When a Good Pancreas Goes Bad

By

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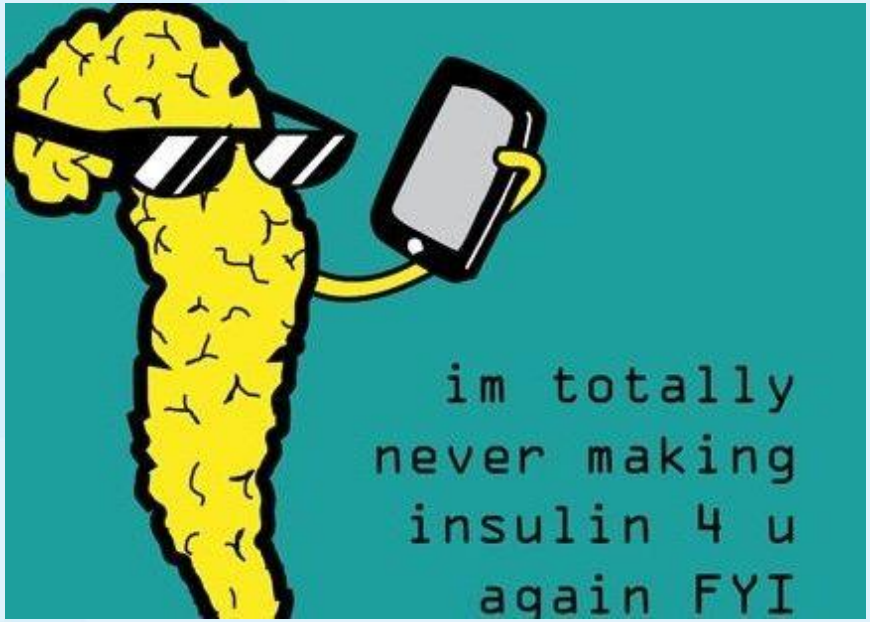
Children's Endocrinology



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Objectives

Identify	Summarize	List	Name
Identify the main 2 types of diabetes and the differences between them	Summarize appropriate nutrition recommendations for children with diabetes	List 2 acute complications that can occur with diabetes	Name 3 technologies for use in diabetes management

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Effective Diabetes Management is Crucial

- For the immediate safety of students with diabetes
- To ensure that students with diabetes are ready to learn and to participate fully in school activities
- To minimize the possibility that diabetes-related emergencies will disrupt classroom activities.
- For the long-term health of students with diabetes

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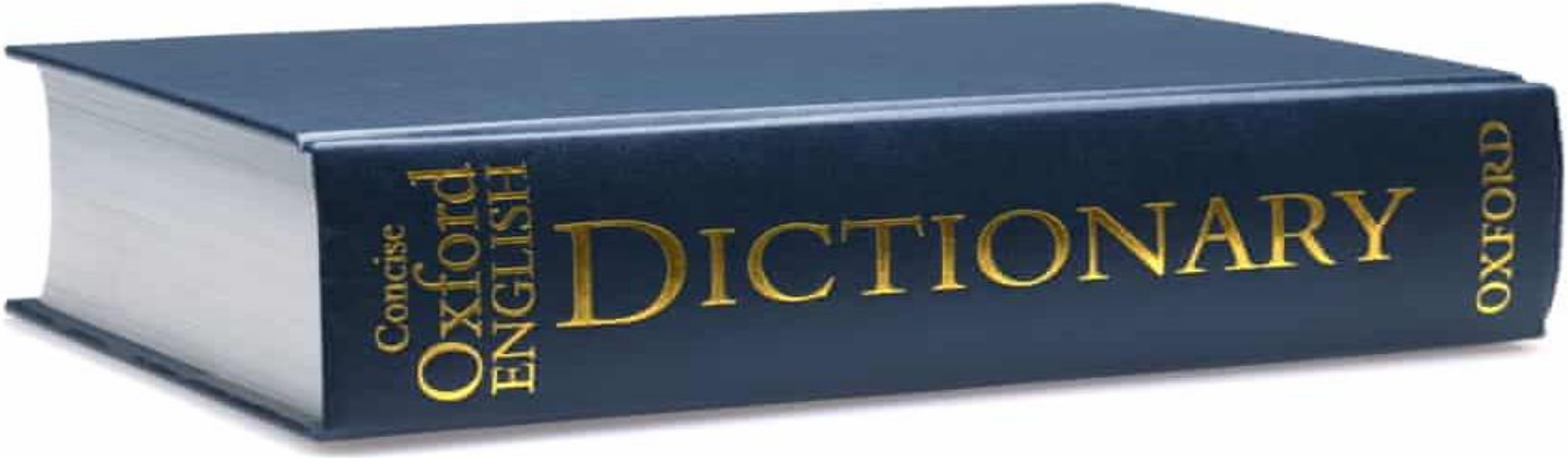

di·a·be·tes
/ˌdīəˈbēdēz, ˌdīəˈbēdis/
noun

A disease in which the body's ability to produce or respond to the hormone insulin is impaired, resulting in abnormal metabolism of carbohydrates and elevated levels of glucose in the blood and urine.

- **People develop diabetes because the pancreas produces little or no insulin or because the cells in the muscles, liver, and fat do not use insulin properly**.

