Basal-Bolus Insulin
Long-acting and rapid-acting insulin therapy

What do the words basal-bolus insulin mean?
Many people with Type 1 diabetes use a combination of long-acting (basal) and rapid-acting (bolus) insulin. This is called “basal-bolus” insulin. You will work with your diabetes educator to learn how to figure out how much basal-bolus insulin you will need every day.

Your goal is to use basal-bolus insulin to keep your blood sugar in target range. You will take enough insulin to cover what you eat and to give your body what it needs. This handout is mostly about calculating bolus insulin.

Basal insulin (long acting)
Refers to the insulin you inject as background insulin to control blood glucose levels overnight and between meals.

Insulin names: Glargine (Lantus) or Detemire (Levemir)
- Works to keep blood sugars in the target range between meals and through the night. It works with the sugar that is released by the liver.
- Dose usually remains the same from day to day. Your doctor or diabetes educator will recommend an adjustment when blood sugars are not in target range.
- Lasts 12-24 hours.
- Taken at the same time every day.

Bolus insulin (rapid acting)
An insulin injection given as a burst to quickly counter carbs eaten or lower high blood sugars.

Insulin names: Humalog, Novolog
- Works to provide insulin in the right amount for the food you are eating (this is called a “Carb Bolus”) and/or to lower high blood sugars (this is called a “Correction Bolus”).
- Dose will be different each time you take it depending on blood sugar and the food/amount of carbohydrates you are eating.
- Lasts about 3 hours.
- Usually taken right before meals and snacks (when you eat carbohydrates).

To Learn More
• Endocrine
  206-987-2640
• Ask your child’s healthcare provider
• seattlechildrens.org

Free Interpreter Services
• In the hospital, ask your nurse.
• From outside the hospital, call the toll-free Family Interpreting Line, 1-866-583-1527. Tell the interpreter the name or extension you need.
Figuring out your bolus (Humalog/Novolog) insulin doses

How do you know how much rapid acting bolus insulin you need for mealtimes and snacks?

Ask yourself these 3 questions:

• How many grams of carbohydrates are you going to eat?
• What is your blood sugar (BS) now?
• How active are you going to be during the next few hours?

1. How many carbs are you going to eat?

First, add up the grams of carbohydrates in the meal or snack.

Insulin/Carbohydrate Ratio

• You need to know your Insulin/Carbohydrate Ratio. It tells you how many units of insulin you need to take for the grams of carbs you are going to eat.
• Everyone has a different insulin/carbohydrate ratio – it’s based on your size/weight and your body’s sensitivity to insulin.
• Ratio example #1: 1 unit of Humalog/Novolog per 10 carbs – 1:10
• Ratio example #2: ½ unit of Humalog/Novolog per 30 carbs – ½:30
• Once you know your carb ratio number (your insulin/carbohydrate ratio), you will use it to figure out your Carb Bolus.
• You should inject Humalog/Novolog 15 minutes before you eat. Young children can get this after their meal if it is uncertain how much of the meal or snack they will eat.

Your insulin/carb ratio is: _______

Grams of Carbohydrates ÷ Insulin/Carbohydrate Ratio = Carb Bolus

2. What is your blood sugar number?

The Correction Bolus is taken when you need to correct (lower) a high blood sugar number. You will need a Correction Bolus when your blood sugar goes above the number determined by your doctor.

Correction Factor (CF)

Your Correction Factor tells you how sensitive you are to insulin – it is an estimate of how much Humalog/Novolog you need to lower your blood sugar down to your target number. You will have a different target number for daytime and bedtime/middle of the night. Everyone has a Correction factor, unique to them, determined by their doctor. A Correction Factor of 50 means that 1 unit of Humalog/Novolog lowers your blood sugar by 50 points.

