Diabetes Update for Nurses and Caregivers: Assisting and Coaching Your Clients with Diabetes Management

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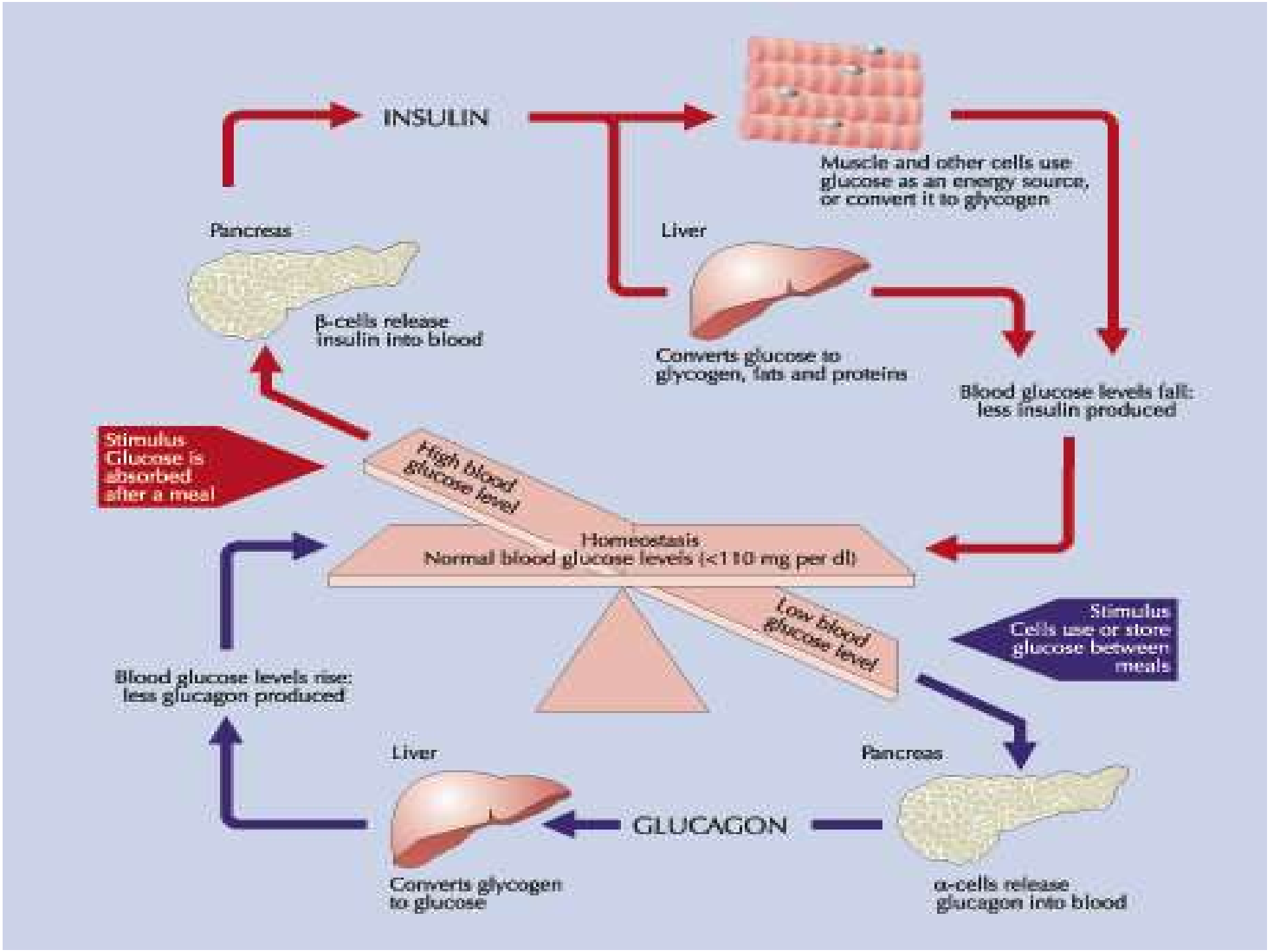
What is Diabetes?

Diabetes mellitus is a metabolic disease characterized by hyperglycemia. This is a result of inadequate insulin secretion, insulin action, or both.*

*American Diabetes Association: Clinical Practice Recommendations 2004

Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus

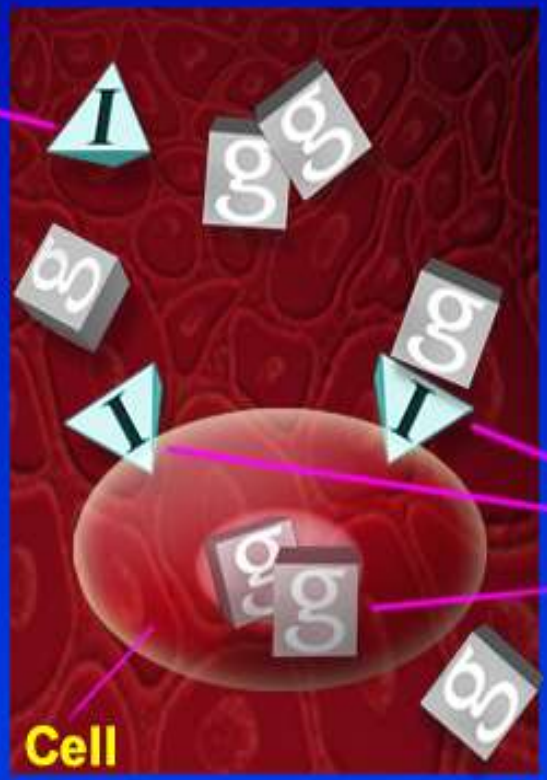
PATHOPHYSIOLOGY OF GLUCOSE REGULATION


INSULIN
Muscle and other cells use glucose as an energy source, or convert it to glycogen
Pancreas
β-cells release insulin into blood
Liver
Converts glucose to glycogen, fats and proteins
Blood glucose levels fall: less insulin produced
Stimulus Glucose is absorbed after a meal
High blood glucose level
Homeostasis
Normal blood glucose levels (<110 mg per dl)
Low blood glucose level
Stimulus Cells use or store glucose between meals
Blood glucose levels rise: less glucagon produced
Liver
Converts glycogen to glucose
GLUCAGON
Pancreas
α-cells release glucagon into blood

Normal Blood Glucose Control

In people without diabetes,
glucose stays in a healthy range because...

