

Update on Insulin Pump Therapy

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Children with diabetes are using pump therapy in greater numbers than ever before. When students with diabetes make the leap from injection therapy to insulin pump therapy, everyone involved in their care, including school nurses and staff members, must be prepared to make the leap with them. School nurses, in particular, need a higher level of understanding and competence than other school personnel.

This article provides an overview about pump therapy and how to help students manage their use of the pump in the school setting.

Advantages of Insulin Pump Therapy

All children with type 1 diabetes require insulin from an outside source. To live with diabetes, they must control their blood glucose by balancing food, insulin, and exercise. Insulin can be given by traditional injection, pen, or pump. The pump acts somewhat like the pancreas by delivering insulin continuously. The insulin pump has several advantages over other forms of insulin delivery:

Precise — The pump delivers insulin in precise units — as little as one tenth of a unit — that can be closely matched to needs.

Predictable — Absorption of short-acting insulin, which is used in the pump, is more predictable than that of long-acting insulin.

Continuous delivery — The pump delivers background or basal insulin 24 hours a day and also allows the user to change the amount delivered on an hourly basis, if necessary.

Convenient — The pump holds a supply of insulin for several days and it eliminates the need for scheduled injections since it delivers insulin continuously.

Individualized therapy — The pump can be programmed to meet each person's needs and is easily adjusted to keep blood glucose levels in the target range during illness or physical activity.

Smart — Most current pumps calculate insulin doses needed based on carbohydrate intake, user's personal insulin-to-carbohydrate ratio and insulin sensitivity factor, and insulin still active in the body from the previous dose.

Improved control — The pump can be lifesaving for children who have a history of widely fluctuating blood glucose levels. People who use the pump are better able to keep their blood glucose in the target range.

Flexibility — The pump gives children more freedom to vary when, what and how much they eat, through the continuous infusion of short-acting insulin and the ability to “cover” with additional doses as needed.

How the Insulin Pump Works

Insulin pumps are computerized devices that look similar to a pager or beeper. The pump is attached to its user through a cannula that is inserted through the skin and taped into place. A needle is used to insert the cannula and then removed. The sites used most often include the fatty tissue areas of the abdomen, buttocks, thigh or arm. The pump site needs to be changed every 48 to 72 hours. Pumps deliver insulin in two ways.

Basal insulin refers to the steady dose of short-acting insulin that the pump delivers throughout the day. Approximately half of the total insulin for the day might be received in the basal insulin that is pre-programmed. In most cases, the nurse will not have to make any changes in the dosage.

Pumps also deliver *bolus* doses of insulin. When the student checks blood glucose and inputs carbohydrate count, the pump suggests the insulin bolus dose needed to correct the blood glucose to the target range and accommodate carbohydrate intake. The student or care giver then pushes a button to deliver the bolus dose of insulin. The bolus is given at meal or snack time or to lower blood glucose when it is too high. Students should come to school with a functioning site and enough insulin in the pump reservoir to last through the school day. The following back-up supplies should be available in the school nurse's office: batteries, 2 infusion sets, infusion set inserter device if needed, 2 insulin reservoirs, insulin bottle, traditional syringe or insulin pen and pen needle, skin prep supplies (disposable pad that cleanses skin), alcohol wipes, a user manual for the pump, a quick programming card, ketone strips, blood glucose testing supplies, glucagon kit, and glucose tablets.

How to Handle Common Problems

Even with diligent self-care, a student's pump site can become nonfunctional during the school day and may require the involvement of the school nurse. The cannula can accidentally fall out or get pulled out. The cannula can become occluded fully or partially under the skin and prevent or interfere with insulin absorption. When a student has used more insulin than usual since the last site change, the pump can run out of insulin. Pumps can break.

If steady delivery of insulin is compromised due to these or other problems, the blood glucose rises quickly, hyperglycemia symptoms escalate, and within a few hours,

the student can progress into DKA (diabetic ketoacidosis). School nurses and staff members must understand that students who use an insulin pump have no long-acting insulin to help prevent the progression to DKA. Therefore, students must be able to respond quickly to any situation that interferes with steady delivery of insulin. They either may change the site in school, with help from the school nurse or a trained school staff member, or they may take an injection of insulin to make up for missed basal and bolus doses.