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Two Main Types

- Type 1
  - Autoimmune condition
  - Destruction of beta cells in the pancreas
  - Most common diabetes in children
  - Must take exogenous insulin
- Type 2
  - Lifestyle/genetic condition
  - Insulin resistance
  - Becoming more common in children
  - May take exogenous insulin or oral medications

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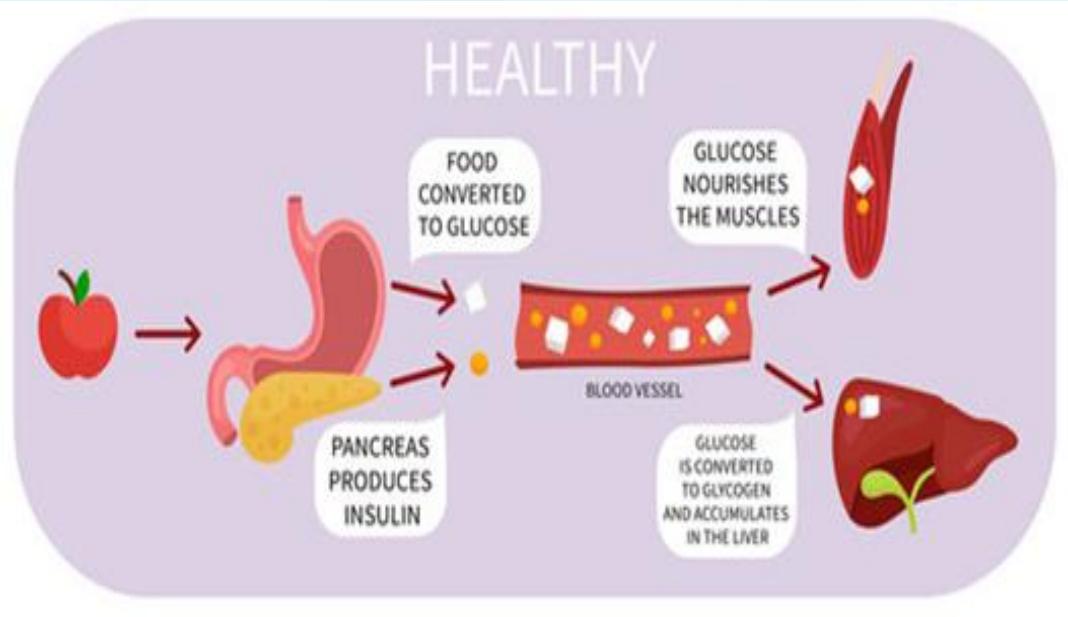
Normal Energy Metabolism



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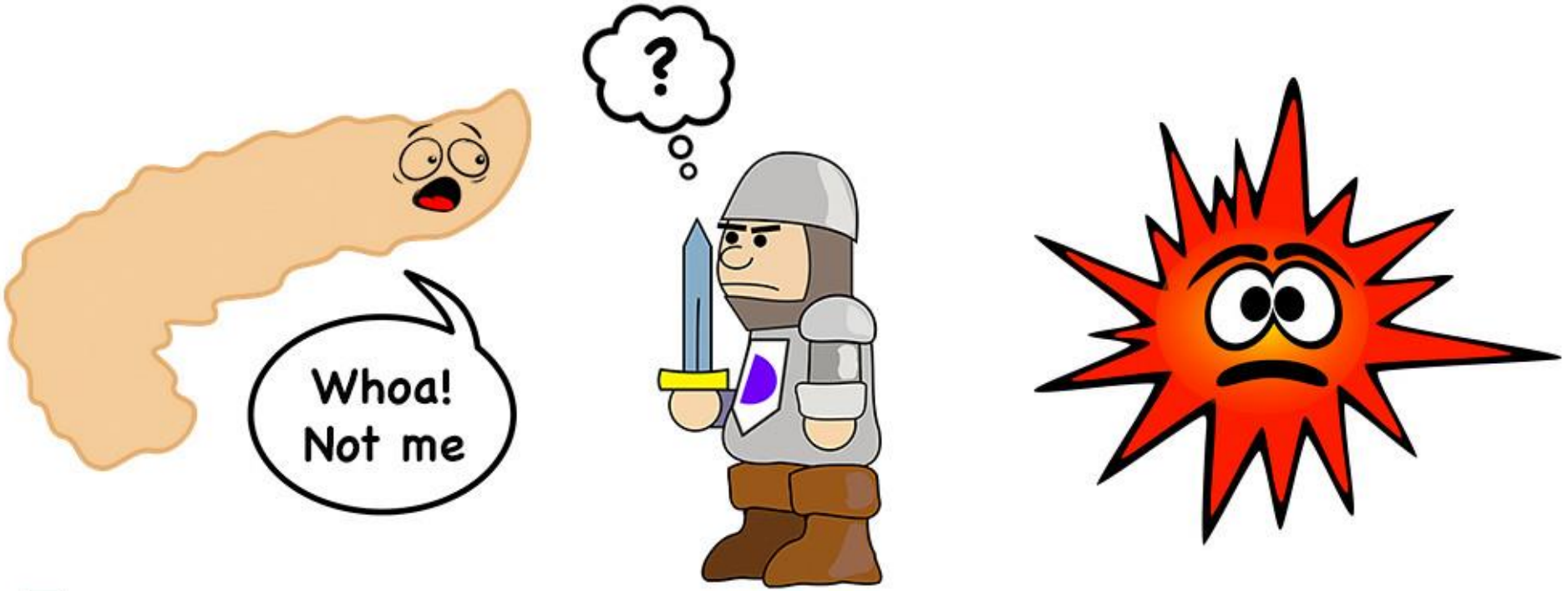

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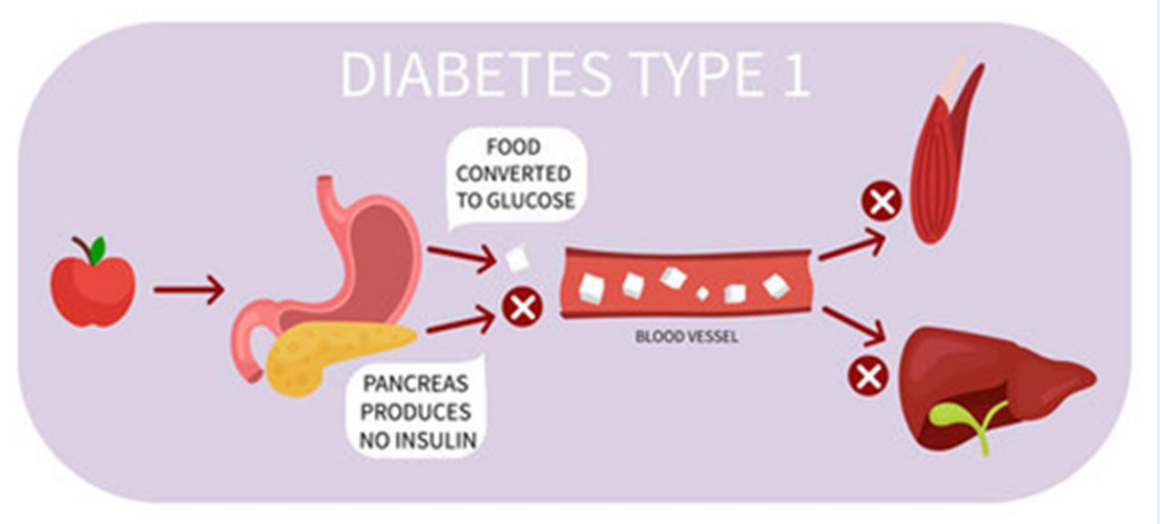
Altered Type 1 Diabetes Metabolism



