

Diabetes Management in Schools



Diabetes Management in Schools

- Nearly 29.1 million adults and children in the U.S. have diabetes (9.3% of the U.S. population)
 - 21.0 million people have been diagnosed
 - 8.1 million people are undiagnosed (27.8% of people with diabetes are undiagnosed)
- About 208,000 of all people younger than 20 years have been diagnosed with diabetes (type 1 or type 2)

Data from the National Diabetes Statistics Report, 2014

(<http://www.cdc.gov/diabetes/pubs/statsreport14/national-diabetes-report-web.pdf>)



Diabetes Management in Schools

- What do those figures mean for children?
 - Over the past 10 years the prevalence of type 1 and type 2 diabetes increased 21% and 30.5% respectively in children age 19 years and younger
 - Racial and ethnic disparities
 - Non-Hispanic white youth had the highest incidence of new cases of type 1 diabetes
 - Native American and Black youth had the highest incidence of new cases of type 2 diabetes
 - **Between 1995-2010 the prevalence of diabetes has increased 226.7% in Oklahoma. This represents the highest percentage increase in the nation**

“SEARCH for Diabetes in Youth Study: 2001-2009” ADA 2012; Abstract 228-OR.

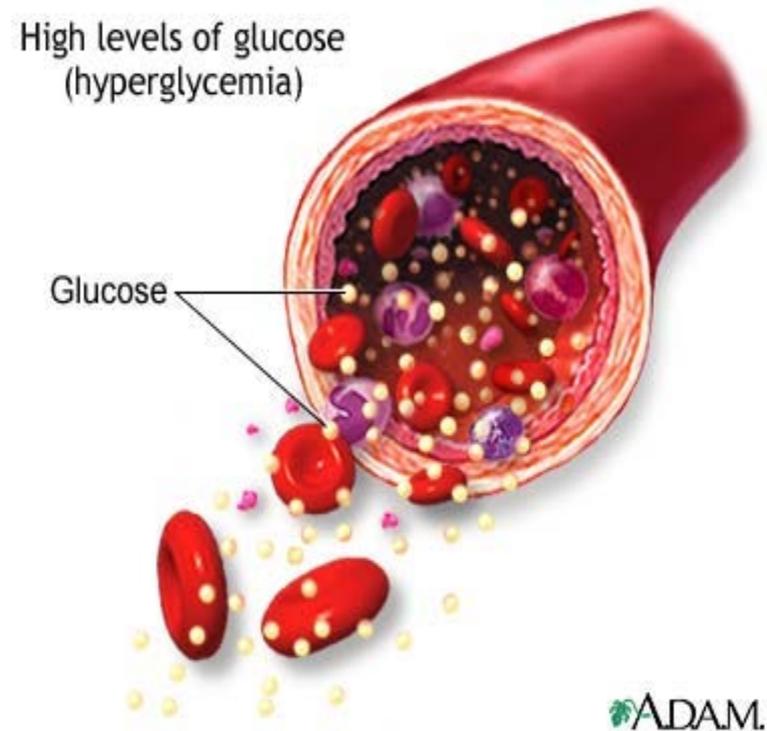
CDC Morbidity and Mortality Weekly Report: “Increasing Prevalence of Diagnosed Diabetes – United States and Puerto Rico, 1995-2010.” November 16, 2012/61(45);918-921.

Journal of the American Medical Association (JAMA) May 3, 2014 presentation Pediatric Academic Societies annual meeting

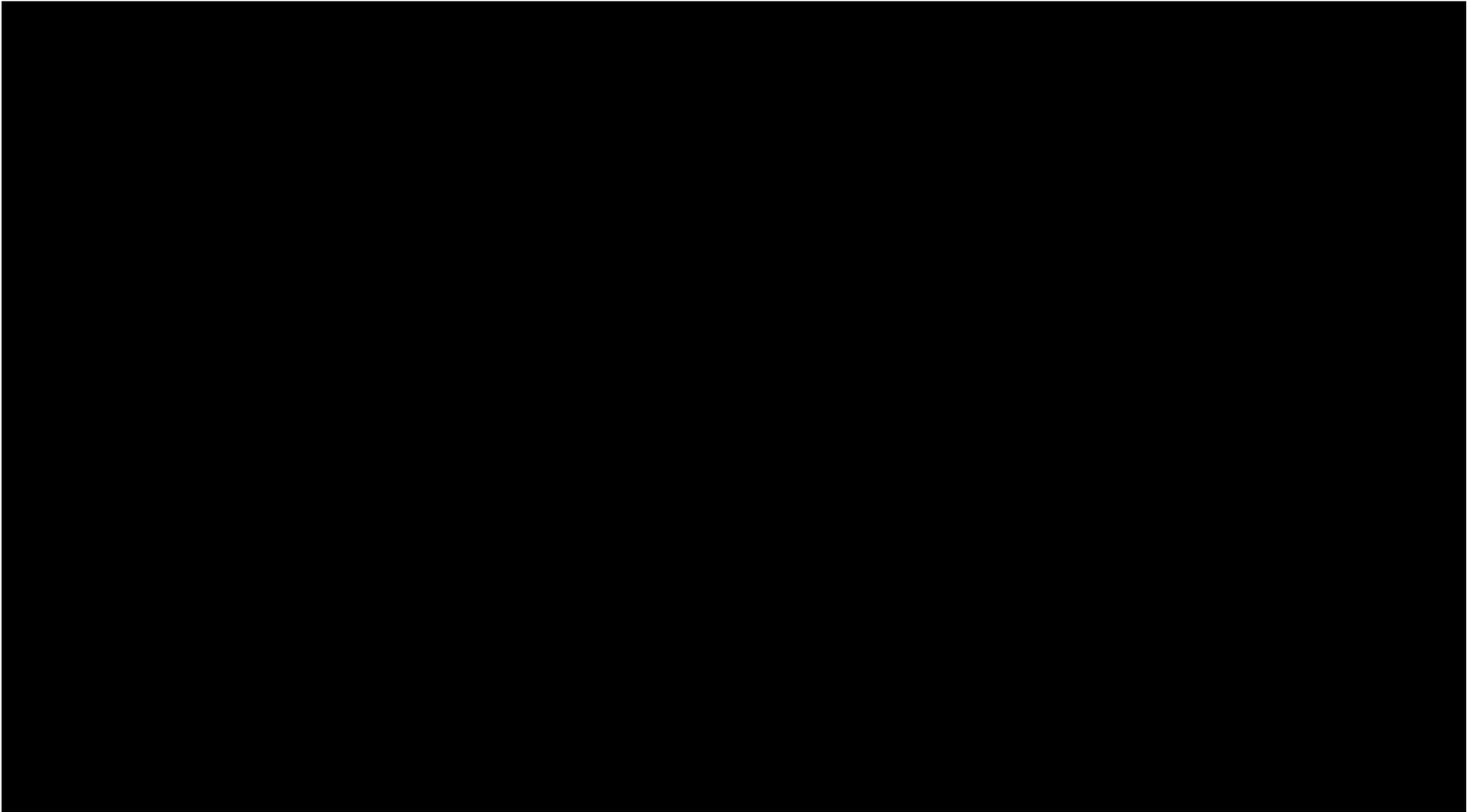
Diabetes Management in Schools

What is diabetes mellitus

- Diabetes mellitus (or simply diabetes) is a group of metabolic diseases in which a person has high blood glucose (sugar) levels, either because the pancreas does not produce enough insulin, or the cells do not respond to the insulin that is produced



Diabetes Management in Schools



Diabetes Management in Schools

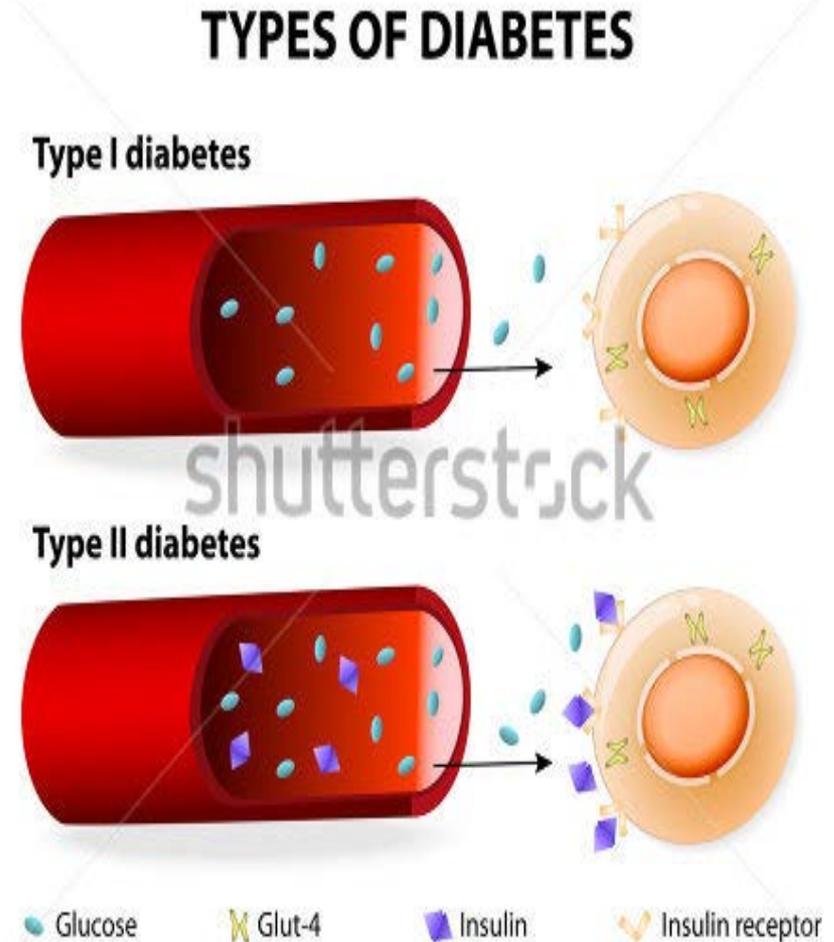
- There are 3 main types of diabetes mellitus
 - Type 1
 - Type 2
 - Gestational



Diabetes Management in Schools

Type 1 diabetes mellitus

- Occurs when the pancreas does not produce insulin
 - Requires multiple doses of insulin every day through shots or an insulin pump
 - Accounts for 5 to 10% of all cases of diabetes and is the most prevalent type of diabetes among children and adolescents
 - Type 1 diabetes cannot be prevented



www.shutterstock.com · 186887918

Diabetes Management in Schools

Symptoms

Type 1 diabetes

- Frequent urination – excess sugar builds up in the bloodstream, fluid is pulled from the tissues
- Excessive thirst – excess fluid pulled from tissues causes thirst
- Extreme hunger – without insulin to move sugar into the cells, muscles and organs become energy-depleted which triggers intense hunger
- Weight loss – despite eating, without energy sugar supplies, muscle tissue and fat stores shrink – usually one of the first signs noticed
- Irritability – moody/irritable
- Weakness and fatigue – cells are deprived of sugar which leads to feeling tired

These symptoms usually develop quickly, over a period of weeks, and can be deadly if left untreated



Diabetes Management in Schools

Symptoms



Diabetes Management in Schools

Type 2 diabetes mellitus

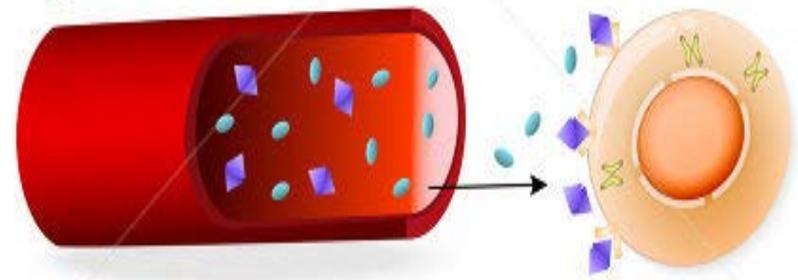
- Occurs when the pancreas does not produce enough insulin or body cells do not use insulin properly (Insulin Resistance)
- Increased diagnosis of type 2 diabetes among children and adolescents in the U.S.
- Managed with diet and other healthy living choices, oral medication, insulin shots

TYPES OF DIABETES

Type I diabetes



Type II diabetes



● Glucose

⚡ Glut-4

■ Insulin

⚡ Insulin receptor

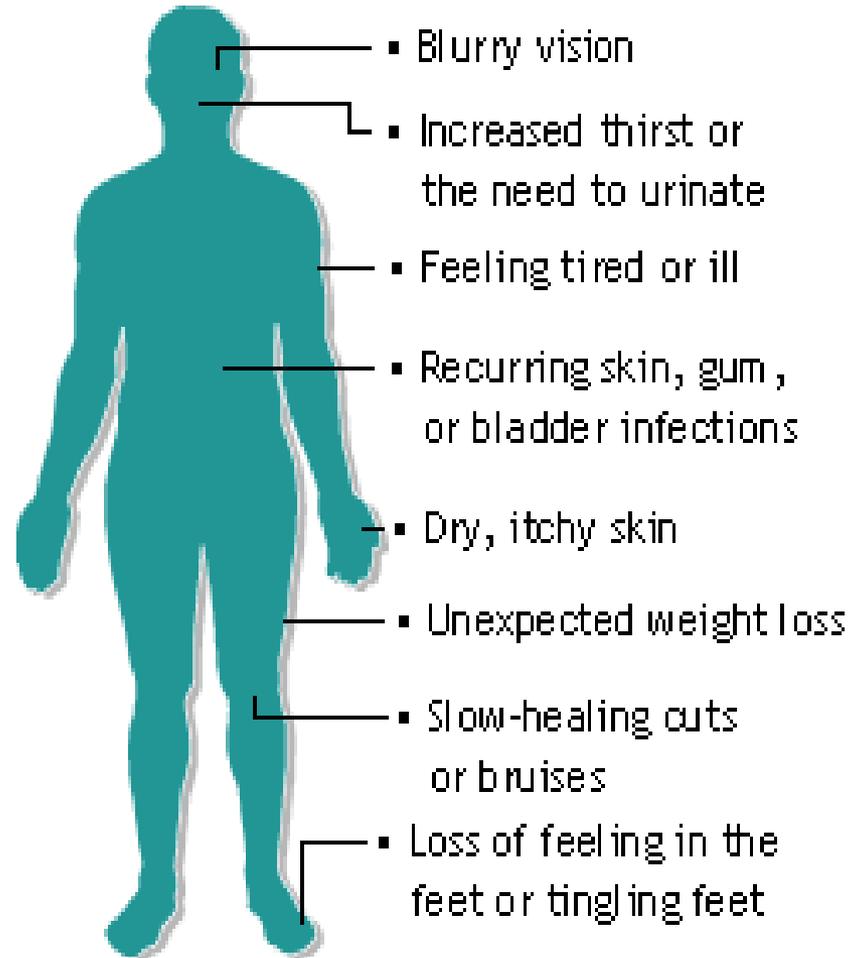
www.shutterstock.com · 186887918

Diabetes Management in Schools

Symptoms of Type 2 Diabetes

- Increased thirst and urination
- Blurry vision
- Unusual fatigue
- Dark skin around the neck or armpits (Acanthosis Nigricans)
- Frequent infections (usually yeast infections)
- Slow healing wounds
- Numbness and tingling of the hands and feet

These symptoms usually occur gradually and may go unnoticed



Diabetes Management in Schools

Acanthosis Nigricans

- Acanthosis Nigricans (AN) is a condition characterized by abnormal thickening and darkening of the skin, especially in body creases
- AN happens as a result of high circulating levels of insulin and treatment of the underlying medical condition usually resolves the skin lesions
- AN is a reliable marker of insulin resistance among children and adolescents

Acanthosis Nigricans



Neck



Outer Elbow



Underarm



Bend of Knee

Diabetes Management in Schools

Gestational Diabetes

- Gestational diabetes mellitus (GDM) is a form of glucose intolerance that develops during pregnancy and typically resolves with delivery
 - The definition applies whether insulin or only diet modification is used for treatment
- Gestational diabetes starts when your body is not able to make and use all the insulin it needs for pregnancy. Without enough insulin, glucose cannot leave the blood and be changed to energy

Sacks MD, D.A.; *Diabetes and Pregnancy: A Guide to a Healthy Pregnancy*, American Diabetes Association , 2011.



