Chapter 21

Adjusting the Insulin Dosage and “Thinking” Scales

BLOOD SUGAR GOALS (suggested ranges)

It is our general goal to have blood sugar levels in the ranges listed below (also see Chapter 7). These ranges are when no food has been eaten for at least two hours. They apply to fasting in the morning as well as for two hours after any meal or snack.

Under 5 years of age
   = 80-200 mg/dl (4.5-11.1 mmol/L)

5-11 years of age
   = 70-180 mg/dl (3.9-10.0 mmol/L)

12 years and above
   = 70-150 mg/dl (3.9-8.3 mmol/L)

A person who has difficulty recognizing low blood sugars or who has severe insulin reactions may be asked to keep the blood sugar at a slightly higher level. Families and the diabetes care provider should discuss the desired range. This range should be written down for future reference. It is important to remember that this is a target goal. **If at least 50 percent of the sugar values are in the target range at each time of day, the HbA₁c level will usually be good.** Not all blood sugar values will be in the target range. The exception to this is during the “honeymoon” period shortly after diagnosis. If more than half of the values are in range and the HbA₁c is still high, blood sugars at other times of the day should be done.
Chapter 7 gives suggestions for other times – including two hours after meals.

After six to 12 months of dealing with diabetes, many families and older teens begin making some of their own insulin adjustments. This should be discussed with the diabetes care provider at a clinic visit. If the decision is mutually agreeable, guidelines for insulin adjustments should be discussed.

ADJUSTING THE INSULIN DOSAGE

The first step in learning to adjust insulin is to know the times of action of the insulins used. Refer to the figures in Chapter 8 and Table 1 in this chapter to review the times of action of various insulins.

The three rapid-acting insulins are:

1. Humalog
2. NovoLog
3. Apidra

All these have similar activity (Chapter 8). They can be used interchangeably.

Changes in insulin dosage are best considered under four categories:

A. Reducing the Insulin Dose
B. Increasing the Insulin Dose
C. Insulin Adjustments for Food and Correction Factor
D. Insulin Adjustments for People Receiving Lantus Insulin

A. Reducing the Insulin Dose (TO PREVENT LOW BLOOD SUGARS: Tables 1, 2 and 3)

Responding to trends in the blood sugar levels

Reducing a specific insulin dose should be done if:

✔ frequent (> 2 per week) blood sugar values below 60 mg/dl (3.3 mmol/L), which we consider is the level of true hypoglycemia, or below 70 mg/dl (3.9 mmol/L) in a preschooler

✔ all blood sugars in a day are below the desired lower limit. The insulin doses should be reduced with the next injection.

We do not know why blood sugars will suddenly be low for a day or longer in a person who has been stable. Most often this is due to increased physical activity, eating less food or opening new bottles of insulin. Also, NPH insulin has variable absorption from day-to-day.

How much the insulin is reduced depends on the age and size of the person and the dose being given. Sometimes all that is needed is to omit or reduce the rapid-acting insulin for a few days.

When are the low values occurring?

● If the low values occur before dinner, the morning NPH insulin can be reduced by one or two units.

● If the reactions are in the early morning hours, the evening NPH or Lantus (given at any time of the day) can be reduced by one or two units.

● If the values are still low the next day, reduce the insulin again.

Think about what time of the day the reactions are occurring and which insulin is having its main action at that time of day. Reduce the insulin that is working at that time by one or two units.

Sometimes the values are high the day after
the insulin dose is reduced. This is because the insulin-balancing hormones may require a day or two to adjust. It is important to be patient when a dose is reduced, and DO NOT GO BACK UP ON THE DOSE just because blood sugars are a bit higher. Wait a few days to let the balancing hormones re-adjust before deciding to go back up on the dose. Remember that even though we suggest waiting a few days to make further changes if the blood sugar is high, this is NOT necessary if it is low. It is OK to make a further reduction the next day if values are still low.

 Thinking ahead to prevent lows (reactions)

Although discussed in more detail in Chapter 6, families need to “think ahead” to prevent lows. Reduce the insulin dosage during days of high excitement and activity or when eating less. When children stay overnight at a friend’s house (or have a friend spend the night) there is often an increase in activity and less sleep. More energy is expended, and it is wise to reduce the p.m. insulin dose and/or the Lantus dose.