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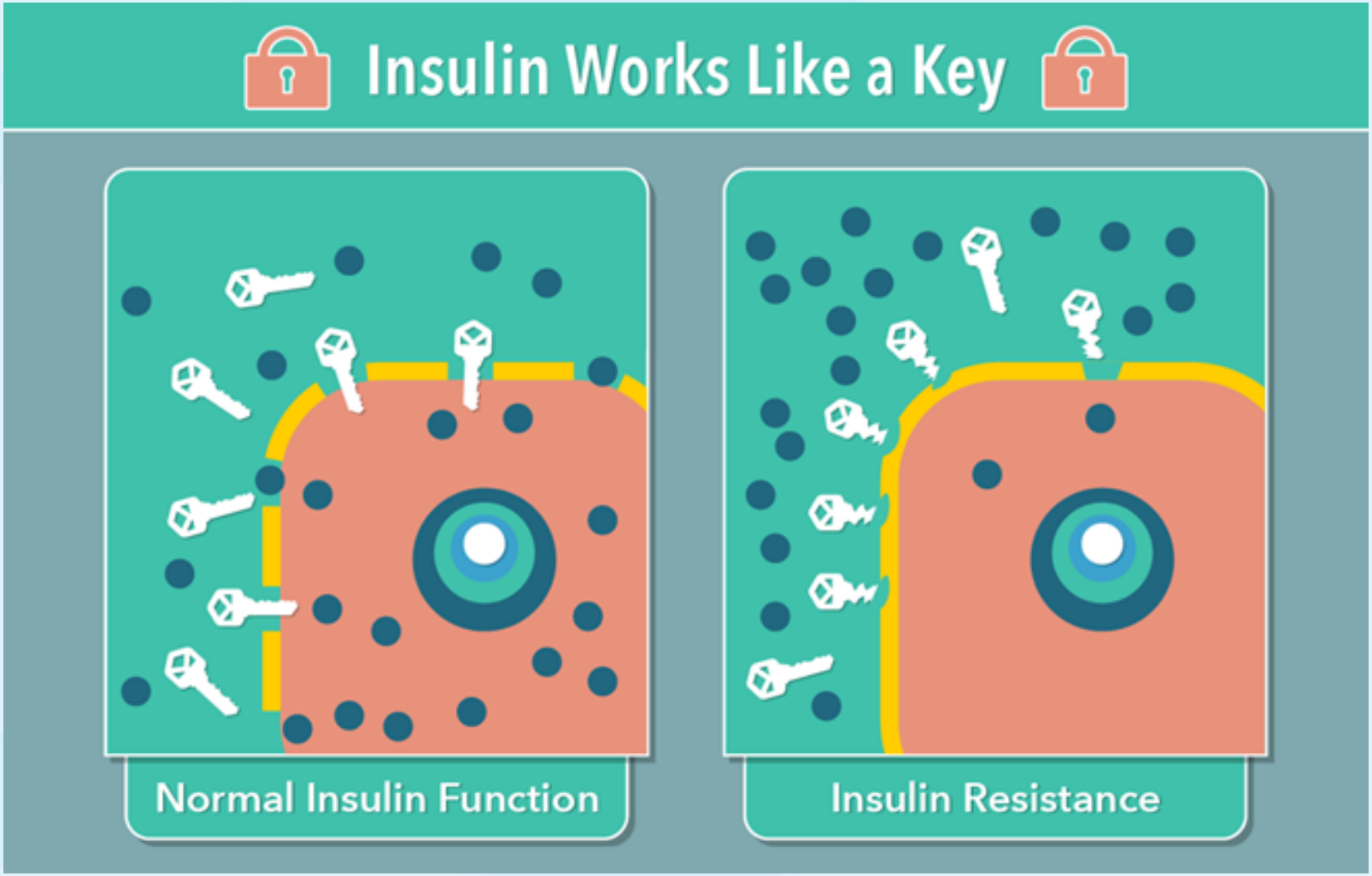

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Genetic Susceptibility
Excess Calorie Intake
Abdominal Obesity
Lack of Exercise

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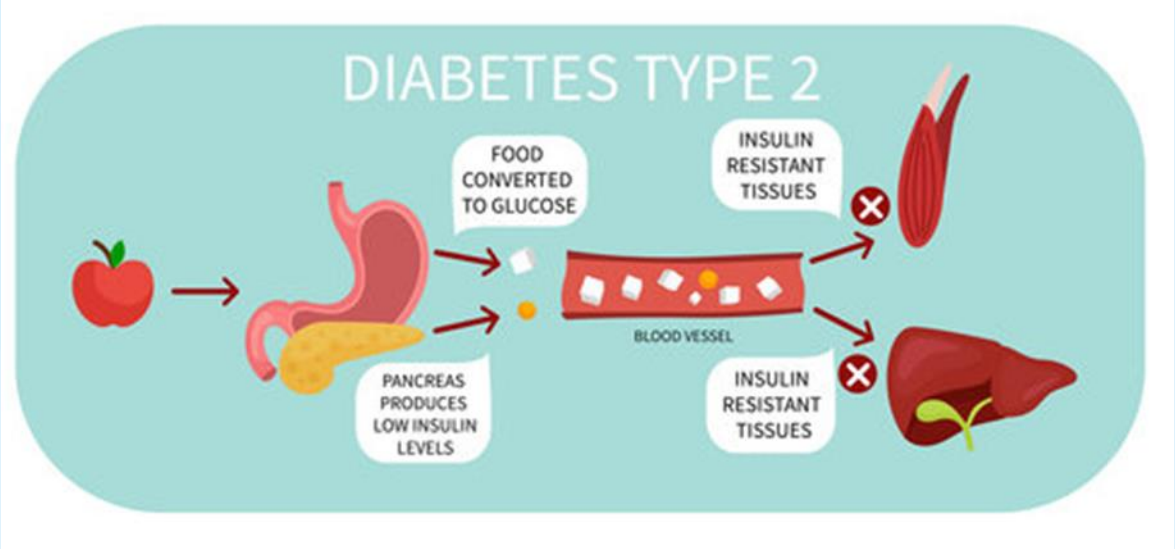
Altered Type 2 Diabetes Metabolism