Insulin
is released
at the right times
and in the
right amounts



Insulin helps
glucose enter cells

High Blood Glucose (Hyperglycemia)

In diabetes, blood glucose builds up for several possible reasons...

Too little insulin is made

Cells can't use insulin well

Liver releases too much glucose

Symptoms of Diabetes

Are due to high blood sugars

- Excessive thirst
- Frequent urination
- Blurry vision
- Numbness or tingling in hands or feet
- Feeling tired most of the time, especially after eating
- More infections than usual
- Wounds that are slow to heal

Diagnosing Diabetes

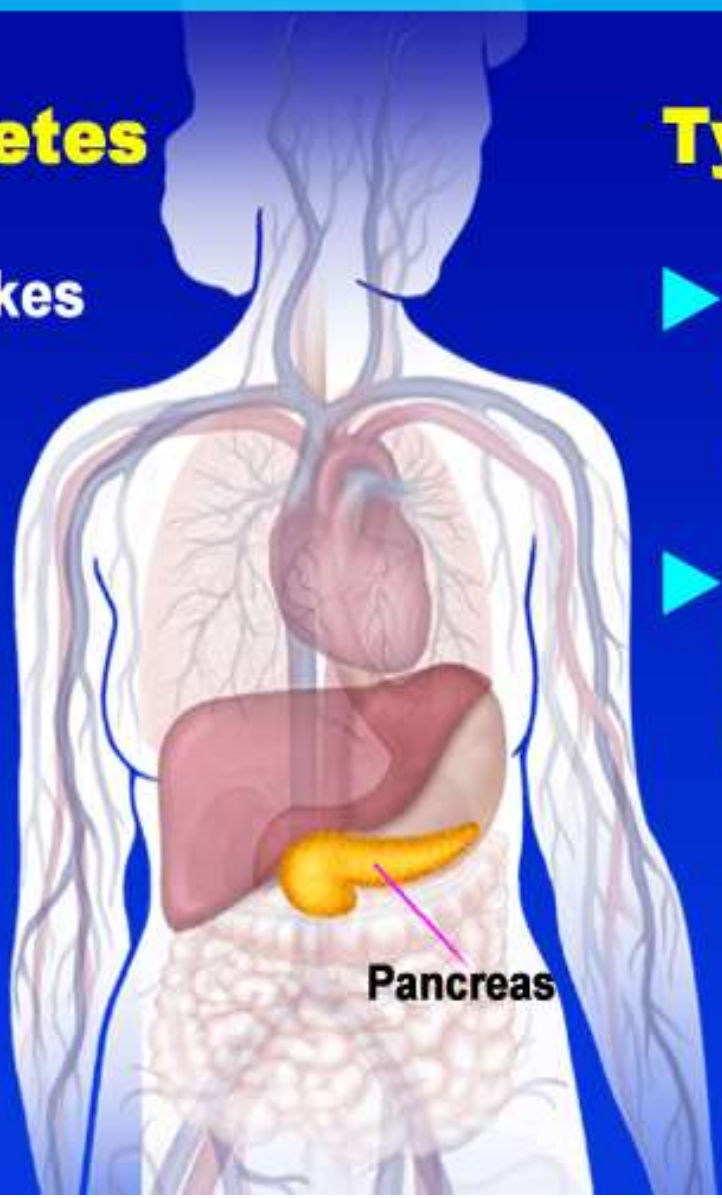
Blood Sugar Levels

	No Diabetes	Pre-Diabetes	Diabetes Diagnosis
Fasting	70 - 99	100 – 125	126 or higher
2 hour Oral Glucose Tolerance test	70 - 145	146 - 199	200 or higher
A1c	5.6% or lower	5.7% – 6.4%	6.5% or higher

Two Main Types of Diabetes

Type 1 Diabetes

- Pancreas makes too little or no insulin



Type 2 Diabetes

- Cells do not use insulin well (insulin resistance)
- Ability for pancreas to make insulin decreases over time

Type 1 Diabetes

- 1 in 10 people with diabetes have type 1
- Most people are under age 20 when diagnosed
- Body can no longer make insulin

Insulin is **always** needed for treatment

Type 2 Diabetes

- 9 in 10 people with diabetes have type 2
- Most people are over age 40 when diagnosed, but Type 2 is becoming more common in children and teens
- Type 2 is more likely in people who:
  - Are overweight
  - Belong to certain ethnic groups
  - Have a family history of type 2 diabetes

Other "types" of diabetes

- Gestational
- MODY- Maturity onset diabetes of youth
- LADA- Latant autoimmune diabetes of adults
- Type 3c- "pancreagenic" diabetes
  - Damage to pancreas, not autoimmune
  - r/t surgery, cancern chronic pancreatitis, Cystic Fibrosis
  - "Acts like" type 1

Diabetes in New Mexico* 2016

- 170,000 New Mexicans (13%)
- 9% of non-Hispanic Whites
- 13% of Hispanics
- 16% of Native Americans
- 5% of Asians
- 2-3 times higher risk in people with ID/DD

** https://ibis.health.state.nm.us/indicator/view/DiabPrevl.RacEth.NM_US.html Updated 2/14/2018*

Pre-Diabetes 2012/13

- 37% of US adults
- 558,000 NM adults (33%, up from 7% in 2010!!)
- +/- 30% will develop diabetes within 5 years

http://www.cdc.gov/diabetes/data/statistics/2014StatisticsReport.html

Diabetes Is...