The following can all lead to low blood sugars:

✔ school trips and field days
✔ family picnics and playing with cousins
✔ long hikes or bike trips
✔ spending the night with a friend
✔ vacations to places like Disneyland® or the beach
✔ deciding to begin a diet
✔ when school is out and the weather is nice, children will play outside after dinner. The evening rapid-acting insulin almost always has to be reduced.
✔ getting cold when playing outside in cold weather (not wearing enough warm clothing)

Temporary reductions in dosage of insulins acting at the time of activity or excitement can help to prevent problems. If there are questions about reducing the insulin dosage, call the diabetes care provider during office phone hours. (Save home calls and pager calls for emergencies.) Remember it is generally best to err on the safe side. Alterations in the insulin dose for sick-day and surgery management are discussed in Chapter 16, “Sick-day and Surgery Management.”
Responding to severe insulin reactions

If a severe insulin reaction occurs, it is important to call the diabetes healthcare provider before giving the next scheduled insulin shot. The stores of balancing hormones (e.g., adrenaline) are reduced with a severe reaction and there is a greater risk for more reactions. The insulin dose should be reduced temporarily. It is important to prevent a severe reaction from occurring again. Sometimes it is helpful to schedule a clinic appointment to discuss this.

B. Increasing the Insulin Dose
(TO TREAT HIGH BLOOD SUGARS: Tables 1, 2 and 4)

Understanding why more insulin is required

An insulin dose may need to be increased:

✔ if the blood sugars have been above the desired range for three or four days in a row and there is not an obvious illness or stress that will soon go away

✔ when children grow, their insulin needs generally increase by one unit for every two pounds gained. Also, when growth hormone levels increase, insulin activity is blocked.

✔ because in some people their own pancreas gradually makes less insulin

✔ in the winter when many people exercise less and their insulin needs increase

✔ during times of high stress or during menses (menstrual period)

✔ if HbA1c values are high (reflecting blood sugars over the past three months)

✔ during an illness, there may be a temporary need for more insulin (especially if ketones are present). This is discussed in Chapter 16, “Sick-day and Surgery Management.”

Resistance to increasing the insulin dose

Some people resist increasing the insulin dose. When blood sugars have been running high, the person’s body becomes accustomed to higher levels. They may feel uncomfortable at lower blood sugar levels. This unpleasant feeling lasts for a short period and will gradually disappear. Also, the most frequent fear of people with diabetes (and their family members) is of low blood sugars. This is particularly true if severe reactions have occurred. People may resist (sometimes subconsciously) increasing the dose and lowering the blood sugars. An increase in the dose may mean a loss of further insulin production in the eyes of some families. This can seem like a time of additional loss.

Knowing which insulin to increase

It is essential to know the times of action of the insulins and the desired ranges for the blood sugars. The insulins working during the four time periods are shown in Table 1. When the blood sugars are above the desired range for three to seven days with no obvious cause, the insulin acting in that time period is increased. Thus:

✔ if the sugars are high before lunch, increase the morning rapid-acting (Humalog/NovoLog/Apidra) or Regular insulin

✔ if the sugars are high before dinner, increase the morning NPH or the rapid-acting insulin or Regular insulin at lunch

✔ if the sugars are high before the bedtime snack, increase the dinner rapid-acting or Regular insulin

✔ if the sugars are high before breakfast, increase the dinner (or bedtime) NPH or the Lantus insulin given at any time of the day (see Table 2)

The increases are usually by a half unit for a preschooler or by a unit for an older child or adult. The blood sugars will tend to run lower on the first day of increased insulin. It may be helpful for the family and care provider to fill out Table 2 together.
The dose may need to be increased again as the balancing hormones adjust. Extra snacks on the first day of an increased dose are often wise. We often suggest a slice of pizza at bedtime on the first night if increasing the insulin working during the night. If the blood sugars are still above the desired range after three to seven days, repeat the increase again. **Continue this program until at least half of the blood sugars at the time of day being worked on are in the desired range.** A general rule is to increase the dosage slowly. If you are not sure whether to make further increases in the insulin dose, fax or mail the blood sugars. You can also call to discuss changes with your diabetes care provider. Faxing or mailing in the blood sugar values allows the diabetes care provider time to review and think about recommendations. It saves the need for copying values over the phone. Sample fax sheets are included in Chapter 7. This reporting should be done during office phone hours. Save home calls and pager calls for emergencies.

### Table 2
**Adjusting Insulin Doses**

Desired range for blood sugars _________ to ___________.