Diabetes Management in Schools

Gestational Diabetes - continued

- 35-60% women with gestational diabetes will develop diabetes in the next 10 to 20 years
- 18% of pregnancies were affected by gestational diabetes
- Children born to moms who experience Gestational Diabetes are at increased risk for obesity and the development of type 2 diabetes



Diabetes Risk After Gestational Diabetes, NDEP, March 2011

http://ndep.nih.gov/media/fs_post-gdm.pdf



Diabetes Management in Schools

Possible Risk Factors for Gestational Diabetes

- Many women who develop gestational diabetes have no known risk factors
- Risk factors are similar to those for type 2 diabetes
 - Being overweight prior to becoming pregnant
 - Family history of diabetes
 - Being a high risk ethnic group
 - Having gestational diabetes before
 - African American, American Indian, Asian American, Hispanic/Latina, Pacific Islander American

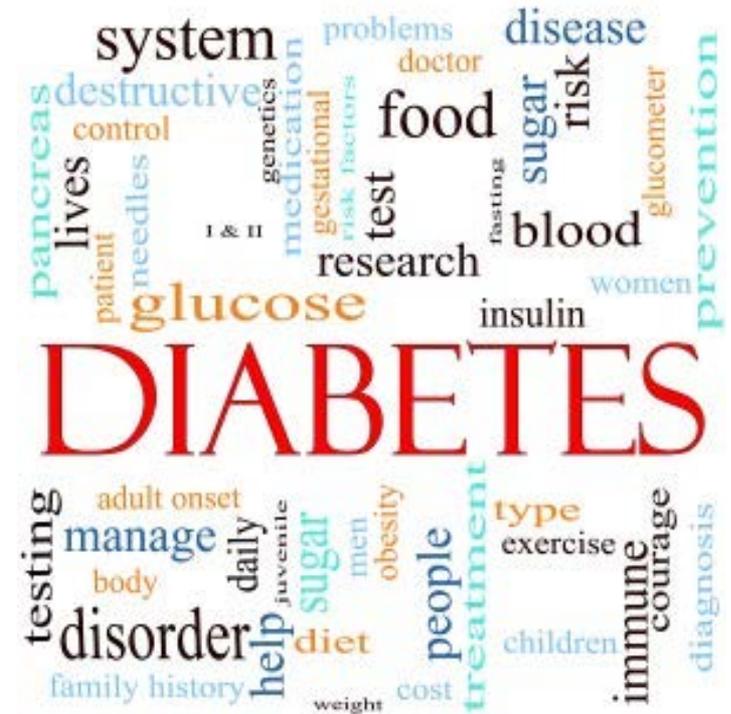


NIH Publication No 13-5129 Last updated October 23, 2013
<http://diabetes.niddk.nih.gov/dm/pubs/gestational/>

Diabetes Management in Schools

Risk Factors Type 2 Diabetes

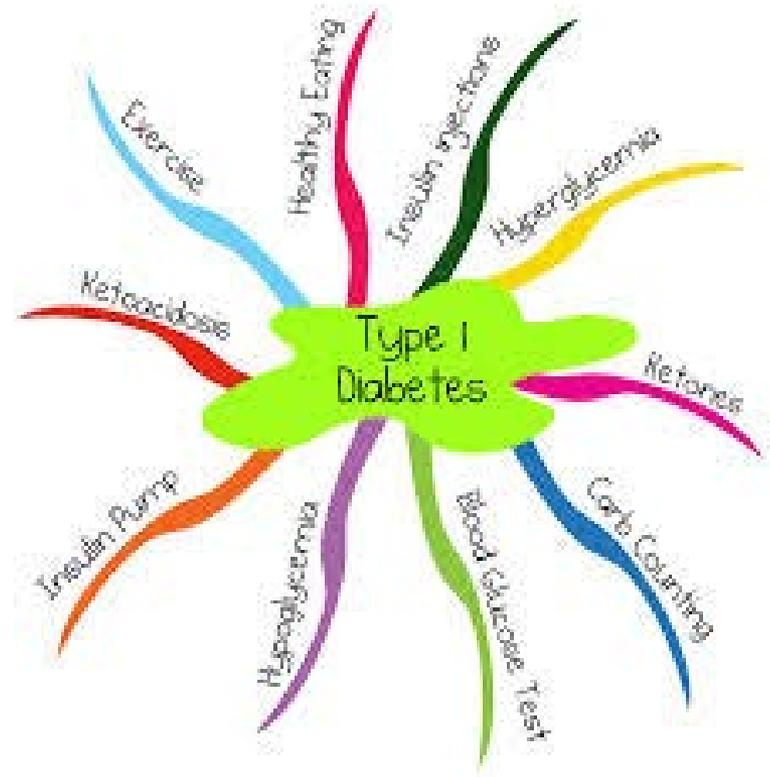
- Overweight/obese
- Having a family member who has Type 2 diabetes
- Race
 - African American
 - Hispanic/Latino
 - American Indian, Alaska Native
 - Asian American
 - Pacific Islander including Native Hawaiian



Diabetes Management in Schools

Diabetes management is a 24/7 ...

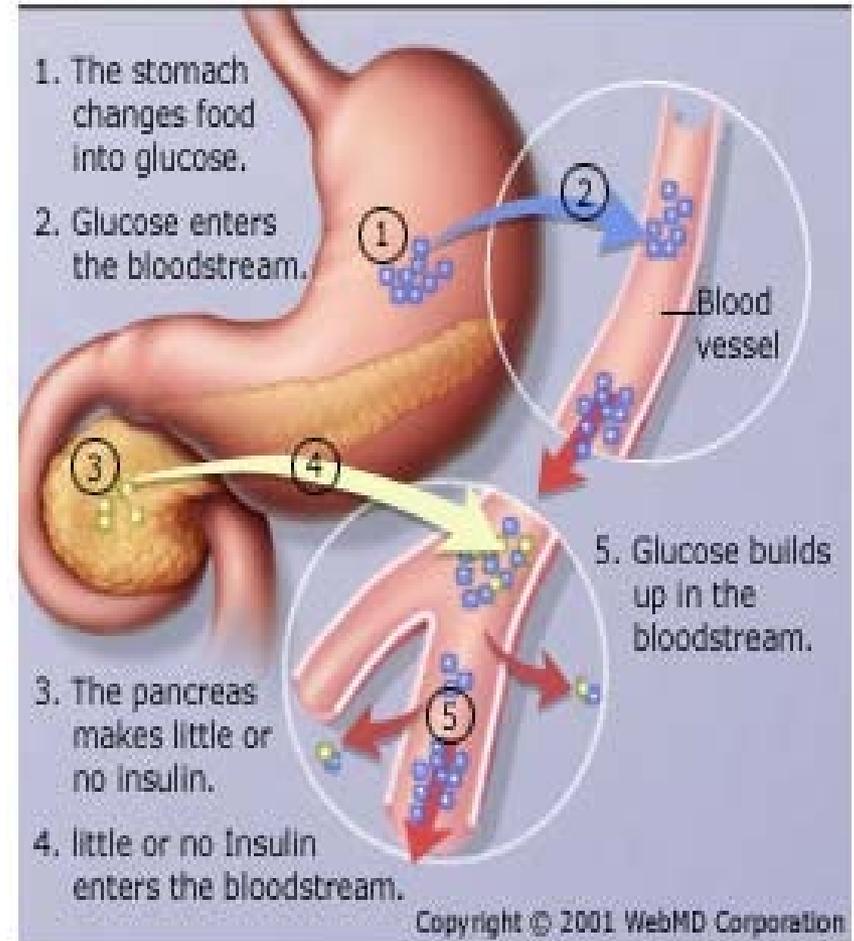
- Every student with diabetes will be different
- Diabetes requires a constant juggling of insulin/medication with physical activity and food
- It is important to recognize the behaviors and signs of “high” and “low” blood sugar levels
- A student with a diabetes emergency will need help from school staff
- Students with diabetes can do the same every day activities as students without diabetes



Diabetes Management in Schools

- Insulin is the key to sugar entering the cells
 - Normally the hormone insulin helps glucose enter the cells to provide energy to the muscles and tissues
 - Insulin comes from the pancreas
 - Insulin lowers the amount of sugar in the bloodstream
 - Once the insulin producing cells of the pancreas are destroyed, it will produce little or no insulin

Type 1 Diabetes



Diabetes Management in Schools

All children with type 1 and some with type 2 diabetes require insulin daily.

- **3 Characteristics**

- Onset of action
- Peak of action
- Duration

- **4 Types of Insulin**

- Rapid acting insulin
 - **Onset** 10-20 minutes
 - **Peak** 1-3 hours
 - **Duration** 3-5 hours



Diabetes Management in Schools

- Short acting insulin
 - **Onset** 30 -60 minutes
 - **Peak** 2-4.5 hours depending on insulin brand
 - **Duration** 3-6 hours depending on insulin brand
- Intermediate acting insulin
 - **Onset** 1-2 hours
 - **Peak** 3.5-9.5 hours
 - **Duration** 16-24 hours
- Long acting insulin
 - **Onset** from 1-4 hours
 - **Peak** 6-16 hours depending on insulin brand
 - **Duration** up to 24 hours depending on insulin brand



Diabetes Management in Schools

The Action of Insulins

Insulin	Onset	Peak	Duration
Rapid Acting			
Lispro (Humalog) Aspart (Novolog) Glulisine (Apidra)	~15 minutes	1-2 hours	3-5 hours
Short Acting			
Regular (Humulin R) (Novolin R)	0.5-1 hour (30-60 minutes)	2-3 hours	3-6 hours
Intermediate			
NPH (isophane) (Humulin N) (Novolin N)	2-4 hours	4-10 hours	10-16 hours
Long Acting			
Glargine (Lantus) Detemir (Levemir)	2-8 hours	8-16 hours	Up to 24 hours



Diabetes Management in Schools

- Insulin is a hormone made of proteins and is affected by extremes in temperature
- Do not expose insulin vials to extreme heat or cold
 - Throw away insulin vials left in a hot car or bus or outside
 - Throw away insulin vials that have been frozen or have ice crystals
- Write the date on the vial when the insulin is opened
- Store open vials of insulin at room temperature below 86°
- Throw away after one month of open date



Diabetes Management in Schools

- Store unopened vials in the refrigerator between 36°-46° F
- Keep until expiration date located on the vial or box
- For field trips, use a special case designed for the insulin thermal lunch bag with a reusable ice pack to keep the insulin cool, but never frozen



Diabetes Management in Schools

- Types of insulin syringes
 - 30 Units
 - 50 Units
 - 100 Units



k1846061 www.fotosearch.com

Diabetes Management in Schools

- Insulin Pens
 - Convenient
 - Some are disposable
 - Some allow a cartridge reload
 - All use disposable needles
 - Easy to prime and measure dosage
 - Most students use pens at school



Diabetes Management in Schools

- Store unused insulin pens and cartridges in the refrigerator
- Keep the insulin pen in use at room temperature, not refrigerated
- Throw away the used pen or cartridge after 28 days.



Diabetes Management in Schools

- Remove pen needles after each injection to prevent air bubbles from entering and insulin from leaking out of the pen
- Refer to manufacturer's instructions to ensure proper storage for insulin pens



Diabetes Management in Schools

Insulin Pump Therapy

- Benefits

- Improved glycemic control
- Rapid or short acting Insulin
- Easier sick day adjustments
- Increased lifestyle flexibility and satisfaction
- Safer exercise because basal rates can be reduced or suspended during activity, decreasing the incidence of exercise induced hypoglycemia
- Infusion sets and sites are typically changed every 2-3 days



Diabetes Management in Schools

Insulin Pump Therapy

- Limitations
 - High learning curve
 - Being connected to a pump is a visual reminder of having a chronic disease
 - Increased risk of ketosis
 - Technical failures are possible
 - Cost
 - \$5,000 for pump and \$1,000 to \$1,500 for supplies per year
 - Children require assistance from a caregiver for pump maintenance and insertion



Diabetes Management in Schools



Diabetes Management in Schools

- Type 1 diabetes – most immediate concerns
 - Hypoglycemia = low blood sugar (glucose)
 - Can occur multiple times during the day
 - Hyperglycemia = high blood sugar (glucose)
 - Can occur multiple times during the day
 - Ketoacidosis = ketones build up in the blood because there is not enough insulin in the body to move glucose into the cells
 - Rare but can result in hospitalization or death

Signs and symptoms of Hypoglycemia may be mistaken for Hyperglycemia – Know your student



Diabetes Management in Schools

- Something to remember:
 - Most children younger than 6 or 7 years of age are unaware of their low blood sugar symptoms; called hypoglycemic unawareness
 - They lack the cognitive ability to recognize and respond to hypoglycemic symptoms and may be a greater risk for hypoglycemia
 - Children under 5 years of age may be at risk for permanent cognitive impairment after episodes of severe hypoglycemia



Diabetes Management in Schools

- Causes of Hypoglycemia (low blood sugar)
 - Blood Glucose below 70mg/dl
 - Taking too much insulin
 - Skipping or delaying meals/snacks
 - Taking too much insulin for the amount of food eaten
 - Exercising longer or harder than planned
 - More likely to occur
 - Before lunch
 - At the end of the school day
 - During/after PE
 - Combination of the above factors
- **Never leave a student alone or send them away when experiencing hypoglycemia. Treat on the spot.**



Diabetes Management in Schools

Symptoms of mild hypoglycemia:

- Sudden change in appearance (shaky, sweaty, pale, cold clammy skin or sleepy)
- Complaints of headache or weakness, dizziness, hunger, tingling in extremities
- Anxiety
- Irritability
- Crying Spells

Response:

1. Check blood glucose (blood sugar) level
2. Give the student a quick acting sugar equal to 15 grams of carbohydrate
3. Recheck blood glucose level in 15 minutes and repeat treatment if blood sugar is below the student's target range
4. Ideally, the student should not return to class or engage in physical activity until the blood glucose level is greater than 100mg/dl



Diabetes Management in Schools

- Symptoms of moderate hypoglycemia
 - Dizziness
 - Drowsiness/Confusion
 - Decreased attentiveness/Dazed look
 - Slurred speech
 - Slowed reaction time/Loss of coordination
 - Blurred vision
- If these symptoms are present provide treatment as the child may not be able to handle this task



Diabetes Management in Schools

- Sources of Carbohydrate for treatment of mild to moderate hypoglycemia

- Glucose tablets

3 to 4

- Sugar

4 teaspoons

- Orange or apple juice

½ cup (4 oz)



- Regular soda pop

½ can (6 oz)



- Low fat milk

1 carton (8 oz)

- Lifesavers

6 pieces

- Sweet Tarts

8 pieces

- Skittles



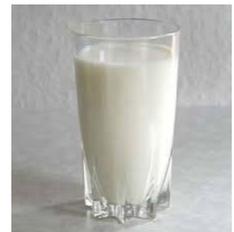
10 pieces

- Fruit Roll-Ups

1 packet

- Cake Mate Gel

1 small tube of the gel



Diabetes Management in Schools

Symptoms of severe hypoglycemia:

