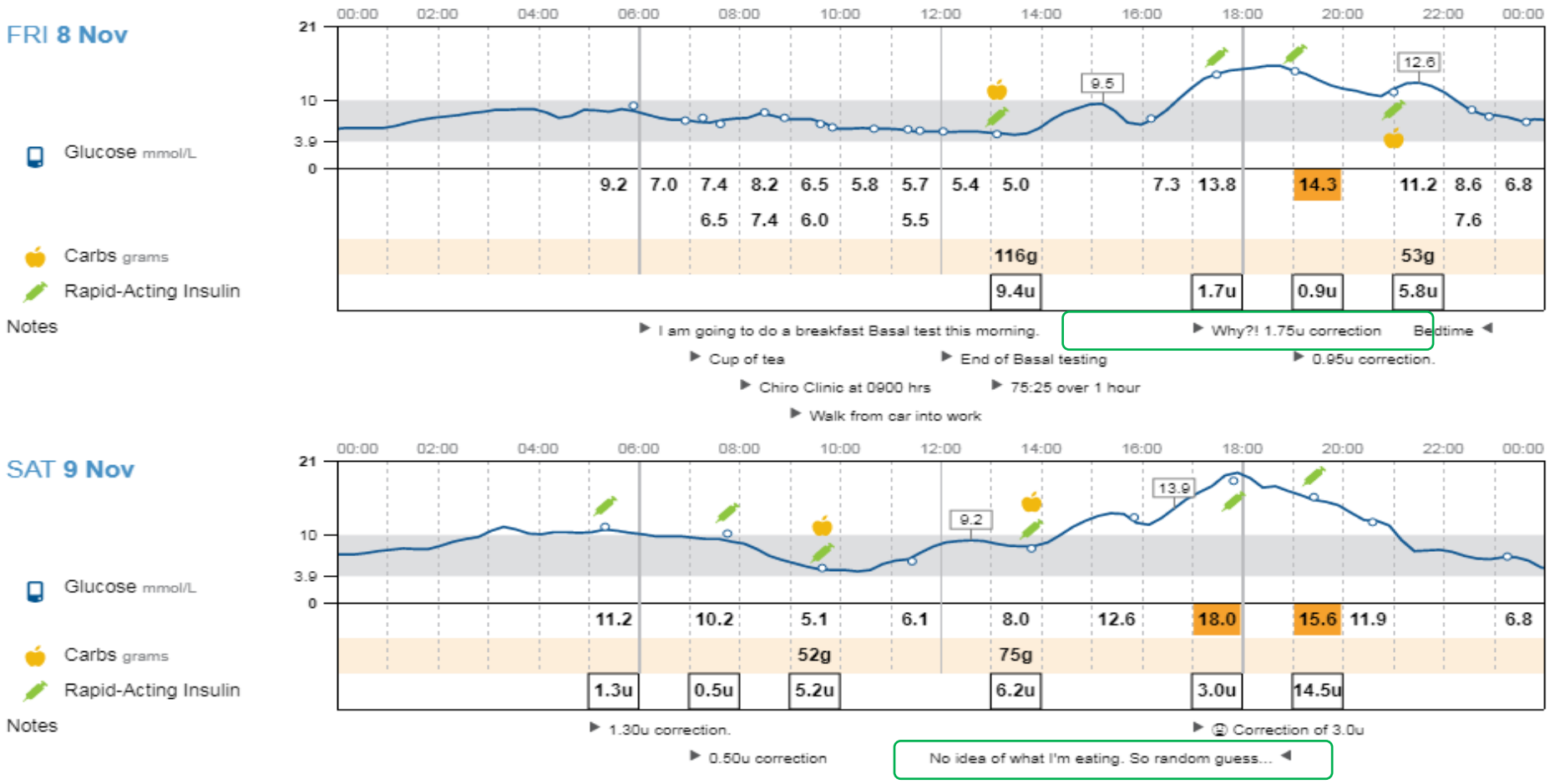


Glucose mmol/L

SAT 16 Nov

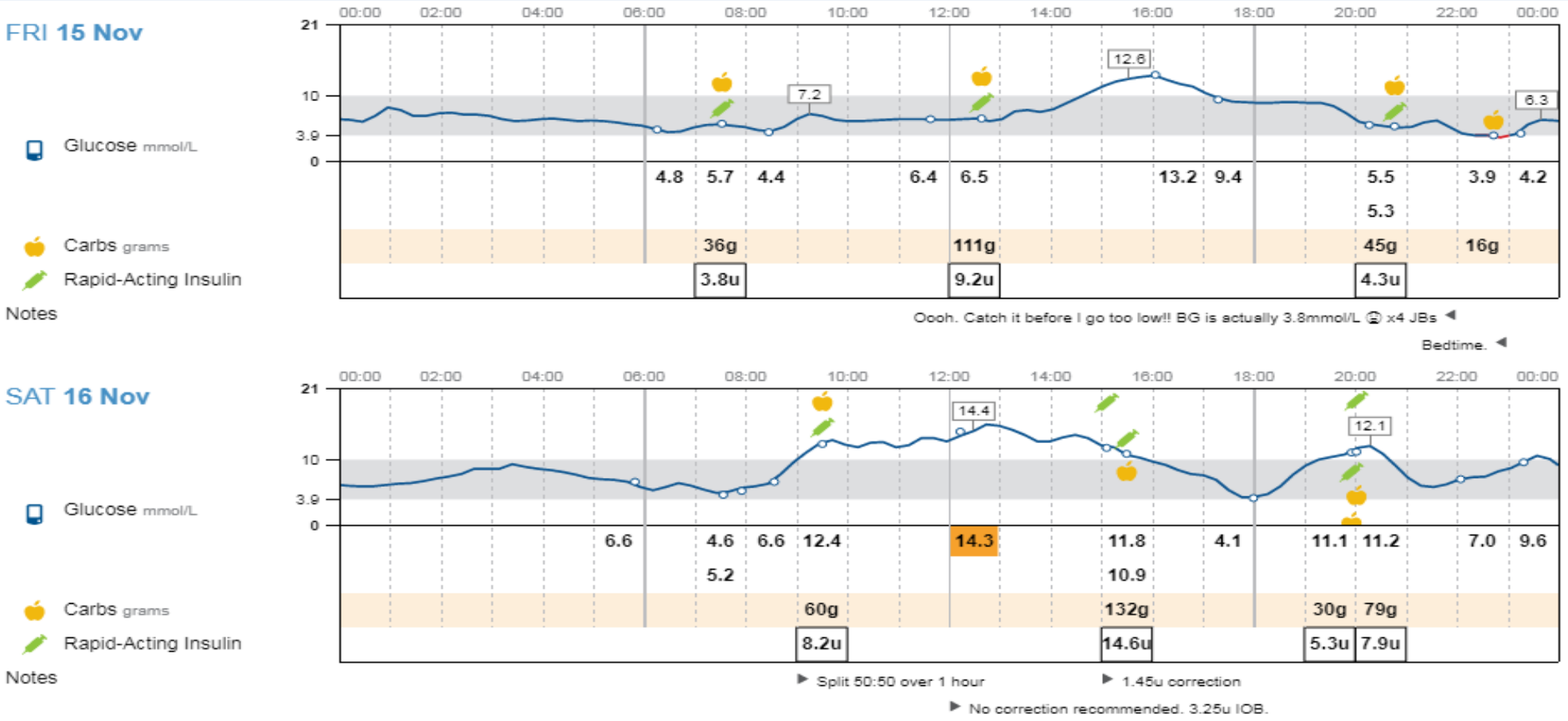


Glucose mmol/L



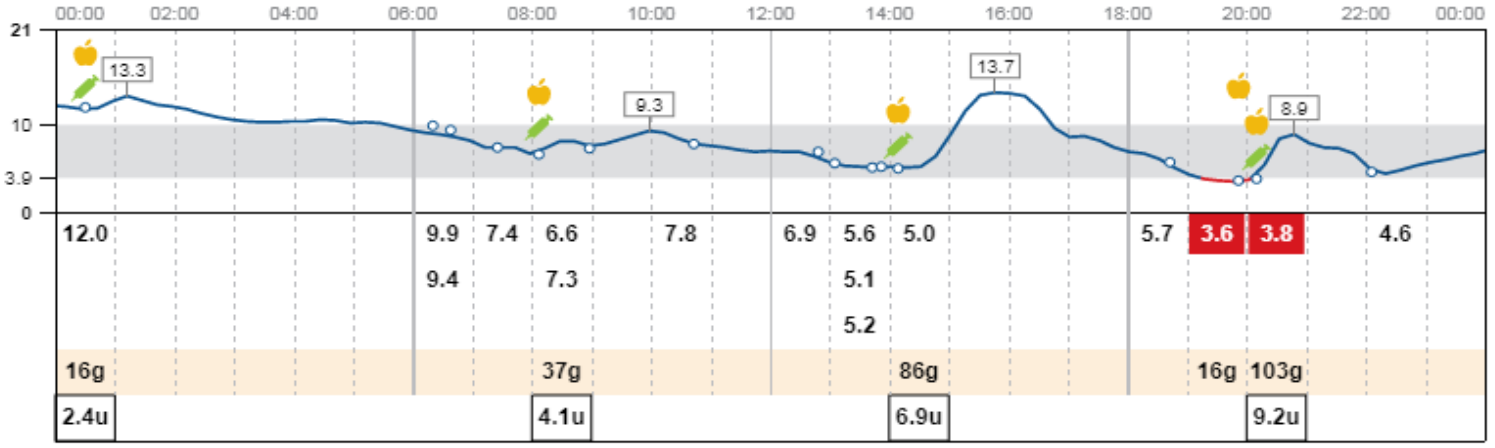