**PATTERN TO FOLLOW FOR CHANGING INSULIN DOSE**

<table>
<thead>
<tr>
<th>Blood sugar levels</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>If HIGH for 3-5 days</strong></td>
</tr>
<tr>
<td><strong>Time of Day</strong></td>
</tr>
<tr>
<td>• before breakfast</td>
</tr>
<tr>
<td>• before lunch</td>
</tr>
<tr>
<td>• before dinner</td>
</tr>
<tr>
<td>• before bedtime</td>
</tr>
</tbody>
</table>

**NOTE:** Most people wait 3 days between increases in doses.

| **If LOW for 1 or 2 days** |
| **Time of Day** | **Insulin to Decrease** | **How Much** |
| • before breakfast | dinner or bedtime NPH or Lantus (given anytime) | by _____ unit(s) |
| • before lunch | morning rapid-acting or Regular (R) | by _____ unit(s) |
| • before dinner | morning NPH or lunch rapid-acting or R | by _____ unit(s) |
| • before bedtime | dinner rapid-acting or R | by _____ unit(s) |

**NOTE:** If still low after decreasing the dose, making another decrease the next day is fine.

Rapid-acting insulins: Humalog, NovoLog and Apidra. R = Regular insulin.
### Table 3
**Insulin Dosing Algorithms for LOW BLOOD SUGARS (B.S.) in mg/dl (mmol/L)**

<table>
<thead>
<tr>
<th></th>
<th>Infants/Toddlers</th>
<th>School Age</th>
<th>Adolescents</th>
<th>College Age</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Birth - 4 yrs.</strong></td>
<td>80-200 (4.5-11.1)</td>
<td>70-180 (3.9-10.0)</td>
<td>70-150 (3.9-8.3)</td>
<td>70-150 (3.9-8.3)</td>
</tr>
<tr>
<td><strong>Target glucose levels</strong></td>
<td><strong>Morning (a.m.) B.S.</strong></td>
<td><strong>Noon B.S.</strong></td>
<td><strong>Afternoon (dinner) B.S.</strong></td>
<td><strong>Bedtime B.S.</strong></td>
</tr>
<tr>
<td></td>
<td>B.S. &lt; 80 (4.5)</td>
<td>B.S. &lt; 70 (3.9)</td>
<td>B.S. &lt; 70 (3.9)</td>
<td>B.S. &lt; 150 (8.3)</td>
</tr>
<tr>
<td></td>
<td>↓ dinner or bedtime</td>
<td>↓ dinner or bedtime</td>
<td>↓ dinner or bedtime</td>
<td>↓ dinner RAI or R</td>
</tr>
<tr>
<td></td>
<td>N or Lantus †</td>
<td>N or Lantus †</td>
<td>N or Lantus †</td>
<td>by 1/4 to 1/2 unit</td>
</tr>
<tr>
<td></td>
<td>by 1/4 to 1/2 unit</td>
<td>by 1/2 - 1 unit</td>
<td>by 1/2 - 1 unit</td>
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<td>B.S. &lt; 150 (8.3)</td>
</tr>
<tr>
<td></td>
<td>↓ a.m. RAI or R</td>
<td>↓ a.m. RAI or R</td>
<td>↓ a.m. RAI or R</td>
<td>↓ dinner RAI or R</td>
</tr>
<tr>
<td></td>
<td>by 1/4 to 1/2 unit</td>
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</tr>
<tr>
<td></td>
<td>↓ a.m. N or noon RAI or R</td>
<td>↓ a.m. N or noon RAI or R</td>
<td>↓ a.m. N or noon RAI or R</td>
<td>↓ dinner RAI or R</td>
</tr>
<tr>
<td></td>
<td>by 1/4 to 1/2 unit</td>
<td>by 1/2 - 1 unit</td>
<td>by 1/2 - 1 unit</td>
<td>by 1/4 to 1/2 unit</td>
</tr>
<tr>
<td></td>
<td>B.S. &lt; 150 (8.3)</td>
<td>B.S. &lt; 130 (7.3)</td>
<td>B.S. &lt; 100 (5.5)</td>
<td>B.S. &lt; 100 (5.5)</td>
</tr>
<tr>
<td></td>
<td>↓ dinner RAI or R</td>
<td>↓ dinner RAI or R</td>
<td>↓ dinner RAI or R</td>
<td>↓ dinner RAI or R</td>
</tr>
<tr>
<td></td>
<td>by 1/4 to 1/2 unit</td>
<td>by 1/2 - 1 unit</td>
<td>by 1/2 - 1 unit</td>
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</tr>
</tbody>
</table>

Appreciation is expressed to DeAnn Johnson, RN, BSN, CDE and others of the Barbara Davis Center staff who helped develop this table.