Your personal correction factor is: _______

To calculate your Correction Bolus, you need to know your Correction Factor.
Now, let’s figure out your **Correction Bolus**:

\[
\text{(Current blood sugar - target blood sugar)} \div \text{Correction Factor} = \text{Correction Bolus}
\]

Current blood sugar        target blood sugar

\[
\text{Correction Factor}
\]

**DO NOT** give a Correction Bolus if it has been less than 3 hours since the last Humalog/Novolog injection was given.

**Carb Bolus + Correction Bolus = Total Bolus Dose (Humalog/Novolog)**

**Example:**

<table>
<thead>
<tr>
<th>Time</th>
<th>BS</th>
<th>Carb</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 a.m. breakfast</td>
<td>315</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>10 a.m. snack</td>
<td>170</td>
<td>Yes</td>
<td>No (only 2 hours since last bolus dose with correction bolus)</td>
</tr>
<tr>
<td>12 p.m. lunch</td>
<td>150</td>
<td>Yes</td>
<td>No (only 2 hours since bolus dose; no correction dose as blood sugar now on target)</td>
</tr>
<tr>
<td>3 p.m. snack</td>
<td>298</td>
<td>Yes</td>
<td><strong>Yes</strong> (3 hours since last injection and blood sugar high)</td>
</tr>
<tr>
<td>5 p.m. dinner</td>
<td>236</td>
<td>Yes</td>
<td>No (only 2 hours since last bolus dose)</td>
</tr>
<tr>
<td>8 p.m.</td>
<td>315</td>
<td>No</td>
<td><strong>Yes</strong> using bedtime target.</td>
</tr>
</tbody>
</table>

**3. How much activity will you be doing in the next few hours?**

- For every 30-60 minutes of increased activity, eat an extra 15-gram carb snack. **DO NOT TAKE INSULIN TO COVER THESE CARBS.**
  
  Or

- If you know you are going to be active within one hour after a meal or snack, you may want to subtract 15 grams from the total number of carbohydrates you are counting for your meal or snack. This will give you less Humalog/Novolog for that dose.
Bolus dose example

Your child’s blood sugar at breakfast is 275. He is going to eat 50 carbs and then he is going to a 60-minute swim practice. His carb ratio is 1:10. His target is 150 and his Correction Factor is 50. What is the dose of Humalog/Novolog?

- Current blood sugar: 275
- Carb Ratio: 1:10
- Grams of carbs eating: 50
- Target: 150
- Correction Factor: 50

Remember the 3 questions:
- How many grams of carbohydrates are you going to eat? 50
- What is your blood sugar now? 275
- How active are you going to be during the next few hours? 60 min. swim.

Solution:

Step 1. Figure your Carb Bolus.
Grams of Carbohydrates LESS 15 grams for planned activity divided by Insulin/Carbohydrate Ratio = Carb Bolus

- 50 Carbs eaten
- -15 Minus 15 for activity
  Adjusted carbs eaten 35

Carb ratio: \[
\frac{3.5}{35} \quad \frac{35}{10} \quad \text{Adjusted carbs}
\]

Step 2. Figure your Correction Bolus.
(Current blood sugar - target blood sugar) ÷ Correction Factor = Correction Bolus

- 275 Current blood sugar
- -150 Minus target blood sugar
  Amount over target 125

Correction factor: \[
\frac{2.5}{50} \quad \frac{125}{25} \quad \text{Amount over target}
\]

Step 3. Figure your total Bolus Dose
Carb Bolus + Correction Bolus = Bolus Dose Humalog/Novolog

\[3.5 + 2.5 = 6 \text{ units}\]

Carb Bolus 3.5
Correction Bolus 2.5
Total dose 6 units
Humalog/Novolog
Basal-Bolus Insulin

Adjusting insulin dosages:

- Take insulin dose adjustment class to learn how to change insulin doses on your own.
- Call into Blood Sugar Line daily, then as instructed.
  Blood Sugar Line 206-987-2640
  or email to endonurse@seattlechildrens.org
  You may also call into the Blood Sugar Line any time you need help with insulin dosages.

Today's Dose (Basal)

<table>
<thead>
<tr>
<th>Lantus (basal)</th>
<th>Bedtime (8-10 p.m.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levemir</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Morning (8-10 a.m.)</td>
</tr>
</tbody>
</table>

Today's Dose (Bolus)

<table>
<thead>
<tr>
<th>Humalog/Novolog</th>
<th>_______ unit per _______ grams carbs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Correction Factor is _______</td>
</tr>
<tr>
<td></td>
<td>Daytime target is _______</td>
</tr>
<tr>
<td></td>
<td>Bedtime/middle of the night target is _______</td>
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