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Progression of Type 2

- At first, the pancreas keeps up with the added demand by producing more insulin
- Over time the pancreas loses its ability to secrete enough insulin to control blood glucose
- In time those with type 2 diabetes will need insulin

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Treatment for Diabetes

Medication

- Insulin for type 1
- Insulin or oral medications for type 2

Monitoring of blood sugar

- Meters
- Glucose monitoring systems

Diet plan

- Carbohydrate

Activity

- Type 2

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What Can I Eat

Goals of Meal Planning

- To balance insulin and carb intake in order to keep the blood sugars as close to normal as possible
- To improve overall health by maintaining the best possible nutrition
- To help attain normal growth and development for children and appropriate weight for everyone

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WHAT IS HEALTHY EATING?

Dietary Guidelines

- Translates the current science on diet and health into guidance to help people choose foods and beverages that comprise a healthy and enjoyable dietary pattern
- The “what” and “how much” of foods and beverages to consume to achieve good health, reduce risk of diet-related chronic diseases, and meet nutrient needs.

The Guidelines

Make every bite count
with the *Dietary Guidelines for Americans*. Here's how:

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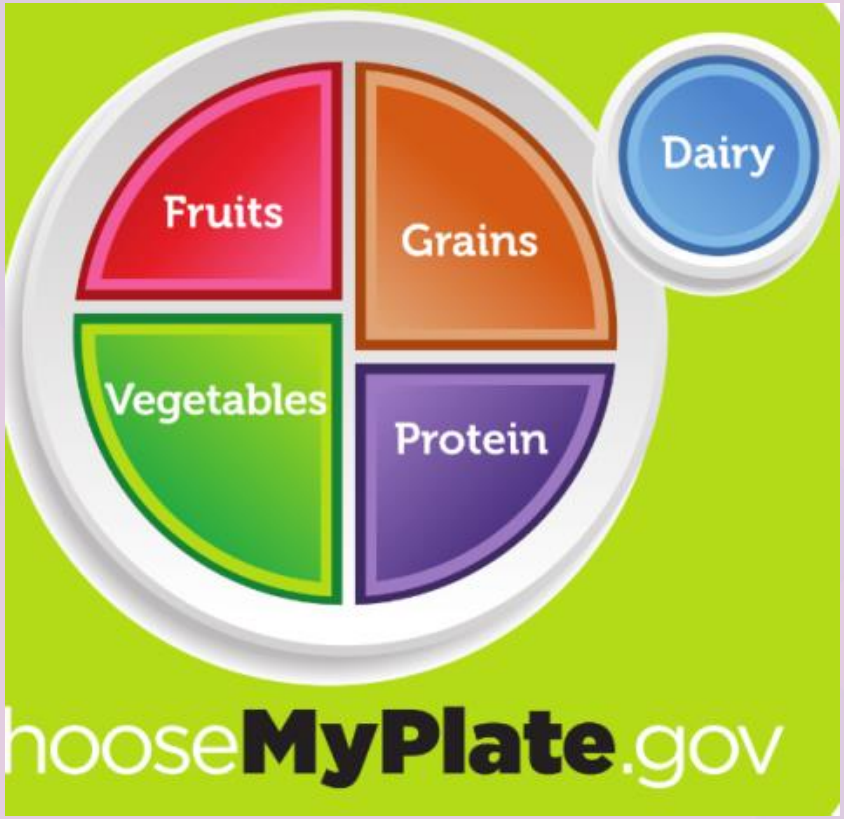
THE PLATE METHOD



- Make half your plate fruits and vegetables.
- Choose a lean protein to fill a quarter of your plate.
- Fill the last quarter of your plate with grains or starches. Be sure to make half your grains whole!
- Dairy products make a great side or beverage.

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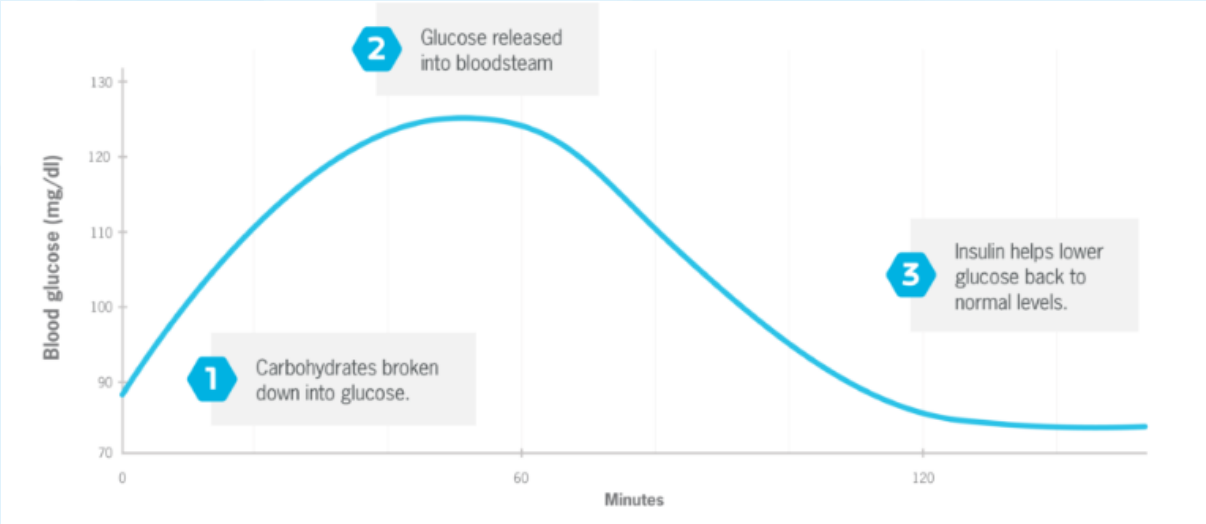
Carbohydrates

- 100% changed to sugar during digestion
- Sugar enters the blood stream in 10 to 90 minutes



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Food Recommendations

Type 1

- Insulin to carbohydrate ratio
- No carbohydrate restriction
- General childhood diet recommendations

Type 2

- Insulin to carbohydrate ratio or set amount of carbohydrate
- General childhood diet recommendations

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How Much Carb??