- Inability to swallow
- Altered state of consciousness or disorientation
- Seizure or convulsion
- Unconsciousness
- Death

This is the most immediate danger to kids with diabetes

Response:

- Position student on side
- Contact school nurse or trained diabetes staff
- Administer prescribed glucagon by injection
- Call 911
- Call student's parent
- Check blood glucose level

Recovery from severe hypoglycemia will take a minimum of 20 minutes. The lower the blood sugar level the longer it takes to recover



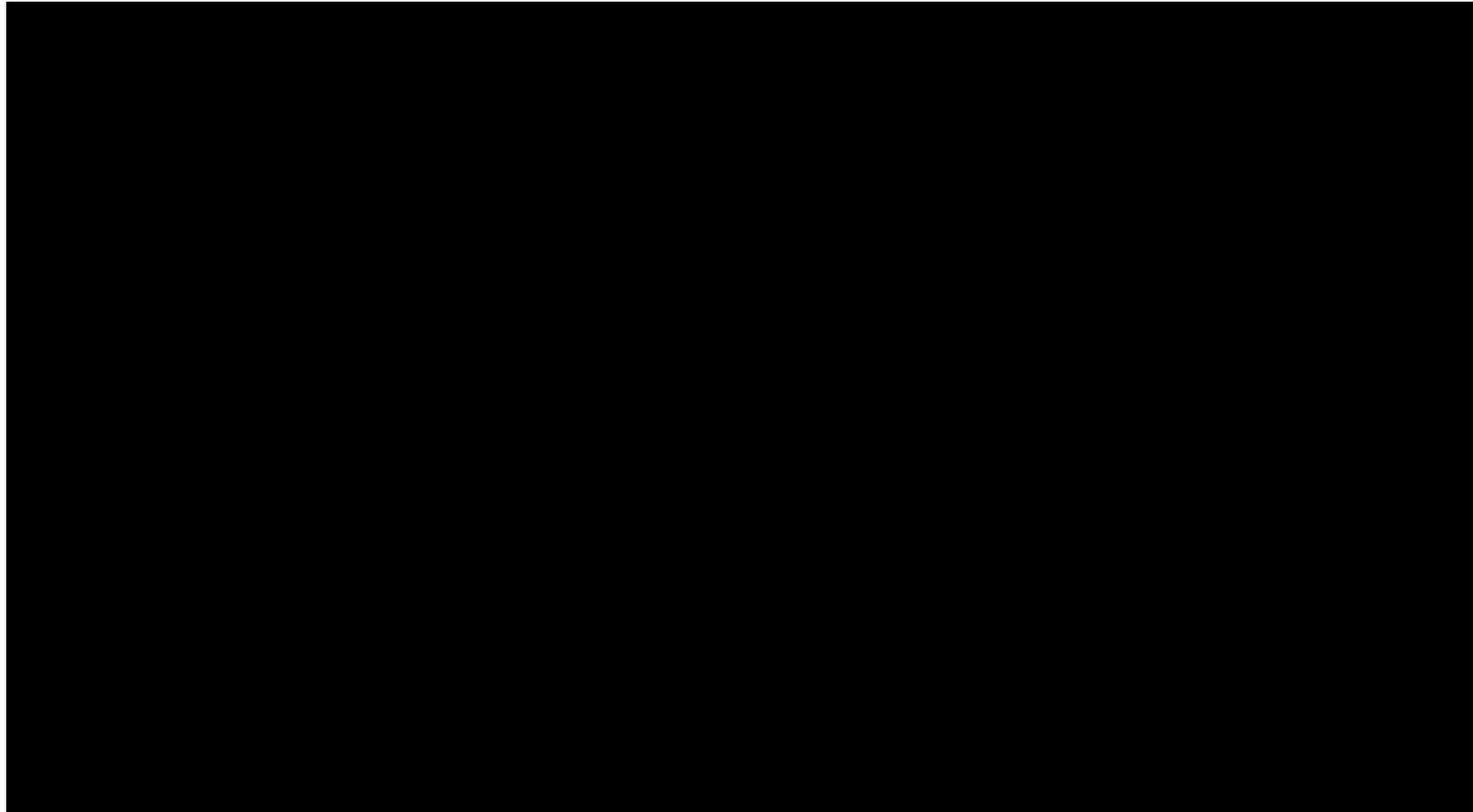
Diabetes Management in Schools

- Glucagon is a naturally occurring hormone formed in the pancreas that promotes the breakdown of glycogen to glucose in the liver
- Give only when hypoglycemia symptoms are **SEVERE**
- Glucagon will cause nausea or vomiting but...

Glucagon is a life saving treatment that will not harm a student!



Diabetes Management in Schools



Diabetes Management in Schools



Diabetes Management in Schools

Glucagon Product	1 mg Dose	½ mg Dose
Novo Nordisk GlucaGen® Hypokit	Children 55 lbs and above	Children <55 lbs
Eli Lilly Emergency Glucagon Kit	Children 44 lbs and above	Children <44 lbs

There is **NO** danger of Overdose
You **CANNOT** hurt the student with Glucagon



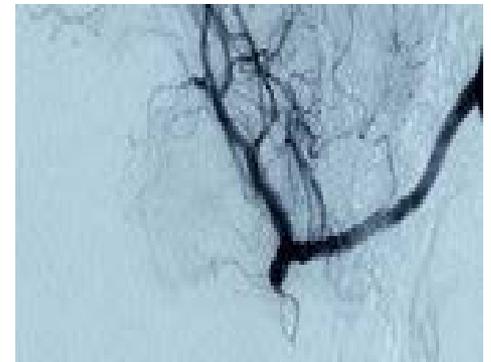
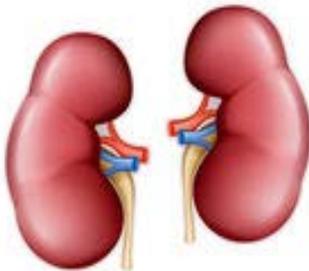
Diabetes Management in Schools

- Causes of Hyperglycemia (high blood glucose)
 - Elevated blood glucose levels greater than 250mg/dl caused by:
 - Too little or no insulin
 - Illness, infection, or injury
 - Stress or emotionally upset
 - Decreased exercise or activity
 - Combination of the above factors



Diabetes Management in Schools

- Hyperglycemia develops slowly over time
 - Risk of Long-Term Complications
 - Blindness in adults (20-74 years of age)
 - Non-traumatic lower extremity pain and amputations
 - Kidney failure



Diabetes Management in Schools

Symptoms of mild hyperglycemia

- Increased thirst and urination
- Blurred Vision/Inability to focus on work
- Fatigue/Sleepiness
- Warm, dry skin
- Flushed face

Response

- Allow free and unrestricted access to liquids and restrooms
- Allow student to administer insulin or seek a trained staff person to administer
- Encourage student to test blood glucose levels more frequently



Diabetes Management in Schools

- Symptoms of moderate hyperglycemia
 - Dry pasty mouth
 - Abdominal pain
 - Nausea
 - Vomiting
 - Fruity smell on the breath



Follow the directions for treatment written in the student's Diabetes Medical Management Plan (DMMP)



Diabetes Management in Schools

- Symptoms of severe hyperglycemia
 - Labored breathing
 - Weakness
 - Confusion
 - Slip in and out of consciousness

Severe hyperglycemia should receive prompt medical attention. Follow the directions written in the student's Diabetes Medical Management Plan.



Diabetes Management in Schools

- For those of you working with adolescents
 - Remember if they are newly diagnosed they may need a lot of encouragement and assistance as they learn to control their disease process
 - Diagnosis with diabetes may trigger depression, anxiety, or increased symptoms of stress in the adolescent as well as the parents
 - Compared with the general population people with diabetes are more likely to develop eating disorders
 - Some substances that adolescents may experiment with can have an effect on their blood sugar levels



Diabetes Management in Schools

- Substance abuse and its effects on diabetes
 - **Nicotine and amphetamine** can induce a chemical process in the body over time which may lead to an increase in blood sugar levels
 - Certain substances (**Ecstasy, Ketamine, Cocaine**) creates an immediate metabolic effect that can raise the blood sugar levels to dangerous levels
 - Increased insulin resistance is associated with **Heroin** use in adult males but not studied in adolescents
 - Light use of **Marijuana** may have some protective qualities especially with the development of type 2 diabetes, heavy use has the opposite effect
 - **Alcohol** consumption may have a U-shaped relationship with type 2 diabetes showing a protective effect for light use and heavy use has the opposite effect



Diabetes Management in Schools

Management Goals for children and adolescents diagnosed with diabetes

- Promote normal growth and development
 - Meal plan: enables optimum nutrition and metabolic control
 - Treatment: matches the normal physiology as closely as possible
 - Support: addresses specific chronic disease-related stressors and promotes social/emotional development
- Minimize risk for long-term complications
 - Requires frequent monitoring of blood glucose as part of intensive management



Diabetes Management in Schools

Treatment Regimens

- Diet/lifestyle, Metformin, Insulin for type 2 diabetes
- Conventional insulin therapy: usually 2-3- shots per day
- Multiple daily injections (MDI): sometimes 4 or more shots per day
- Continuous subcutaneous insulin infusion (CSII)



Diabetes Management in Schools

You enjoy daily life CAREFREE...

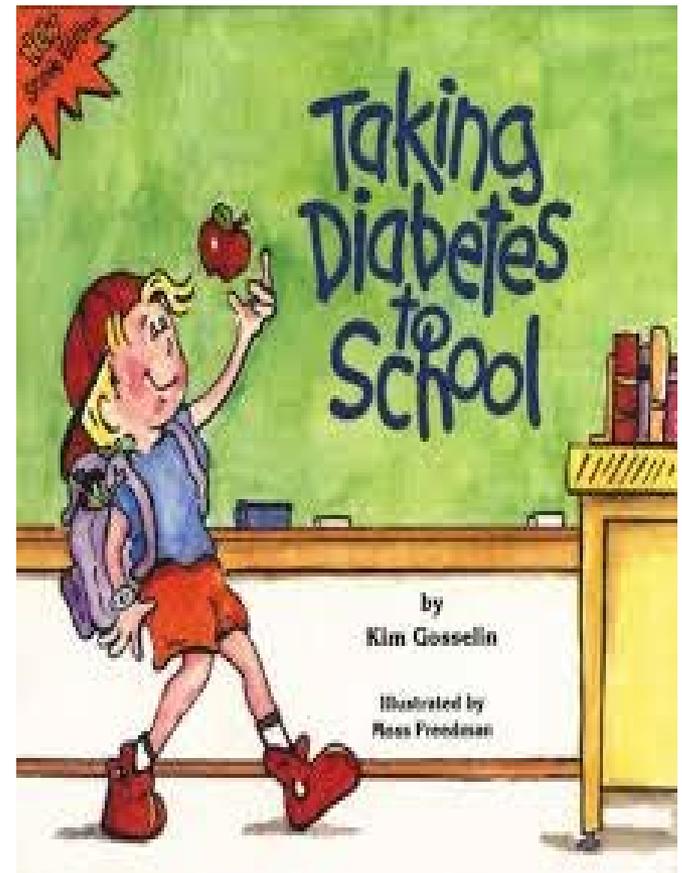


We worry about waking up ^{IN THE} MORNING.

Diabetes Management in Schools

What does effective diabetes management at school mean

- Appropriate accommodations
 - Designating trained diabetes personnel
 - Access to the tools that monitor and maintain blood glucose levels
 - Extra time for completion of exams/work assignments
 - Assisting the student with performing diabetes care tasks as needed
 - Excused absences for diabetes care appointments



Diabetes Management in Schools

What are the elements of effective diabetes management in school (continued)

- Planning for disposal of sharps and materials that come in contact with blood
- Recognizing and treating hypo and hyperglycemia
- Administering insulin or glucagon as needed
- Planning for disasters and emergencies
- Following the individualized meal plan
- Planning for field trips, class parties, extracurricular activities



Diabetes Management in Schools

- Diabetes Medical Management Plan (DMMP)
 - Basis for all school based diabetes care plans
 - Must be in place for the child's diabetes care to be implemented in the school
 - Developed by the student's health care team, parent/guardian, and student (if applicable), and signed by the physician
 - Individualized
 - Implemented collaboratively by the school diabetes team including:
 - School nurse
 - Teacher
 - Student
 - Parent/guardian
 - Other designated school personnel



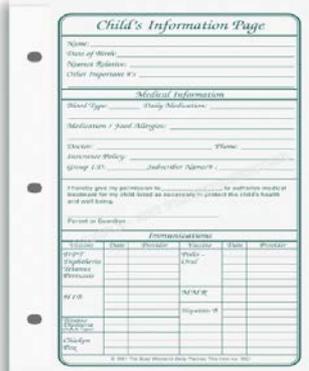
Diabetes Management in Schools

- DMMP required information includes:
 - Emergency contact information
 - Level of self-care
 - Blood glucose monitoring
 - Insulin/medication administration
 - Glucagon administration
 - Meal and snack schedule
 - Physical activity and sports
 - Recognition and treatment of hypo and hyperglycemia



Diabetes Management in Schools

- Other **recommended** areas to be included in the DMMP
 - Date of diagnosis
 - Current health status
 - Specific medical orders
 - 72 hour disaster or emergency plan
 - Assessment of student's self-care skills for performing diabetes care tasks
 - List of diabetes equipment and supplies needed for school
 - It is recommended that parents provide equipment and supplies
 - Information on conditions that call for additional blood glucose monitoring



The image shows a form titled "Child's Information Page" with various sections for medical and personal information. The sections include:

- Personal Information:** Name, Date of Birth, Parent Signature, Child Signature, and Other Important Info.
- Medical Information:** Blood Type, Family Medications, Medications / Food Allergies, Allergies, Insurance Policy, Group L.A.S., and Referral Agency.
- Emergency Information:** A statement of permission for school medical personnel to act in an emergency to protect the child's health and safety.
- Parent or Guardian:** Name, Address, City, State, Zip, and Phone.
- Emergency Contacts:** A table with columns for Name, Phone, and Address, with rows for Grandparents, Siblings, Friends, and Neighbors.

Diabetes Management in Schools

- Needs addressed by Section 504 Plan/IEP
 - Location for and timing of blood sugar monitoring and treatment
 - Identity of trained diabetes personnel
 - Location of diabetes supplies
 - Free access to water and restroom
 - Nutrition - including provisions for meals and snacks
 - Full participation in all school-sponsored activities
 - Alternative times for academic exams if student is experiencing hypoglycemia or hyperglycemia
 - Access to blood glucose checks and treatment supplies during exams
 - Maintenance of confidentiality and student's right to privacy
 - Permission for absences without penalty for health care appointments and prolonged illness



Diabetes Management in Schools

- Quick Reference Emergency Plan
 - Summarizes how to recognize and treat hypoglycemia and hyperglycemia
 - Based on the individual information from the DMMP
 - Distributed to all personnel who have responsibility for the student with diabetes



Type 1 Diabetes
Do you know the symptoms?

Type 1 Diabetes is an Autoimmune Disease that occurs when the immune system attacks and destroys the insulin producing Beta cells in the Pancreas.

Type 1 Diabetes is NOT related to obesity or poor lifestyle choices.

