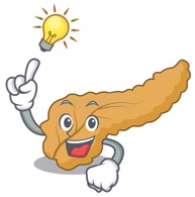
Ratio & Correction



An insulin-to-carb ratio allows you to adjust the rapid-acting insulin dose according to your child's carbohydrate intake, like the pancreas would.

Here is a list of your new vocabulary defined to help you through this document and to refer back to at any time:

- **Food bolus:** the amount of insulin given for the carbohydrates eaten at a meal or snack
- **Insulin-to-carb ratio**: the method used to calculate the food bolus. It represents the grams of carbohydrates that one unit of rapid-acting insulin "covers," This can also be referred to simply as your "ratio" or "carb ratio"
- **Correction Bolus:** the amount of rapid-acting insulin given to bring your blood sugar to target range
- **Target Blood Sugar**: Blood sugar value desired 4h after a rapid-acting insulin injection. This target value is usually set at 6.0 mmol/L

- **Insulin Sensitivity**: An estimation of how much 1 unit of rapid-acting insulin will lower the blood sugar within the next 4 hours. For example, if 1 unit of insulin lowers the blood sugar by 2 mmol/L the insulin sensitivity would be 2.

Advantages of ratios over sliding scale

- Greater meal flexibility, as the insulin dose is tailored to the child's appetite.
- No need to give a fixed amount of carbohydrate at mealtime.
- Improved blood sugar management.
- Method used by the insulin pump.

This document is based on "Basal-Bolus Insulin with Multiple Daily Injections" done by Heather Nichol RN, MScN, CDE from BC Children's Hospital.

STEP 1: Food Bolus

Insulin dose calculated at meals or snacks based on the number of carbohydrates that will be eaten. This dose of insulin will be calculated using the ratio provided by your diabetes team.

For example, a ratio of 1:12 means that 1 unit of rapid-acting insulin is needed for every 12g of carbohydrates your child is about to eat at a meal or a snack.

Formula to calculate the food bolus:

Grams of carbohydrates ÷ Ratio denominator*

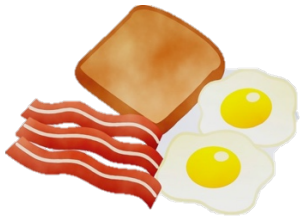
*The ratio denominator is the number after the colon (:)

Let's Practice:
Carbohydrates = 65g
Carb Ratio = 1:15

Food Bolus = *65g* ÷ 15
= 4.33 units
(do not round down yet)

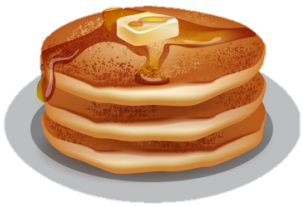
→ *1:15 means one unit of insulin is needed for each 15g of carbohydrates*

This offers flexibility at mealtimes as you can adjust an insulin dose to the number of carbs in a meal. For example, these three breakfasts will require different insulin dosages because they offer different amount of carbohydrates.



Breakfast 1
1 toast, 2 eggs,
2 slices of bacon
Carbs: 15g

Breakfast 2
1 cup cooked oats,
½ cup blueberries
Carbs: 40g



Breakfast 3
3 pancakes + 1 tbsp
maple syrup
Carbs: 75g

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STEP 2: Correction Bolus

Insulin dose calculated at meals when current blood sugar is above or below blood sugar target of 6 mmol/L. This correction bolus will vary depending on how far away from target your current blood sugar is and your insulin sensitivity. This dose of insulin will be added to the food bolus at a meal. No correction is needed with a snack.

For example, your correction bolus will give more insulin if your blood sugar is 14mmol/L compared to 10mmol/L. Also, you will need more insulin if your insulin sensitivity is 2 compared to 8.

Formula to calculate the correction bolus:

(Current Blood Sugar – Target Blood Sugar) ÷ Insulin Sensitivity

Let's Practice:
Current Blood Sugar = 12.8 mmol/L
Target Blood Sugar = 6.0 mmol/L
Insulin Sensitivity = 5

Correction Bolus = (12.8 – 6) ÷ 5
= 6.8 ÷ 5
=1.36 units
(do not round down yet)

STEP 3: Total Bolus

The Total Bolus is the total dose of rapid insulin given before a meal. It is the addition of the Food Bolus and the Correction Bolus. The insulin dose may be round down at this final step. Make sure to have a 0.5 unit pen.

Formula to calculate the total bolus:

Food Bolus (step 1) + Correction Bolus (step 2)

Let's Practice:
Food Bolus: 4.33 units
Correction Bolus: 1.36 units

Total Bolus = 4.33 units + 1.36 units
= 5.69 units
(now you can round down)
→ 5.5 units

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If I'm not ready for ratios and correction, can I stay on the sliding scale?

Absolutely! There is no need to rush ratios if you are not ready. Discuss with your nutritionist if you are hesitant to start this new method, as she can help you find the right management for you.

You can use a "hybrid" model, where ratios AND sliding scales are used. For example, you can remain on a lunch sliding scale at school, but use the ratio and the correction formula with the meals that are supervised by the parents. If you chose to keep the sliding scale, offer a stable amount of carbohydrates for that meal to reduce blood sugar variability.

Practice section:

Example 1:
Carbs = 45g
Ratio = 1:15
Current Blood Sugar = 14.2 mmol/L
Blood Sugar Target = 6.0 mmol/L
Insulin Sensitivity = 4

How much insulin would you give?

1) Food Bolus:

2) Correction Bolus:

3) Total Bolus :

Example 2:
Carbs = 80g
Ratio = 1:30
Current Blood Sugar = 3.6 mmol/L
Blood Sugar Target = 6.0 mmol/L
Insulin Sensitivity = 5

How much insulin would you give?

1) Food Bolus:

2) Correction Bolus:

3) Total Bolus :

Example 3:
Carbs = 100g
Ratio = 1:7
Current Blood Sugar = 19.6 mmol/L
Blood Sugar Target = 6.0 mmol/L
Insulin Sensitivity = 2

How much insulin would you give?

1) Food Bolus:

2) Correction Bolus:

3) Total Bolus :

To get **your child's ratios and insulin sensitivity**, provide your dietitian with the above answers, a food record and the current insulin dosages (meal sliding scales, snack fixed dosages and basal insulin).

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