

# CHAPTER 13:

## INSULIN PUMPS IN SCHOOL AND WORK ENVIRONMENTS



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**S**afety in the school/workplace is essential for people using insulin pumps. Thus, some education is essential. For children and adolescents, this is generally the parents' responsibility. In the work place, it is the responsibility of the person with diabetes.

One of the first steps is to let the school/workplace know that the person will be wearing an insulin pump. The pump is sometimes mistaken for a cell phone or other device that may not be allowed in the school. A teacher or administrator may attempt to take the pump. The school needs to know that the pump is delivering an essential medicine (insulin). If shots were previously taken at school, they will no longer be needed on a routine basis. Instead, an insulin bolus from the pump will need to be given by the child, often with the help or supervision of a person in the school. Younger children will obviously need the most help.

The school/workplace will need to know that blood sugar checks will still need to be done. For older youth, it is helpful if they can be done in the classroom. This is especially true prior to lunch, as the pump insulin bolus for lunch (or any snack) is best given 15 to 30 minutes prior to eating the food. The exception is when the blood sugar is low (e.g.,  $< 80$  mg/dl [ $< 4.5$  mmol/L]). It is then better to wait and give the bolus just prior to eating. Table 1 shows an example of a monitoring log that can be used to record blood sugar levels and insulin boluses.

A school health plan for using an insulin pump is included in Table 2 of this chapter. It includes the insulin dosages to be given for food or for high blood sugar corrections. The information

sheet describes smart pumps as having the essential information already pre-programmed into the pump. Thus, the person (or a school helper) may only need to enter the estimated grams of carbohydrates (carbs) to be eaten or the blood sugar level (for a high sugar correction). Either the person or a school helper will need to accept the recommended dose and allow the insulin bolus to be delivered.

Hypoglycemia should be treated as previously described. A Treatment Plan is included in Table 3. The only difference for pump users is that school or work personnel need to know how to turn off the pump in case of a severe low blood sugar or at least to be able to disconnect the tubing from the insertion site.

The school needs to know that high blood sugars (with or without elevated ketones) may occur. Table 4 outlines a treatment plan for high blood sugars and ketones. If this occurs, it may be necessary to go back to the old method of giving a shot of rapid-acting insulin using a syringe. It may also be necessary to do a pump set change at the school. Privacy will be needed for this. Figure 1 in Chapter 11 outlines a Ketone Treatment Tree.

Pumps have been stolen when left in the open. The school will need to help provide a safe place to put the pump if the person is to disconnect during periods of heavy exercise. However, with prolonged exercise the student may need to reconnect to the pump periodically to take an insulin bolus.