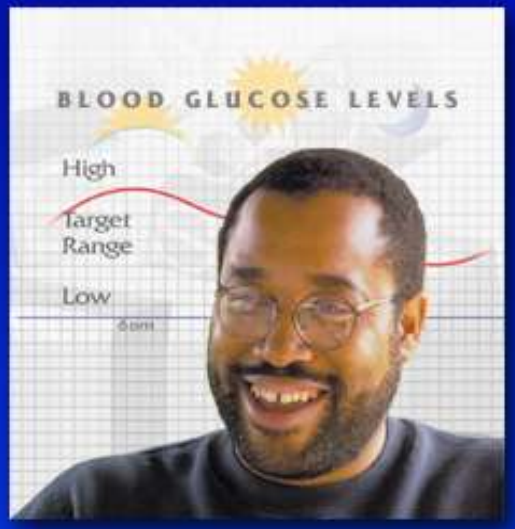
Common

Affects 1 in every 16 people

Chronic

A lifelong condition

Controllable



Good management depends on YOU!

Diabetes is a Self-Managed Disease

But… "many hands make light work"

~John Heywood

The AADE 7 ™ Self-Management Behaviors

* Healthy eating
* Being active
* Monitoring
* Taking medication
* Problem solving
* Healthy coping
* Reducing risks

http://www.diabeteseducator.org/DiabetesEducation/Definitions.html

The Team Approach to Diabetes Care

- Patient-centered
- Family/ Support System
- Community/ Community Health Workers
- Provider (doctor, PA, nurse practitioner)
- Medical Home Team
- Diabetes Educator/ Dietitian
- Dentist, Optometrist, Foot Doctor, Psychologist, and others

Study results: Diabetes Management in People with Intellectual and Developmental Disabilities- Common Themes

- Focus on "ability" not "disability"
- Encourage person to be an active participant in diabetes self-management
- Support the person in self-management
  - Develop adapted resources to promote self-care
- Support for caregivers
  - Provide education and training about diabetes for support staff

Brenda’s Story

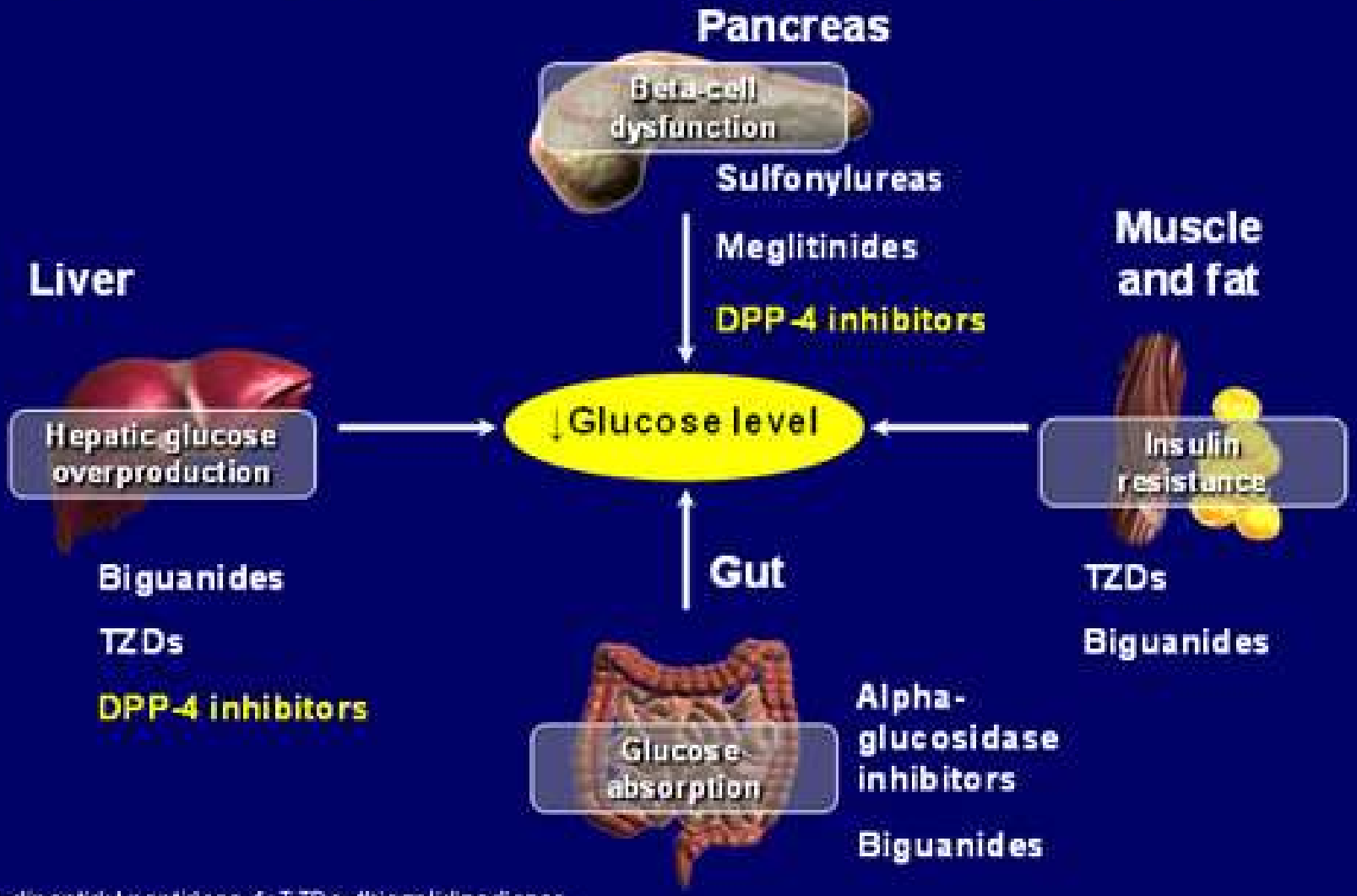
How to make reasonable adjustments to diabetes care for adults with a learning disability

- Make information accessible
- Provide training for staff
- Address social barriers
- Involve supporters
- Plan for and make reasonable adjustments
  - Tailored to specific individual needs

https://www.diabetes.org.uk/resources-s3/2018-02/Diabetes%20UK%20-%20How%20to%20make%20reasonable%20adjustments%20to%20diabetes%20care%20for%20adults%20with%20a%20learning%20disability.pdf (a guide book)

Taking Medications

Major Targeted Sites of Oral Drug Classes



DPP-4=dipeptidyl peptidase-4; TZDs=thiazolidinediones.

