



Supporting Students with Diabetes

Kennedy Krieger Institute's Specialized Health Needs Interagency Collaboration

The Specialized Health Needs Interagency Collaboration (SHNIC) program is a collaborative partnership between Kennedy Krieger Institute and the Maryland State Department of Education.



Kennedy Krieger Institute

Objectives

1. Describe basic etiology and common symptoms of diabetes.
2. Discuss management of the student's health care needs including potential complications and interventions to keep the student safe in school.
3. Identify the educational impact of the disease and potential strategies and accommodations to promote academic success.



Diabetes basics

- The digestive tract breaks down carbs into glucose. Glucose is a form of sugar that enters the bloodstream.
- Insulin is a hormone produced by the pancreas that is responsible for regulating blood glucose levels.
- Diabetes is a condition where insulin is not produced, or not enough is produced to keep up with the body's metabolic needs.



Complications

- Damages nerves and blood vessels causing heart disease, stroke, kidney problems, blindness, and amputation.
- Other issues include susceptibility to other diseases, loss of mobility, depression and pregnancy complications.



Diabetes types

1. Type 1 diabetes (T1D)
2. Type 2 diabetes (T2D)
3. Steroid-induced diabetes
4. Cystic fibrosis related diabetes (CFRD)
5. Gestational diabetes



Type 1 diabetes (T1D)

- Autoimmune disorder destroys the insulin-producing B-cells of the pancreas
 - Pancreas produces little or no insulin
 - No age limit, can occur at any time
 - Cannot be prevented or cured
- Requires external insulin administration
- 2022 ADA recommendations for insulin dependence includes continuous glucose monitors (CGM) and insulin pumps



Type 2 diabetes (T2D)

- Progressive disease that usually begins with insulin resistance because the body doesn't use insulin properly
- Typically occurs age >10 years, more common in racial/ethnic minority youth
- Risk factors include physical inactivity, obesity, family history, race/ethnicity, maternal gestational diabetes
- Maintained with oral medications and external insulin administration
 - Carb counting and sliding scale
 - Fixed-dosing and sliding scale insulin



Steroid induced diabetes

- Corticosteroids mimic the action of cortisol
- Cortisol leads to insulin resistance and hyperglycemia
- Usually reversible once steroids are discontinued
- Can increase risk for long term T2D
- Treatment includes oral medications and insulin administration
 - Long-acting
 - Short-acting



Cystic fibrosis related diabetes (CFRD)

- Production of mucus related to cystic fibrosis causes scarring to the pancreas, disrupting hormones
- Insulin is produced by pancreas
- Symptoms similar to T1D
- Treatment is insulin regimen and possibly oral medications



Gestational diabetes

- Develops during pregnancy when the body fails to produce enough insulin
- Hormones produced by the placenta contribute to insulin resistance
- Usually goes away after the baby is born but the woman can be at increased risk for developing diabetes
- Newborn baby is also at increased risk for obesity and developing T2D



Blood glucose monitoring (BGM)



Blood glucose monitoring (BGM)

- Method and time for checking blood glucose
 - Before meals/snacks
 - Before, during, and after physical activity
 - May occur more frequently with new diagnosis or change in treatment plan, symptoms of altered BG, illness, changes in behavior, etc.
- Goal blood glucose range
 - Before meals: 80-180
 - Before exercise: 150 or higher



BGM testing 1 of 2

- Meter should only be used to read blood from sites designed for its use (forearm is usually the most popular alternate site)
- Testing site should be clear, dry and warm
- Use the side of finger while avoiding the tip or pad
- Avoid site with bruising or injury
- Do not “over-milk” the site while waiting for blood flow as this can skew result



BGM testing 2 of 2

- Test strips should be monitored and stored per manufacturer instructions
 - Note expiration of test strips (usually 3 months once opened)
 - Temperature concerns (room temperature, dry space)
- Consider plan when need for testing outdoors, on field trips, etc.)
- Code on strips must match BGM device
- Equipment should be readily accessible for student's needs



Continuous glucose monitoring (CGM)