There is NO KNOWN CAUSE of Type 1 Diabetes, and, so far, THERE IS NO CURE!

excessive thirst lethargy blurry vision
weight loss loss of consciousness HEADACHE
NAUSEA mood swings acetone breath
stomach pain bedwetting extreme hunger
frequent urination vomiting

If you, or someone you love, is experiencing any or all of these symptoms contact your medical professional urgently.

Left untreated Type 1 Diabetes is fatal.

Approximately half of all cases of Type 1 Diabetes are diagnosed before the age of 18 years with up to 90% of cases with NO FAMILY HISTORY of this disease.

Type 1 Diabetics require daily doses of insulin via multiple injections or insulin pump infusion in order to survive.

A Type 1 Diabetes Awareness initiative by the Parents of Aussie Kids with Type 1 Diabetes Support Network.



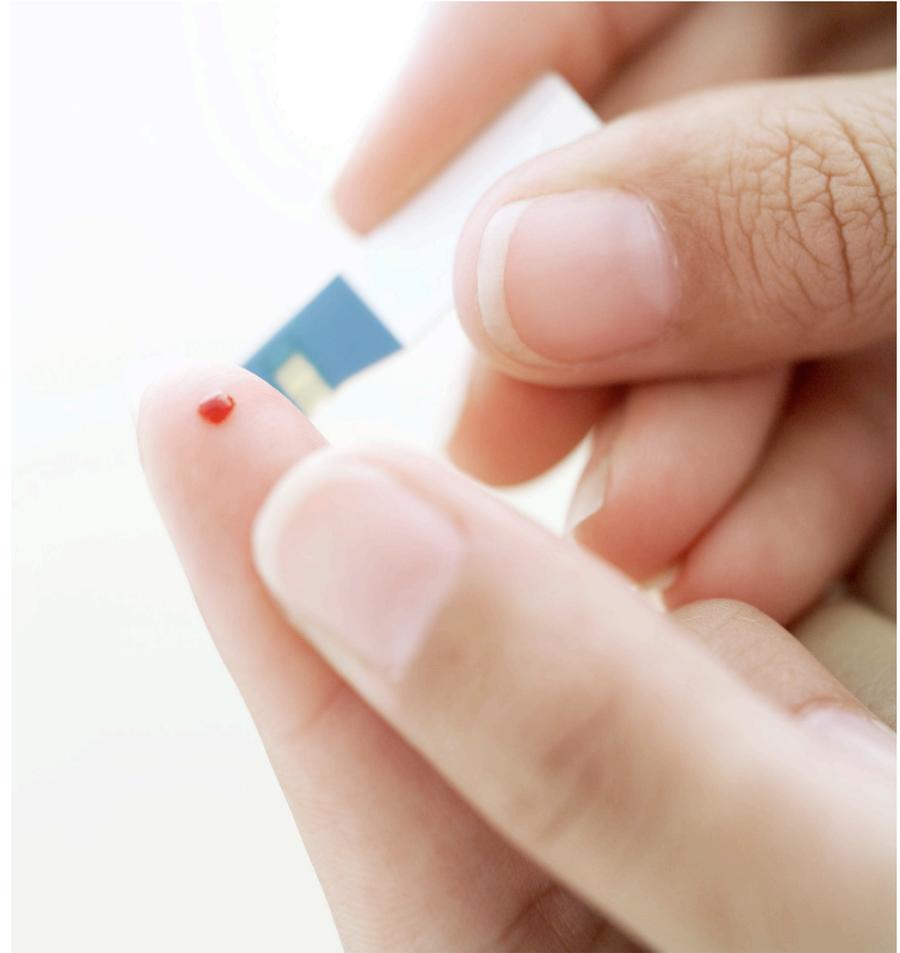
Diabetes Management in Schools

Plan	What it covers	Who writes it
DMMP	“Doctor’s Orders” – details all aspects of routine and emergency diabetes care	Student’s personal diabetes health care team
504 Plan IEP	Education Plans – address each student’s needs for services to manage their diabetes safely and effectively in school, where required under Section 504 or the Individuals with Disabilities Education Act (IDEA)	504 team IEP team
Quick Reference Emergency	Tool for school staff – how to recognize and treat hypoglycemia or hyperglycemia	School nurse, if applicable Diabetes staff volunteer
Individualized Health Care Plan	School nursing care plan: how diabetes care as prescribed in the DMMP will be delivered in the school	School nurse



Diabetes Management in Schools

- Blood Glucose Monitoring
 - Maintain blood glucose within target range
 - Early identification, treatment, and prevention of hypoglycemia and hyperglycemia
 - Decrease risk of long-term complications
 - Is key to understanding how well the diabetes is being controlled
 - Many variables can impact blood glucose, including insulin, food, activity, stress, injury, and illness



Diabetes Management in Schools

- Blood glucose monitoring technology
 - Simple and easy to use
 - Small meters
 - Reliable results with smaller samples
 - Options for alternate site testing
 - Enhanced electronic functions record, share, and analyze data



Diabetes Management in Schools

Basic Steps

- Know the targeted blood glucose range per DMMP
- When to check
 - Times and special circumstances specified in the DMMP
- When to take immediate action to get blood sugar back within target range per DMMP



Diabetes Management in Schools

Recommended Plasma Blood Glucose Goal Range (mg/dl)

Ages	Before Meal BG Goals	Rational
Toddlers/Preschoolers (0 – 6 years)	100-180 mg/dl	A lower goal is reasonable if it can be achieved without excessive hypoglycemia
School Age (6-12 years)	90-180 mg/dl	A lower goal is reasonable if it can be achieved without excessive hypoglycemia
Adolescents and young adults (13-19 years)	90-130 mg/dl	A lower goal is reasonable if it can be achieved without excessive hypoglycemia
American Diabetes Association. “Standards of medical care in diabetes.”	Diabetes Care 2013 January; 36: (Suppl 1): S11-66	



Diabetes Management in Schools

- Blood Glucose Monitoring
 - When to Check
 - DMMP specifies when to test for each individual student
 - Routine checks:
 - Before meals and snacks
 - Before, during, and/or after physical activity
 - Extra check may be necessary per DMMP
 - Hypoglycemia or hyperglycemia symptoms
 - Change in diabetes medications
 - Periods of stress
 - Prior to academic tests
 - Early or delayed release from school
 - When the alarm sounds on the insulin pump



Diabetes Management in Schools

Lancing Devices

- There are many types of lancets and lancing devices on the market
- All contain a very sharp needle in a plastic sleeve



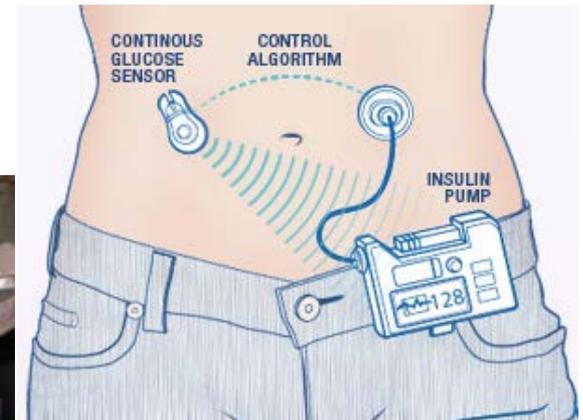
Blood Glucose Monitor

- There are a number of reliable meters on the market
- Work with parent/guardian to become familiar with the operation of the student's particular meter



Diabetes Management in Schools

- Continuous Glucose Monitors (CGM)
 - Have recently been approved for use with children
 - Features of a CGM System
 - Components
 - Range
 - Calibration
 - Sensor Duration
 - Pump Interaction
 - Alarms
 - Arrows

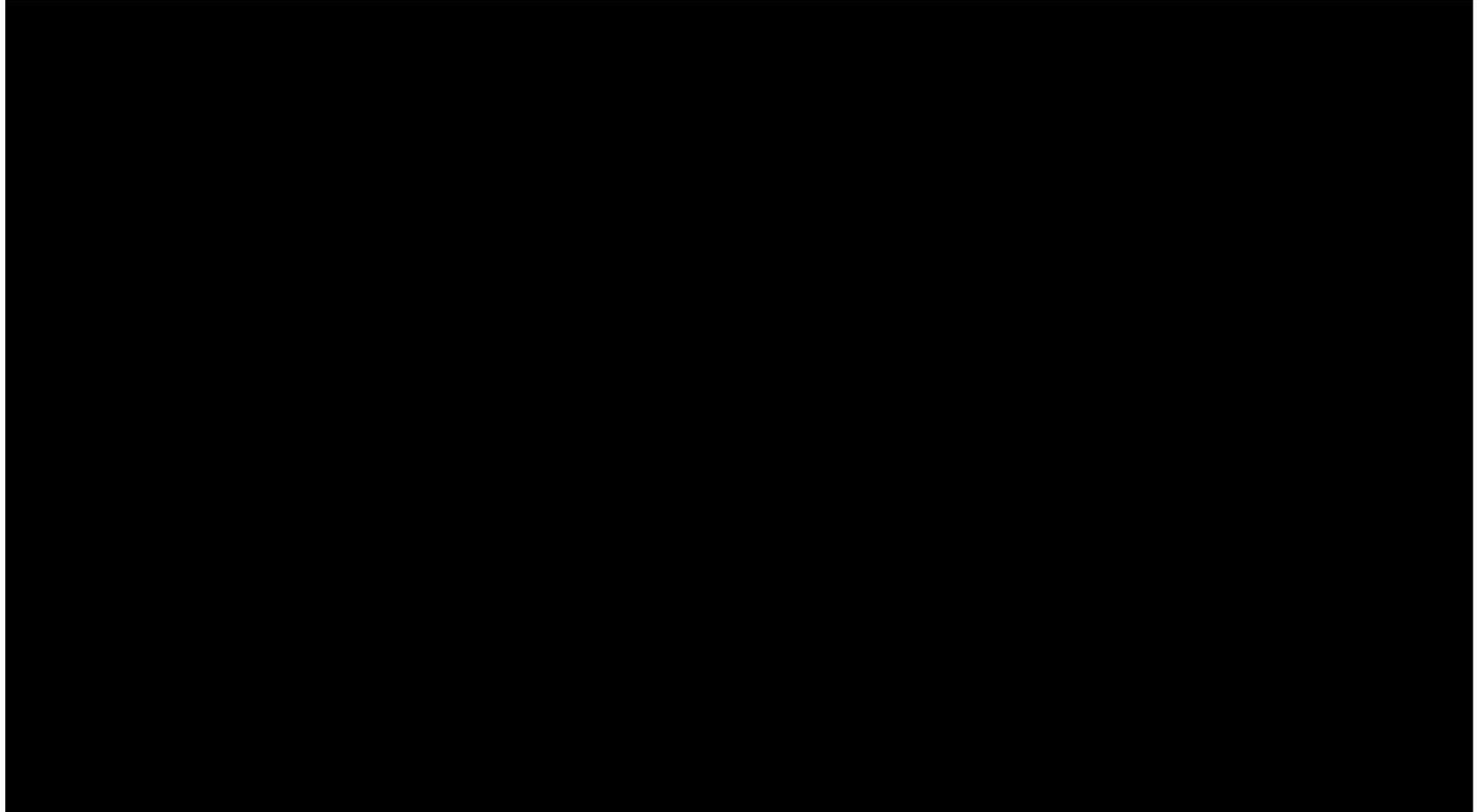


Diabetes Management in Schools

- Ketones
 - Ketones are organic compounds that result when the body fat is broken down for energy
 - Glucose is usually used by cells for energy. But when there is no insulin to help it transport out of the blood and into the cells, the body has an “energy crisis” and starts to break down body fat into ketones as an alternative fuel source
 - May occur when insulin is not given, during illness, extreme bodily stress, or with dehydration
 - Causes abdominal pain, nausea/vomiting, and worsening dehydration
 - This can progress to a serious complication called diabetic ketoacidosis (DKA)



Diabetes Management in Schools



Diabetes Management in Schools

- Why test for ketones
 - DKA is a critical emergency state
 - Early detection and treatment prevents DKA and hospitalizations due to DKA
 - Untreated, DKA leads to severe dehydration, coma, permanent brain damage, or death
 - DKA is the number one reason for hospitalizations of children with diabetes



Diabetes Management in Schools

Symptoms of **DKA**

- Nausea/vomiting
- Abdominal pain
- Fruity breath odor
- Rapid breathing
- Thirst and frequent urination
- Fatigue or lethargy

When to check for ketones

The DMMP should specify:

- When blood glucose remains high
 - consistently above 300 mg/dl for both type 1 and 2, or
 - above 250 mg/dl in type 1 with symptoms of hyperglycemia, or as designated in the DMMP
- During acute illness, infection or fever
- Whenever symptoms of DKA are present



Diabetes Management in Schools

- How quickly does DKA progress
 - Unlike low blood glucose, which can progress very quickly, the progress of untreated high blood glucose to DKA is usually a slow process - over hours or even days
 - A single high blood glucose reading without other symptoms is not a cause for alarm
 - DKA can progress much more quickly for students who use insulin pumps with rapid or short acting insulin only, or in those who have an illness or infection
 - Students are at most risk when symptoms of DKA are mistaken for a stomach virus (stomach flu) and blood glucose is high, but goes unchecked and untreated



Diabetes Management in Schools

Check for ketones

Urine testing

- Most common method used in schools



Blood testing

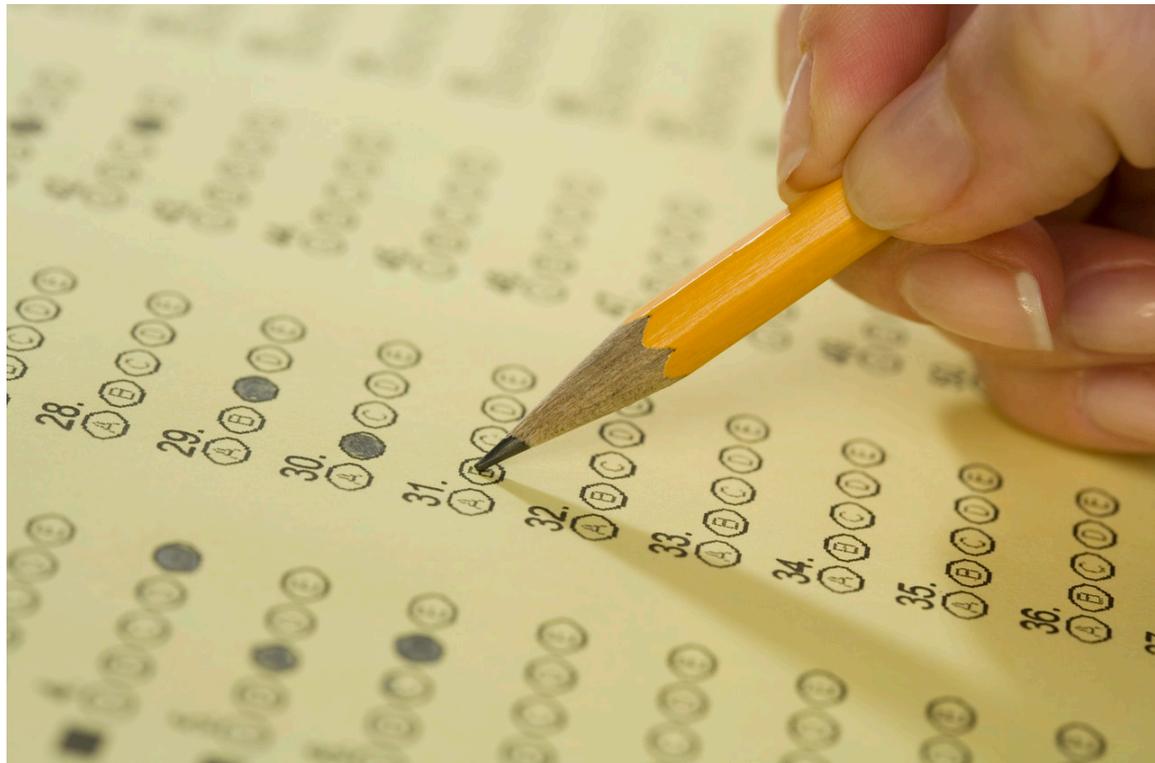
- Requires a special meter and strips
- Procedure similar to blood glucose checks



Follow package instructions regarding expiration dates, time since opening, correct handling, etc., as incorrect results may occur if supplies are past the expiration date. **Ketone strips stored in bottles expire six months after opening.**

Diabetes Management in Schools

Post Test



Diabetes Management in Schools

- Nutrition: Why be concerned
 - Good nutrition is important for preventing, managing, and slowing the rate of development of diabetes and its complications
 - Nutrition planning is essential for good diabetes control
 - Maintain blood glucose within target range
 - Prevent or delay complications
 - Help children and teens grow and develop properly
 - Achieve healthy weight
 - Promote optimal learning



Diabetes Management in Schools

- Basic Meal Plans
 - The key elements of food are – protein, fat, and carbohydrate
 - An imbalance between carbohydrate intake and insulin action can result in low blood glucose levels or high blood glucose levels
- Carbohydrate (carb) has the greatest effect on blood glucose levels.