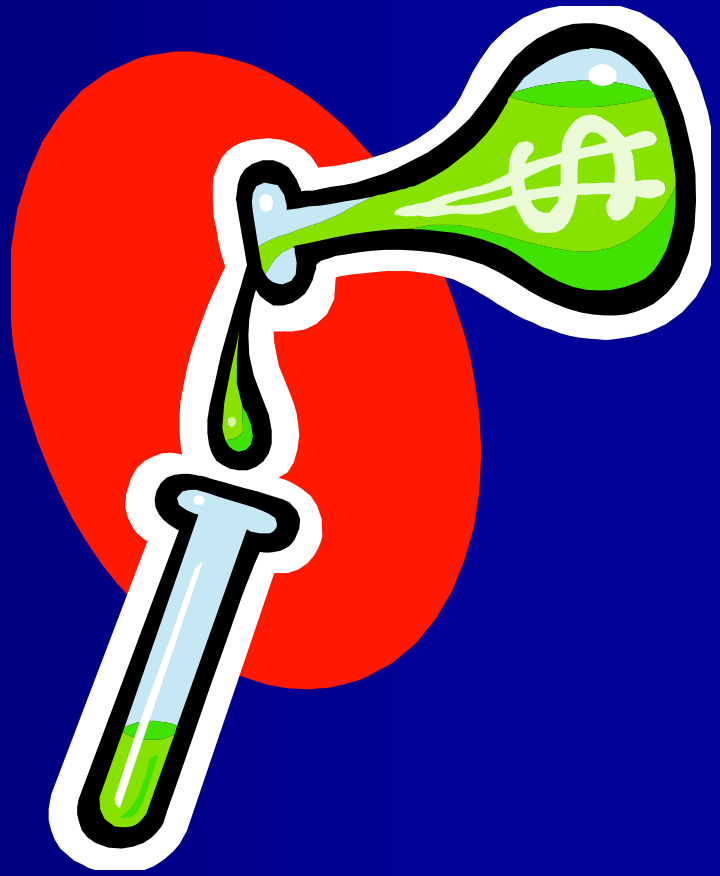
DeFronzo RA. *Ann Intern Med*. 1999;131:281–303.
Buse JB et al. In: *Williams Textbook of Endocrinology*. 10th ed. Philadelphia: WB Saunders; 2003:1427–1483.

Diabetes Pills

Name	Primary Action
Metformin/ Glucophage	Decrease liver sugar output
Glyburide/ Glipizide/ Glimiperide	Increase insulin production
Pioglitazone	Increase insulin sensitivity in muscle
Januvia/ Onglyza/ Tradjenta	Improves after-meal blood glucose disposal
Invokana/ Farxiga/ Jardiance	Decrease renal reabsorption of glucose

Combination Medications

- Glucovance
  - Glucophage
  - Glucotrol
- Metaglip
  - Metformin
  - Glipizide
- Janumet
  - Januvia
  - Metformin

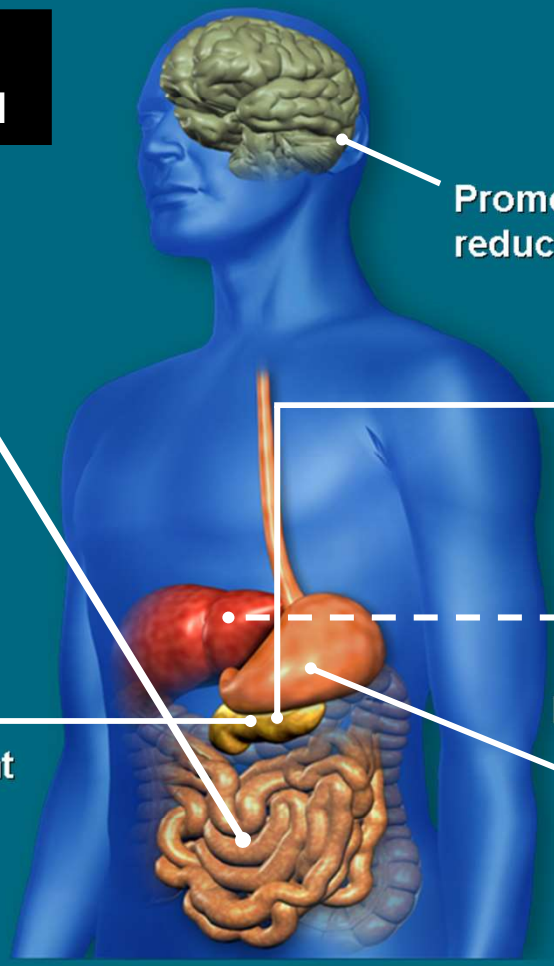


INJECTABLE Diabetes Medications

Class	Primary Action
▪ Incretin mimetics ▪ Synthetic Amylin analogs	▪ Improve post-meal blood glucose disposal, improve satiety
▪ Insulins – Rapid/Short Acting – Intermediate Acting – Long Acting	▪ Provide additional insulin to transport glucose from blood into muscles and cells

GLP-1 Effects in Humans

Understanding the Natural Role of Incretins



GLP-1 secreted upon the ingestion of food

↓ Beta-cell workload

Promotes satiety and reduces appetite

↑ Beta-cell response

Alpha cells:
↓ Postprandial glucagon secretion

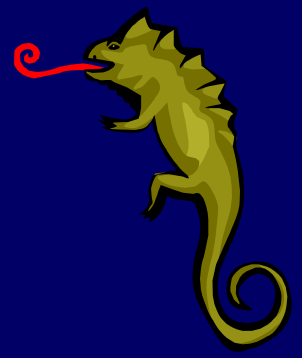
Liver:
↓ Glucagon reduces hepatic glucose output

