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How To Achieve The Best Control Of Your Child's Diabetes

Achieving the best control (HbA1c < 7%) requires checking blood sugars (fingersticks) 3-4 times per day. The Diabetes Control and Complications Trial (DCCT) concluded that complications from diabetes were less when the HbA1c was less than 7%. The following sections will help you achieve the best HbA1c for your child by learning how to adjust your child's insulin dose.

Good control of your child's diabetes requires a Balance between Insulin, Diet, and Exercise. Exercise works to lower the blood sugar, while Stress and Infection (common cold, strep throat) may increase the blood sugar. There are some variables (hormonal changes, metabolism changes, changes in absorption of insulin from different injection sites, etc.) that are more difficult to control. These variables do not come into play very often, but may sometimes explain some of the high/low blood sugar readings.

It is important to record the blood sugar readings in a chart that is easy to view one week at a time. Circle all readings greater than 180. This makes it easier to view the readings over a week and quickly see any obvious patterns (example: always >180 in the morning).

Why Should You Check Blood Sugars?

First, the blood sugar tells exactly how good your child's control is at any one time. When reviewed over a week's time, it helps you determine whether any changes need to be made in the insulin dose.

Second, it enables you to adjust your child's insulin dose based on whether these blood sugar readings are high or low.

With experience, you will learn exactly how much insulin to add or subtract based on your child's blood sugar readings. Your goal is to keep the blood sugars between 80-150mg/dl. High blood sugars for a short period of time (hours) will not harm your child.

REMEMBER: Whenever the insulin dose is changed, check a blood sugar at the next time when that insulin should reach its peak action. For example, if you increase the Regular insulin in the morning (before breakfast at 8:00A.M.) because the blood sugar is over 400, check another blood sugar at 11:00 A.M. (2-3 hours after the 8:00 A.M. dose). If the blood sugar at that time is now 80-150, then the change in the insulin dose was correct.

Use the following Dose Chart as a guide to adjusting your child's daily insulin. I will help you decide on a starting Base Dose.

The Base Dose is the dose of insulin you give daily which maintains blood sugars between 80-150.

Depending on the daily blood sugar readings, you may increase or decrease the Regular or Humalog insulin only above the base dose, but only for that day!

Changes in the base dose are only made after looking at several days of blood sugar readings (see below). Remember, when you make changes in the Regular or Humalog insulin dose on a particular day because the blood sugar was too high or low, it is only for that day. If the blood sugar is high or low on the next day, return to your base dose and then increase or decrease the insulin dose as per your chart for that day only!

AM Base Dose:

____ units Regular

____ units Humalog

____ units Lente/NPH

PM Base Dose:

____ units Regular

____ units Humalog

____ units Lente/NPH

Bedtime Base Dose:

____ units Regular

____ units Humalog

____ units Lente/NPH

If the blood sugar reading is:

- 1) less than _____: decrease Regular/Humalog ____ units and/or increase quick acting sugars (milk and juice)
- 2) _____ - _____: no change
- 3) _____ - _____: increase Regular/Humalog ____ units and/or decrease quick acting sugars
- 4) _____ - _____: increase Regular/Humalog: ____ units and/or decrease quick acting sugars and complex sugars (breads). Use more protein until blood sugar is <200 mg/dl
- 5) _____ - _____: increase Regular/Humalog: ____ units and changes in meals as above
- 6) >400+ Ketones: increase Regular/Humalog: ____ units and changes in meals as above

Regular insulin begins to lower blood sugars in approximately 30 minutes and lasts 4-6 hours. Humalog insulin begins to lower blood sugars in approximately 10-15 minutes and lasts 2-4 hours. With experience, you will learn how to combine Regular and Humalog in one injection to help lower the high blood sugars (ask me for a handout on combining Regular and Humalog).

The above chart discusses changing the Regular or Humalog when the blood sugars are high or low. Which insulin is changed will depend on blood sugar readings, the presence of urine ketones, and when insulin was last given (consider the possibility of insulin actions overlapping).

Remember, keeping written records of the blood sugars will help identify trends of high and low blood sugars and show how the change made in the insulin dose affected the next blood sugar

I will recommend insulin changes for each range of blood sugars. With experience, you will be able to modify the above chart to better suit your child.

