Manually calculating insulin for meals

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Patient information

Manually Calculating Insulin for Meals

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Carbohydrate Counting

For a refresher on carbohydrate (carb) counting and label reading, please see the below link to the DigiBete website's carb counting education videos and resources:
https://www.digibete.org/carbohydrate-counting/

Calculating insulin for meals

Now you are confident in carb counting, the next step is to match bolus (rapid-acting) insulin with your carb intake.

There are two methods that you can use:

A) Manual calculation (page 2–3)
B) Calculation using Tables (page 4-5)

Definitions:

- The **Insulin to Carb Ratio (ICR)** means the number of grams of carb covered by 1 unit of rapid acting insulin.
- My **Insulin Sensitivity Factor (ISF)** is how much 1 unit of rapid-acting insulin will lower my blood glucose. ISF is also known as 'correction factor'.

Rounding down the insulin dose

- The smallest unit from an insulin pen is 0.5 unit. When calculating insulin dose it is recommended to round down to the nearest 0.5 unit.
  Example: 9.4 round down to 9 units and 9.8 round down to 9.5 units.

A) Manual Calculation

i) Calculating insulin dose for your carbohydrate

Your ICR will be given to you by a member your Children and Young People's Diabetes team.

Formula for calculation: Insulin dose = total carbs in meal ÷ ICR (grams of carbs to 1 unit of insulin)

Example 1:
If 60g carbs is calculated in a meal, and your ICR is 1:10g (1 unit of insulin for every 10g carbs)

Insulin dose = 60g (carbs in the meal) ÷ 10 (ICR)
Insulin dose = 6 units

Example 2:
If 75g carbs is calculated in your breakfast and your ICR is 1:8g (1 unit for every 8g carbs)

Insulin dose = 75g ÷ 8
Insulin dose = 9.3 = 9 units

ii) Calculating correction insulin dose

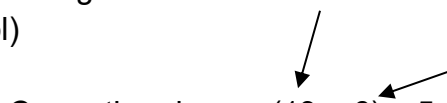
If your blood glucose levels (BGL) are high before a meal (or 2 hours after a meal), you will need to give yourself an additional bolus of (rapid-acting) insulin to bring your BGL back down to target range. To calculate this, you will need an insulin sensitivity factor (ISF).

Your ISF will be given to you by a member your Children and Young People's Diabetes team.

Correction dose = number of mmol I want to lower blood glucose ÷ my ISF

Formula for calculation: Correction dose = (blood glucose – target) ÷ ISF

Example:
Your blood glucose level is 13. Your target BGL is 6.0. Your ISF is 5 (1 unit insulin lowers BGL by 5mmol)



Correction dose = (13 – 6) ÷ 5
Correction dose = 1.4 = 1 unit

I would need 1 unit extra of bolus insulin to bring my blood glucose into target range.

iii) Putting it all together: Calculating Insulin for meals with correction

To put it all together you need to add **insulin for meals + correction dose**

Example:
Meal total carbohydrate 100g
ICR: 1:10g
ISF: 6
Blood glucose level 15mmol/L
Target BGL: 6.0mmol/L

Insulin dose = 100g (carbs in the meal) ÷ 10 (ICR)
= 10 units

Correction dose = (15 – 6.0) ÷ 6
= 1.5 units

Total insulin required = insulin meal dose + correction dose
= 11.5 units

B) Calculation Using Tables

i) Calculating insulin dose for your carbohydrate

This chart is useful to help calculate your insulin requirements without having to do the maths manually.

Line up your ICR with your carbohydrate (in grams) consumed for your insulin required for your bolus – see example below of ICR of 1:8 and 80g carbohydrate consumed.
(**Note** if carbs not in increments of 10 round number down; **OR** could add the grams lines together. For example: for 85g you could add both the 80g line + the 5g line and this would give you 10 units + 0.5 unit = 10.5 units).

	Insulin to Carb Ratio (ICR)											
	1:35	**1:30**	**1:25**	**1:20**	**1:18**	**1:15**	**1:12**	**1:10**	**1:8**	**1:7**	**1:5**	**1:3**
0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0.5	0.5	0.5	1	1.5
10	0	0	0.5	0.5	0.5	0.5	1	1	1	1.5	2	3.5
20	0.5	0.5	1	1	1	1	1.5	2	2.5	3	4	6.5
30	1	1	1	1.5	1.5	2	2.5	3	3.5	4	6	10
40	1	1	1.5	2	2	2.5	3	4	5	5.5	8	13
50	1.5	1.5	2	2.5	2.5	3	4	5	6	7	10	16.5
60	1.5	2	2.5	3	3	4	5	6	7.5	8.5	12	20
70	2	2	3	3.5	4	4.5	5.5	7	8.5	10	14	23
80	2	2.5	3	4	4.5	5	6.5	8	10	11.5	16	26.5
90	2.5	3	3.5	4.5	5	6	7.5	9	11	13	18	30
100	3	3	4	5	5.5	6.5	8	10	12.5	14	20	33