Beta cells:
Enhances glucose-dependent insulin secretion

Stomach:
Helps regulate gastric emptying

Adapted from Flint A, et al. *J Clin Invest*. 1998;101:515-520
Adapted from Larsson H, et al. *Acta Physiol Scand*. 1997;160:413-422
Adapted from Nauck MA, et al. *Diabetologia*. 1996;39:1546-1553
Adapted from Drucker DJ. *Diabetes*. 1998;47:159-169

Incretin Mimetics



- Exenatide
  - Byetta- twice a day
  - Bydureon- weekly

  www.byetta.com
- Liraglutide
  - Victoza- once a day

  www.victoza.com
- Dulaglutide
  - Trulicity- once a week

  www.trulicity.com

- Type 2 Diabetes
- Injection- variable dose schedules
- Improves beta cell function
- Improves satiety
- Improves post-meal glucose levels
- S/E: nausea, weight loss

Insulins

- **Rapid acting**
  - Lispro (Humalog)
  - Insulin Aspart (Novo Log)
  - Glulisine (Apidra)
- **Short acting**
  - Regular
- **Intermediate acting**
  - NPH
- **Long acting**
  - Glargine (Lantus)
  - Detemir (Levemir)
- **Combinations**
  - 70/30
  - 75/25
  - 50/50
- **Long- Acting Insulin + GLP1**
  - **Deguldec/ Liraglutide (Xultophy)**

New Insulins

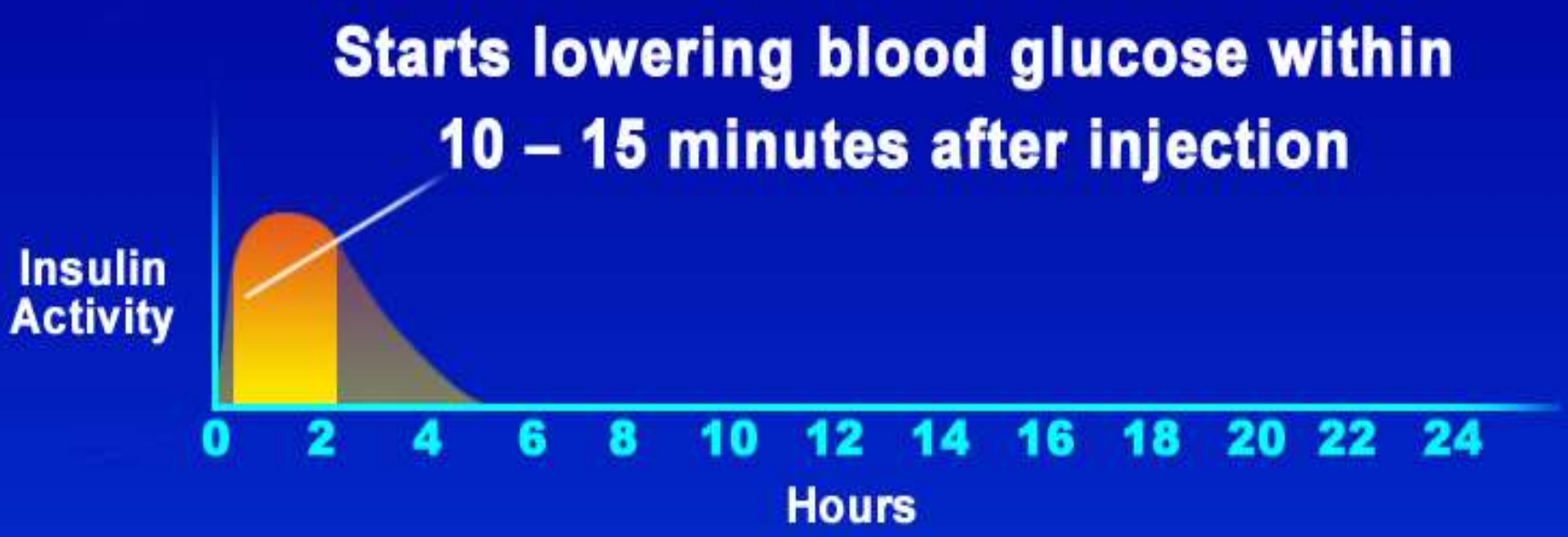
Rapid- Acting

- Humalog U200
  - 2x concentrated for smaller volume of insulin
  - Can be given right before or right after eating
  - Available only in pen delivery

Long-Acting

- Toujeo U-300 Solostar Pen
  - 3x concentrated Glargine
  - Up to 36 h duration
- Tresiba U-200 Pen
  - 2x concentrated Degludec
  - Up to 42 h duration
- Basaglar Pen
  - Generic Glargine

Rapid-Acting Insulins



Lispro (Humalog), aspart (Novalog), and glulisine (Apidra):