Diabetes Management in Schools

- Total carbohydrate matters more than the source (sugar or starch) and will determine how high blood glucose will be after a meal or snack
- The student's Registered Dietitian or healthcare provider will help determine the amount of carb that is right for each individual child at each meal, and that information can be found in the DMMP



Diabetes Management in Schools

- To count carbohydrates from a food label, look for the serving size and the total carbohydrate, not grams of sugar
- Once the carbohydrate content is determined for each food item in the meal or snack, add up the total number of grams of carbohydrate that will be eaten
- It is important to be sure the numbers are correct

Nutrition Facts	
Serving Size 1 cup (4 oz)	
Serving Per Container 3	
Amount Per Serving	
Calories 75 Calories from Fat 27	
	% Daily Value*
Total Fat 3 g	5%
Saturated Fat 0 g	0%
Cholesterol 0 mg	0%
Sodium 300 mg	4%
Total Carbohydrate 10 g	3%
Dietary Fiber 5 g	20%
Sugars 3 g	
Protein 2 g	
Vitamin A 80% • Vitamin C 60% • Calcium 4% • Iron 4%	
* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
	Calories: 2,000 2,500
Total Fat	Less than 65g 80g
Sat Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g
Calories per gram:	
Fat 9 • Carbohydrate 4 • Protein 4	

The serving size for the food is 1 cup.

There are 3 servings or 3 cups in this container.

The total carbohydrate tells how many grams of carbohydrate are in 1 serving.

Sugar is already included in the total carbohydrate amount. This value shows the amount of natural or added sugar.

Diabetes Management in Schools

- Double check the amounts to be sure they are correct
 - Children less than 11 years old may have difficulty with the addition or division and may need your help

Nutrition Facts	
Serving Size 1 cup (4 oz)	
Serving Per Container 3	
Amount Per Serving	
Calories 75 Calories from Fat 27	
	% Daily Value*
Total Fat 3 g	5%
Saturated Fat 0 g	0%
Cholesterol 0 mg	0%
Sodium 300 mg	4%
Total Carbohydrate 10 g	3%
Dietary Fiber 5 g	20%
Sugars 3 g	
Protein 2 g	
Vitamin A 80% - Vitamin C 60% - Calcium 4% - Iron 4%	
* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
	Calories: 2,000 2,500
Total Fat	Less than 65g 80g
Sat Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g
Calories per gram:	
Fat 9 • Carbohydrate 4 • Protein 4	

The serving size for the food is 1 cup.

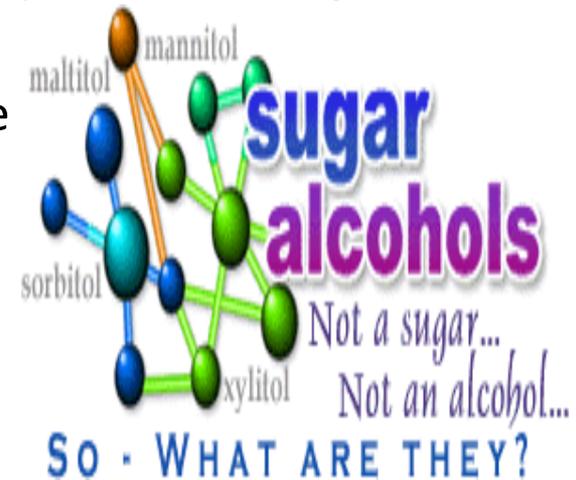
There are 3 servings or 3 cups in this container.

The total carbohydrate tells how many grams of carbohydrate are in 1 serving.

Sugar is already included in the total carbohydrate amount. This value shows the amount of natural or added sugar.

Diabetes Management in Schools

- Sugar Alcohols – What are they
 - Sugar alcohols are one type of reduced-calorie sweetener
 - Sugar alcohols provide fewer calories than sugar and have less of an effect on blood glucose than other carbohydrates
 - They do not contain alcohol even though they are called sugar alcohols
 - The sugar alcohols commonly found in foods are
 - Sorbitol
 - Mannitol
 - Xylitol
 - Isomalt
 - Hydrogenated starch hydrolysates
 - Sugar alcohols come from plant products such as fruits and berries
 - Sugar alcohols are included in the Total Carbohydrate content per serving of any food



Diabetes Management in Schools

Insulin to carb ratio:

- Is determined by the student's health care team
- Should be included in the DMMP
- Usually stated as a ratio of 1 unit of insulin to X grams of carbohydrate
- May vary from meal to meal for a student
 - Breakfast may be different than lunch which may be different from dinner



Diabetes Management in Schools



<p style="text-align: right;">22</p> <p>Breakfast: eggs, sausage, biscuit, fruit, juice , yogurt</p> <p>Lunch: Soft shell tacos, refried beans, melon, skim/1% milk</p>	<p style="text-align: right;">23</p> <p>Breakfast: mini Pancake, sausage, fruit, juice, yogurt</p> <p>Lunch: Shephard's Pie with garlic mashed potatoes, dinner roll, green salad, banana, skim/1% milk</p>	<p style="text-align: right;">24</p> <p>Breakfast: Breakfast Pizza, fruit, juice, yogurt</p> <p>Lunch: Broccoli Mac and Cheese, Cucumber-apple salad, grapes, skim/1% milk</p>
<p style="text-align: right;">29</p> <p>Breakfast: eggs, sausage, biscuit, fruit, juice , yogurt</p> <p>Lunch: Cheese and veggie quesidilla, ww tortilla, spinach, salsa, refried beans, pears/kiwi, skim/1% milk</p>	<p style="text-align: right;">30</p> <p>Breakfast: mini Pancake, sausage, fruit, juice, yogurt</p> <p>Lunch: Baked Fish, whole wheat roll, mashed potatoes, peas, mandarin oranges, skim/1% milk</p>	<p style="text-align: right;">31</p> <p>Breakfast: Breakfast Pizza, fruit, juice, yogurt</p> <p>Lunch: Ham and Pineapple Pizza, carrots and celery, green beans, banana, skim/1% milk</p>

Diabetes Management in Schools

- Example of how to calculate an insulin dose using an insulin-to-carb ratio and blood glucose correction:
- Insulin-to-carb ratio = 1 unit of rapid acting insulin per 15 gm carb*
- Blood glucose correction = 1 unit of rapid acting insulin per 50 mg/dL over 150 mg/dL blood glucose*

Sample School Breakfast

- 1 scrambled egg 0.4 grams of carb
 - 1 sausage patty (pork) 0 grams of carb
 - 1 Biscuit (refrigerated dough) 12.6 grams of carb
 - ½ cup grape juice 18.7 grams of carb
 - 8 oz 1% white milk 12.2 grams of carb
- Total = 43.9 grams of carb**

- Pre-meal Blood Glucose = 250
- Total Carb = 43.9 grams
- Insulin needed for carbs = $43.9 \div 15 = 2.92$ or 3 units
- Insulin needed to lower blood glucose to target level = $250 - 150$ (target) = $100 \div 50 = 2$ units
- **Total Dose = $3 + 2 = 5$ units**

*Insulin-to-carb ratios and blood glucose corrections are individualized for each child.

****This example should not be used as a recommendation for dosing***



Diabetes Management in Schools

- Another example

- Ham & Pineapple Pizza = 16 gm
- Carrot & celery sticks = 8 gm
- 1 cup Green beans = 8 gm
- 8 oz milk (low fat) = 12.2 gm
- 1 sm banana = 12.4 gm

Total grams of carbohydrates =
56.6 gm

1 unit insulin per 15 gm
carbohydrate

$56.6 \div 15 = 3.8$ units pump or 4
units by syringe or pen



- One more example

- Baked breaded fish = 12.1gm
- Whole wheat roll = 24 gm
- ½ cup mashed potatoes = 17.8gm
- ½ cup peas = 10.7gm
- ½ cup mandarin oranges = 20.4gm
- 8 oz milk (low fat) = 12.2gm

Total grams of carbohydrate =
97.2gm

- 1 unit insulin per 12 gm
carbohydrate

- I:C ratio = 1:12
- $97.2 \div 12 = 8.1$ Units of insulin
per pump or 8 units per
syringe or pen for the meal
bolus

Diabetes Management in Schools

- Provide school menus and nutrition information to student/parent/guardian in advance
- Provide sufficient time for eating
- Monitor actual food intake per DMMP
 - Young or newly diagnosed, developmentally delayed
 - Picky eaters
 - It is recommended you let the picky eater eat first, then figure the carbohydrates and insulin according to what was actually eaten
 - Respect and encourage independence



Diabetes Management in Schools

Beyond the routine - School Parties

- Provide parent/guardian with advance notice of parties/special events
- Follow the student's DMMP, 504 Plan, or IEP
- Some may prefer to bring their own foods, but may eat what is available
- Provide nutritious party snacks or non-food treats for all
- Limit use of food as a reward

Beyond the routine - Field Trips

- Notify parent/guardian as soon as trip is scheduled to allow for food and insulin adjustments
- Bring plenty of quick acting sugar sources to treat hypoglycemia
- Bring lunch as appropriate
- Bring diabetes equipment and supplies, including glucagon, if specified in DMMP
- Bring list of emergency contacts, copy of emergency care plan



Diabetes Management in Schools



Snack Examples for school parties

15-20 gm carb snacks

- 1 small apple or orange
- 8 animal crackers
- 4-5 vanilla wafers
- ½ cup applesauce



20-30 gm carb snacks

- 1 granola bar
- 1 packet of sandwich crackers
- 1 pudding cup
- 1 large banana



Diabetes Management in Schools

- As a teacher, you can help by
 - Supporting self-care by capable students
 - Providing easy access to diabetes supplies
 - Ensuring students eat snacks and meals at scheduled times and make sure snacks are available to treat low blood sugars
 - Allowing students reasonable time to make up missed work or tests
 - Learning about diabetes and complying with the student's Diabetes Medical Management Plan and/or the student's 504 Accommodation Plan



Diabetes Management in Schools

- Classroom tips
 - Create a diabetes information sheet for substitute teachers
 - Learn signs and responses to low/high blood sugar levels
 - Allow blood glucose monitoring and free access to bathrooms/water during class
 - Teach your class about diabetes
 - Let parents know, in advance, of changes to the class schedule (field trips, special events, etc.)



Diabetes Management in Schools

- Resources
 - www.diabetes.org/schools
 - www.diabetes.org/safeatschool
 - www.diabetes.org/504plan
 - www.calorieking.com
 - <http://tracker.diabetes.org/>
 - <http://www.my-calorie-counter.com/>
 - http://ndep.nih.gov/media/youth_schoolguide.pdf
 - <http://www.myfitnesspal.com/>
 - <http://www.cdc.gov/diabetes/prevention/factsheet.htm>
 - <http://www.diabetesforecast.org/2013/jan/>

Free Diabetes Planner and Carb Counter APPs from the iPhone App Store



Diabetes Management in Schools

- Children with Diabetes: <http://childrenwithdiabetes.com>.
- Juvenile Diabetes Research Foundation: www.jdrf.org
- National Diabetes Education Program: <http://ndep.nih.gov>
 - <http://ndep.nih.gov/schoolguide>
- Carb counting books under \$25.00
 - The CalorieKing Calorie, Fat, & Carbohydrate Counter 2013
 - Calorie, Fat, & Carbohydrate Counter, 2009 Ed.
 - The Diabetes Carbohydrate & Fat Gram Guide
 - Complete Guide to Carb Counting
 - Complete Book of Food Counts



Diabetes Management in Schools

- How to:
 - Test blood sugar
 - Measure ketones
 - Give insulin injection
 - Administer glucagon injection