- A reusable transmitter sends information about BG from a sensor to a wireless device (phone or insulin pump)
- Uses sensors on the skin to continually measure BG and notify if trending low or high
- Sensor replaced every 7-10 days
- Treatment decisions should not be based solely on CGM results
- BG should be confirmed meter testing whenever the reading suggests a need for treatment



Insulin administration



Insulin dosing

- Carbohydrate coverage (CHO)
- Correction dose only
- Correction dose plus CHO
- Fixed dose
- Fixed dose with correction scale



Type of insulin

Types	Considerations
Rapid acting	<ul style="list-style-type: none">• Given at mealtime, used to cover high BG before/after meals• Starts working within 10-15 minutes after injection• Peak time → 1 hour• Action time → up to 4 hours
Short acting	<ul style="list-style-type: none">• Reaches the bloodstream within 30 minutes after injection• Peak time → 2-3 hours• Action time → 3-6 hours
Intermediate	<ul style="list-style-type: none">• Reaches the bloodstream about 2-4 hours after injection• Peak time → 4 to 12 hours• Action time → 12 to 18 hours
Long acting	<ul style="list-style-type: none">• Given once per day at the same time• Covers insulin needs while sleeping, between meals• Lasts for 12-24 hours, no peak action time



Insulin delivery

1. Syringe
2. Insulin Pen
3. Smart Pen
4. i-Port
5. Insulin Pump



Insulin by syringe 1 of 2

- Traditional method of vial and syringe
- Insulin-specific syringe must be used
- Ensure safe and effective storage
 - Unopened insulin should be stored in a refrigerator and manufacturer expiration dates should be followed
 - Opened can be stored at room temperature or in the refrigerator up to 28 days
 - Avoid exposure to extreme temperatures, should never be frozen



Insulin by syringe 2 of 2

- Insulin MUST be administered in fatty tissue (back of arms, side of thighs, upper buttocks, abdomen)
- Rotate injection sites to prevent lipohypertrophy (lump of fatty tissue under the skin)
- Sub Q not IM injection (too fast absorption)



Insulin by syringe injection technique

1. Calculate the total amount of insulin needed.
2. Clean off the tops of the insulin bottle with an alcohol pad.
3. Put air in the syringe to equal the total number of units needed. Inject the air into the insulin vial.
4. Carefully draw out the number of units needed.
5. Tap the syringe to remove air bubbles. Tiny air bubbles are not dangerous but may decrease the amount of insulin given.
6. Clean skin with alcohol.
7. Gently pinch skin, insert needle at 90-degree angle with a quick motion, let go of skin before injecting insulin, inject insulin, wait 5 seconds before withdrawing syringe
8. Remove needle at the same 90-degree angle used for insertion
9. Press injection site for 5-10 seconds with finger to prevent insulin from leaking out.



Insulin pen

- Pre-filled disposable pen or reusable pens with replacement insulin cartridges
- The type/brand of pen must match the orders
- Allows an individual to “dial” the dose
- All pens use a replaceable needle changed with each dose



Insulin pen injection technique

1. Calculate the total amount of insulin needed.
2. Clean off the top of the insulin pen with an alcohol pad.
3. Attach pen needle.
4. If first use of the pen, dial pen to 10 units, and squirt dose through the pen needle to prime. If not, dial pen to 2 units, and squirt dose through the pen needle
5. Dial calculated dose.
6. Clean skin with alcohol.
7. Gently pinch skin, insert needle at 90-degree angle with a quick motion, let go of skin before injecting insulin, inject insulin, wait 10 seconds before withdrawing syringe.
8. Remove needle at the same 90-degree angle used for insertion.
9. Press injection site for 5-10 seconds with finger to prevent insulin from leaking out.