- 1/3 cup fruit cocktail in juice
- Salad with ranch
- 8 ounces skim milk
- 1/2 cup mixed vegetables
- 1 small bun

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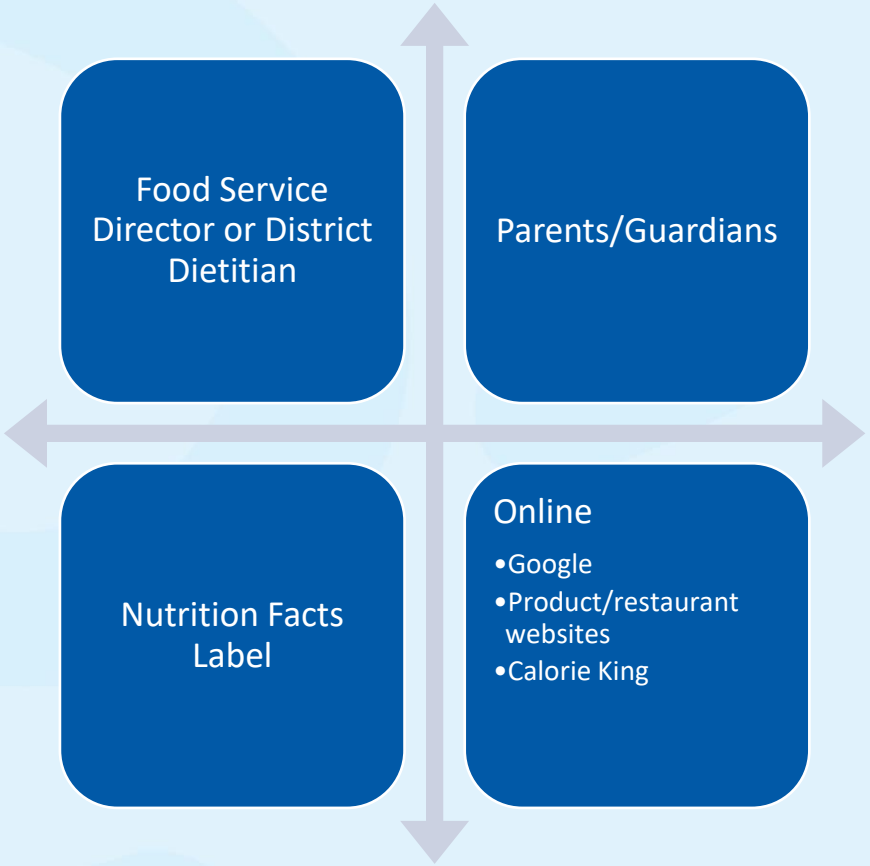
Sources of Carbohydrate Information



- http://www.calorieking.com

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Calculate the Carb

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How Much Carb??

- 1/3 cup fruit cocktail in juice – 10 grams
- Salad with ranch – 4 grams carb
- 8 ounces skim milk - 12 grams carb
- 1/2 cup mixed vegetables – 7 grams carb
- 1 small bun – 21 grams

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How would you respond to this meal??

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Calculating Dose for Food

Insulin to carb ratio

Written 1: X

Means that 1 unit covers X grams of carb

Example

- Insulin to carb ratio is 1:15
- 1 units for every 15 grams of carb
- Total carb ÷ 15
- 54 grams ÷ 15 = 3.6 units
- Round to 4 units or 3.5 if using ½ units

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Constant Juggling

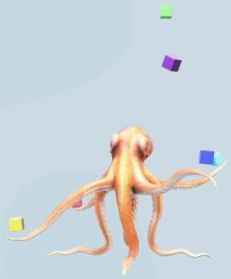
Glucose Raising

- Food
- Not enough insulin or carbs don't match insulin provided
- Illness, stress, injury
- Side effects from other medications (steroids)

- Too much insulin
- Carbohydrates don't match insulin given or didn't finish all carbohydrates after providing insulin
- Exercise or activity *

Glucose Lowering

* Physical activity generally lowers blood glucose. However, certain activities may raise blood glucose for some students.



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Blood Sugar vs Glucose

Meter	Continuous glucose monitor
Amount of sugar in the blood stream	Sugar in the interstitial fluid
Most accurate if blood sugar is rapid rising or falling	Can lag meter reading by 15 minutes
Readings can be impacted by technique	Data updates every 5 minutes

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Target Blood Sugar/Glucose

70-180

Low Blood Sugar aka Hypoglycemia

< 80 for younger than 5
< 70 for 5 and older

Low blood glucose levels, which can be life-threatening, present the greatest immediate danger to students with diabetes