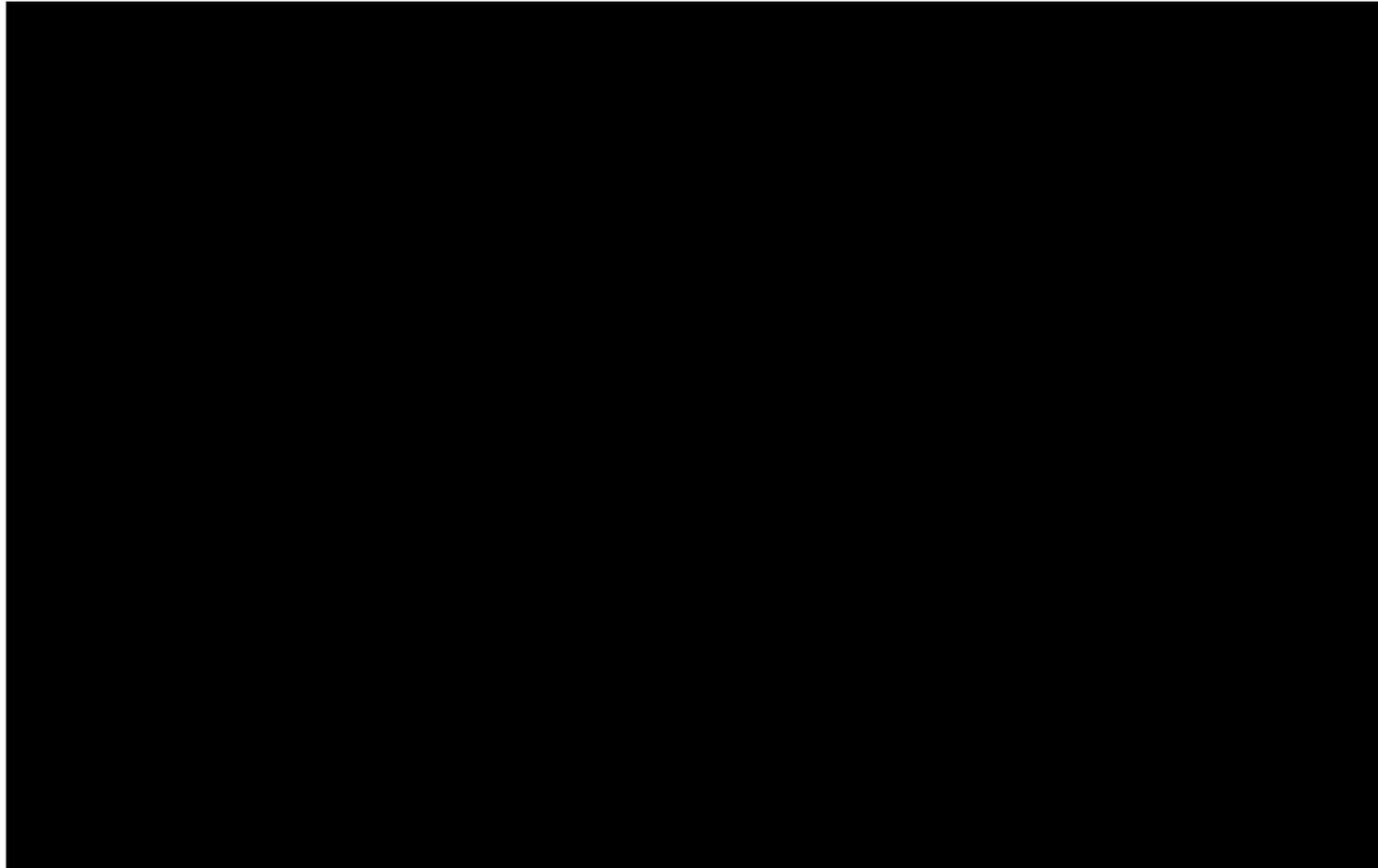
Diabetes Management in Schools

Blood Glucose Monitoring



Diabetes Management in Schools

Blood Glucose Monitoring



Preparation

1. Gather blood glucose monitoring supplies:

- Lancet
- Test strips
- Meter



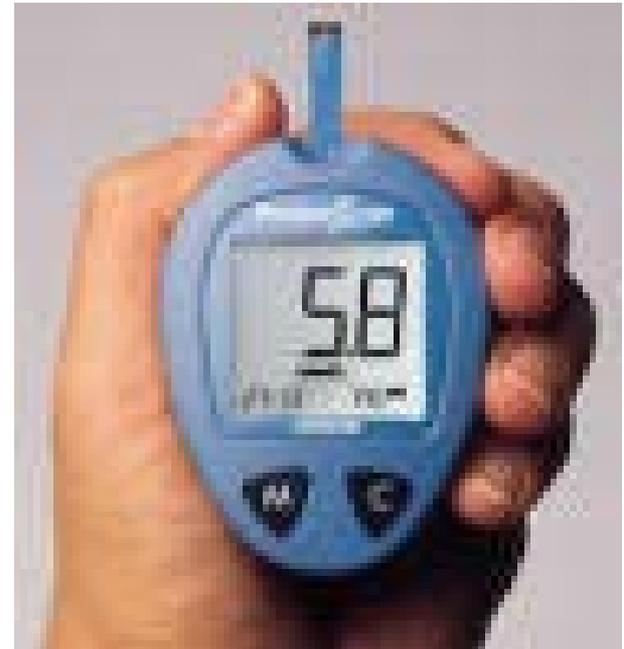
2. Student washes hands and dries thoroughly

3. If assisting or performing for student, put on disposable gloves



Readying the Meter

4. Turn the meter on
5. Check code number
6. Insert a strip into the meter





Lancing the Finger

7. Hold the lancet device to the side of the finger and press the button to stick the finger



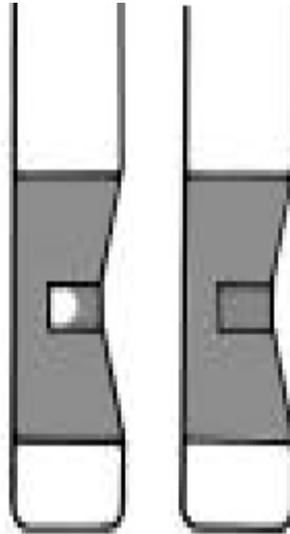


Applying Blood to Strip

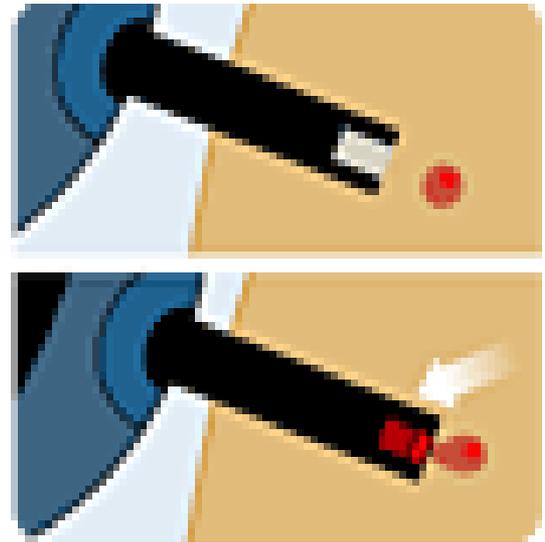
8. Follow instructions included with the meter when applying blood to strip



**Drop,
not smear**



**Cover ALL of
test strip
window**



**Some strips
suck blood
onto the strip**

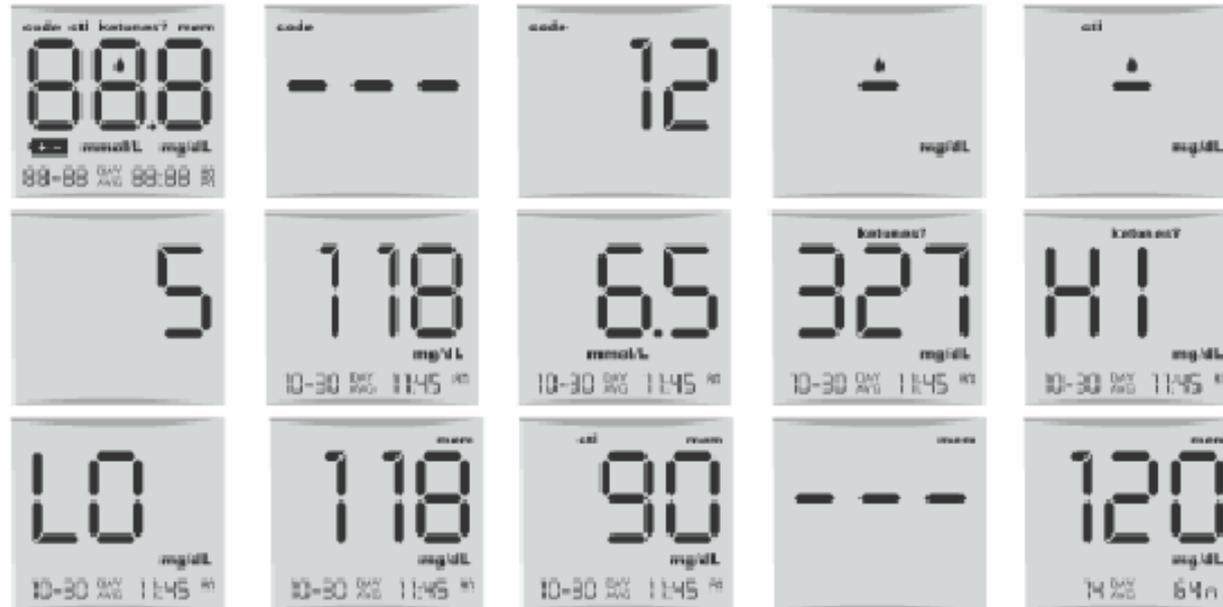


Results

9. Wait until blood glucose result is displayed
10. Dispose of lancet
11. Record blood glucose results, take action per DMMP

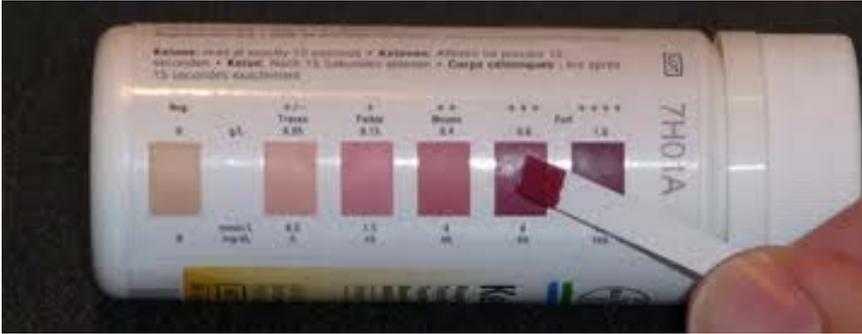


What does the display mean

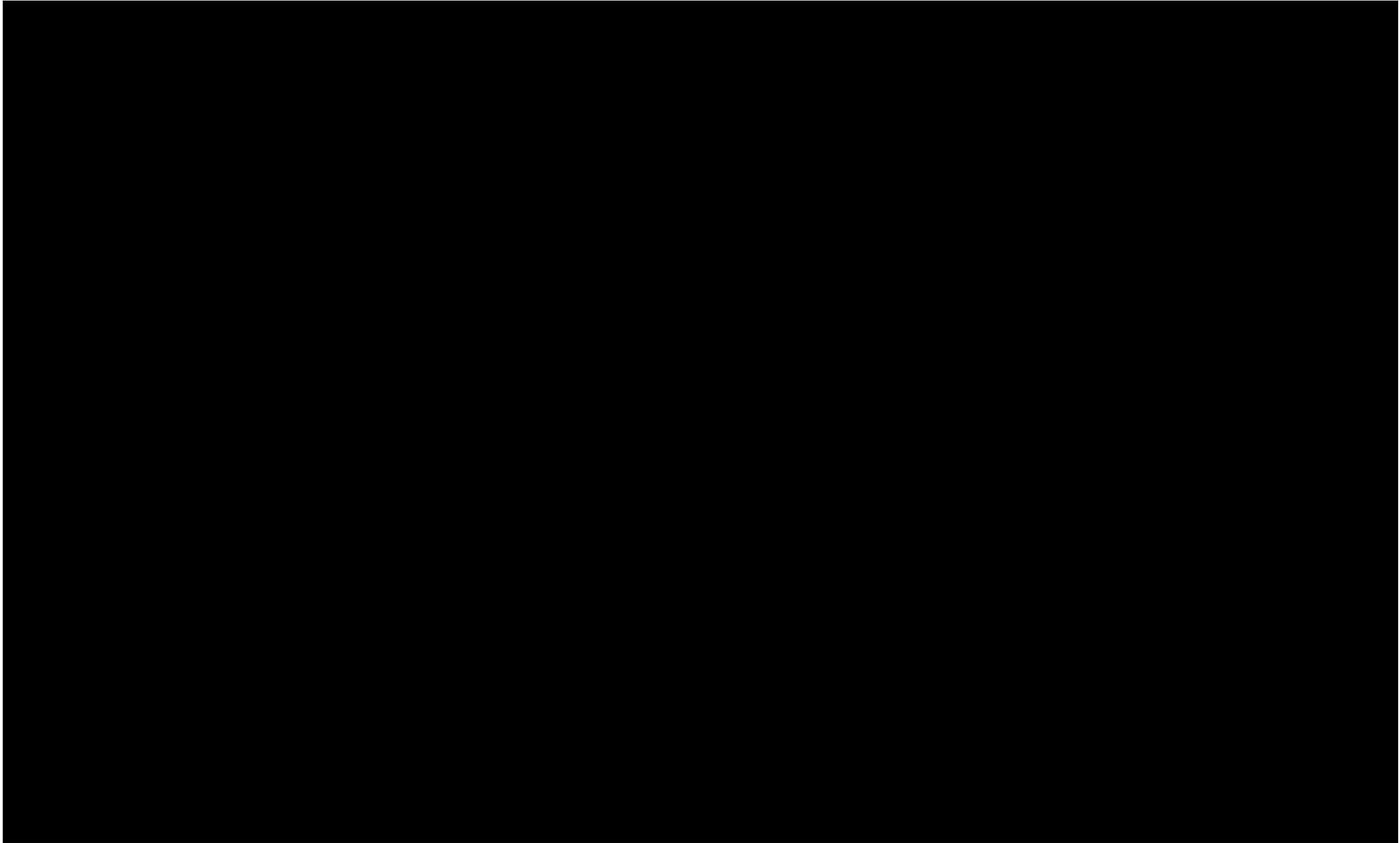


- Check manual
- Contact manufacturer (1-800; Website)

Urine Ketone Testing

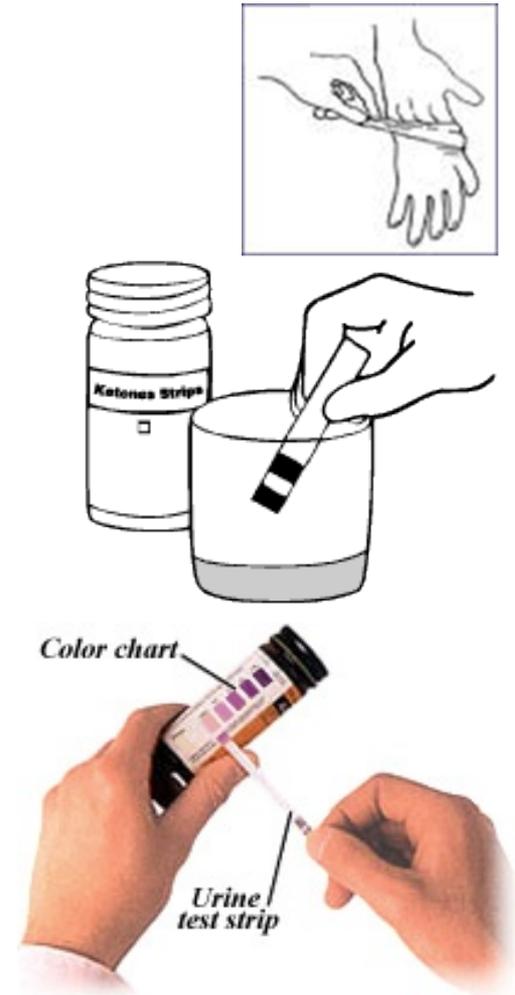


Urine Ketone Testing

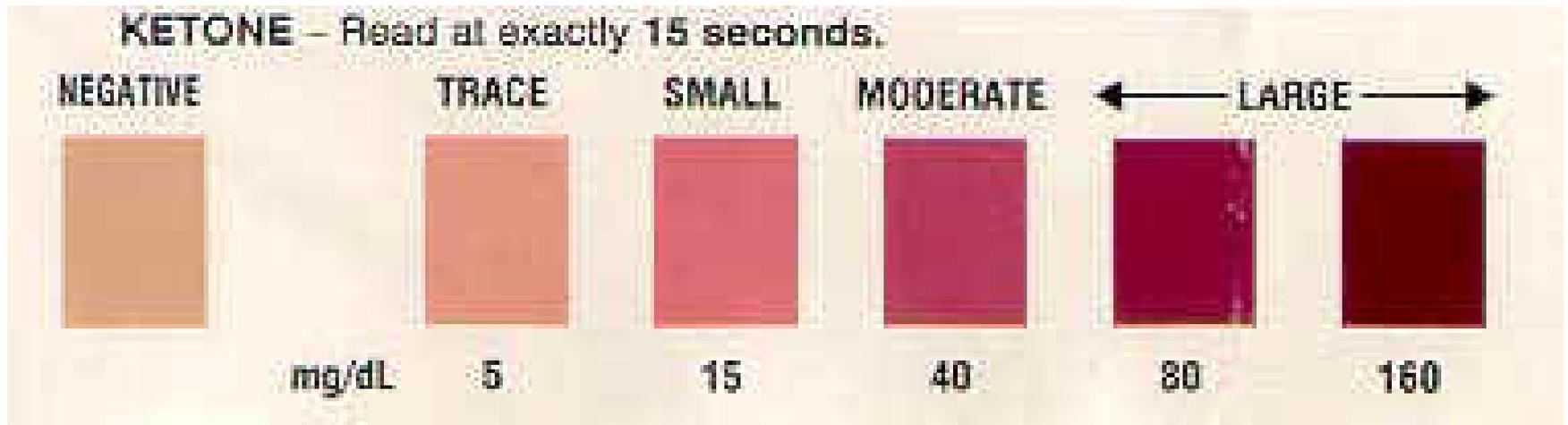


How to test urine ketones

1. Gather supplies
2. Student urinates in clean cup
3. Put on gloves, if performed by someone other than student
4. Dip the ketone test strip in the cup containing urine. Shake off excess urine.
5. Wait 15 - 60 seconds
6. Read results at designated time
7. Record results, take action per DMMP