Example: If the blood sugar is >400, you may increase the Humalog 4 units for that day. Two hours later, the blood sugar is <150. Each time the blood sugar is >400, and 4 extra units of Humalog are given, the blood sugar drops to <150. Written records serve to point out these consistent trends and help to set up specific changes in insulin dose for any high blood sugars.

Remember, when the blood sugar is high, decrease the foods eaten which rapidly increase blood sugars after that meal (quick acting sugars like juice and milk). If your child is able to recognize the symptoms of a low blood sugar, it is also safe to delay eating until the blood sugar decreases into the normal range (80-150).

Begin each day at your Base dose and add or subtract Regular/Humalog insulin according to the chart above.

EXAMPLE: Base Dose 4R/4NPH. If the blood sugar at 8 AM on Monday is 400, you will increase the dose to 6R/4NPH for that day only. The next day you return to your Base dose of 4R/4NPH. If the blood sugar at 8 AM on Tuesday is 200, you will return to your Base dose of 4R/4NPH and increase the Regular one unit to 5R/4NPH. If the blood sugar at 8 AM on Wednesday is 100, you will again return to your Base dose of 4R/4NPH with no increases in the Regular.

Do not continue adding insulin to the previous day's dose. Always return to the base dose.

In this example, you will notice that we are increasing the Regular insulin by 2 additional units when the blood sugar was 400, but only 1 additional unit when the blood sugar was 200. The exact number of additional units you will give at a particular time of day will depend on the blood sugar reading and the dose schedule set up.

How To Change Base Dose:

Which blood sugar should you look at to determine if the insulin dose is right?

- Morning Regular/Humalog = Lunch test (3-4 hours after injection)
- Morning Lente /NPH = Dinner test (6-8 hours after injection)
- Dinner Regular/Humalog = Bedtime test (3-4 hours after injection)
- Dinner Lente/NPH = 12 MN-3 AM (6-8 hours after injection)
- Bedtime Regular/Humalog = 12 MN-3 AM (3-4 hours after injection)
- Bedtime Lente/NPH = Breakfast test

The Base Dose of both the Regular/Humalog and the Lente/NPH can be changed if necessary. Reviewing 3-7 days of blood sugars will help you decide on any changes needed. You are looking for a daily trend to the blood sugar readings

For example, if the blood sugars are high before lunch every day for one week, this would be considered an example of a daily trend. You would then consider an increase in the morning dose of

Regular/Humalog until the pre-lunch blood sugar readings are in the normal range. This new insulin dose would now become your Base dose.

Remember, when evaluating blood sugar readings and making changes, always consider every insulin given and the time when it reaches its peak action. Example: Lente/NPH given at dinner and Regular/Humalog given at bedtime may both lower the blood sugar at similar times (12 MN-3 AM).

Use the chart above to help you determine the insulin that affects the blood sugar at a specific time of day. Never make a change of more than 1-2 units/day when changing the Base dose.

REMEMBER: You will still be changing the Regular/Humalog insulin on a daily basis according to the chart above if the blood sugar is high or low.

Example: Base dose is 4R/4L in the morning: The blood sugar at lunch is >200 mg/dl 3 days in a row: That morning the blood sugar is high at 240. You will need to make two changes:

1. Increase the Regular insulin (for that day only) 1-2 units because of the 240 blood sugar.
2. Increase the Base dose of Regular insulin one unit because of the trend of 3 days of high blood sugars at lunch.
3. The total dose that morning would be 6-7R/4L.
4. The next day, if the blood sugar in the morning were 100, you would give 5R/4L.
5. 5R/4L would now become your new Base dose.
6. If the blood sugar at lunch is still >150 for 3 days in a row, you would have to increase the morning base dose of Regular insulin again until the readings are <150.

Example: Base dose is 4R at dinner: The blood sugar at bedtime is >200 mg/dl 3 days in a row. The blood sugar that day at dinner is normal at 100. In this case, you will only need to change the Base dose until the blood sugar readings are <150.:

1. Increase the dinner Base dose of Regular insulin 1-2 units.
2. Wait 3 days
3. If the blood sugars are normal at bedtime, then no more changes in the Base dose are necessary.
4. If the blood sugars are still >150, continue increasing the Regular at dinner 1-2 units every 3 days until the blood sugar is <150.