↓ = lower, decrease; N = NPH; RAI = Rapid-acting insulin (Humalog, NovoLog or Apidra); R = Regular insulin

*Values in parenthesis represent mmol/L. † Decrease Lantus given at any time of day.
Table 4

Insulin Dosing Algorithms for HIGH BLOOD SUGARS (B.S.) in mg/dl (mmol/L)

<table>
<thead>
<tr>
<th></th>
<th>Infants/Toddlers</th>
<th>School Age</th>
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<td>70-150 (3.9-8.3)</td>
</tr>
<tr>
<td>Target glucose levels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Morning (a.m.) B.S.**
- B.S. > 200 (11.1)
- ↑ dinner or bedtime
- N or Lantus †
- by 1/4 to 1/2 unit

**Noon B.S.**
- B.S. > 200 (11.1)
- ↑ a.m. RAI or R
- by 1/4 to 1/2 unit

**Afternoon (dinner) B.S.**
- B.S. > 200 (11.1)
- ↑ a.m. N or noon RAI or R
- by 1/4 to 1/2 unit

**Bedtime B.S.**
- B.S. > 200 (11.1)
- ↑ dinner RAI or R
- by 1/4 to 1/2 unit

Appreciation is expressed to DeAnn Johnson, RN, BSN, CDE and others of the Barbara Davis Center staff who helped develop this table.

↑ = raise, increase; N = NPH; RAI = Rapid-acting insulin (Humalog, NovoLog or Apidra); R = Regular insulin

* Values in parenthesis represent mmol/L. † Increase Lantus given at any time of day.
C.  Insulin Adjustments for Food and Correction Factor

When choosing a dose of rapid-acting insulin, thinking about the blood sugar level and the food to be eaten is always important. To make dose decisions a bit easier, many families and care providers choose a correction factor which can be added to the insulin dose to cover carbohydrate eaten (if they are carb-counting). The correction factor refers to the units of insulin needed to correct a blood sugar level. The goal is to return the blood sugar level into the desired range. A correction factor is generally used when Humalog/NovoLog has not been given within the previous two hours. The most common correction dose is one unit of rapid-acting insulin per 50 mg/dl (2.8 mmol/L) of glucose above 150 mg/dl (8.3 mmol/L). Corrections may be to 150 mg/dl (8.3 mmol/L) during the night. However, every person is different. A preschooalter may do better with one unit per 100 mg/dl (5.5 mmol/L) above 200 mg/dl (11.1 mmol/L). The person or family will need to find out what works. It is a helpful way to get the blood sugar back on track.

If food is to be eaten at the time of doing the correction (e.g., time for lunch or afternoon snack), the insulin to cover the food can be added to the correction dose. For example, in Table 5, if a person planned to eat three carb choices (45g of carbohydrate) and their I/C ratio (Chapter 12) was 1:15, the dose of rapid-acting insulin would be three units. If their blood sugar was 250 mg/dl (13.9 mmol/L), the correction factor would be two units. The total dose to be taken would be five units (three units plus two units). If no food were to be eaten, then the dose to be taken would just be the two unit correction factor.

If the correction dose is to be given after an exercise induced high sugar, it should be reduced by half. (Delayed hypoglycemia may follow as adrenaline levels decrease and sugar goes back into muscle – see Chapter 13.) Also, if a correction is to be done at bedtime, many people use half of the usual dose. Prevention of lows during the night is important.

Correction insulin doses are also discussed in Chapter 26 on insulin pumps. Insulin-to-carbohydrate (I/C) ratios are also discussed in Chapter 12 on food management.

<table>
<thead>
<tr>
<th>Blood Sugar mg/dl</th>
<th>Correction Factor*</th>
<th>Carb Choices**</th>
<th>Total Units of Insulin</th>
</tr>
</thead>
<tbody>
<tr>
<td>150 8.3</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>200 11.1</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>250 13.9</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>300 16.7</td>
<td>3</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>350 19.4</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
</tbody>
</table>

* Assuming a correction factor of one unit of rapid-acting insulin per 50 mg (2.8 mmol/L) above 150 mg/dl (8.3 mmol/L).