Insulin pumps

- A computerized device that delivers insulin doses through a flexible plastic tube called a catheter
- Catheter is inserted through the skin into the fatty tissue and is taped in place
- Can measure a continuous dose (“basal” insulin) and a surge dose (“bolus” insulin) dose
- Pump may work with the CGM
- Student’s plan must specify alternate means of insulin administration in the event of pump failure



School managment



Role of the school nurse

- School nurse is lead team member
- Performs a nursing appraisal and develops an individualized health plan (IHP) based on the nursing assessment and the student's diabetic medical management plan (DMMP)/healthcare provider orders.
- Implementation of DMMP/healthcare provider orders and the [Maryland State School Health Services Guideline – Management of Diabetes in Schools – 2017](#)



DMMP

- Routine and emergency needs of the student
- The school has the responsibility to provide appropriate staff to provide, or support the DMMP during school-sponsored events and field trips
- School nurse, a substitute nurse (e.g., another nurse who is not the usual school nurse), other school health services program staff or other trained school staff should be available during all school-sponsored activities to provide needed diabetes care based on the student's needs or support the care of students who self-manage their diabetes.



Potential school emergencies

- Low blood glucose (hypoglycemia)
- Severe low blood glucose (requires Glucagon administration)
- High blood glucose (hyperglycemia)
- Diabetic ketoacidosis (DKA)



Hypoglycemia: Low blood glucose

- BG below 70 mg/dL
- Requires immediate action
- Caused by too much insulin, skipping meals, not eating enough to cover amount of insulin given, miscalculated carb intake, exercise or increased activity without eating, increased emotions, hormone fluctuations, illness
- Prevent by testing BG routinely per orders, testing in classroom, eating at regular times, rotate insulin injection sites
- Can affect student's ability to learn related to attention and memory issues. May not return to normal cognitive and motor function for an hour



Action for hypoglycemia

MILD

If BG below defined mg/dL hungry, shaky, weak, dizzy, headache, blurred vision, sweaty, clammy, tired, flushed, hot, fast heartbeat

MODERATE

Mild symptoms plus behavior/mood changes, anxious, irritable, spacing out, poor coordination, tingling around lips

SEVERE

Unconsciousness, semi-consciousness, inability to control airway, inability to swallow, seizing, worsening of symptoms despite treatment

- Provide quick-acting glucose product equal to 15 grams of carbohydrate (or glucose gel), if conscious and able to swallow
- Repeat BG check 15 minutes after use of quick-acting glucose
- If BG still low, re-treat with 15 grams quick-acting CHO as stated above.
- If BG in acceptable range and lunch/snack time, have student eat and cover meal CHO per orders
- If CGM in use and BG >70 mg/dL and arrow going up, no need to recheck

- Do not give anything by mouth
- Give Glucagon per IHP and ECP
 - 1 mgOR
 - 0.5mg IM or Sub-Q
- Place student in the recovery position
- Suspend pump, if applicable, and restart pump at ordered BG level
- Call 911 and state glucagon was given for hypoglycemia; notify parent/guardian
- If glucagon is not available or there is no response to glucagon, administer glucose gel inside cheek, even if unconscious or seizing. If glucose gel is administered, place student in recovery position

Glucagon

- Emergency treatment for severe hypoglycemia
 - A hormone that raises BG levels within 5-15 minutes
 - Available as an injection or nasal spray
 - Cannot harm, cannot overdose
 - If given, 911 MUST be called
- Storage location should be noted in student's IHP and must be accessible
 - Storing at room temperature
 - Monitoring expiration date
 - Replace after use



Hyperglycemia: High blood glucose

- BG above 240 mg/dL
- Treat immediately before diabetic ketoacidosis (DKA) occurs
- Caused by taking too little insulin, eating food not covered by insulin, decreasing exercise, having an illness or injury, stress, hormone fluctuations with menstruation, stress, medications, insulin resistance
- Prevent by taking medications and eating on time, check BG per schedule, exercise on time
- Can result in poor academic performance by interfering with ability to concentrate, nausea, vomiting, fatigue



Diabetic ketoacidosis

- A life-threatening condition when BG levels are high
- Ketones form when there is not enough insulin and the body starts to break down fat for energy
- Ketones are then detected in blood or urine as a by-product
- BG usually in excess of 250
- Usually caused by not taking any/enough insulin
- Perform ketone testing according to IHP and ECP
 - BG > 240mg/dL two times in a row
 - Student complains of nausea or vomiting



