

## **Glucagon Education for School Nurses in Tennessee**

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**Objectives: At the end of this module the school nurse will be able to:**

- 1. State what glucagon is and describe its action medically.**
- 2. State when, how and by whom it can be prescribed.**
- 3. Describe the new glucagon law in Tennessee (Tennessee Code/Title 49 Education/Chapter 5 Personnel/Part 4 Employment and Assignment of Personnel/49-5-415. Assistance in self-administration of medications - Administration of glucagons by volunteers. Public Chapter No. 808, signed into law on June 11, 2002).**
- 4. State when glucagon should be given, how it should be prepared, the dosage and side effects, as well as follow-up care after glucagon is given.**
- 5. State how glucagon should be stored including identifying its expiration date and need for replacement.**
- 6. Describe the role of the school nurse in delegation of glucagon administration.**
- 7. State the signs of hypoglycemia in insulin dependent school aged children with diabetes mellitus. Describe the proper short term and long-term treatment of hypoglycemia in school-aged children in order to prevent the need for glucagon.**

**Objective one: What is glucagon?**

Glucagon (GLOO-ka-gon) is a hormone that raises the level of glucose in the blood. The alpha cells of the pancreas, in areas called the islets of Langerhans, make glucagon when the body needs to put more sugar into the blood. Glucagon also is an emergency medicine used to treat severe hypoglycemia, (low blood sugar) in patients with diabetes who have lost consciousness or cannot take some form of sugar by mouth. Glucagon raises blood glucose levels. It does this by causing the breakdown of glycogen stored in the liver into glucose. Glucose is then released into the blood stream. Glucagon, like insulin, must be injected. (If it were taken by mouth, stomach acids would destroy it). It may be injected safely into fat, muscle or a vein. Once injected, glucagon's effect is almost instantaneous--blood glucose levels rise within 2 to 10 minutes. Glucagon is considered a "drug of last resort." Minutes count when the child is at risk for brain damage.

**Objective two: To whom is it prescribed, when and by whom?**

Anyone who uses insulin or a sulfonylurea is at risk for severe hypoglycemia and, therefore, may require glucagon. Severe hypoglycemia means a low blood glucose that can't be treated with sugar by mouth because the person is drowsy, confused, unconscious or having convulsions. Glucagon can be used then because it's given by injection.

In the United States, the glucagon kit is dispensed by prescription only as a Glucagon Emergency Kit or a Glucagon Emergency Kit for Low Blood Sugar. A physician or a nurse practitioner must write this prescription. It is recommended that a child in school have one kit at home and one at school.

**Objective three: What is the new law in Tennessee regarding the administration of Glucagon in schools?**

On June 11, 2002, the Tennessee Code Annotated, Section 49-5-415 was amended as follows:

(b) In addition to the assistance with self-administration of medications provided for in subsection (a), school personnel who volunteer under no duress or pressure and who have been properly trained by a registered nurse employed or contracted by the LEA may administer glucagon in emergency situations to a student based on that student's individual health plan (IHP). However, if a public school nurse is available and on site, the nurse shall provide this service to the student. The public school nurse employed or contracted by the LEA shall be responsible for updating and maintaining each IHP. The department of health and the department of education shall jointly amend current "Guidelines for Use of Health Care Professionals and Health Procedures in a School Setting" to reflect the appropriate procedures for use by registered nurses in training volunteer school personnel to administer glucagon. The Board of Nursing must be afforded the opportunity to review and comment on the guidelines before they take effect and any training begins. The guidelines developed must be used uniformly by all LEAs which choose to allow volunteer school personnel to administer glucagon. *Training to administer glucagon shall be repeated annually and competencies shall be documented in the employee's personnel file.* The provisions of subdivision (a)(3) regarding protection from liability shall apply also to the volunteers who provide services pursuant to this subsection (b) and the registered nurses who provide their training. [Acts 1996, ch. 979, §§ 1,2; 2002, ch. 808, § 1.]