** One Carb choice = 15g carbohydrate. In this example, one unit of insulin is given for each 15g carb choice.
D. Insulin Adjustments for Lantus Insulin

In Chapter 8 you can find:

✔ The most common ways we currently use Lantus insulin.

✔ A method to determine the starting Lantus dose.

✔ An example for Lantus given at dinner or in the evening (Figure 1). The dose of Lantus is increased or decreased until most of the morning blood sugars are in the desired ranges.

These ranges are:

Under five years of age
= 80-200 mg/dl (4.5-11.1 mmol/L)

5-11 years of age
= 70-180 mg/dl (3.9-10.0 mmol/L)

12 years and above
= 70-150 mg/dl (3.9-8.3 mmol/L)

Most people will adjust up or down by one or two units of Lantus insulin (or one-half unit for toddlers) every two or three days until morning values are in the ranges listed above.

As stated in Chapter 8, Figure 1, we often use a mixture of Humalog/NovoLog/Apidra (H/NL/AP) and NPH in the morning. The H/NL/AP dose may be the same dose as previously used. The NPH dose is about one-half the previous NPH dose that had been given in the morning. The amount of NPH is adjusted up or down until the sugar levels at dinnertime are mostly within the ranges listed above. Table 6 provides an algorithm that may be helpful in adjusting insulin dosages.

The H/NL/AP dosages for meals are best adjusted by measuring blood sugar levels two hours after the meal. The same sugar levels given above can also apply for the desired values two hours after eating. Others routinely aim for a blood sugar level below 140 mg/dl (7.8 mmol/L) two hours after meals. If the values are not in the desired range two hours after eating, the Insulin to Carbohydrate (I/C) ratio will need to be changed. If the blood sugar value is high, more insulin for carbohydrate in the I/C ratio will need to be given. An example would be to change from 1:15 (1 unit/15g carbohydrate) to 1:10 (1 unit/10g carbohydrate). If the sugar level is below the lower limit, less insulin is needed. An example would be to change from a ratio of 1:15 (1 unit/15g carbohydrate) to 1:30 (1 unit/30g carbohydrate). Call your healthcare provider if you need help.

Snacks are often not necessary with Lantus insulin. However, if the blood sugar is below 130 mg/dl (7.3 mmol/L) at bedtime, it is usually wise to have a bedtime snack. When the blood sugar is above this level and the person is having more than 15g of carbohydrate at bedtime, H/NL/AP may be necessary.
“THINKING” SCALES
(AND REPLACING THE
TERM “SLIDING” SCALES)

It is important to emphasize that “sliding” scales are really “thinking” scales. They give
the person or family ranges of H/NL/AP
and/or Regular insulin to “think about.” The
blood sugar level SHOULD NEVER be the
only factor considered. Food intake and
both recent and expected exercise also need
to be considered with every shot. An
example would be a five-year-old going out to
play with friends after dinner in the summer.
Even if the blood sugar was 200 mg/dl (11.1
mmol/L) before dinner, it would be wise to
reduce (or omit) the evening dose of rapid-
acting insulin. This would also apply if mom
(or dad) was making tuna noodle casserole for
dinner, and they knew that the five-year-old
disliked tuna noodle casserole. Sliding scales
require careful thinking prior to giving each
insulin shot, and it is better to call them
“thinking” scales. Thinking scales for
different aged children are often based on
whether they are still quite sensitive to rapid-
acting insulin or not as sensitive. Possible scales
should be discussed with your diabetes care
provider.

Many families adjust Humalog/NovoLog/
Apidra and/or Regular (not NPH) insulin
dosages with every injection. They use a
thinking scale in which the amount of rapid-
acting insulin given is based on:

1. the blood sugar level
2. the expected food intake
3. both recent and expected exercise
4. other factors (e.g., illness)

The range of insulin is usually preset by the
family and the diabetes care provider working
together. The insulin scale can be written down
in Table 7. Thinking scales are particularly
helpful when parents alternate giving injections
and desire a pattern that both can follow. If the
blood sugar is low, the amount is decreased. In
contrast, the dose is increased for higher blood
sugars, if less exercise is expected or if a large
meal is to be eaten. Smaller children obviously
have lower dosages than larger children.
Children in the first year after diagnosis (who
make more of their own insulin) are usually
more sensitive to rapid-acting insulins and will
have lower dosages.