Care Plans for the Student with a Pump

All children who use pumps should have a school healthcare plan that carefully spells out the responsibilities of the school nurse, the level of self-direction of the student, emergency contact numbers, and a plan for an alternative form of insulin delivery. The student's healthcare provider should include current basal dose, bolus dose for high blood glucoses, and bolus dose for meals/snacks. Boluses for meals are given according to the amount of carbohydrates eaten. The student's healthcare plan also should include a protocol for handling pump problems. This protocol should be individualized to the student's abilities and to the school nurse's comfort level. Children who wear pumps can participate in all school activities. They can leave the pump in place during most athletic activities and they have flexibility in food choices and meal timing. As noted above, when students suspect problems with their pumps, they may need to go to the nurse's office quickly and may not be able to wait until the end of class.

To be safe with insulin pump therapy in school, students must:

- check their blood glucose multiple times throughout the day, preferably in the location where they are at the time they need to test;
- respond to low or high blood glucose readings;
- receive help when blood glucose levels are low or high; and
- never go to the nurse's office or anywhere alone when they are experiencing high or low blood glucose episodes.

Pump Information and Training Resources

To be prepared to assist students with diabetes who use pumps, school nurses should achieve technical competence with the following pump therapy tasks:

- inserting the pump cannula (if the student's healthcare plan specifies this task);
- delivering a dose of insulin through the pump (bolus);
- checking pump memory (time of the last bolus dose);
- troubleshooting steps (how to determine if there is a problem with the pump); and
- replacing batteries.

School nurses have several options for obtaining training in insulin pump therapy. Diabetes educators and insulin pump company staff members often provide training for school nurses and staff. Contact the local chapter of the American Association of Diabetes Educators to discuss your training needs. The back cover of most pumps lists a toll-free telephone number that can be called for technical assistance or for obtaining copies of user manuals from manufacturers (see the list below). In addition, most children who use insulin pumps live with adults who are very involved in their diabetes care and are trained in use of the pump. Many of these people are capable of providing school nurses with necessary training.

Conclusion

We all have a role in helping the student with diabetes succeed. School nurses are encouraged to obtain a copy of the National Diabetes Education Program's publication "Helping the Student with Diabetes Succeed: A Guide for School Personnel," to put an effective management approach in place in their schools. The school guide can be obtained by calling (800) 438-5383 or by visiting the program's website at www.ndep.nih.gov and downloading a copy. Furthermore, the American Diabetes Association (ADA) offers a set of companion instructional modules, based on the school

guide, for healthcare professionals to train school personnel on diabetes care tasks. The modules can be downloaded free of charge from the ADA's website at www.diabetes.org/schooltraining.

On a personal note, having raised two children with diabetes who are pump users, my hope for every school-aged child with diabetes is to receive the support of a school nurse who has the time and interest to learn all that is needed to grow into the role of a well-informed care giver and advocate.

SOURCES FOR SUPPORT

Insulin Pump Companies

- Animas (www.animascorp.com; 1-877-937-7867)
- Medtronic Minimed (www.minimed.com; 1-800-933-3322)
- Nipro (www.niprodiabetes.com; 888-651-7867)
- Omnipod (www.myomnipod.com; 1-800-591-3455)
- Roche (www.disetronic-usa.com; 800-280-7801)
- Smith Medical (www.DeltecCozmo.com; 1-800-826-9703)

Diabetes Organizations

- American Association of Diabetes Educators (www.diabeteseducator.org)
- American Diabetes Association (www.diabetes.org)
- Centers for Disease Control and Prevention (www.cdc.gov/diabetes)
- Children with Diabetes (www.childrenwithdiabetes.com)
- Juvenile Diabetes Research Foundation (www.jdrf.org)
- National Diabetes Education Program (www.ndep.nih.gov)
- National Institute of Diabetes and Digestive and Kidney Diseases (www.niddk.nih.gov) 

ABOUT THE AUTHOR

Catherine Marschilok, MSN, CDE is Board Certified in Advanced Diabetes Management and has certification in Animas, Deltec, Medtronic Minimed and Omnipod Insulin Pumps. She currently serves on JDRF's Clinical Affairs Advisory Committee and International Public Affairs Committee and on the National Diabetes Education Program's Diabetes in Children and Adolescents Work Group.