How Do You Change The Lente Or Nph Base Dose?

If the blood sugar is over 150, 3 days in a row, in the morning before breakfast and/or at dinner, then the long acting insulin corresponding to that time may need to be increased. The insulin dose can be increased 1-2 units. Wait 3-5 days to see if there is an improvement in the blood sugars. Continue to increase the insulin dose every 3-5 days until the blood sugars are less than 150. This new dose will become the new base dose.

Until the new base dose of Lente/NPH has been established, it will still be necessary to increase the Regular/Humalog when the blood is high (as described above).

If your child is having insulin reactions (low sugar <50), at the same time each day, several days in a row, then the insulin affecting that time needs to be decreased (see chart above).

Are There Any Exceptions To The Above Guidelines

If the blood sugars are >150 in the morning more than 3 days in a row, be sure the blood sugars at

bedtime are consistently <150 before you increase the bedtime Lente/NPH. Why?

If the bedtime blood sugar has been >150 more than 3 days in a row, make the necessary changes (increasing dinner Regular/Humalog and/or adjusting the dinner meal) to correct the bedtime blood sugar. This correction in the bedtime blood sugar will make it easier to lower the morning blood sugar readings.

If you first increase the bedtime Lente/NPH (to help decrease the high morning blood sugars) and do not first lower the high bedtime blood sugars, you will end up increasing the bedtime Lente/NPH too much, and run the risk of a low sugar reaction while asleep.

Why Are My Child's Blood Sugars High?

Common causes include a change in food intake or exercise, new stress or anxiety, and infections (common cold, sore throat, viral illness). Most medicines do not affect the blood sugars. If the blood sugars are running high and low with no trend, then the problem is more likely due to inconsistent eating habits. If the blood sugars are high throughout the day, then infection or stress or improper eating may be the culprit. Your child's blood sugars may be high as much as one week preceding an illness.

Assuming there has been no obvious changes in diet, exercise, or stress to explain the sudden high blood sugars, it will be necessary to adjust the insulin dose to correct these blood sugars (as described above).

REMEMBER: If your child's blood sugars over 3-7 days show big swings (50-400), and there is no consistent pattern (always high at dinner or high at lunch, etc.), then increasing the base dose will not correct the problem and may cause more severe low sugar reactions.

Summary

As discussed above, your child's insulin dose can be changed in one of two ways. The reason for changing the Regular/Humalog insulin on a daily basis is to correct high (or low) blood sugars. If your child begins the day with a high blood sugar and no change is made in the Regular/Humalog insulin as suggested, then the blood sugar readings will probably run high the rest of that day. This makes it more difficult to bring the blood sugars under control.

In addition to increasing the Regular/Humalog (morning, dinner, bedtime) when the blood sugar is over 400mg/dl, you can also decrease quick-acting carbohydrates (fruits, milk, and juices) eaten at the meal when the insulin is given. This will help lessen any further rise in your child's blood sugar at that time.

It is normal for the blood sugar to rise after meals. The more quick-acting carbohydrates eaten in a meal, the higher the blood sugar will rise immediately after that meal.

In older children who learn to recognize when their blood sugar is dropping, it is safe to even delay the meal until the blood sugar drops below 180.

Consistent meal timing and offering the proper nutritional balance between carbohydrates, protein, and fats, are important to achieving the best control for your child.

The problem of inconsistent blood sugars must be addressed to help lessen the complications caused by diabetes. Areas to concentrate on include timing of meals and insulin injections, composition of

meals, changes in exercise, presence of an infection (cold, sore throat, etc.) and recognizing sources of stress and anxiety.

This information should not be used as substitute for the medical care and advice of your child's physician. Health related topics found on the Andorra Pediatrics web site should not be used for diagnosing purposes or be substituted for medical advice. As with any new or ongoing treatment, always consult your professional healthcare provider before making any changes in treatment or beginning any new treatment. If you have any questions or concerns, please call our office.