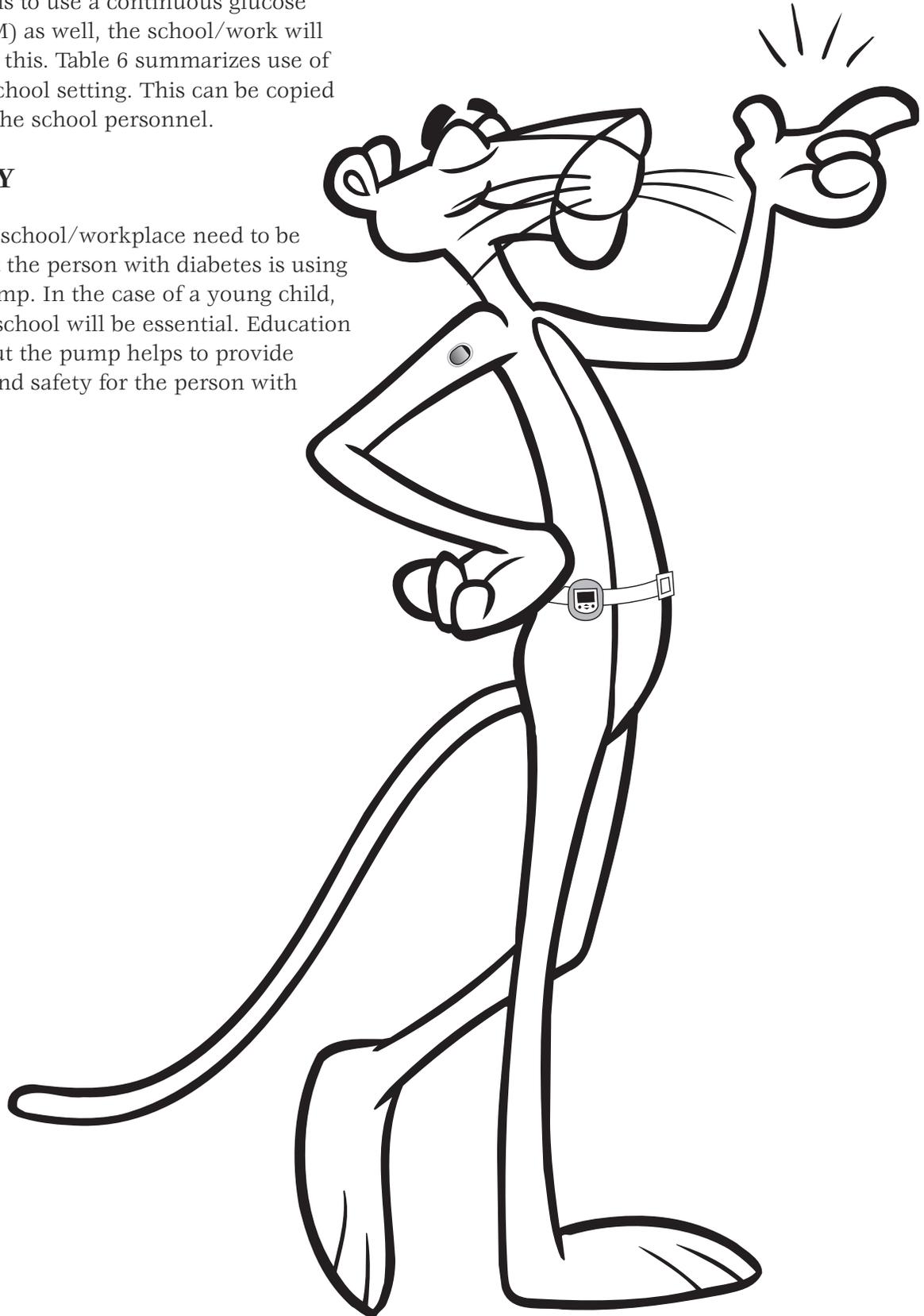
Field trips from the school require a bit of extra planning (Table 5). However, a student must

NEVER be told they can't participate because of having diabetes. To exclude a person based on having diabetes is illegal under Federal laws.

If the person is to use a continuous glucose monitor (CGM) as well, the school/work will need to know this. Table 6 summarizes use of CGM in the school setting. This can be copied and given to the school personnel.

## SUMMARY

People in the school/workplace need to be informed that the person with diabetes is using an insulin pump. In the case of a young child, assistance at school will be essential. Education of others about the pump helps to provide optimal use and safety for the person with diabetes.





## TABLE 2:

Photo of  
student

### INDIVIDUALIZED HEALTH PLAN (IHP for SCHOOLS): DIABETES WITH PUMP

Student: \_\_\_\_\_ DOB: \_\_\_\_\_ Home Phone: \_\_\_\_\_  
Mother: \_\_\_\_\_ Work Phone: \_\_\_\_\_ Cell Phone: \_\_\_\_\_  
Father: \_\_\_\_\_ Work Phone: \_\_\_\_\_ Cell Phone: \_\_\_\_\_  
Guardian: \_\_\_\_\_ Phone: \_\_\_\_\_  
School Nurse: \_\_\_\_\_ Phone: \_\_\_\_\_  
School: \_\_\_\_\_ Grade: \_\_\_\_\_ Teacher: \_\_\_\_\_  
Physician: \_\_\_\_\_ Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
Diabetes Educator: \_\_\_\_\_ Phone: \_\_\_\_\_ 504 Plan on file  Yes  No  
Hospital of Choice: \_\_\_\_\_ Date of Diagnosis \_\_\_\_\_  
Medications Insulin (Type): \_\_\_\_\_ Health Concern (circle): type 1 or type 2 diabetes  
Pump Type: \_\_\_\_\_ Infusion set type: \_\_\_\_\_  
Target Blood Sugar Range: \_\_\_\_\_ to \_\_\_\_\_

