West Hertfordshire Hospitals NHS Trust

A guide to...

Manually calculating insulin for meals

Patient Information

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Carbohydrate Counting

For a refresher on carbohydrate (carbs) counting and label reading please watch our STAR carbohydrate counting education video on: *https://youtu.be/O8UTL-ub2iI*

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 0.5units. When calculating insulin dose it is recommended to round down to the near 0.5 units.
  Example: 9.4 round down to 9 units & 9.8 round down to 9.5 units.

A) Manual Calculation

Calculating insulin dose for your carbohydrate

Your ICR will be given to you by a member your Children and Young Persons 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 = 60 g (carb 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

A) Manual Calculation

Calculating Correction Insulin Dose

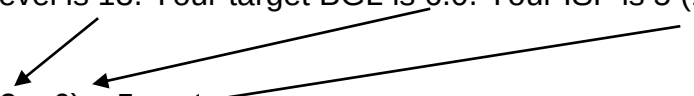
If your blood glucose levels (BGL) are high before a meal (or 2 hours after a meal), you will need to give yourself an additional bolus of (rapid-acting) insulin to bring your BGL back down to target range. To calculate this, you will need an insulin sensitivity factor (ISF)

Your ISF will be given to you by a member your Children and Young Persons 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.

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

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. Example: for 85g could add use both 80g line + 5 g line would is 10units +0.5units =10.5units)

	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

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

Putting it all together:
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 = 11.5units for total bolus

B) Calculation using 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**
Grams carbs	**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

*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
Blood Glucose Level mmol/L	**<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

Additional Insulin to Carb Ratios

	Insulin to Carb Ratio (ICR)											
Grams carbs	**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

	Insulin to Carb Ratio (ICR)											
Grams carbs	**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