From the Insulin Dose Guide for Insulin Pumps, CGMs, and AIDs

Check Your Basal Rates

Basal insulin from a pump delivers roughly half of the day's short-acting insulin as a steady release around the clock. This insulin offsets the production and release of glucose from the liver and from muscle glycogen stores when you eat no food. Basal insulin helps this glucose enter cells to provide fuel, rather than backing up and causing the glucose to rise in the blood. On MDI, an injection of long-acting insulin each day serves the same function.

Basal rates are important because:

- This background insulin provides the foundation for bolus insulin doses. Your carb factor and correction factor work more consistently and accurately after your glucose stays steady and level form a steady infusion of basal insulin.
- Low basal rates have to be compensated for with larger meal boluses or larger correction doses for highs that follow. High basal rates have to be compensated for with smaller meal boluses or extra carbs for lows. While either of these may be selected for specific reasons, they often result in erratic glucose readings.
- Accurate basal rates allow you to skip or delay meals without going low or high. The right basal rates keep you sailing smoothly on a steady breeze throughout the day.

Select and Verify Your Basal Rate(s)

Correct basal rates depend on an accurate TDD, so the TDD is always determined first. If your A1c is higher than 7.5% or 8.0% with few lows, you can find more accurate basal rates and pump settings in the right column of the **Pump Settings Tool**.

Basal insulin typically makes up 40-60% of the total daily dose (TDD) of insulin for most adults. Children before puberty, athletes, and the thin elderly often require basal rates closer to 40% of the TDD. Selecting a starting basal rate, and then checking and adjusting it if needed, provides the best rate(s). You may want to try a single starting basal rate for the entire day and vary that rate based on basal testing.

Most people see their glucose improve when they use 55-60% of the TDD as basal and deliver slightly more during the daytime hours. This reduces post-meal glucose spikes but should not be so excessive that it causes lows.

Basics

Verify your basal rates with three 8-hour intervals of fasting spread throughout the day. Check overnight rates first because they are the easiest to verify, and once adjusted, provide a great guide to the selection of daytime basal rates. Sleep accounts for about a third of your life, so having good glucose readings through the night automatically leads to

a better A1c, avoids scary lows during the night, and sets you up for better glucoses through the rest of the day.

If a single basal rate works successfully through the night, start with that for your daytime rate. If you use more than one rate overnight, start with an average of these rates as your daytime rate.

Split daytime checks into two 8-hour segments done on different days. These shorter peroids avoids long periods of fasting that can increase your insulin sensitivity and make your basal requirement appear to be artificially low.

- Check the first half of your day when you can skip breakfast and have a late lunch.
- Check the second half of the day 5 hours or more after your breakfast bolus and 3 hours or more after your last meal. Skip lunch and eat a late dinner once checking is complete.