#### REQUIRED BLOOD SUGAR CHECKING AT SCHOOL:

- Trained personnel must perform blood sugar check.
- Trained personnel must supervise blood sugar check.
- Student can perform checking independently.
- Student can carry supplies and check where needed.

#### TIMES TO DO BLOOD SUGAR(S):

- Before lunch.  Before P.E.
- After lunch.  After P.E.
- Before getting on bus/going home.  Before snack.
- As needed for signs/symptoms of low or high blood sugar.

#### CALCULATING A MEAL OR SNACK INSULIN DOSE:

- √ Time to Bolus:  Before the meal.  After the meal.
- √ Check blood sugar level before the meal or snack.
- √ Enter the blood sugar value into the pump.
- √ Count the grams of carbohydrates in the food eaten or to be eaten.
- √ Enter the grams of carbohydrates into the pump.
- √ The pump will calculate the prescribed amount of insulin.
- √ Deliver the bolus dose by pressing the designated button(s) on the pump.
- √ If bolus given prior to meal, do not administer more than 10 minutes before eating.
- √ If blood sugar is less than 70 mg/dl (< 3.9 mmol/L), wait to give meal bolus until after meal.
- √ If blood sugar is greater than 250 mg/dl (> 13.9 mmol/L), deliver a correction bolus prior to eating.
- √ The settings on the pump are established by the student's healthcare provider and should not be changed by school personnel.

**Insulin to Carbohydrate Ratio:** \_\_\_\_\_ unit(s) of insulin per \_\_\_\_\_ grams of carbohydrates.

## TABLE 3:

**STUDENT:** \_\_\_\_\_ **DOB:** \_\_\_\_\_

**TREATMENT PLAN: Low Blood Sugar (Hypoglycemia) - Below 70 mg/dl (< 3.9mmol/L)**

Causes:

- Bolused too much insulin.
- Too few carbohydrates consumed for the amount of insulin given.
- Too much exercise.
- High excitement.