**Objective four: When should glucagon be given, by whom and how much (dosage) and preparation?**

When you're considering using glucagon, remember: It can only help--it can't harm. It is virtually impossible to overdose on glucagon, and it is hard to give it incorrectly. Unless corrected, severe hypoglycemia will lead to unconsciousness, convulsions (seizures), and possibly death. Severe hypoglycemia means a low blood glucose that can't be treated with sugar by mouth because the person is drowsy, confused, unconscious, or having convulsions. Glucagon can be used because it's given by injection. If severe symptoms such as convulsions (seizures) or unconsciousness occur, the patient with diabetes should not be given anything to eat or drink. There is a chance that he or she could choke from not swallowing correctly. Glucagon should be administered, and the parent and student's doctor should be called at once.

Glucagon should be injected by someone trained to do so when the person with diabetes is unable to take sugar by mouth to treat low blood glucose. It's helpful, but not necessary, to test the blood glucose first to confirm hypoglycemia. Glucagon treatment requires a manually dexterous person who is composed, confident and competent in the whole procedure. In Tennessee schools if a licensed health professional is present when glucagon is needed, they should administer it. Parents are also trained to give glucagon, but if neither of the former are

present, the teacher or other responsible person must know the staff member that has been trained by the school nurse and call that person immediately.

Glucagon, like insulin, must be injected. Within the glucagon kit are a syringe pre-filled with a liquid and a vial of powdered glucagon. You prepare the glucagon for injection immediately before use by following the instructions that are included with the glucagon kit. The diluent should be injected into the vial with the glucagon powder and the two mixed together. Then the liquefied glucagon should be drawn up into the syringe. In general, small children (under 20 kg, or 44 pounds) are given  $\frac{1}{2}$  cc (half the syringe), while older children and adults are given 1cc (the entire syringe). In children, some authorities advise using  $\frac{1}{2}$  cc to start with, and then giving the other  $\frac{1}{2}$  about 20 minutes later if needed. This method can lessen the rebound hyperglycemia that usually ensues after use of glucagon. There is no danger of overdose, however. The injection is usually given in a large muscle, such as the buttocks, thigh or arm. (The needle on the syringe is usually larger than those on insulin syringes).

**Objective five: What are the side effects and follow-up care after administration of glucagon as well as storage needs?**

It's true that some people vomit after receiving glucagon. Because of this, be sure to place the person on his or her left side prior to injecting or immediately afterwards so they do not choke. The affected student should become conscious in less than 15 minutes *after* glucagon is injected, but if not, a second dose may be given. Get the patient to a doctor or to emergency care as soon as possible because being unconscious too long can be harmful. In some instances, someone should call 911, while another person injects the glucagon.

After injecting glucagon, when the person regains consciousness and is able to swallow, offer some form of sugar followed by food. Glucagon is not effective for much longer than 1 1/2 hours, and glucose levels need to be restored. The printed expiration date on the glucagon does not apply after mixing, so any unused portion must be discarded, and the prescription refilled.

Replace the supply of glucagon as soon as possible. in case another hypoglycemic episode occurs. Glucagon should not be mixed or used after the expiration date printed on the kit and on the vial. Check the date regularly and replace the glucagon before it expires.

To store glucagon:

Keep glucagon out of the reach of other children.

Store glucagon away from heat and direct light.

Store the unmixed glucagon at room temperature.

Do not store the unmixed glucagon in a bathroom, near a sink, or in other damp places. Heat or moisture may cause the glucagon to break down.

Do not keep outdated glucagon or glucagon, which is no longer needed. Be sure that any discarded glucagon is out of the reach of children.

In the school setting, glucagon must be easily accessible in a place known to nurses and other school personnel to whom the nurse has delegated this procedure. An older child who is competent may be allowed to carry the glucagon kit in his/her backpack as they move about the school grounds, but school personnel must be aware that the student carries it. It should not be exposed to heat in the sun or in a parked car in the summer. Nor should glucagon be carried in a pocket—body temperature will over time destroy the effectiveness of the hormone.