Stable basal/background insulin checks.

High CHO meals & error with CHO estimations leading to delayed hyperglycaemia



High CHO meals leading to delayed hyperglycaemia

WED **13 Nov**



Notes

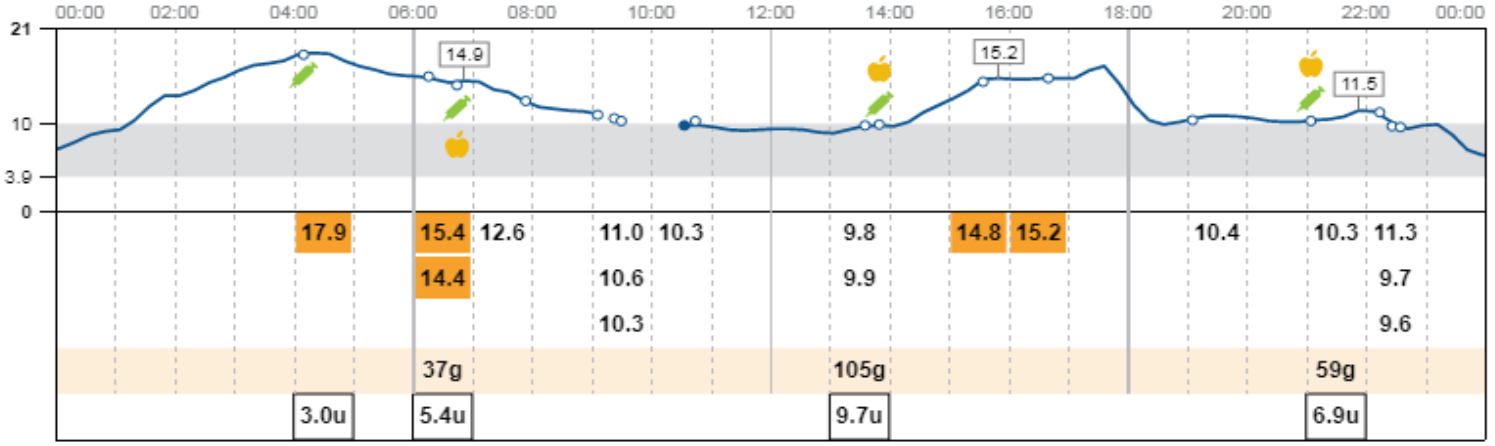
...ided for them. With correction I had 2.45u.