If you see this	Do this: ACTION PLAN
<p><b>Signs of Mild Low Blood Sugar (STUDENT IS ALERT)</b></p> <ul style="list-style-type: none"> <li>√ Headache</li> <li>√ Sweating, pale</li> <li>√ Shakiness, dizziness</li> <li>√ Tired, falling asleep in class</li> <li>√ Inability to concentrate</li> <li>√ Poor coordination</li> <li>√ Other</li> </ul>	<ol style="list-style-type: none"> <li>1. Have responsible person accompany student to health office or check blood sugar in the classroom</li> <li>2. Check blood sugar</li> <li>3. If less than 70 mg/dl (&gt;3.9 mmol/L), give one of the following sources of sugar               <ul style="list-style-type: none"> <li>• 2-4 glucose tablets</li> <li>• 6-9 Sweetarts® candies</li> <li>• 4-6 Lifesavers® candies</li> <li>• 2-4 oz (60-120 cc) Orange or other 100% juice</li> <li>• 4-6 oz (120-180 cc) sugar soda (not sugar-free)</li> </ul> <p><b>DO NOT BOLUS FOR THESE CARBS!</b></p> </li> <li>4. After 15 minutes, check blood sugar again Repeat if necessary until blood sugar is &gt; 70 mg/dl (&gt;3.9 mmol/L)</li> </ol>
<p><b>Signs of Moderate Low Blood Sugar (STUDENT IS NOT ALERT)</b></p> <ul style="list-style-type: none"> <li>√ Severe confusion</li> <li>√ Disorientation</li> <li>√ Not able to or unwilling to swallow</li> <li>√ May be combative</li> </ul>	<ol style="list-style-type: none"> <li>1. Check blood sugar.</li> <li>2. Keeping head elevated, give one of the following forms of sugar:               <ul style="list-style-type: none"> <li>• 1 tube Cake Mate® gel applied between cheek and gum</li> <li>• ½-1 tube instant glucose applied between cheek and gum</li> </ul> </li> <li>3. May place pump in suspend or stop</li> <li>4. Disconnect insulin pump at insertion site</li> <li>5. Store pump in a safe place</li> <li>6. After 15 minutes, check blood sugar again</li> <li>7. Re-treat if necessary, until blood sugar is &gt; 70 mg/dl (&gt;3.9 mmol/L)</li> <li>8. If blood sugar is stable (70-150mg/dl or 3.9-8.3mmol/L), turn pump back on/reconnect</li> <li>9. Notify parent/guardian</li> </ol>
<p><b>Signs of Severe Low Blood Sugar</b></p> <ul style="list-style-type: none"> <li>√ Not able or unwilling to swallow</li> <li>√ Unconsciousness</li> <li>√ Seizure</li> <li>√ <b>GIVE NOTHING BY MOUTH!</b></li> </ul>	<ol style="list-style-type: none"> <li>1. Place student on side.</li> <li>2. If personnel are authorized to use Glucagon, give prescribed dose: _____ mg(s) or _____ units(s) on insulin syringe               <ul style="list-style-type: none"> <li><input type="checkbox"/> Intramuscular                      <input type="checkbox"/> Subcutaneous</li> </ul> </li> <li>3. Call 911, then parent and physician, notify school nurse</li> <li>4. Place pump in suspend or disconnect insulin pump at insertion site</li> <li>5. Remain with student until help arrives</li> <li>6. Pump needs to remain with the student if transported to hospital</li> </ol>

**TABLE 4:**

**STUDENT:** \_\_\_\_\_ **DOB:** \_\_\_\_\_

**TREATMENT PLAN: High Blood Sugar (Hyperglycemia)**

**Causes:**

- Illness
- Underestimated carbohydrates and bolus
- Insulin pump not delivering insulin
- Increased stress
- Excessive exercise without proper insulin

<b>If you see this:</b>	<b>Do This: ACTION PLAN</b>
<p><b>Signs of High Blood Sugar</b>                      Excessive thirst                      Frequent urination                      Hunger                      Nausea, vomiting                      Hyperactivity                      Headache                      Other</p>	<ol style="list-style-type: none"> <li>1. Accompany student to health office</li> <li><b>2. If nausea and vomiting, check ketones as soon as possible</b></li> <li>3. Check blood sugar</li> </ol>
<p><b>Treatment of High Blood Sugar</b></p>	<p><b>If the Blood Sugar is 150 – 300 mg/dl (8.3-16.7mmol/L):</b></p> <ol style="list-style-type: none"> <li>1. Give the correction bolus</li> <li>2. Recheck the blood sugar in 2 hours, re-bolus if necessary</li> </ol> <p><b>If the Blood Sugar is &gt; 300 mg/dl (&gt; 16.7mmol/L):</b></p> <ol style="list-style-type: none"> <li>1. Check urine or blood ketones (See <b>TREATMENT PLAN: Check Ketones</b> on next page)</li> <li>2. If ketones are negative, have the student give a correction bolus via the pump</li> <li>3. If ketones are positive, may need correction bolus via injection</li> <li>4. Contact school nurse and parents</li> <li>5. Recheck blood sugar and urine/blood ketones every 2 hours</li> <li>6. Call the parents</li> </ol> <p><b>If there are two consecutive unexplained Blood Sugar levels &gt; 300 mg/dl (&gt; 16.7 mmol/L) with or without ketones:</b></p> <ol style="list-style-type: none"> <li>1. Call the parents immediately</li> <li>2. May need to change the infusion set</li> <li>3. May need correction bolus via injection – school nurse should contact healthcare provider or parent for dosage instructions</li> </ol>