**Objective six: What is the RN school nurses' role in delegation of glucagon administration? Who to train, how to train, how to supervise and when to update?**

School districts in Tennessee may adopt the policy put forth in the new law or continue to have only licensed personnel (nurses) in the school administer glucagon. The school should consider the location of the school in relation to local hospitals as well as parents' requests and EMS response times.

According to the new Tennessee law "school personnel who volunteer...and who have been properly trained by a registered nurse employed or contracted by the local education agency may administer glucagon in emergency situations to a student based on that student's individual health plan"... "The department of health and the department of education shall jointly amend current "Guidelines for Use of Health Care Professionals and Health Procedures in a School Setting" to reflect the appropriate procedures for use by registered nurses in training volunteer school personnel to administer glucagon."... "The guidelines developed must be used uniformly by all local education agencies which choose to allow volunteer school personnel to administer glucagon."

Registered nurses doing this training should keep in mind that, in one study, sixty-nine percent of parents had difficulty (preparing and administering glucagon) ranging from opening the container to drawing the correct dose into the syringe. All of these parents had had verbal instruction and demonstration. The researchers suggested that glucagon administration needs to be taught "hands on" with time to practice, and the skill reassessed on an annual basis.\*

\*Harrism, G. et al. "Glucagon Administration—under evaluated and under taught" Diabetes Centre, Royal North Shore Hospital, New South Wales, Australia.

**Objective seven: How can school personnel and families avoid the need for glucagon?**

Early symptoms of hypoglycemia include:

Anxious feeling, behavior change similar to being drunk, blurred vision, cold sweats, confusion, cool pale skin, difficulty in concentrating, drowsiness, excessive hunger, fast heartbeat, headache, nausea, nervousness, nightmares, shakiness, slurred speech, and unusual tiredness or weakness. Symptoms of hypoglycemia can differ from person to person. It is important that diabetic children learn their own signs of low blood sugar so that it can be treated quickly. It is a good idea also to check their blood sugar to confirm that it is low.

School personnel should know what to do if symptoms of low blood sugar occur to prevent the need for glucagon. Eating or drinking something containing sugar when symptoms of low blood sugar first appear will usually prevent them from getting worse, and will probably make the use of glucagon unnecessary. Good sources of sugar include glucose tablets or gel, corn syrup, honey, sugar cubes or table sugar (dissolved in water), fruit juice, or 6 ounces of nondiet soft drink. If a meal is not scheduled soon (1 hour or less), the diabetic student should also eat a light snack, such as crackers and cheese or half a sandwich or drink a glass of milk to keep their blood sugar from going down again. They should not eat hard candy or mints because the sugar will not get into the blood stream quickly enough. They also should not eat foods high in fat such as chocolate because the fat slows down the sugar entering the blood stream.

After 10 to 20 minutes, the student's blood sugar should be checked again to make sure it is not still too low. The school nurse should notify the parent or doctor right away if the symptoms do not improve after eating or drinking a sweet food.

One in six children and adolescents with type one diabetes may experience severe hypoglycemia in a single year. Intensive diabetes management may double or triple the risk of severe hypoglycemia. Some diabetic children who participate in after school sports should do blood glucose testing at 3pm (prior to the exercise), and based on the level, take an appropriate snack and have a sugar source available. It may be necessary to train a school employee that is available after school in glucagon administration as school nurses are not usually available after school hours.