Test Results: Color code



- no ketones
- trace
- small
- moderate
- large ketones present



Considerations

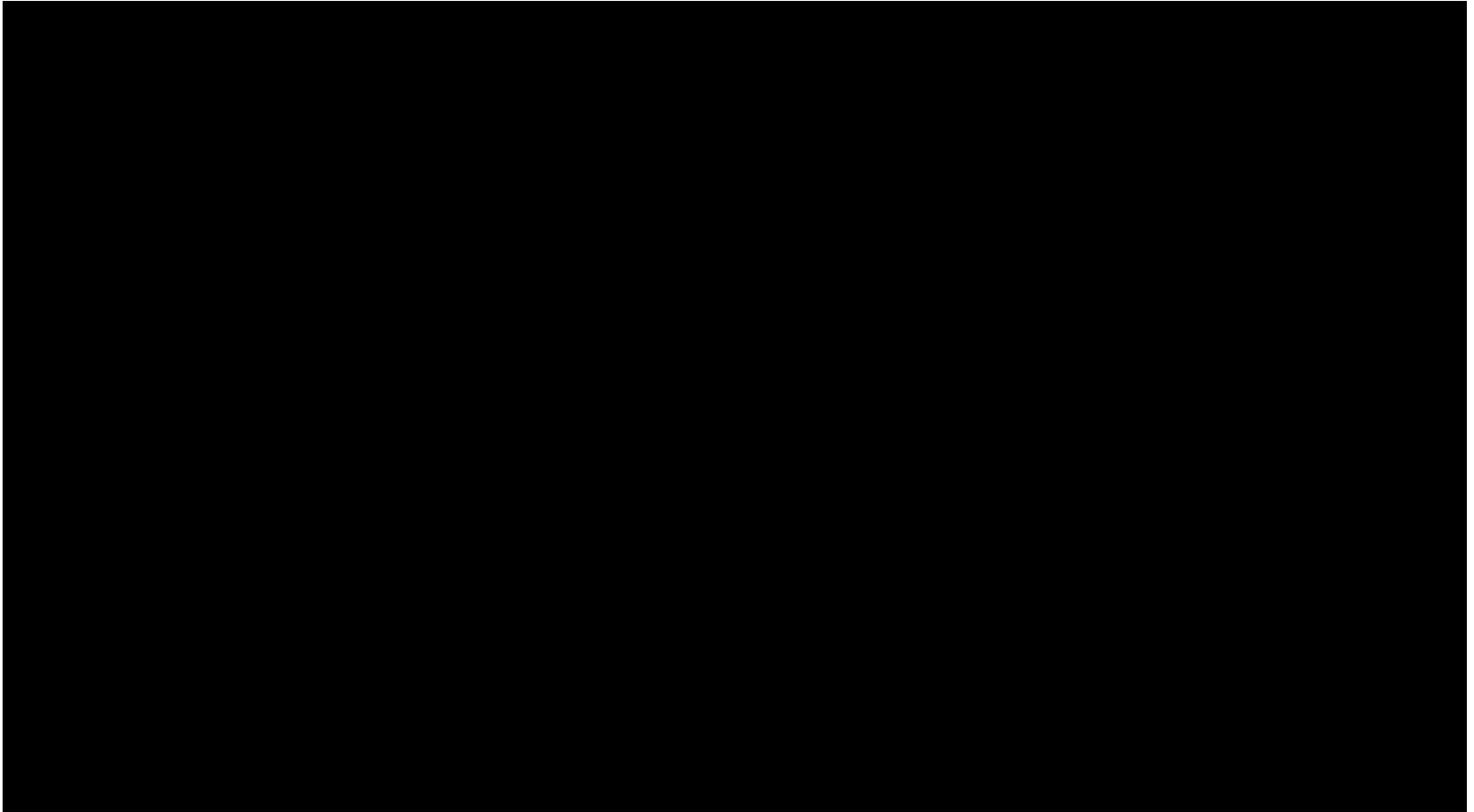
- Colors on the strips and timing vary according to brand
- If using a scale with “urine glucose” and “urine ketones,” be sure to read the correct scale when testing for ketones
- Follow package instructions regarding expiration dates, time since opening, correct handling, etc., as incorrect results may occur



Insulin Injections



Insulin Injections



Insulin Syringe & Vial: Preparation

1. Get Supplies:

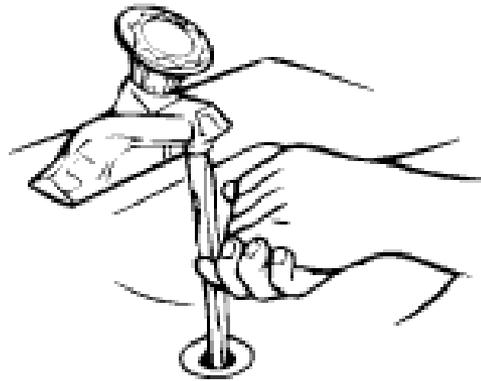
- Insulin (Verify)
- Syringe
- Alcohol wipe
- Disposable gloves
- Sharps container



Syringe & Vial: Preparation

2. Wash & dry hands

& put gloves on



3. Clean the insulin vial

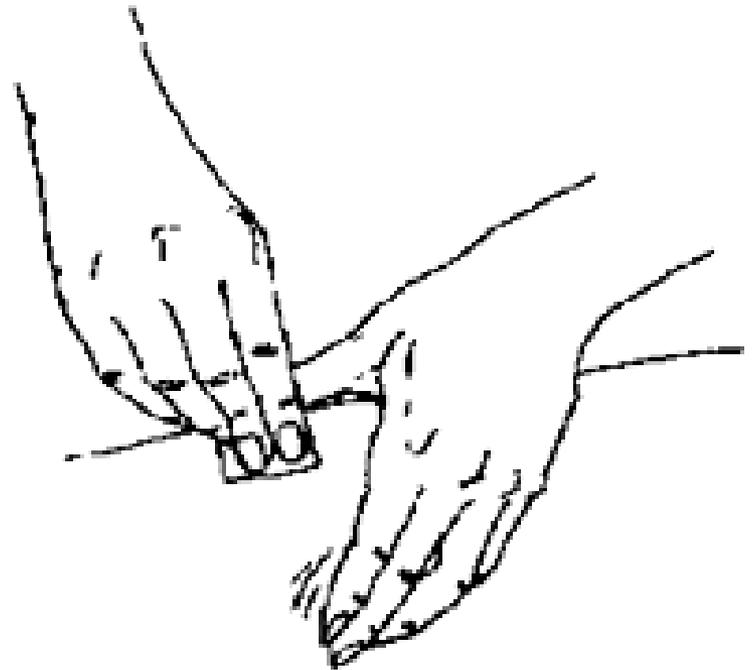




Syringe & Vial: Preparation

4. Have student select injection site

5. Clean the injection site

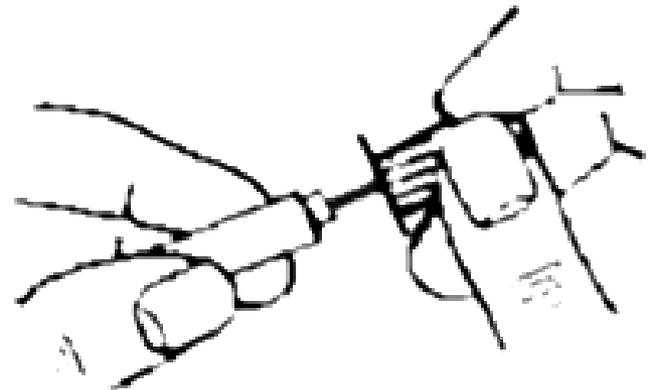




Syringe & Vial: Preparation

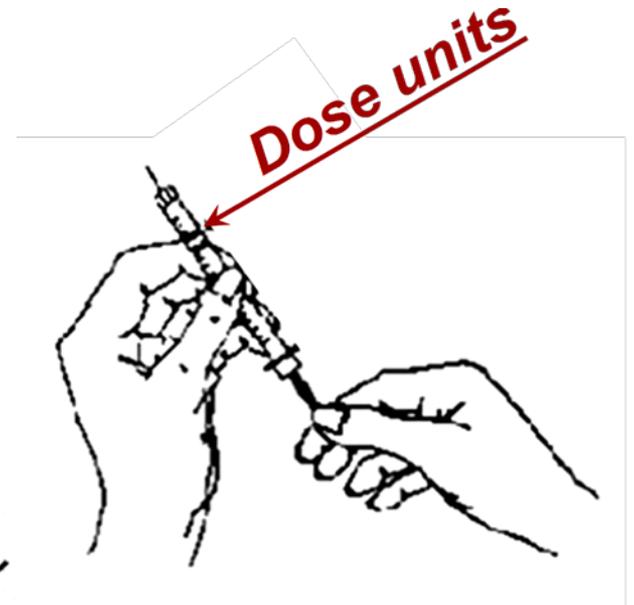
6. Check the insulin dose

7. Remove the cap from syringe



Syringe & Vial: Dosing

8. Pull the plunger down to number of units to be administered

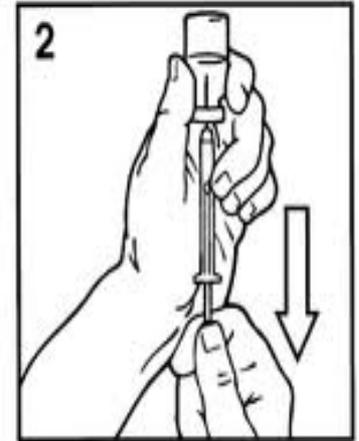


9. Inject air into bottle



Syringe & Vial: Dosing

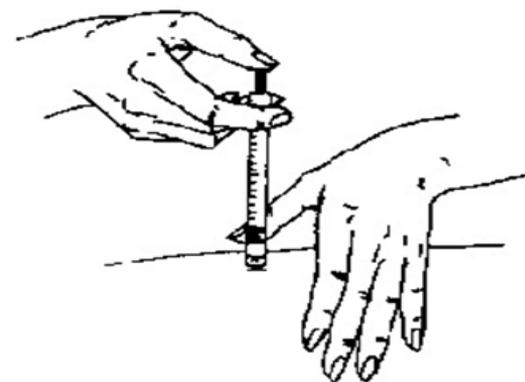
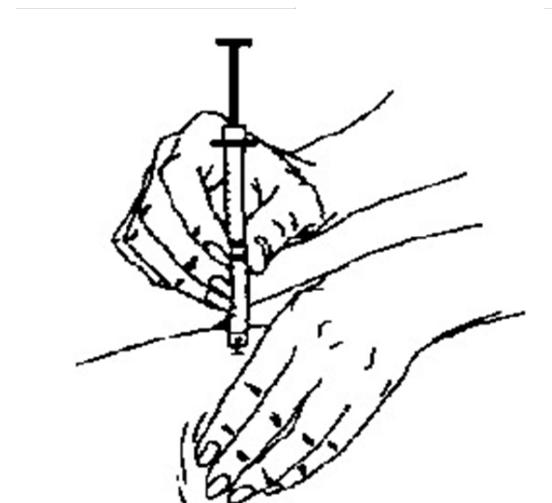
10. Draw out prescribed number of units of insulin as per DMMP



www.shutterstock.com - 196754411

Syringe & Vial: Injecting

11. Pinch up the skin
12. Push needle into skin at 90°
13. Release pinch
14. Push the plunger in
15. Count to “5”
16. Remove needle and dispose of syringe
17. Document time, dosage, site, and blood glucose value

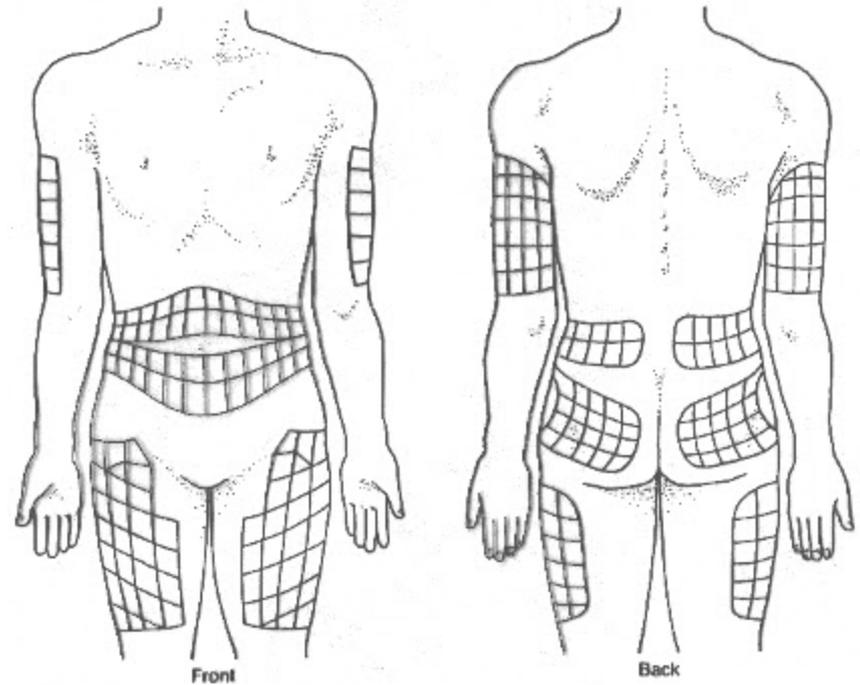


Insulin Injection Sites



Insulin injection sites:

- Outer arm
- Abdomen
- Hip area
- Thigh

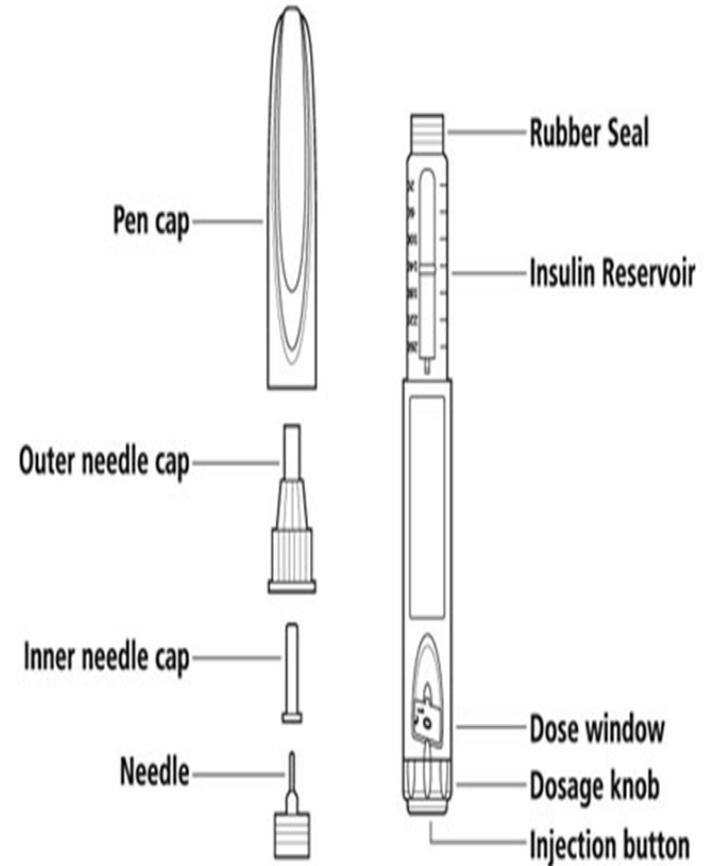


Common insulin injection sites



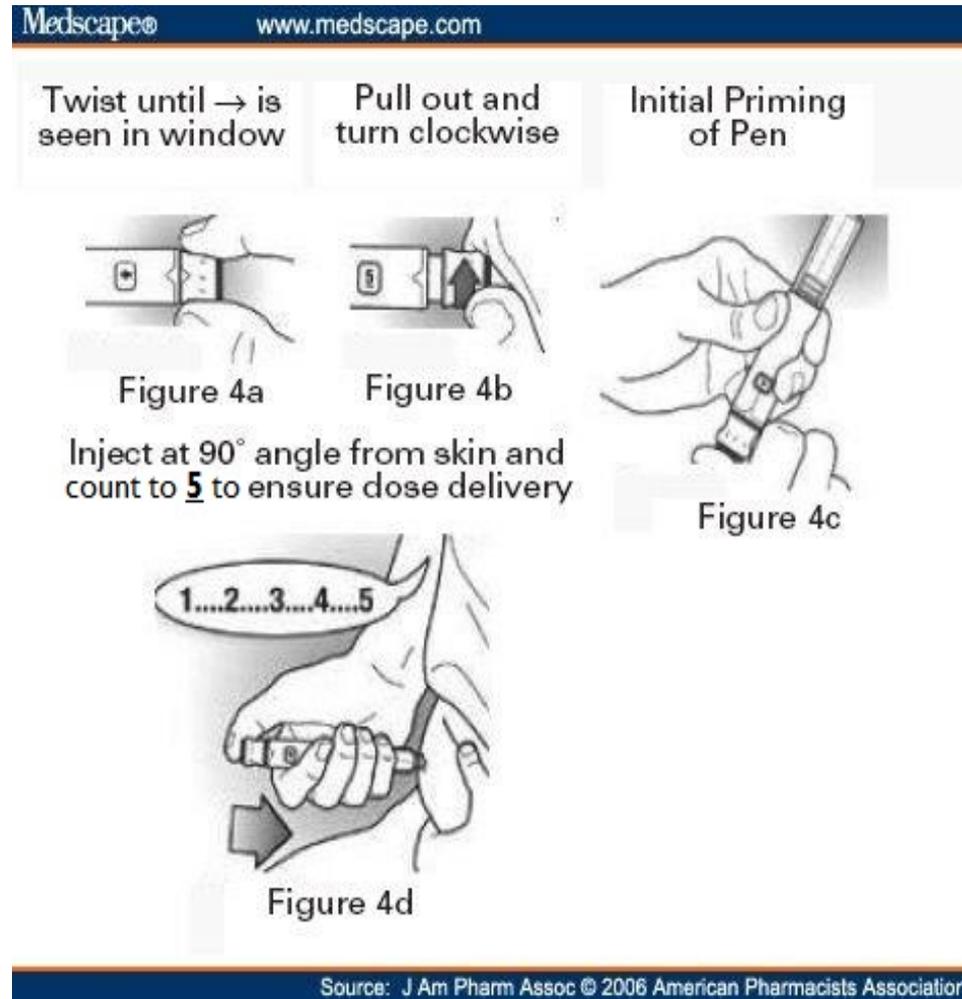
Insulin Pen: Preparation

1. Verify insulin type & gather supplies
 - pen device (with cartridge)
 - pen needle
 - alcohol wipe
 - sharps container
2. Wash hands
3. Put gloves on
4. Chose injection site
5. Clean injection site
6. Screw on pen needle



Insulin Pen: Dosing

7. Prime the pen according to manufacturer instructions
8. Hold upright
 - Remove air by pressing the plunger
 - Repeat "Prime" if no insulin shows at end of needle
9. Dial number of units to be given as per DMMP





Insulin Pen: Injecting

10. Choose and clean injection site
11. Pinch up the skin
12. Push the needle into the skin at 90° angle
13. Release pinched skin
14. Push down on the plunger
15. Count to “5”
16. Remove and dispose of pen needle
17. Document time, dose, site, and blood glucose value



Insulin Pen: Injecting

Insulin Pen Devices

TOP TIP



Injection with the pen device



1. Choose the appropriate site for injection



2. Push the needle through the skin at 90° keeping thumb away from dosage button



3. Push thumb down completely and count to 5 or follow manufacturer's recommendations



4. Remove needle



5. Remove needle from pen



6. Dispose of needle safely

Having prepared the pen device, you need to know how to correctly inject the insulin. These diagrams will show you how. Please note that healthcare professionals may use a specific type of sharps bin with a small inlet in which to place the needle.

Jump to page

Your Notes



7 / 17

00:01:16



VIRTUAL
COLLEGE



Print

Glossary



0 %



Save

Help

Minimise

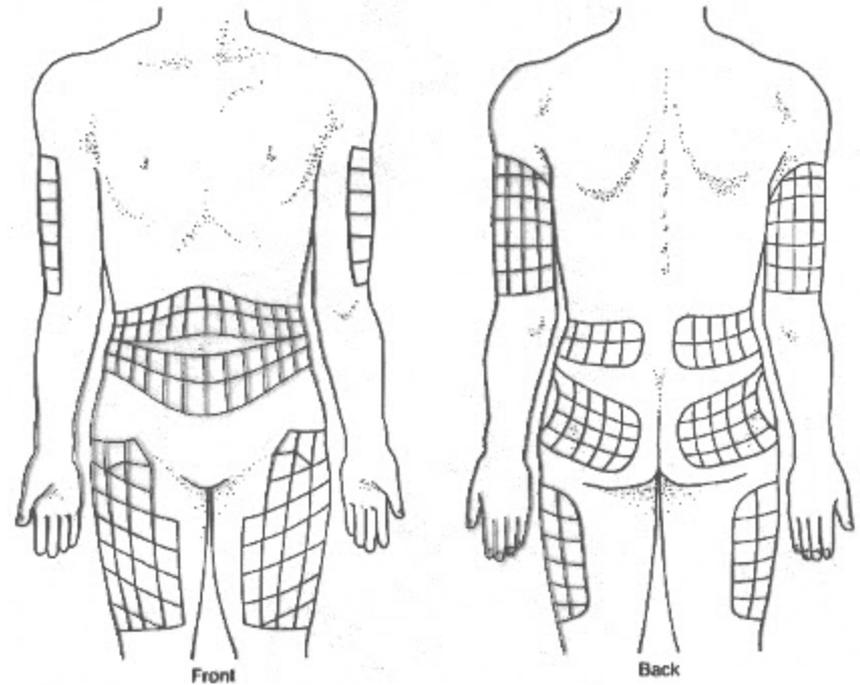
Quit

Insulin Injection Sites



Insulin injection sites:

- Outer arm
- Abdomen
- Hip area
- Thigh



Common insulin injection sites



After Giving Insulin

- Check site for leakage
- Correction doses
 - Retest per DMMP to check effectiveness
- Meal/snack doses
 - Timeliness in relation to eating
 - Supervision of food amount per DMMP

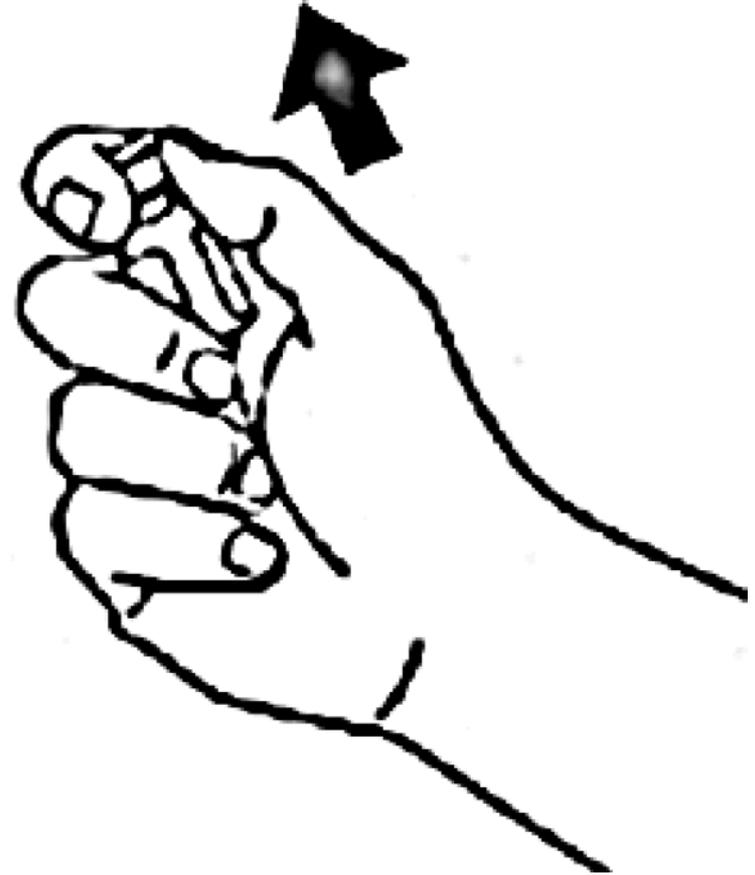


Glucagon



Glucagon Preparation

1. Flip cap off glass vial containing dry powder
2. Remove cap from syringe



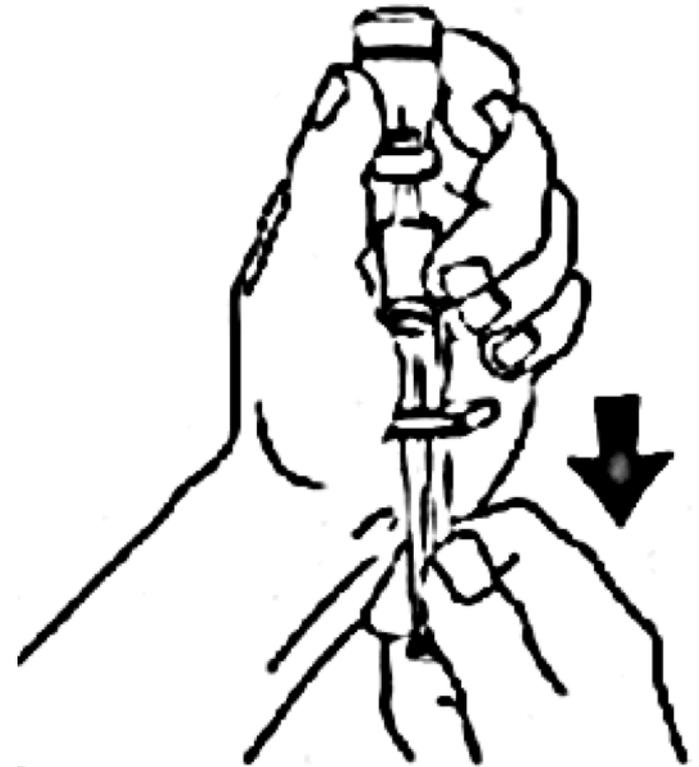
Mixing Solution

3. Inject entire fluid in syringe into the bottle containing powder
4. Shake gently or roll to mix until all powder is dissolved and solution is clear



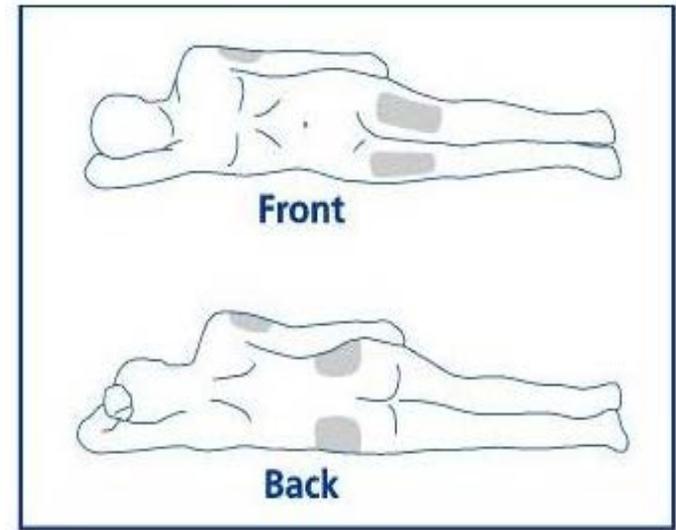
Drawing Out

5. Inspect. Solution should be clear and colorless
6. Draw prescribed amount of glucagon back into syringe



Dosing & Injecting

7. Clean site if possible
8. Inject at 90° angle into the tissue under cleansed area
 - buttocks
 - thigh (preferred location)
 - arm



© Healthwise, Incorporated

Diabetes Management in Schools

References

- American Diabetes Association (ADA) 2010. Diabetes Care In the School and Day Care Setting. *Diabetes Care*, 33(Supp1), S70-74.
- Centers for Disease Control and Prevention, National Diabetes Prevention Program www.cdc.gov/diabetes/prevention/prediabetes.htm
- Evert, A. Real Work Meal Planning Strategies for Children and Adolescents with Diabetes. *School Nurse News*. November 2006:23(5), 34-37.
- Lipman, TH; Chang Y; Murphy, KM. "The epidemiology of type 1 diabetes in children in Philadelphia 1990-1994: evidence of an epidemic. *Diabetes Care* 2002;25(11): 1969-75.
- National Diabetes Education Program (NDEP) and the National Institutes of Health (NIH) 2010. *Helping the Student With diabetes Succeed: A Guide For School Personnel*. http://nedp.nih.gov/media/youth_NDEPSchoolGuide.pdf
- Nguyen T, Mason K, Sanders C, Yazdani P, Heptulla R. Targeting Blood Glucose Management in School Improves Glycemic Control in Children with Poorly Controlled Type 1 Diabetes Mellitus. *Journal of Pediatrics*. 2008:153, 575-578.
- Substance Abuse and Mental Health Services Administration. (2013). Diabetes Care for Clients in Behavior Health Treatment. *Advisory*, volume 12, Issue 1.



Acknowledgement

Support of this presentation is provided by
the Maternal and Child Health Service
Title V Block Grant



Barbara Smith, RN, MPH, MEd
School Health Coordinator
Oklahoma State Department of Health
Maternal and Child Health Service
1000 N.E. 10th Street
Oklahoma City, Oklahoma 73117-1299
(405) 271-4471
barbarads@health.ok.gov

Amy Terry, MS, RN
Adolescent Health Coordinator
Oklahoma State Department of Health
Maternal and Child Health Service
1000 N.E. 10th Street
Oklahoma City, Oklahoma 73117-1299
(405) 271-4471
AmyT@health.ok.gov

Nancy Bacon, MS, RD/LD, CDE
Maternal and Child Health Consultant
Oklahoma State Department of Health
Maternal and Child Health Service
1000 N.E. 10th Street
Oklahoma City, Oklahoma 73117-1299
(405) 271-4480
NancyB@health.ok.gov

Tonya Young, BS, CHES
School Health Educator
Maternal and Child Health Service
Oklahoma State Department of Health
1000 N.E. 10th Street
Oklahoma City, Oklahoma 73117-1299
(405) 271-4471
TonyaY@health.ok.gov