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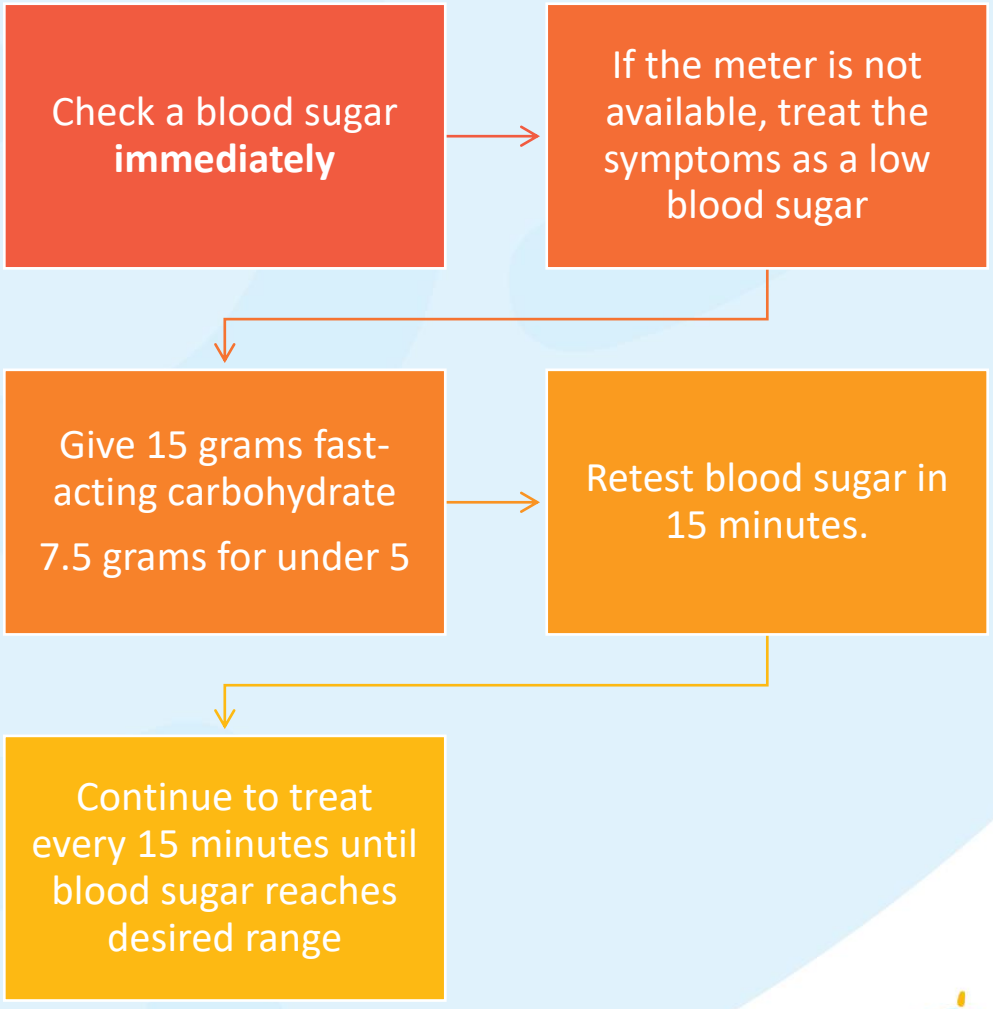
Treatment
Rule of 15



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Fast-Acting Carbs

7.5 Grams Fast Acting Carbohydrate Ideas	15 Grams Fast Acting Carbohydrate Ideas
¼ cup (2 ounces) juice	½ cup (4 ounces) juice
¼ cup of regular soda pop	½ cup of regular soda pop
½ tablespoon sugar	1 tablespoon sugar
½ tablespoon syrup	1 tablespoon syrup
½ tube glucose gel	3-4 glucose tabs
½ tablespoon regular jelly	1 tablespoon honey

Never use a carbohydrate source with fat, such as chocolate, to treat hypoglycemia

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Further Treatment

If the next meal or snack is more than 1 hour away give long-acting carbs

7.5 Grams Long Acting Carbohydrate Ideas	15 Grams Long Acting Carbohydrate Ideas
½ slice of bread 2 graham cracker squares 3 saltine crackers 21 gold fish crackers ¼ cup chocolate milk ½ cup milk 4 ounces of formula/breastmilk	1 slice of bread 3 graham cracker squares 6 saltine crackers ½ cup chocolate milk 1 cup milk

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Glucagon

- Hormone that signals the liver to release glucose
- Used in cases of severe hypoglycemia
  - Unresponsiveness
  - Seizures
  - Unsafe to swallow food or liquid
- Several forms
  - Nasal
  - Mix and inject
  - Premixed
  - Premixed auto injector

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- Food
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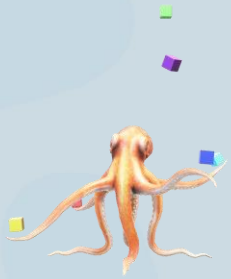