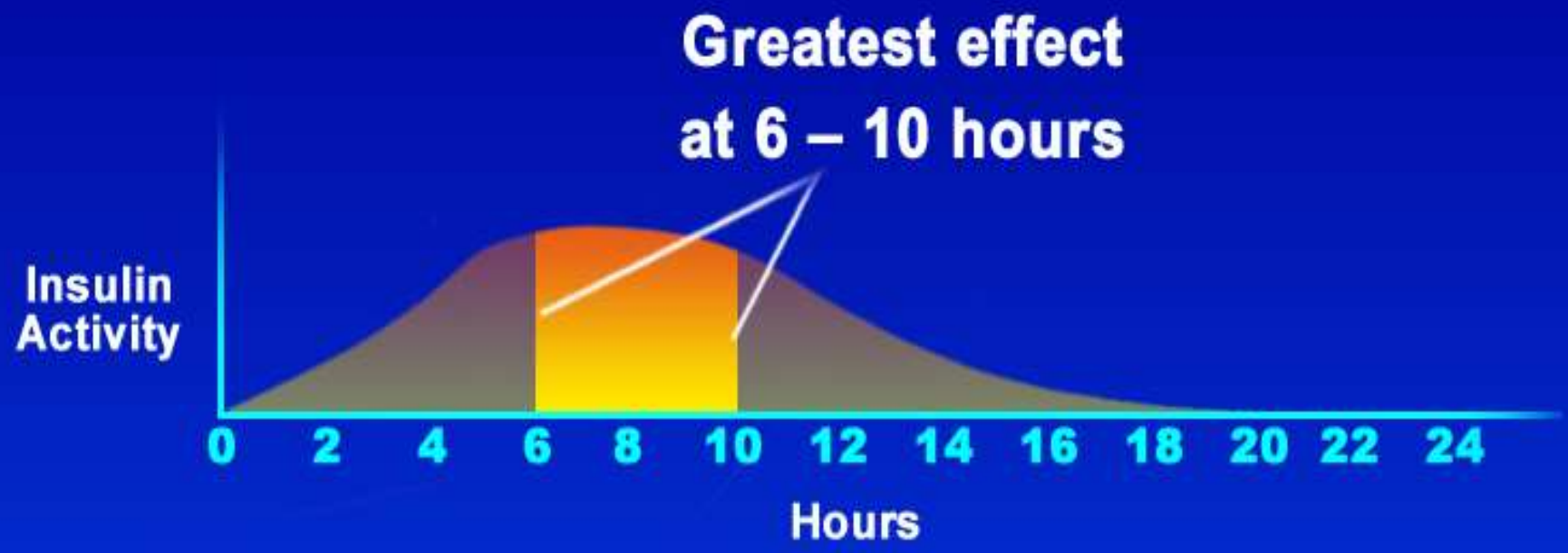
- **Should be taken immediately before eating**
- **Reduce blood glucose after eating**

Short-Acting Insulins

Regular insulin (Humulin R and Novolin R):

- Should be taken 30 – 60 minutes before eating
- Reduces blood glucose after eating