Grams carbs

ii) Calculating Correction Insulin Dose

Line up your ISF with your blood sugar level (in mmol/L) to see how much insulin you require to correct your high blood sugar (to blood sugar of 6). See example of ISF of 5 and blood glucose 15 mmol/L. (**Note** if blood glucose is not a round number round down).

	Insulin Sensitivity Factor (ISF) to target BGL of 6											
	12	11	10	9	8	7	6	5	4	3	2	1
<4	treat hypo											
4 to 7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0.5	0.5	1	2
9	0	0	0	0	0	0	0.5	0.5	0.5	1	1.5	3
10	0	0	0	0	0.5	0.5	0.5	0.5	1	1	2	4
11	0	0	0.5	0.5	0.5	0.5	0.5	1	1	1.5	2.5	5
12	0.5	0.5	0.5	0.5	0.5	0.5	1	1	1.5	2	3	6
13	0.5	0.5	0.5	0.5	0.5	1	1	1	1.5	2	3.5	7
14	0.5	0.5	0.5	0.5	1	1	1	1.5	2	2.5	4	8
15	0.5	0.5	0.5	1	1	1	1.5	1.5	2	3	4.5	9
16	0.5	0.5	1	1	1	1	1.5	2	2.5	3	5	10
17	0.5	1	1	1	1	1.5	1.5	2	2.5	3.5	5.5	11
18	1	1	1	1	1.5	1.5	2	2	3	4	6	12
19	1	1	1	1	1.5	1.5	2	2.5	3	4	6.5	13
20	1	1	1	1.5	1.5	2	2	2.5	3.5	4.5	7	14

Blood Glucose Level mmol/L

iii) Putting it all together: Adding Insulin for meals with correction

ICR of 1:8 and 80g carbohydrate consumed **AND** ISF of 5 and blood glucose 15.5 mmol/L = using table insulin bolus required 10 + 1.5 = 11.5 units for total bolus

Your Own Values and Tables

MY DIABETES VALUES

Fill in below….

Time block OR meal	Insulin to Carb Ratio (ICR)	Insulin Sensitivity Factor (ISF)

	Insulin to Carb Ratio (ICR)*											
	1:35	**1:30**	**1:25**	**1:20**	**1:18**	**1:15**	**1:12**	**1:10**	**1:8**	**1:7**	**1:5**	**1:3**
0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0.5	0.5	0.5	1	1.5
10	0	0	0.5	0.5	0.5	0.5	1	1	1	1.5	2	3.5
20	0.5	0.5	1	1	1	1	1.5	2	2.5	3	4	6.5
30	1	1	1	1.5	1.5	2	2.5	3	3.5	4	6	10
40	1	1	1.5	2	2	2.5	3	4	5	5.5	8	13
50	1.5	1.5	2	2.5	2.5	3	4	5	6	7	10	16.5
60	1.5	2	2.5	3	3	4	5	6	7.5	8.5	12	20
70	2	2	3	3.5	4	4.5	5.5	7	8.5	10	14	23
80	2	2.5	3	4	4.5	5	6.5	8	10	11.5	16	26.5
90	2.5	3	3.5	4.5	5	6	7.5	9	11	13	18	30
100	3	3	4	5	5.5	6.5	8	10	12.5	14	20	33

Grams carbs

***Your ICR not here. See page 6 for additional ICR**

	Insulin Sensitivity Factor (ISF) to target BGL of 6											
	12	11	10	9	8	7	6	5	4	3	2	1
<4	treat hypo											
4 to 7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0.5	0.5	1	2
9	0	0	0	0	0	0	0.5	0.5	0.5	1	1.5	3
10	0	0	0	0	0.5	0.5	0.5	0.5	1	1	2	4
11	0	0	0.5	0.5	0.5	0.5	0.5	1	1	1.5	2.5	5
12	0.5	0.5	0.5	0.5	0.5	0.5	1	1	1.5	2	3	6
13	0.5	0.5	0.5	0.5	0.5	1	1	1	1.5	2	3.5	7
14	0.5	0.5	0.5	0.5	1	1	1	1.5	2	2.5	4	8
15	0.5	0.5	0.5	1	1	1	1.5	1.5	2	3	4.5	9
16	0.5	0.5	1	1	1	1	1.5	2	2.5	3	5	10
17	0.5	1	1	1	1	1.5	1.5	2	2.5	3.5	5.5	11
18	1	1	1	1	1.5	1.5	2	2	3	4	6	12
19	1	1	1	1	1.5	1.5	2	2.5	3	4	6.5	13
20	1	1	1	1.5	1.5	2	2	2.5	3.5	4.5	7	14