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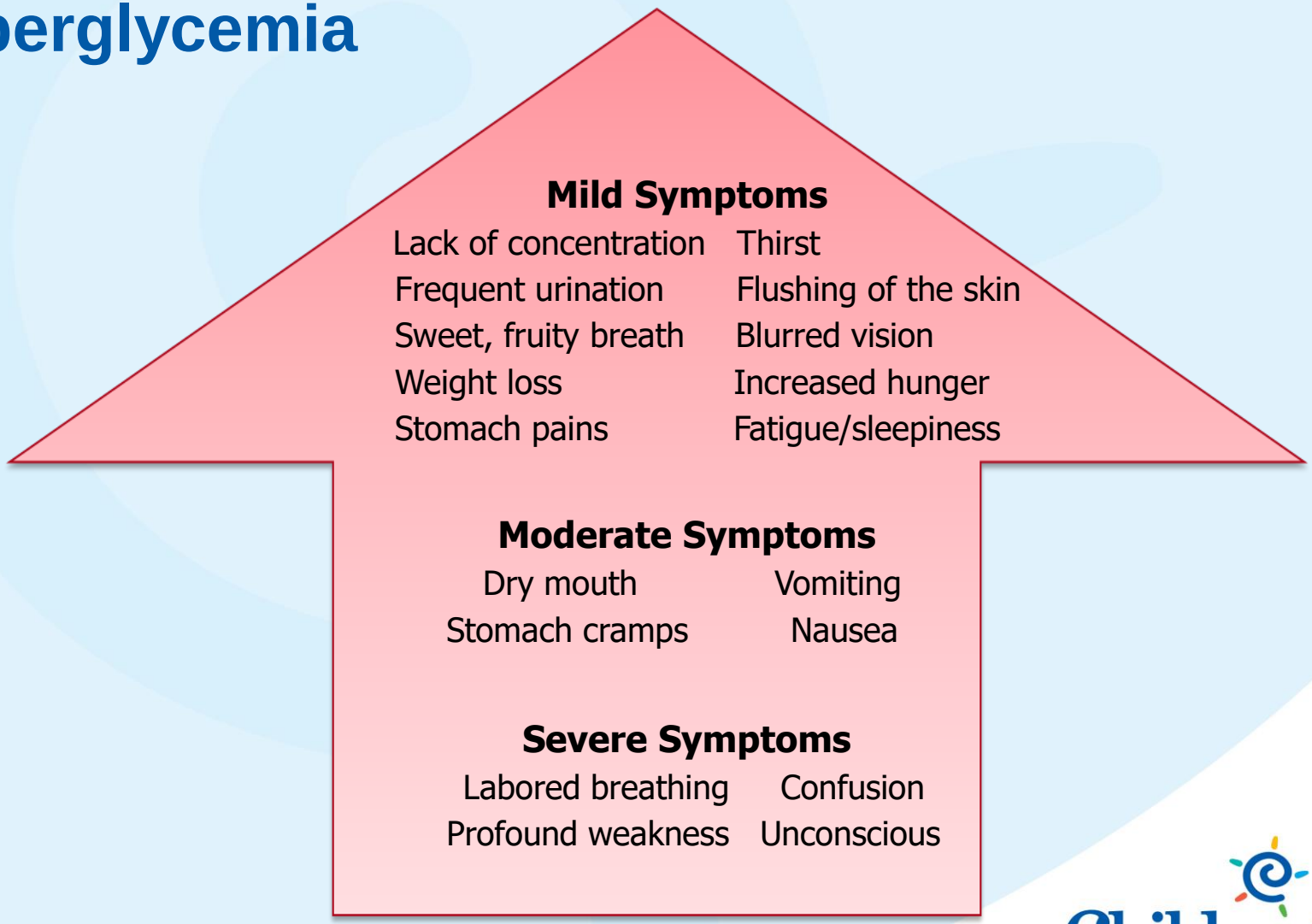
High Blood Sugar aka Hyperglycemia



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Treatment

Correction insulin

Test for ketones

- Glucose of above 240
- Illness even if blood sugar is normal

Increase fluid intake

- Carbohydrate-free liquids
- 1 ounce for every year of age

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Avoid Insulin Stacking

Rapid insulin starts to work in 10-15 minutes

Continues to work for 2-3 hours

Do not correct more often than 2-3 hours to prevent hypoglycemia

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Additional Math

Correction Factor

- Used to treat blood sugars that are not at goal prior to a meal
- Current glucose – target glucose ÷ correction
- Correction is the number of points 1 unit of insulin will lower glucose

Example:

Current glucose 167

Target glucose 120

Correction 50

Work it out:

167 – 120 = 47

47 ÷ 50 = 0.94

Round 0.94 to 1

Answer:

It will take 1 unit of insulin to lower the glucose from 167 to 120

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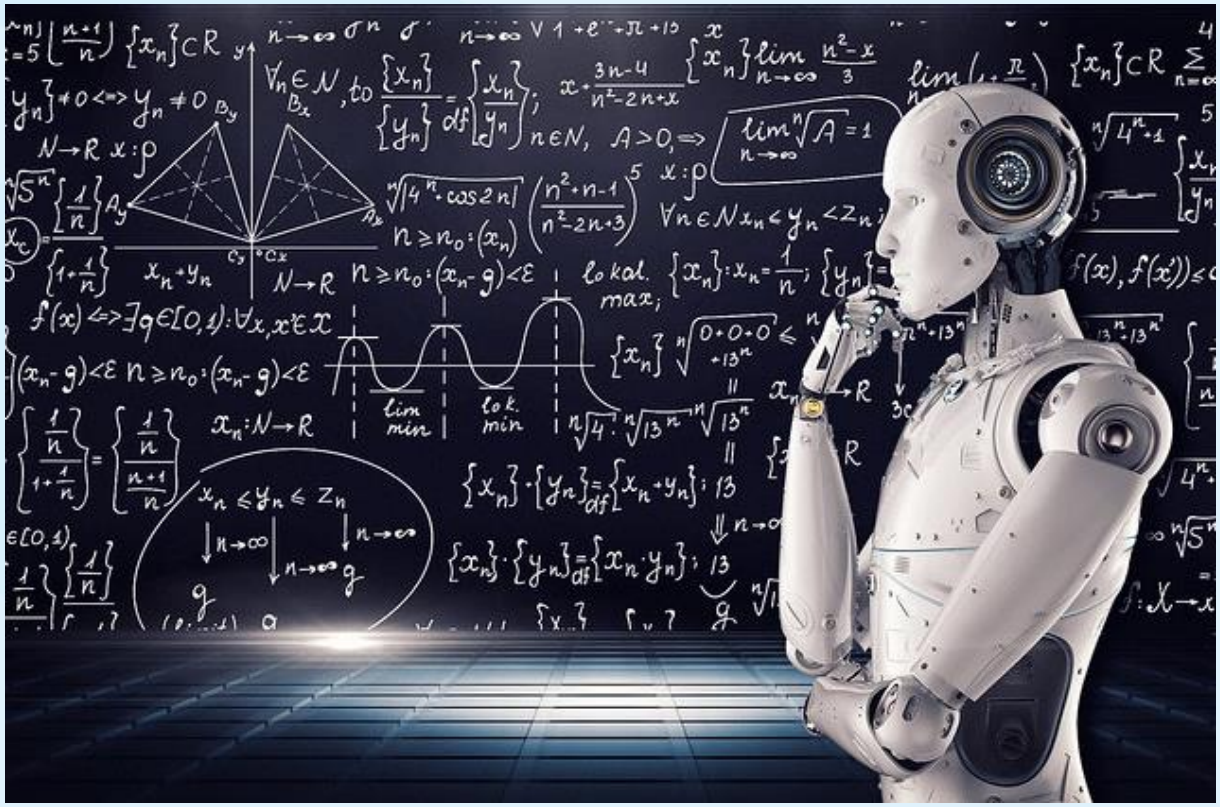
Diabetes Management Goes High Tech



