Application Example

Regulating Insulin During Exercise

SETTING

Ms. Jones is a middle school physical educator in a large school district who has decided to start the school year with an aerobic exercise unit to help her students with fitness and give them options to do at home. Her hopes are to increase fitness by the end of the year and also incorporate aerobic homework after the unit concludes.

STUDENT

Carol is a 13-year-old middle schooler who has type 1 diabetes. She is active at home but does not play sports or engage in any other structured physical activities. She has been having trouble with low blood sugar since her most recent growth spurt. Although she is aware of her needs and completely independent in monitoring her blood sugar, she is worried about the upcoming aerobic activities unit; the class runs for over an hour, and her past physical activity experiences have been half-hour classes.

APPLICATION

After consulting her parents and the school nurse, the team has decided that it might be a good idea to have Carol check her blood sugar at the beginning, middle, and end of the class to ensure that she is not experiencing low blood sugar as a result of the increased physical activity. This will relieve Carol's anxiety about having low blood sugar around her new peers. The following points are also important to consider:

- Carol's growth spurt is probably due to puberty, which can affect energy requirements during the day as well as result in the normal self-consciousness that many children experience as their bodies change. Further, the insulin dosage for this child may need to be altered depending on exercise intensity.
- Because Carol is not an experienced exerciser, how her body responds to low- to moderate-intensity physical activity may vary and require monitoring (see earlier explanation of exercise-induced hyperglycemia versus exercise-induced hypoglycemia).

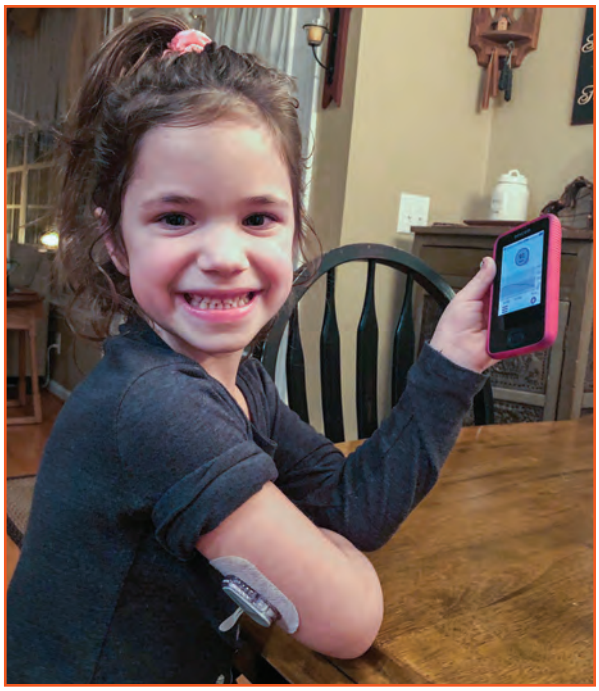

Photo courtesy of Francis Kozub.

FIGURE 17.1 Insulin pumps can now be connected to Bluetooth technology and provide easier access to blood sugar levels in children.

in the fatty tissue under the skin, have become the preferred method of delivery (Maas et al., 2010). For youths, the insulin pump has some advantages, including a reduced risk of hypoglycemia during and following exercise. However, if the pump fails to deliver insulin during exercise, the risk of life-threatening hyperglycemia is increased due to the lack of insulin and the heightened physical activity. Further, temperature is a concern because high or low temperatures degrade the insulin in the pump (Colberg et al., 2016). Instructors responsible for students who use insulin pumps must be aware of the importance of maintaining the pump as well as the integrity of the infusion site.

Exercise in general has significant advantages and is only contraindicated if there is a risk for elevated blood pressure due to poor management of blood sugar levels. Further, individuals with diabetic neuropathy should avoid contact sports (Tran & Galassetti, 2014). Neuropathy is a condition in which nerves in the hands and feet are damaged, resulting in tingling and numbness. Physical educators must be aware of circulation problems and neuropathy in children with diabetes, which can affect foot health and general skin care. It is not

recommended that people with diabetes participate in physical activity while barefoot. Socks, water slippers, and other types of appropriate footwear should be available for use during physical activity to avoid the risk of cuts, blisters, and other foot injuries.

Seizure Disorders

Seizures in children and adults are the most common neurological disorder globally, and many people with seizure disorders are advised to avoid regular physical activity because of concerns over safety (Brna et al., 2017). Misunderstandings about seizures and potential contraindications with physical activity are important concerns for physical educators. First, the nature of seizures must be understood. Seizures result when abnormal electrical activity occurs in the brain, causing involuntary movements; varied sensations, perception, and behavior; and altered levels of consciousness. Although seizures are common, the Centers for Disease Control place the prevalence at 1.2 percent of the U.S. population (CDC, 2019b). **Epilepsy**, a condition in which seizures occur with relative frequency, occurs in about 1 percent of children. Uncontrolled and prolonged seizures have the potential to result in serious long-term and even fatal consequences. For this reason, proper attention to help reduce seizures as well as monitor the frequency and duration of episodes is necessary.

Types of Seizures

There are multiple systems used for categorizing seizures. In the system commonly used in educational settings, seizures are classified as either generalized or partial seizures. **Generalized seizures** can be **tonic–clonic** (**grand mal**) and result in jerking movements and a loss of consciousness, or they may produce a sudden change in muscle tone, with the child perhaps falling. Seizures that result from disturbance in a single portion of the brain, thus affecting one area of control or mental activity, are categorized as **partial** or **complex partial**, depending on whether the person remains conscious. Children are less frequently affected by partial seizures than adults. More common in children are generalized tonic–clonic or grand mal seizures, or the noticeable loss of consciousness followed by thrashing movements, foaming at the mouth, and loss of bladder control. It is important to note that an **aura** or warning precedes many seizures. Many seizures can also be stimulated by a trigger or common factor, such as flashing lights, intense pain, psychological stress, and even fatigue.

First Aid for Tonic–Clonic (Grand Mal) Seizures in Physical Education

1. In many situations, children who have experienced repeated seizures have an aura or warning sign that a seizure is about to happen. In this case, help the child to the floor and be sure to cushion the head.
2. If the child wears glasses, remove them. If the child has some type of mouth guard or prosthetic dental work, remove it if possible so the airway remains open. Turning the head to the side allows saliva to drain and keeps the airway open. Do not attempt to restrain or put any object in the child's mouth.
3. Make sure the area is clear of objects the child may bump into during the seizure.
4. Make sure to note the length of the seizure—a prolonged loss of consciousness or convulsive part of the seizure is a medical emergency. For seizures lasting more than a few minutes, first-time seizures, or seizures occurring in the water, the American Red Cross recommends calling emergency medical personnel.
5. If emergency medical personnel are not needed, let the child rest, if needed. Be sure to inform the child of what happened and discuss missed events or information with the child.

The American Red Cross (2020).