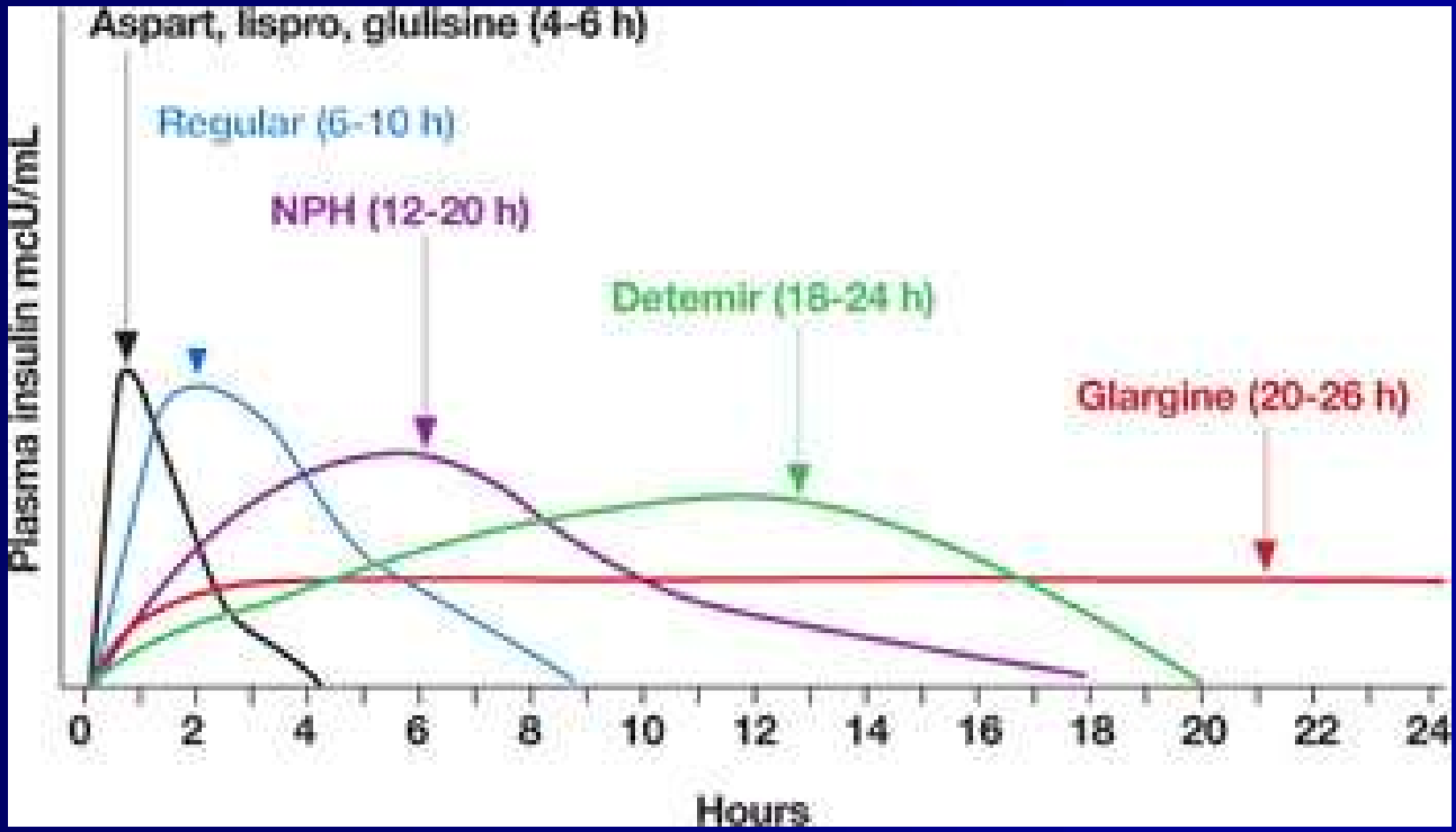
Intermediate-Acting Insulins



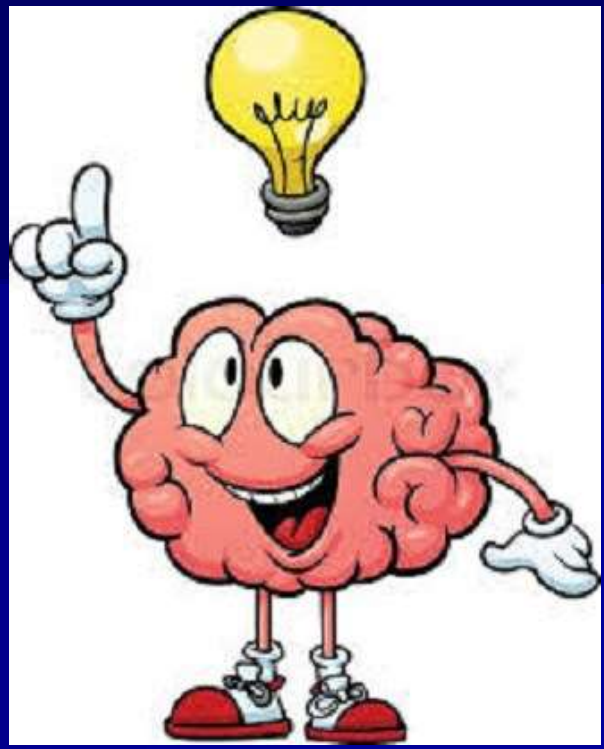
NPH (Humulin N, Novolin N) and Lente (Humulin L, Novolin L):

- Usually taken before breakfast, dinner, or bedtime
- Usually used with rapid- or short-acting insulins

Long-Acting compared to the other insulins

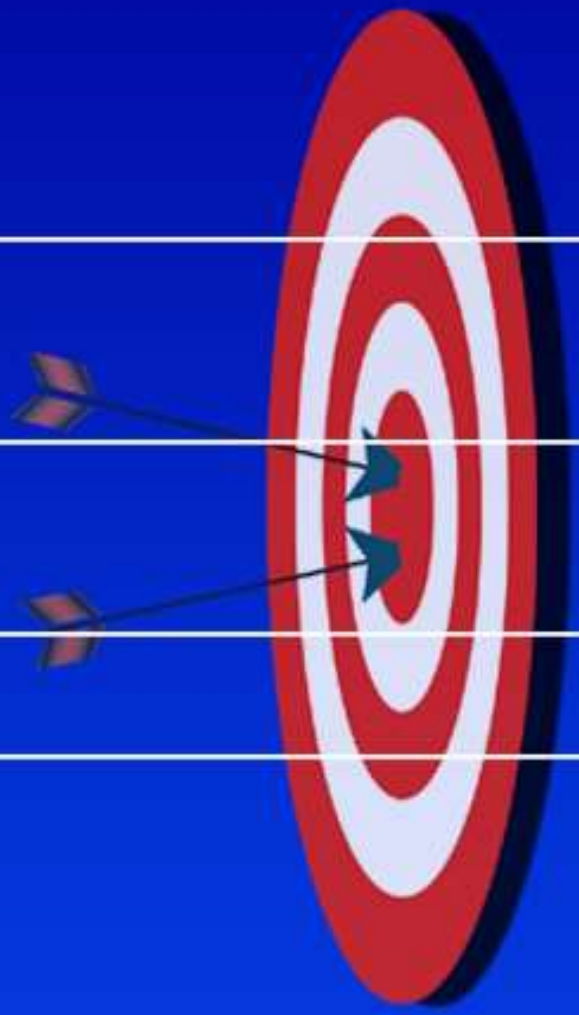


Brainstorming



Monitoring Blood Sugar and Problem Solving (lows/highs)

Glucose and A1C Levels



Test	Suggested Ranges for People with Diabetes
Blood glucose before meals	90 – 130 mg/dL
Blood glucose after meals	Less than 180 mg/dL
A1C	Less than 7%

HbA1c
(also known as A1c)

- A test that measures the amount of glucose bound to red blood cells
- Represents 3 month average blood sugar, based on the lifecycle of the red blood cell
- Goal of 7% is equal to average estimated glucose of 154 mg/dl
- A very high HbA1c represents poor control and higher risk of diabetes complications

A1c / Average Blood Sugar Comparison

A1C (%)	Avg. Blood Sugar (mg/dl)
5	80
6	120
7	150
8	180
9	210
10	240
11	270
12	300

Blood Sugar Testing: Using Results

	Before Breakfast	After Breakfast	Before Lunch	After Lunch	Before Dinner	After Dinner
Day 1	130		65		120	
Day 2	120		75		90	
Day 3	110		60		115	

Blood Sugar Testing: Using Results

	Before Breakfast	After Breakfast	Before Lunch	After Lunch	Before Dinner	After Dinner
Day 1	120			215		225
Day 2	130		120	225		
Day 3	110				125	285

Diabetes and Illness

- Illness can make blood sugars go up and be more difficult to control
- High blood sugars can make any illness last longer, delay wound healing, or make infections harder to treat
- High blood sugars can lead to a medical emergency called DKA or Diabetic Ketoacidosis
  - Signs: Throwing up, can't keep food or drink down, stomach pain, very weak, can go into a coma

Sick Day Management

- Have a plan before it is needed
- Continue diabetes medications
- Drink plenty of fluids
- Consume carbohydrates: solid or liquid
- Test blood sugar and urine ketones often
- Know when to call the doctor or seek help