Blood Glucose Level mmol/L

Additional Insulin to Carb Ratios

Grams carbs	Insulin to Carb Ratio (ICR)											
	1:13	**1:12**	**1:11**	**1:10**	**1:9**	**1:8**	**1:7**	**1:6**	**1:5**	**1:4**	**1:3**	**1:2**
0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0.5	0.5	0.5	0.5	0.5	1	1	1.5	2.5
10	0.5	1	1	1	1	1	1.5	1.5	2	2.5	3.5	5
20	1.5	1.5	1.5	2	2	2.5	3	3	4	5	6.5	10
30	2	2.5	2.5	3	3	3.5	4	5	6	7.5	10	15
40	3	3	3.5	4	4.5	5	5.5	6.5	8	10	13	20
50	3.5	4	4.5	5	5.5	6	7	8	10	12.5	16.5	25
60	4.5	5	5.5	6	6.5	7.5	8.5	10	12	15	20	30
70	5	5.5	6	7	7.5	8.5	10	11.5	14	17.5	23	35
80	6	6.5	7	8	9	10	11.5	13	16	20	26.5	40
90	7	7.5	8	9	10	11	13	15	18	22.5	30	45
100	7.5	8	9	10	11	12.5	14	16.5	20	25	33	50

Grams carbs	Insulin to Carb Ratio (ICR)											
	1:50	**1:35**	**1:30**	**1:27**	**1:25**	**1:22**	**1:20**	**1:19**	**1:18**	**1:16**	**1:15**	**1:14**
0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
20	0.5	0.5	0.5	0.5	1	1	1	1	1	1	1	1.5
30	0.5	1	1	1	1	1.5	1.5	1.5	1.5	2	2	2
40	0.5	1	1	1.5	1.5	2	2	2	2	2.5	2.5	2.5
50	1	1.5	1.5	2	2	2	2.5	2.5	2.5	3	3	3.5
60	1	1.5	2	2	2.5	2.5	3	3	3	3.5	4	4
70	1	2	2	2.5	3	3	3.5	3.5	4	4	4.5	5
80	1.5	2	2.5	3	3	3.5	4	4	4.5	5	5	5.5
90	1.5	2.5	3	3	3.5	4	4.5	4.5	5	5.5	6	6.5
100	2	3	3	3.5	4	4.5	5	5	5.5	6	6.5	7

Exercise Tables

Aerobic exercise (physical activity that raises your heart rate) will usually lower your blood glucose during and after exercise. Examples include walking, running, swimming and cycling. This means you may need to reduce your bolus (rapid-acting) insulin and/ or have extra fast acting carbohydrate.

If you choose to reduce your insulin, it is recommended that you do this for any meal before your exercise if the exercise is within two hours of eating.

After exercise, it is recommended that you eat a complex carbohydrate snack or meal within an hour of the end of the exercise and start by giving the full amount of calculated insulin for the carbohydrates and correction. If you are noticing a trend of low blood glucose levels following exercise, you may need to try reducing your bolus insulin by 10-20%, or more for this meal following exercise.

You can use the table below to calculate your new bolus insulin dose if you are about to and/ or have recently exercised.

	Units of bolus insulin after adjusting for exercise		
Units of bolus insulin for meal	**-10% of dose**	**-20% of dose**	**-30% of dose**
1	0.5	0.5	0.5
1.5	1	1	1
2	1.5	1.5	1
2.5	2	2	1.5
3	2.5	2	2
3.5	3	2.5	2
4	3.5	3	2.5
4.5	4	3.5	3
5	4.5	4	3.5
5.5	5	4	3.5
6	5.5	4.5	4
6.5	5.5	5	4.5
7	6.0	5.5	4.5
7.5	6.5	6	5
8	7.0	6	5.5
8.5	7.5	6.5	5.5
9	8	7	6
9.5	8.5	7.5	6.5
10	9	8	7
10.5	9.5	8	7
11	9.5	8.5	7.5
11.5	10	9	8
12	10.5	9.5	8
12.5	11	10	8.5
13	11.5	10	9
13.5	12	10.5	9
14	12.5	11	9.5
14.5	13	11.5	10
15	13.5	12	10.5

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