Many families now use carbohydrate
counting (see Chapter 12) as the method to
determine insulin dosage for food to be eaten.
They must still consider the blood sugar level.
Examples are:

✔ subtracting one or two units if the value is
  below 70 mg/dl (3.9 mmol/L)
✔ adding one or two units if the value is above
  180 mg/dl (10.0 mmol/L)
✔ giving the insulin after the meal, allowing
  the insulin dose to be based on the carbs
  actually eaten (especially for toddlers)

Additional rapid-acting insulin can be added
to this meal dose. The amount added should
take into consideration the current blood sugar
and any planned activity. If gym occurs one to
two hours after the morning shot, one or two
units of rapid-acting insulin might be
subtracted. If it is raining on a summer evening
and exercise is to be less, one or two extra units
of the rapid-acting insulin might be given.
Even if a family is using carbohydrate counting
to determine insulin for food intake, they must
use thinking scales.

One advantage of thinking scales is that the
blood sugar level must always be measured if
the scale is to be used. Sometimes one scale is
used for the morning and a different scale for
the evening. As indicated in Table 7, it may
even be necessary to use one scale for an active
day and a different scale for a quiet day.

It is important to remember that thinking
scales are not “written in stone.” A scale that
works fine for a few months may have to be
altered if the blood sugars are not in the desired
range. Always bring the scale along to clinic
# Algorithm for Adjusting Lantus Insulin Regimens

## 1. Lantus dose:

When using **only** Lantus insulin (*no* NPH), determine the dose based on the pre-breakfast blood sugar

*(morning blood sugar goal = 70-180 mg/dl [3.9-10.0 mmol/L])*

If morning blood sugar value is:

- **60-70 mg/dl (3.3-3.9 mmol/L)** = decrease the Lantus dose by one unit
- **< 60 mg/dl (< 3.3 mmol/L)** = decrease the Lantus dose by two units
- **180-240 mg/dl (10.0-13.3 mmol/L)** = increase the Lantus dose by one unit
- **> 240 mg/dl (> 13.3 mmol/L)** = increase the Lantus dose by two units

## 2. Using an a.m. NPH dose

*(afternoon or dinner blood sugar goal = 70-180 mg/dl [3.9-10.0 mmol/L])*

If afternoon blood sugar value is:

- **60-70 mg/dl (3.3-3.9 mmol/L)** = decrease **a.m.** NPH dose by one unit
- **< 60 mg/dl (< 3.3 mmol/L)** = decrease **a.m.** NPH dose by two units
- **180-240 mg/dl (10.0-13.3 mmol/L)** = increase **a.m.** NPH dose by one unit
- **> 240 mg/dl (> 13.3 mmol/L)** = increase **a.m.** NPH dose by two units

## 3. Humalog, NovoLog or Apidra (H/NL/AP)

*(two hours after a meal blood sugar goal = 70-180 mg/dl [3.9-10.0 mmol/L])*

If blood sugar value two hours after the meal is:

- **60-70 mg/dl (3.3-3.9 mmol/L)** = decrease the **H/NL/AP** dose prior to the meal by at least one unit
- **< 60 mg/dl (< 3.3 mmol/L)** = decrease the **H/NL/AP** dose prior to the meal by at least two units
- **180-240 mg/dl (10.0-13.3 mmol/L)** = increase the **H/NL/AP** dose prior to the meal by one unit
- **> 240 mg/dl (> 13.3 mmol/L)** = increase the **H/NL/AP** dose prior to the meal by two units

*For teens and adults, the healthcare provider may wish the blood sugar goal to be 70-150 mg/dl (3.9-8.3 mmol/L) rather than 70-180 mg/dl (3.9-10.0 mmol/L).

**If carb counting, subtract or add these amounts, but it may be necessary to talk with the dietitian to change the I/C ratio.

Call your health care provider if you have questions.
visits so the dose can be reviewed with the diabetes care provider. Also, write down the dose of insulin given in each shot on the blood sugar record sheet (see Chapter 7). This makes it possible for you and the diabetes care provider to more easily review dosages and how the scales being used are working.