**TABLE 4 (continued)**

**STUDENT:** \_\_\_\_\_ **DOB:** \_\_\_\_\_

**TREATMENT PLAN: Check Ketones**

<p><b>How to check Urine Ketones using urine checking strips:</b></p> <ol style="list-style-type: none"> <li>1. Completely cover the colored square on the fluid end of the strip by dipping into fresh urine</li> <li>2. Immediately remove the strip from the urine</li> <li>3. Gently tap the edge of the strip to remove excess urine</li> <li>4. Wait 15 seconds using the second hand on a watch (if using Ketostix®)</li> <li>5. Wait one minute if using the Chemstrip uGK® strip</li> <li>6. Compare the check strip area with the corresponding color chart</li> <li>7. Record the appropriate urine ketone result</li> </ol>	<p><b>How to treat Urine Ketones:</b></p> <p><b>Urine Ketones = Trace – Small</b></p> <ol style="list-style-type: none"> <li>1. Have the student drink 8-oz. of sugar-free fluid every hour until ketone free</li> <li>2. Recheck blood sugar in 2 hours</li> <li>3. If ketones are still present, call parents</li> </ol> <p><b>Urine Ketones = Moderate – Large</b></p> <ol style="list-style-type: none"> <li>1. Recommend release student to parent/guardian for closer monitoring and management</li> <li>2. May need to administer correction bolus by pump or injection or by syringe as directed by healthcare provider or parent/guardian</li> <li>3. Have the student drink 8-oz. of sugar-free fluid every hour until ketone free</li> </ol>
<p><b>How to check Blood Ketones using Precision Meter and Blood Ketone checking strips:</b></p> <ol style="list-style-type: none"> <li>1. Obtain a blood sample from the finger</li> <li>2. Apply blood sample to the ketone electrode strip</li> <li>3. Apply enough blood to the strip to start the count down process</li> <li>4. A numeric value will appear at the end of the blood ketone checking process</li> </ol>	<p><b>How to treat Blood Ketones:</b></p> <p><b>Below 0.6 mmol/L = negative Blood Ketones</b></p> <ol style="list-style-type: none"> <li>1. No action needed</li> </ol> <p><b>0.6 to 1.5 mmol/L = trace to small Blood Ketones</b></p> <ol style="list-style-type: none"> <li>1. Have the student drink 8-oz. of sugar-free fluid every hour until ketone free</li> <li>2. Recheck blood sugar in 2 hours or recheck urine ketones in 2 hours</li> <li>3. If ketones are still present, call parents/guardian</li> </ol> <p><b>Above 1.5 mmol/L = moderate to large Blood Ketones</b></p> <ol style="list-style-type: none"> <li>1. Recommend release student to parent/guardian for closer monitoring and management</li> <li>2. May need to administer correction bolus via injection</li> <li>3. Have the student drink 8-oz. of sugar-free fluid every hour until ketone free</li> </ol> <p><b>Above 3.0 mmol/L = very large Blood Ketones</b>          Contact parents or healthcare provider          May need more intensive medical care</p>

**TABLE 5:****STUDENT:** \_\_\_\_\_ **DOB:** \_\_\_\_\_**Field trip information:**

1. Notify parent and school nurse in advance so proper training can be accomplished.
2. Adult staff must be trained and responsible for student's needs on field trip.
3. Extra snacks, blood sugar meter, copy of health plan, glucose gel or other emergency supplies must accompany student on field trip.
4. Adult(s) accompanying student on a field trip will be notified of student's health accommodations on a need-to-know basis.