### **Glucagon Education Module Test**

1. When is glucagon given?
  - a. during an episode of hypoglycemia
  - b. when the diabetic child has lost consciousness during severe hypoglycemia
  - c. when the child has not taken insulin, but he has eaten a full meal
  - d. when any school aged child is having a seizure
  
2. What is the usual dose of glucagon for a child who weighs less than 45 pounds?
  - a. ½ ml. subq or IM
  - b. 1 ml subq or IM
  - c. 1 mgm/Kgm. orally
  - d. 0.5 mgm/Kgm. orally
  
3. Immediately after administering glucagon the school nurse should:
  - a. call the parents of the child
  - b. call the doctor
  - c. take the child's blood pressure
  - d. turn the diabetic child on their side
  
4. Before giving glucagon, it is necessary to:
  - a. mix the diluent with the powdered glucagon and draw the mixture into a syringe
  - b. weigh the child and calculate a dosage
  - c. take a blood glucose level
  - d. get a verbal order for its administration from the child's doctor
  
5. Glucagon should be stored:
  - a. in an airtight container in the refrigerator
  - b. away from high humidity and temperatures above 90 degrees
  - c. in a locked box in the school health office

- d. in the principal's office but not locked up
6. In Tennessee as of June 2002:
- a. only licensed health professionals can administer glucagon
  - b. only EMT's can give glucagon
  - c. non-licensed school staff may give glucagon if an RN has trained them
  - d. only non-licensed school staff can give glucagon
7. What is the best way to avoid having to give glucagon?
- a. home school all unstable diabetic school-aged children
  - b. prevent episodes of severe hypoglycemia by consistent glucose monitoring
  - c. anytime the child says they have low blood sugar give them 12 ounces of regular cola
  - d. administer 5 units of humulin insulin for every carbohydrate serving the child has eaten
8. What characteristics should the school nurse look for in choosing whom to train to give glucagon in emergencies?
- a. dexterity, confidence, competence, and the ability to stay calm in stressful situations
  - b. a person who is diabetic and already on insulin
  - c. coaches, health educators and physical education teachers
  - d. a volunteer who works regularly in the school as a teacher's aide
9. Unless corrected, hypoglycemia will lead to:
- a. unconsciousness
  - b. convulsions
  - c. possibly death
  - d. all of the above
10. After giving the injection of glucagon, the child with diabetes should regain consciousness within:
- a. an hour
  - b. 20-30 minutes
  - c. 15-20 minutes
  - d. 2-10 minutes
11. Once the child with diabetes who is unconscious has had glucagon and has revived, the school nurse or person to whom she has delegated the task should:
- a. offer the alert child a sugar source such as glucose tablets or Cake Mate gel
  - b. call the child's parents

- c. call the child's doctor
  - d. anticipate nausea and/or vomiting
  - e. all of the above
12. The reason the child who has been given glucagon should receive a meal within an hour after the hypoglycemic episode is:
- a. he or she will be hungry
  - b. the child will feel that the incident is over and he/she is normal
  - c. the effects of glucagon only last an hour and a half
  - d. the child's blood sugar will remain low until he/she eats
13. The registered nurse who works in the school system in Tennessee must have:
- a. an individualized health plan for every diabetic child according to the 2002 law on glucagon
  - b. a protocol, which covers any and all diabetic school-aged children
  - c. a school system wide policy covering the decision to allow trained school staff to administer glucagon
  - d. malpractice insurance
14. Each registered nurse who works in the schools as an employee or by contract must, by law, in Tennessee:
- a. use an up to date pediatric nursing textbook to teach school staff to administer glucagon
  - b. use the new state "Guidelines for Use of Health Care Professionals and Health Procedures in a School Setting"
  - c. use the protocols and procedures prepared by the American Diabetic Association regarding glucagon
  - d. ask their local diabetic educator to prepare a class and instruct the volunteers from the local schools
15. The volunteers at the schools, in which children with insulin dependant diabetes are enrolled, shall be retrained in glucagon administration:
- a. every 90 days
  - b. twice a year
  - c. annually
  - d. no retraining is necessary

KEY 1.b 2.a 3.d 4.a 5.b 6.c 7.b 8.a 9.d 10.d 11.a 12.c 13.a 14.b 15. c