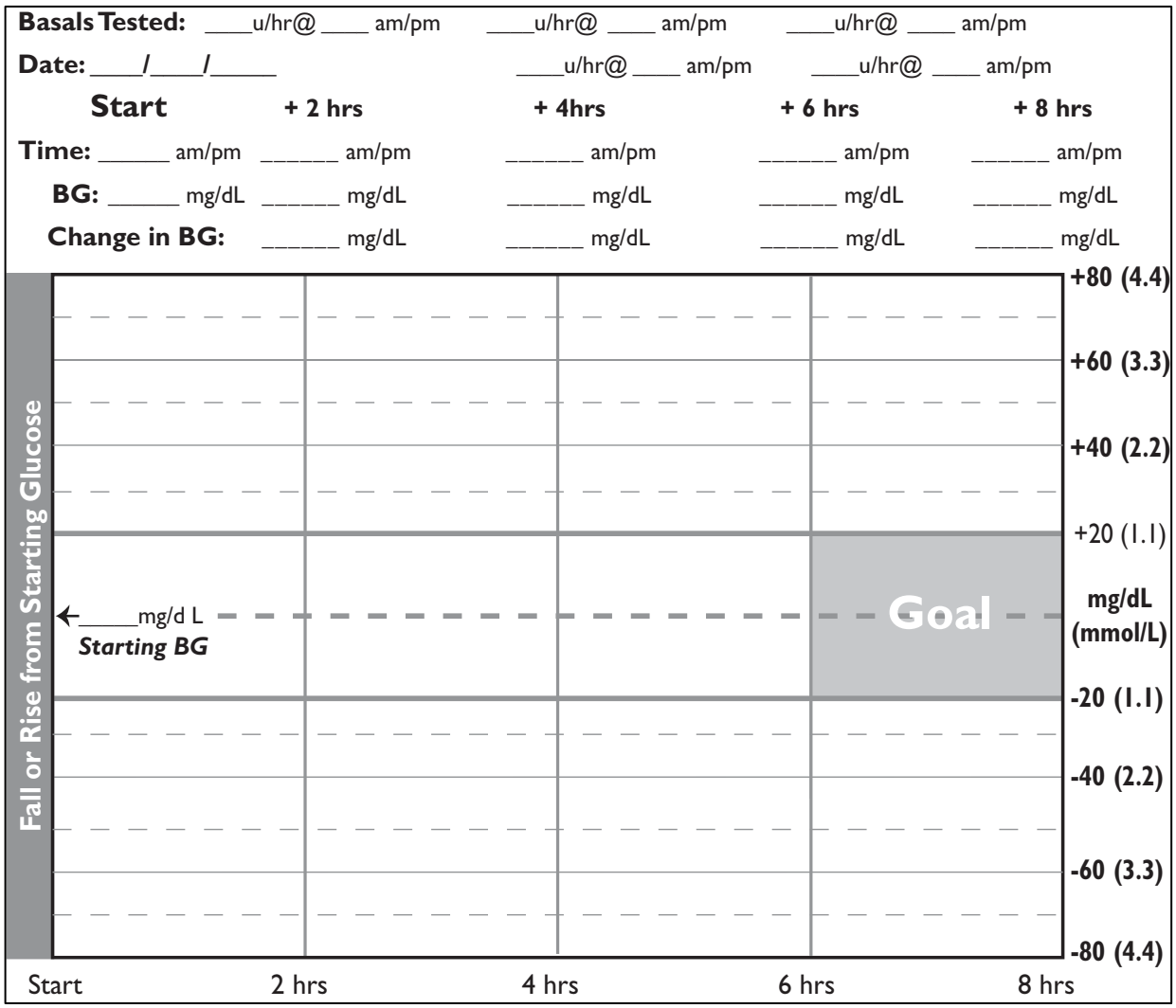
Before starting to check and adjust your basal rates, be sure to save your current basal rates. Write them down, take a photo of them, or duplicate your basal rates as an alternate basal profile in your pump and adjust these.

Steps to Check Your Basal Rates

On a CGM, temporarily set the high and low alerts at 20 to 25 mg/dl (1.1 mmol/L) above and below your starting glucose. The CGM will then alert you any time your glucose strays. An alternate method for overnight basal checks is to view the 12-hour screen on your CGM in the morning for a few days. Then plot out the glucose trend line for a 6 to an 8-hour period that starts at least 5 hours after your last bolus and last food intake the night before.

On a glucose meter, check your glucose 5 hours after your last bolus and then every 2 hours or when symptoms suggest you are low.

Basal Checking Tool



1. Start a basal check any time your glucose is between 90 and 140 mg/dL (5.0 – 7.8 mmol/L), you have not eaten in the last 3 hours, and have not taken a bolus in the last 5 hours.
2. Eat no carbs, but small amounts of protein (a few nuts, a slice of cheese, or boiled egg) are OK.
3. Check your glucose or view your CGM screen and record the value every 1-2 hours on the graph above to plot how your glucose responds over time. Check also if you feel your glucose is low.
4. If your glucose goes below 70 mg/dL (3.9 mmol/L), stop checking and have some carbs.
5. If your glucose rises or falls more than 20 mg/dL (1.1 mmol/L), see Table 10.5 for how to adjust your basal rates.

Repeat basal rate checks and adjustments until they keep your glucose within (+/-) 20 mg/dL (1.1 mmol/L) of your starting glucose.

Adjust Your Basal Rates From Your Results

When needed, change your basal rates using Table 10.5 as a guide. If your checks show that you need a major change in your basal rate, your CarbF and CorrF may also need to be adjusted. Table 10.7 shows how much insulin you will add or remove when you adjust a basal rate over a period of 6, 8, or 24 hours.