**SUMMARY**

In summary, it is important for families to consistently look at blood sugar levels. The HbA\textsubscript{1c} value may be up to one point lower in families who record values and look at patterns. They then need to make insulin adjustments to obtain or maintain optimal diabetes control. **Keeping a blood sugar and insulin dose log (record) will allow the family to see patterns to make the insulin adjustments.** It is most frustrating when high blood sugars are obtained week after week and no adjustments are made. If a family is uncertain whether changes in insulin need to be made, fax, e-mail or mail the blood sugar values and insulin dosages to the diabetes care provider to get help. Remember to bring your log book to the clinic visit. We have heard every possible excuse (“My dog ate them,” “I left it at home”). Needless to say, we don’t believe any of them. As a compromise, consider using the log book for 1-2 weeks out of the month. Another helpful time would be if exercise or schedules change. This will help you know when you need assistance with insulin adjustments.

**DEFINITIONS**

**Correction factor:** Use of a set amount of insulin to correct the blood sugar into the desired range. The most common example is giving one unit of Humalog/Novolog/Apidra insulin for every 50 mg/dl (2.8 mmol/L) above 150 mg/dl (8.3 mmol/L) blood sugar level.

**Sliding scale:** Altering the insulin dose based on the blood sugar levels.

**Thinking scale:** Altering the insulin dose considering factors other than just blood sugar levels. The other factors might include: food amount, exercise, stress, illness and menses.
**Questions and Answers from NewsNotes**

**Q** What is meant by “sliding” scales for insulin adjustments and who should use them?

**A** “Sliding” scales generally refer to giving different dosages of Humalog/NovoLog/Apidra or Regular insulin depending on the level of blood sugar. They should not be used for NPH or Lantus. We prefer the term “thinking” scale to emphasize that the blood sugar level, food intake and exercise must all be considered before each insulin dose is chosen. On some occasions, illness, stress and menses must also be considered. The diabetes care provider should discuss the “thinking” scale for the dose of rapid-acting insulin individually for each person. Some people are still making their own insulin and will need less rapid-acting insulin, particularly at younger ages; see below.

Both of these scales would then need to be adjusted after “thinking” about food intake, exercise, stress, illness or other factors. Some people even need a different scale for their morning compared with their evening dosage of rapid-acting insulin. It should always be remembered that the scale may have to be reduced if heavy exercise has just been done or is about to be done. There is no good substitute for thinking and reasoning! If you do at least three blood sugar tests per day and want to try a thinking scale, you should discuss this with your diabetes care provider.

**Q** Do the needs for insulin change with the seasons?

**A** The short answer is “yes.” To illustrate this, think of summer camp. Nearly every person going to camp has their routine dose of insulin substantially reduced because of all the extra activity. To a lesser degree this happens in spring - over a week or two the snow suddenly disappears, the sunshine appears and children are out playing, bicycling, etc. With the increased activity, low blood sugars are more likely. Snacks may have to be adjusted and/or insulin doses may need to be lowered.

In contrast, the opposite happens with going back to school in the fall, especially for those going to new schools. This may be a time of extra stress as well as reduced activity. Activity is decreased with the evening homework. Blood sugars may go up and insulin doses may need to be raised.

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**A four-year-old diagnosed at age three might do fine with a thinking pre-meal scale of:**

<table>
<thead>
<tr>
<th>Blood Sugar</th>
<th>Units of Humalog/NovoLog/Apidra or Regular Insulin</th>
</tr>
</thead>
<tbody>
<tr>
<td>mg/dl</td>
<td>mmol/L</td>
</tr>
<tr>
<td>&lt; 100</td>
<td>&lt; 5.5</td>
</tr>
<tr>
<td>100-200</td>
<td>5.5-11.1</td>
</tr>
<tr>
<td>201-300</td>
<td>11.2-16.7</td>
</tr>
<tr>
<td>&gt; 300</td>
<td>&gt; 16.7</td>
</tr>
</tbody>
</table>

**A 16-year-old who developed diabetes at age three might have an entirely different pre-meal scale:**

<table>
<thead>
<tr>
<th>Blood Sugar</th>
<th>Units of Humalog/NovoLog/Apidra or Regular Insulin</th>
</tr>
</thead>
<tbody>
<tr>
<td>mg/dl</td>
<td>mmol/L</td>
</tr>
<tr>
<td>&lt; 70</td>
<td>&lt; 3.9</td>
</tr>
<tr>
<td>70-150</td>
<td>3.9-8.3</td>
</tr>
<tr>
<td>151-200</td>
<td>8.4-11.1</td>
</tr>
<tr>
<td>&gt; 200</td>
<td>&gt; 11.1</td>
</tr>
</tbody>
</table>