Technology available for

- Blood glucose monitoring
- Insulin delivery

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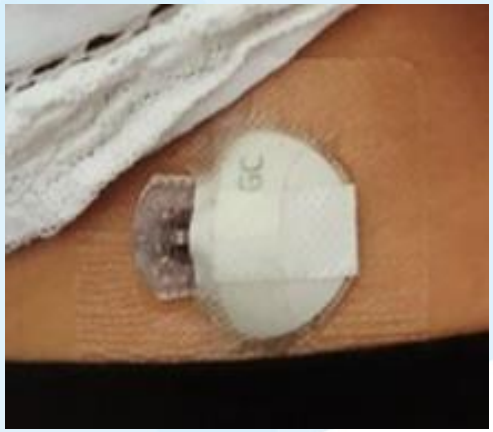
Available Glucose Sensors

	Dexcom	Guardian	Libre
Wear	10 days	7 days	14 days
Calibrations	No	Every 12 hours 3-4 time daily optimal	No
Sharing	Yes	Yes	No
High/Low Alerts	Yes	Yes	Yes
Age	Over 2	14 and above	Over 4



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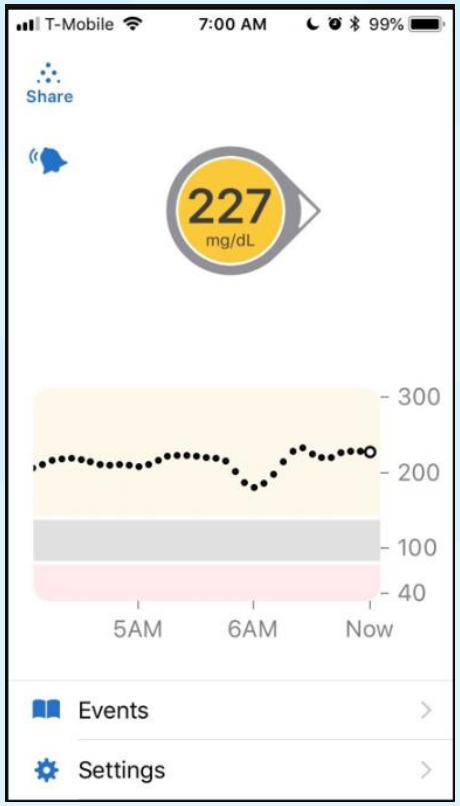
Data

- Current Glucose
- Trend Arrow
- Trend Graph



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Insulin Pumps How they Work

- Deliver a small amount of insulin in the background to replace the long-acting insulin – basal rate
- Deliver an amount of insulin to cover food and correct for high blood sugars when the user enters information – bolus
- Insulin is delivered through a canula
- Smart pumps can adjust the basal rate based on the sensor reading

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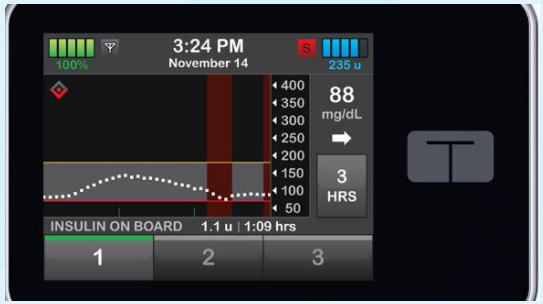
Available Insulin Pumps

	Tandem	Medtronic	Omnipod
Models	T:slim X2 with Basal IQ T:slim X2 with Control IQ	630G 670G 770G	Eros Dash
Max amount of insulin	300 units	300 units	200 units
Smart Features	Yes	Yes	No
Tubing	Yes	Yes	No



Omnipod Eros

(Eros pods are not compatible with DASH PDM)

Omnipod DASH

Sleek PDM (not an app) and new DASH pod

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Insulin Pumps

Pros	Cons
Insulin is always with wearer	Don’t work by themselves
Can deliver insulin in very specific amounts	High risk of developing DKA
Improved glucose control	Use requires extensive training

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Features

- Reusable
- Removable insulin cartridges
- Delivers up to 30 units in ½ unit increments
- Bluetooth technology and smartphone app to help calculate and record insulin dose

Smart Insulin Delivery

inpen®

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Diabetes Medical Management Plan

- Basis for all school-based diabetes care plans
- Developed by the student's personal health care team and parent/guardian and signed by a member of student's personal health care team
- Individualized
- Implemented collaboratively by the school diabetes team:
  - school nurse
  - the student
  - parent/guardian
  - other school personnel

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Sections of the DMMP

- 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 hypoglycemia and hyperglycemia

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Recap of Objectives

Identify

- Identify the main 2 types of diabetes and the differences between them

Summarize

- Summarize appropriate nutrition recommendations for children with diabetes

List

- List 2 acute complications that can occur with diabetes

Name

- Name 3 technologies for use in diabetes management

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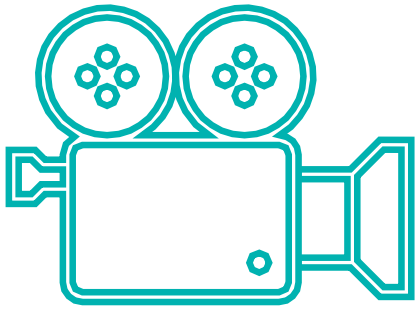

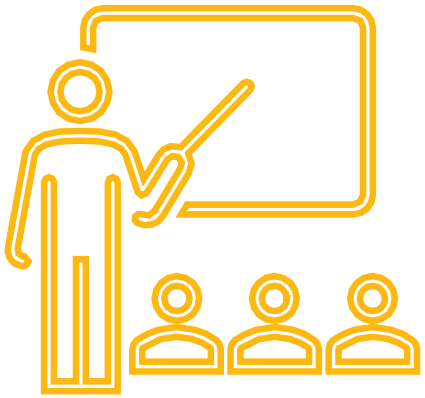

Education Resources Available on the Internet

- https://www.childrensomaha.org/department/endocrinology-diabetes/diabetes-patient-education/

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