<b>SUPPLIES</b>	<b>NEEDED</b>	<b>NOT NEEDED</b>
Blood sugar meter and blood sugar strips	<input type="checkbox"/>	<input type="checkbox"/>
Lancets with lancing device	<input type="checkbox"/>	<input type="checkbox"/>
Blood ketone strips (if using the Precision meter)	<input type="checkbox"/>	<input type="checkbox"/>
Urine ketone strips	<input type="checkbox"/>	<input type="checkbox"/>
Insulin syringes	<input type="checkbox"/>	<input type="checkbox"/>
Antibacterial skin cleanser or alcohol wipes	<input type="checkbox"/>	<input type="checkbox"/>
Insulin pump cartridge/reservoir	<input type="checkbox"/>	<input type="checkbox"/>
Insulin pump infusion set	<input type="checkbox"/>	<input type="checkbox"/>
Transparent dressings	<input type="checkbox"/>	<input type="checkbox"/>
Insulin pump batteries	<input type="checkbox"/>	<input type="checkbox"/>
Quick-serter/Sof-serter/Sil-serter (if used)	<input type="checkbox"/>	<input type="checkbox"/>
Bottle of refrigerated rapid-acting insulin – Humalog (Lispro)/NovoLog (Aspart)	<input type="checkbox"/>	<input type="checkbox"/>
Pump alarm card	<input type="checkbox"/>	<input type="checkbox"/>
Glucose tabs, Cake Mate gel, juice, or other source of glucose	<input type="checkbox"/>	<input type="checkbox"/>
Carbohydrate snack	<input type="checkbox"/>	<input type="checkbox"/>
Glucagon Emergency Kit* (if delegated by RN)	<input type="checkbox"/>	<input type="checkbox"/>
Pump manual	<input type="checkbox"/>	<input type="checkbox"/>
Sharps container	<input type="checkbox"/>	<input type="checkbox"/>
Copy of current basal rates and bolus dosing	<input type="checkbox"/>	<input type="checkbox"/>

<b>PUMP COMPANY NAME</b>	<b>24-HOUR HELP PHONE NUMBER</b>
MiniMed	1-800-826-2099
Deltec	1-800-426-2448
Roche/Disetronic	1-866-703-3476
Animas	1-877-767-7373

A parent/guardian of the above named student, I give my permission to the school nurse and other designated staff to perform and carry out the diabetes tasks as outline in the Individualized Health Plan (IHP) and for my child's healthcare provider to share information with the school nurse for the completion of this plan. I understand that the information contained in this plan will be shared with school staff on a need to know basis. It is the responsibility of the parent/guardian to notify the school nurse whenever there is any change in the student's health status or care.

Parent/Guardian: \_\_\_\_\_ Date: \_\_\_\_\_

School Nurse: \_\_\_\_\_ Date: \_\_\_\_\_

## TABLE 6:

### CONTINUOUS GLUCOSE MONITORING (CGM) IN THE SCHOOL:

\*A continuous glucose monitor reads glucose levels from a sensor in the interstitial fluid (under the skin). It usually reads within 20% of a finger stick blood sugar value. It can be programmed to alert (vibrate or alarm) for high and low glucose levels. CGM is meant to provide additional glucose information. It is not approved for use in making treatment decisions.

**Always make sure hands are clean and check a blood sugar via finger stick before performing treatment.**

#### **ALERT SETTINGS**

CGM will alert if interstitial glucose (sugar) is less than \_\_\_\_\_ or above \_\_\_\_\_. If CGM alerts for low or high glucose levels, check finger stick blood sugar and treat according to doctor's care plan.

#### **ARROWS**

Some continuous monitors show arrows on the screen to indicate the speed at which the glucose levels are changing. Arrows on the face of the monitor may point straight down, indicating a rapidly falling glucose level. Treatment should then be as in A. 2. below. The arrows may also point straight up, which means a rapid increase in glucose level. Treatment should be as in C. below. A horizontal or 45° arrow (or one arrow in contrast to two arrows) may mean that the glucose level is not changing as rapidly.