Wake up.

Bedtime

50:50 over 1 hour. Gave the full amount of insulin as I'd just treated the hypo with JBs

THU **14 Nov**



Notes

Correction of 3.ppu

End of Sensor.

IOB 5.80u No further insulin recommended

Already corrected

Start of new sensor.

Pod change. IOB 5.10u.

IOB 3.15u. BG 16.7mmol/L. No correction suggested.

New Pod.

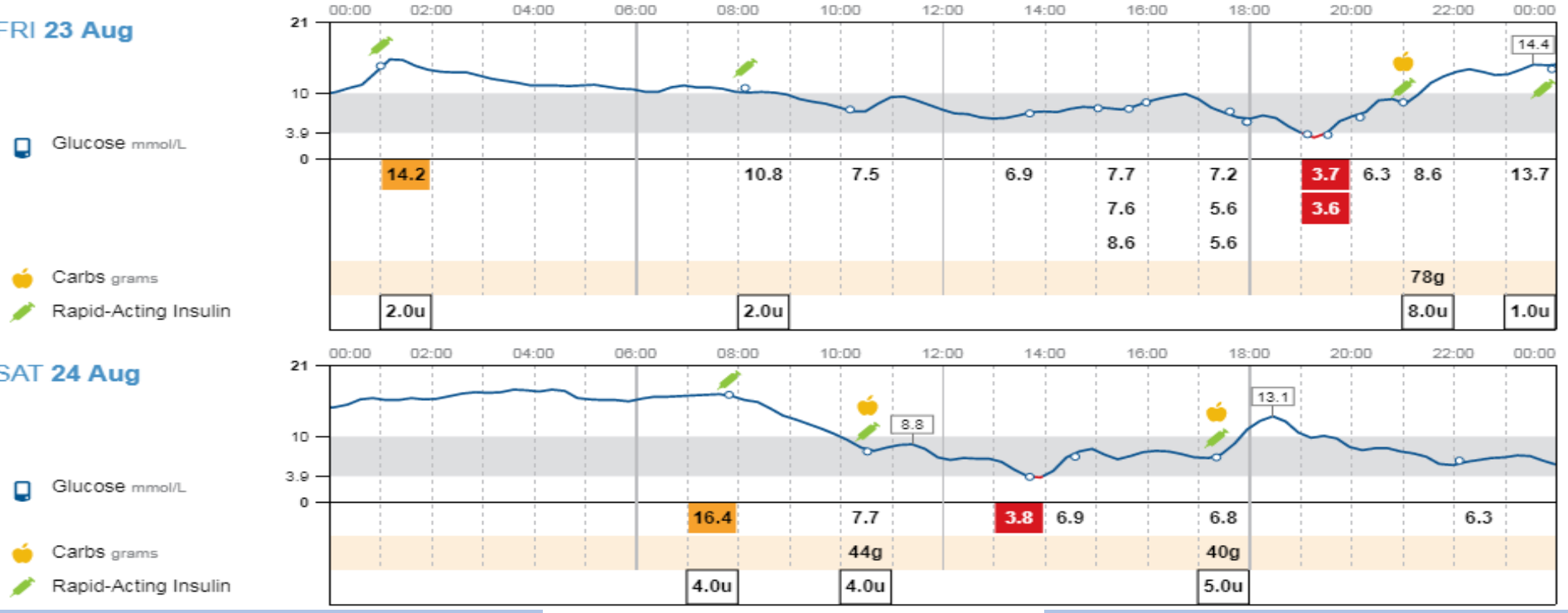
Don't want to correct etc as off dancing and I won't eat until 2045ish.

Bedtime.

Daily Log

23 August 2019 - 5 September 2019 (14 Days)

LibreView



High fat pizza

Carbohydrate counting and insulin pumps..