10.5 How to Adjust Your Basal Rates from a Basal Check

1. If your glucose FALLs or RISEs by:	20 mg/dL 1.1 mmol/L	30 mg/dL 1.7 mmol/L	40 mg/dL 2.2 mmol/L	50 mg/dL 2.8 mmol/L	60 mg/dL 3.3 mmol/L	70 mg/dL 3.9 mmol/L	80 mg/dL 4.4 mmol/L
2. And your TDD is:	**3. LOWER or RAISE the basal rate for 8 hours by:**						
20 u	0.026 u/hr	0.038 u/hr	0.051 u/hr	0.064 u/hr	0.077 u/hr	0.089 u/hr	0.102 u/hr
30 u	0.038 u/hr	0.057 u/hr	0.077 u/hr	0.096 u/hr	0.115 u/hr	0.134 u/hr	0.153 u/hr
40 u	0.051 u/hr	0.077 u/hr	0.102 u/hr	0.128 u/hr	0.153 u/hr	0.179 u/hr	0.204 u/hr
50 u	0.064 u/hr	0.096 u/hr	0.128 u/hr	0.159 u/hr	0.191 u/hr	0.223 u/hr	0.255 u/hr
60 u	0.077 u/hr	0.115 u/hr	0.153 u/hr	0.191 u/hr	0.230 u/hr	0.268 u/hr	0.306 u/hr
80 u	0.102 u/hr	0.153 u/hr	0.204 u/hr	0.255 u/hr	0.306 u/hr	0.357 u/hr	0.408 u/hr
100 u	0.128 u/hr	0.191 u/hr	0.255 u/hr	0.319 u/hr	0.383 u/hr	0.446 u/hr	0.510 u/hr

Example: For a glucose rise of 40 mg/dL during an 8 hour test with a TDD of 40 units a day, the current basal rate would be raised as much as 0.10 u/hr over an 8 hour period.

1. If your glucose rises or falls more than 20 mg/dL (1.1 mmol/L) from the starting glucose during the basal check, use this table to raise or lower your current rates. Raise your basal rate if your glucose rises or lower it if it falls.
2. Adjust basal rates until they keep your glucose relatively flat for 6 to 8 hours on 2 or more occasions.

Another way to adjust basal rates is to divide how much your glucose rises or falls over 8 hours, divide that number by your CorrF, and then divide that by 8 to get the units/hour by which your basal rate will be increased or decreased. For example, if your glucose rises 60 mg/dL in 8 hours of checking and your CorrF is 30 mg/dl per unit of insulin, 60 mg/dL divided by 30 mg/dL/unit equals 2 units. When 2 units are divided by 8 hours, the result will give a maximum basal increase of 0.25 u/hr in the current basal rate. You might start by raising the basal rate by 0.2 u/hr over this 8-hour period and then recheck.

When you change your rate is often as important as **how much** you change it. After a basal rate is changed in your pump, it takes more than 4 hours for its full effect to be seen.

Basal rates and insulin work slowly, so basal adjustments must be made early. Adjust the basal rate 5 to 8 hours BEFORE a high or low reading occurs, or 2 to 3 hours before the glucose BEGINS to rise or fall.

Don't chase your basal's tail! From the time a basal rate is changed, it continues to affect your glucose for another 4 to 5 hours. Basal rates do not vary much during the day once you make proper adjustments early. If one of your basal rates is 0.6 u/hr and another is 1.2 u/hr, you are likely in a circle chasing the previous basal's tail. Raise the 0.6 u/hr rate and lower the 1.2 u/hr rate by equal amounts to bring them closer. Bringing rates closer together often provides better results.

10.7 Total Units When You Change a Basal Rate

When you change a basal rate, it helps to know how many total units the change brings.

Change in Basal Rate	Total units over 6 hrs	Total units over 8 hrs	Total units over 24 hrs
+/- 0.025 u/hr	+/- 0.15 u	+/- 0.2 u	+/- 0.6 u
+/- 0.05 u/hr	0.3 u	0.4 u	1.2 u
+/- 0.1 u/hr	0.6 u	0.8 u	2.4 u

Basal adjustments of 0.025 and 0.1 u/hr equal 0.6 and 2.4 units over the entire day. For a glucose that falls or rises slightly during a basal test, a basal change of 0.025 or 0.05 u/hr (or 0.2 and 0.4 units over 8 hours) may fix this.

Derived from **Pumping Insulin** to improve your glucose results. Be sure to check all your bolus calculator settings against those in right column of the Pump Settings Tool.

Now that your basal rates are correct, it's time to Check Your Carb Factor.