#### **WHEN TO USE CGM INFORMATION**

##### **A. Lows or Pending Lows**

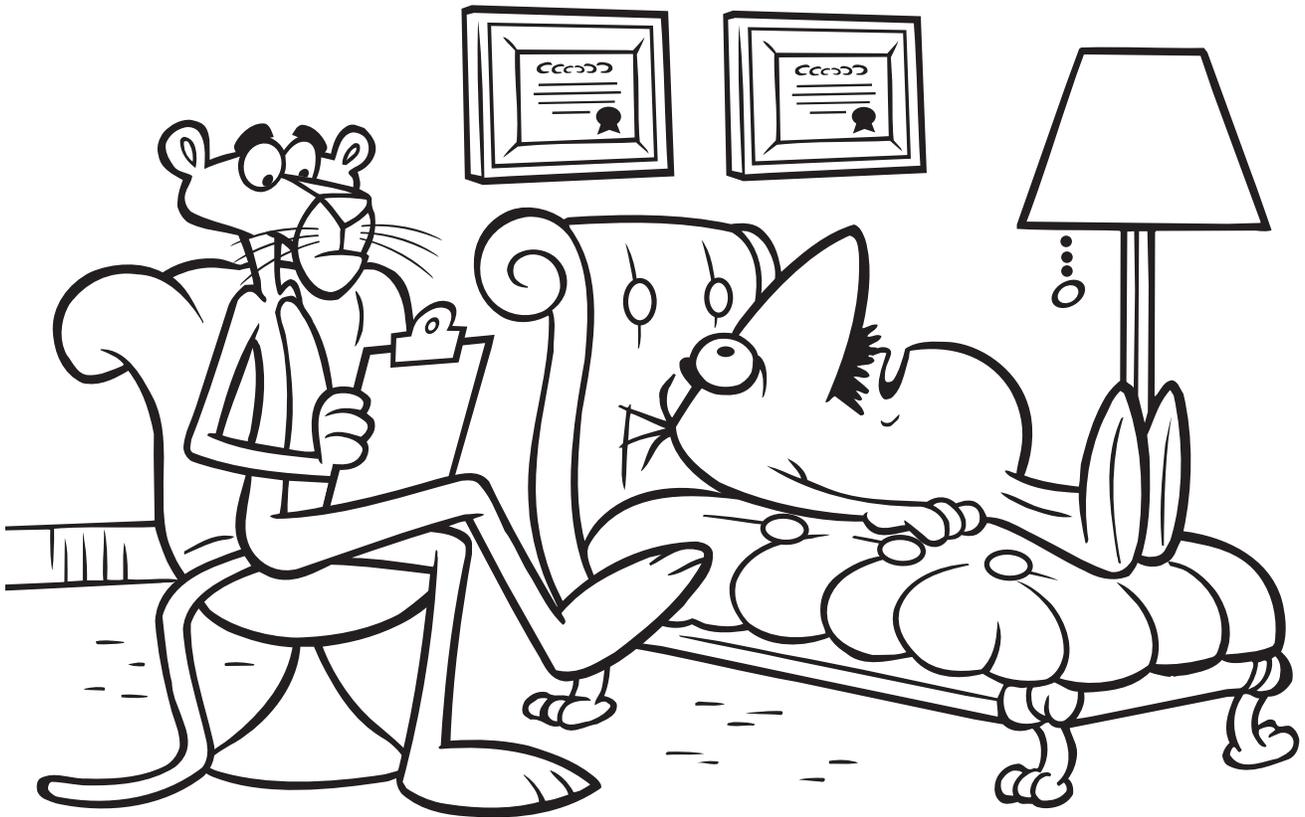
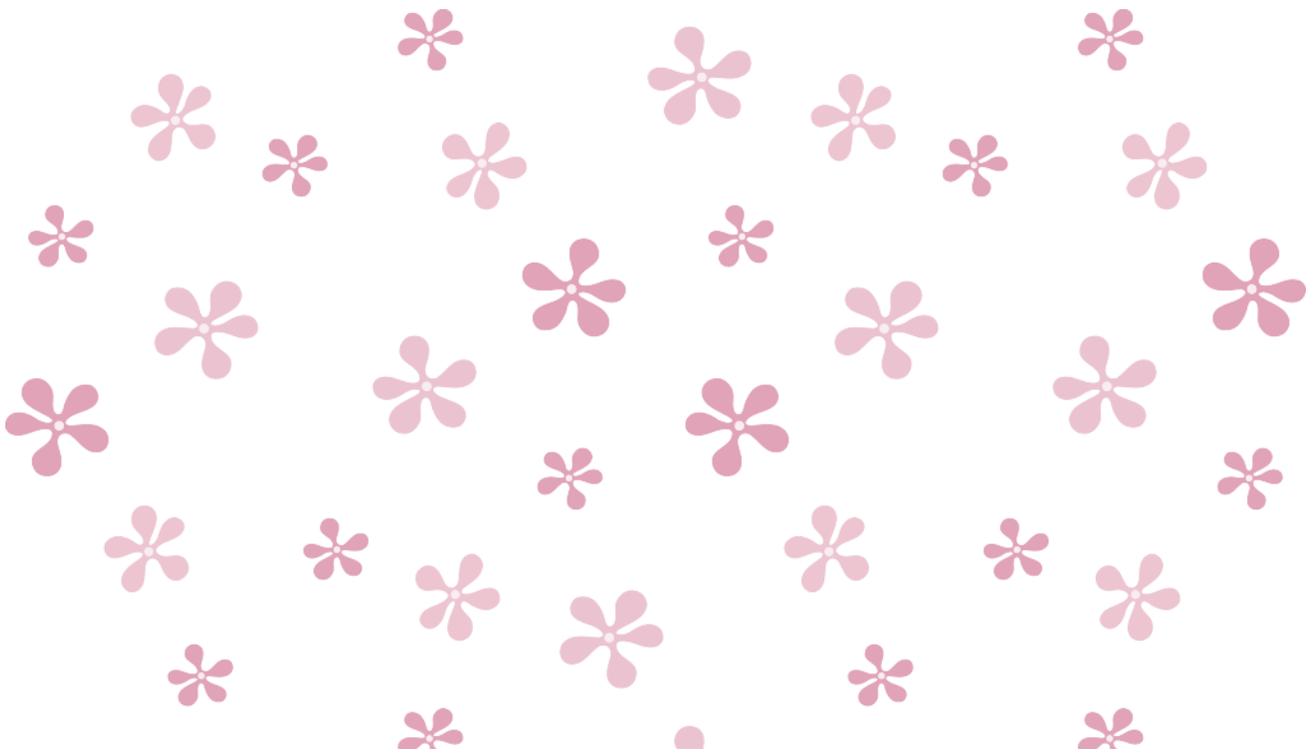
- 1. CGM screen shows < 70 mg/dl (< 3.9 mmol/L) with or without arrow(s):** Check finger blood sugar and if low proceed with doctor's care plan for treatment and food. Repeat blood sugar every fifteen minutes until level is above 70 mg/dl (3.9 mmol/L).
- 2. CGM screen shows < 100 mg/dl (< 5.5 mmol/L) with downward arrow(s):** Check finger stick blood sugar. If blood sugar is between 70 and 100 mg/dl (3.9 – 5.5 mmol/L) give 5-10 grams of carbohydrate (to prevent blood sugar from going lower). If < 70 mg/dl (3.9 mmol/L) proceed with doctor's care plan for treatment and food.

##### **B. Glucose levels in good range**

- 1. CGM screen shows 80-200 mg/dl (4.5 – 11.1 mmol/L):** Check blood sugar as usual per care plan or if symptomatic.

##### **C. Highs or Pending Highs**

- 1. CGM screen shows > 200 mg/dl (> 11.1 mmol/L) with upward arrows or > 250 mg/dl (> 13.9 mmol/L):** Check finger stick blood sugar and follow doctor's care plan for treatment of high blood sugar. Recheck blood sugar in two hours. If still high, call parent. Check ketones and, if positive, give correction insulin dose with a standard syringe or an insulin pen.



**SOCIAL WORKERS AND PSYCHOLOGISTS  
ARE THERE TO HELP YOU.**