Action for hyperglycemia

MILD/MODERATE

Thirsty, dry mouth, blurred vision, change in appetite, nausea, frequent or increase urination, fatigue

SEVERE

Extreme thirst, dehydration, fruity smelly breath, vomiting, severe abdominal pain, heavy breathing, shortness of breath, chest pain, sleepiness, lethargy, depressed consciousness

If BG is greater than defined level or complaints of nausea, vomiting, and/or abdominal pain, check urine/blood for ketones

If ketones are trace to small

- Follow plan/EAP
- Give sugar-free fluid or water as ordered
- Give insulin as listed in insulin orders

If ketones are moderate to large

- Follow plan/EAP
- Give sugar-free fluid or water as ordered
- If student uses pump, disconnect pump
- Give insulin as listed in insulin orders

If large ketones and vomiting or large ketones and other signs of DKA

- Call 911
- Notify parent/guardian
- Recheck BG and ketones



Emergency planning

- Staff training for signs and symptoms for which emergency care may be needed
- Procedures for classroom teachers and other school staff to contacting the school nurse or other school health services staff
- How glucagon and fast acting sugar will be stored to allow immediate availability to students and staff for those students who do not possess and/or self-administer their medication
- List of school staff designated and trained to administer glucagon
- A plan for an adult to accompany a student to the health suite when necessary



Emergency kit suggestions

- BG meter with testing strips
- Antiseptic wipes
- Lancets
- Batteries
- Insulin and supplies including syringes, pump, etc.
- Glucagon, fast-acting glucose (gel)
- Ketone strips
- Carb containing snack (cheese or peanut butter crackers)
- Hypoglycemia food supplies (quick sugar, carb snack, protein snack)



Impact on education



Impact on education

- Diabetes can impact a student's cognition, attention, behavior
- Learning accommodations in the classroom may be necessary
- Diabetes management may require student to miss instruction time during the day or more frequently be absent from school
- Development of 504/IEP
- Staff should be trained on DMMP



Considerations for 504/IEP 1 of 2

- Ability to visit the school nurse as needed
- Easy/immediate access to snacks (provided by parent/guardian)
- Unrestricted access to water
- Unrestricted use of the bathroom
- BGM monitoring in the classroom
- Self-administration of insulin in the classroom
- Training of school staff
- Modification of procedures for academic testing (e.g., quizzes, exams, standardized testing)
- No penalty for absences or tardiness due to diabetes management activities
- No penalty for illness or issues that escalate to prolonged blood glucose levels outside of target range



Considerations for 504/IEP 2 of 2

- Alternate times for academic testing (only when BG in range)
- Plan and place for rest breaks, frequent breaks
- Extra set of books, rolling backpack, convenient locker location, distance between classes
- Preferential seating
- Extended time to travel between classes



Summary

- Managing diabetes at school requires communication and planning.
- The DMMP will be individualized to the student's management and intervention (routine and emergency).
- Staff training and access to emergency supplies in the school setting is essential.



Resources

American Diabetes Association diabetes.org/

Safe at School: American Diabetes Association diabetes.org/tools-support/know-your-rights/safe-at-school-state-laws/training-resources-school-staff

Helping the Student with Diabetes Succeed: A guide for School Personnel diabetes.org/sites/default/files/2022-11/School-guide-final-11-16-22.pdf

Division of Pediatric Endocrinology at Johns Hopkins Hospital hopkinsmedicine.org/johns-hopkins-childrens-center/what-we-treat/specialties/endocrinology/

Diabetes in Children: NASN National Association of School Nurses nasn.org/nasn-resources/resources-by-topic/diabetes

NIH National Institute of Diabetes and Digestive and Kidney Diseases niddk.nih.gov/health-information/diabetes

Nurse Files- Colorado Kids with Diabetes coloradokidswithdiabetes.org/nurse-files/

Children's Hospital of Wisconsin: Resources for Schools childrenswi.org/medical-care/diabetes-program/resources-for-schools



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