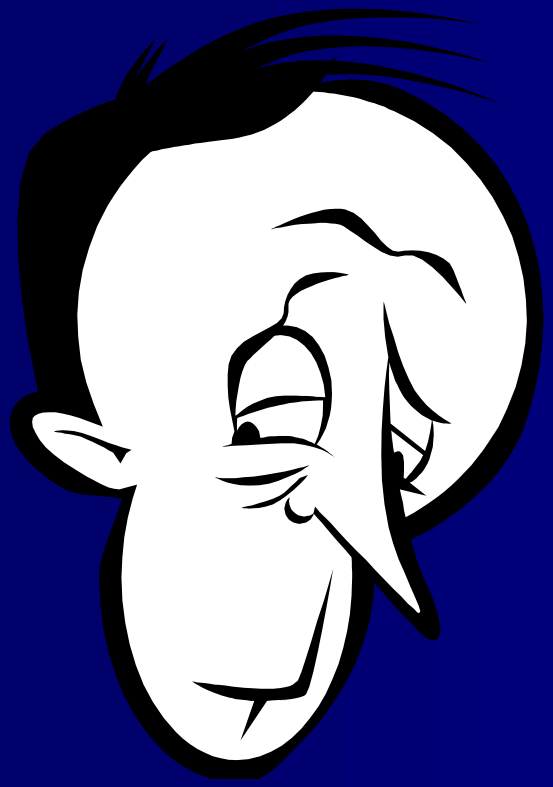
Sick Day Foods
(Equal to 15 gms carbohydrate)

- 4 oz juice or regular soda
- 8 oz Gatorade ™ or Pedialyte ™
- ½ cup regular gelatin
- ½ cup unsweetened applesauce
- ½ cup mashed potatoes
- 1/3 cup rice
- 6 saltine crackers
- 1 cup soup
- 1 popsicle or ½ cup ice cream or sherbet
- 3 graham cracker squares

Sick Day Management: When to Call the Doctor

- Blood sugar higher than 240 with treatment for 8 hours or higher than 400 for 4 hours
- Fever of 101 or higher
- Sick for 24 hours with no improvement
- Nausea, vomiting or diarrhea for more than 4-6 hours
- Symptoms of dehydration
- Symptoms of DKA- can lead to coma if not treated
  - Difficulty breathing
  - Moderate or Large urine ketones
  - Abdominal pain and vomiting

Hypoglycemia
(low blood sugar)



Signs

Symptoms

Treatment

Hypoglycemia: Signs

- Blood Sugar 70 or lower
  - Mild
  - Moderate
  - Severe
- Causes
  - Too much insulin
  - Not enough food
  - Exercise
- Increased Risk
  - Elderly
  - Poor nutrition/ chronic illness
  - New to meds

Hypoglycemia: Symptoms

- Headache
- Hunger or nausea
- Weak
- Dizzy
- Shaky
- Anxious
- Sweaty
- Irritable/ mood changes
- Combative
- Difficulty concentrating
- Slurred speech
- Unconsciousness

Hypoglycemia Symptoms

What to look for in non-verbal clients

- Dizzy
- Unsteady gait
- Shaky
- Anxious
- Crying/ upset
- Sweaty
- Irritable/ mood changes
- Combative
- Lethargic, not responding as usual

Hypoglycemia: Treatment

- 15-20 gm fast-acting carbohydrate (sugar)
- Re-test blood sugar in 15 minutes, if still low, repeat the treatment
- **Do not over-treat**
- Identify and treat cause
- Monitor blood sugar frequently

Hypoglycemia: Treatment

15-20 gm Carbohydrate =

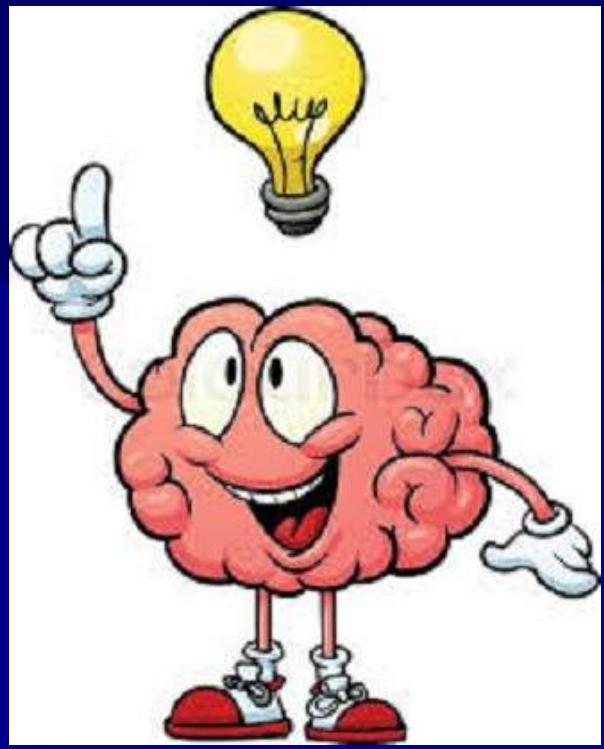
- 4 – 6 oz. fruit juice
- 1 small piece of fruit
- 5 pieces of hard candy
- 8 oz. fat-free milk
- 4 oz. Regular soda
- 4 glucose tablets
- 1 tablespoon jelly
- 1 tablespoon honey

Glucagon Emergency Kit

Hypoglycemia: Patient Education

- Recognize signs
- Appropriate treatment procedure
- Always carry something for hypoglycemia
- Educate family members
- Monitor trends
- Safety issues
- Prevention measures

Brainstorming



Healthy Eating

The "Diabetic Diet"

P.S. There is no "diabetic diet"

Myths and Facts about Diabetes

- Eating too much sugar causes diabetes
- People with diabetes can't eat sweets or chocolate
- A low carb diet is the best for people with diabetes
- Your body needs carbohydrates for energy
- Fruit is healthy, so is it OK to eat as much as you want.
- You are in charge of managing your diabetes

What Happens When We Eat?

After eating, most food is turned into blood glucose, the body's main source of energy

Total Carbohydrates Count

Carbohydrates give energy

But too much carbohydrate can raise blood glucose above your target range

Ask your care team: How much carbohydrate is right for you?

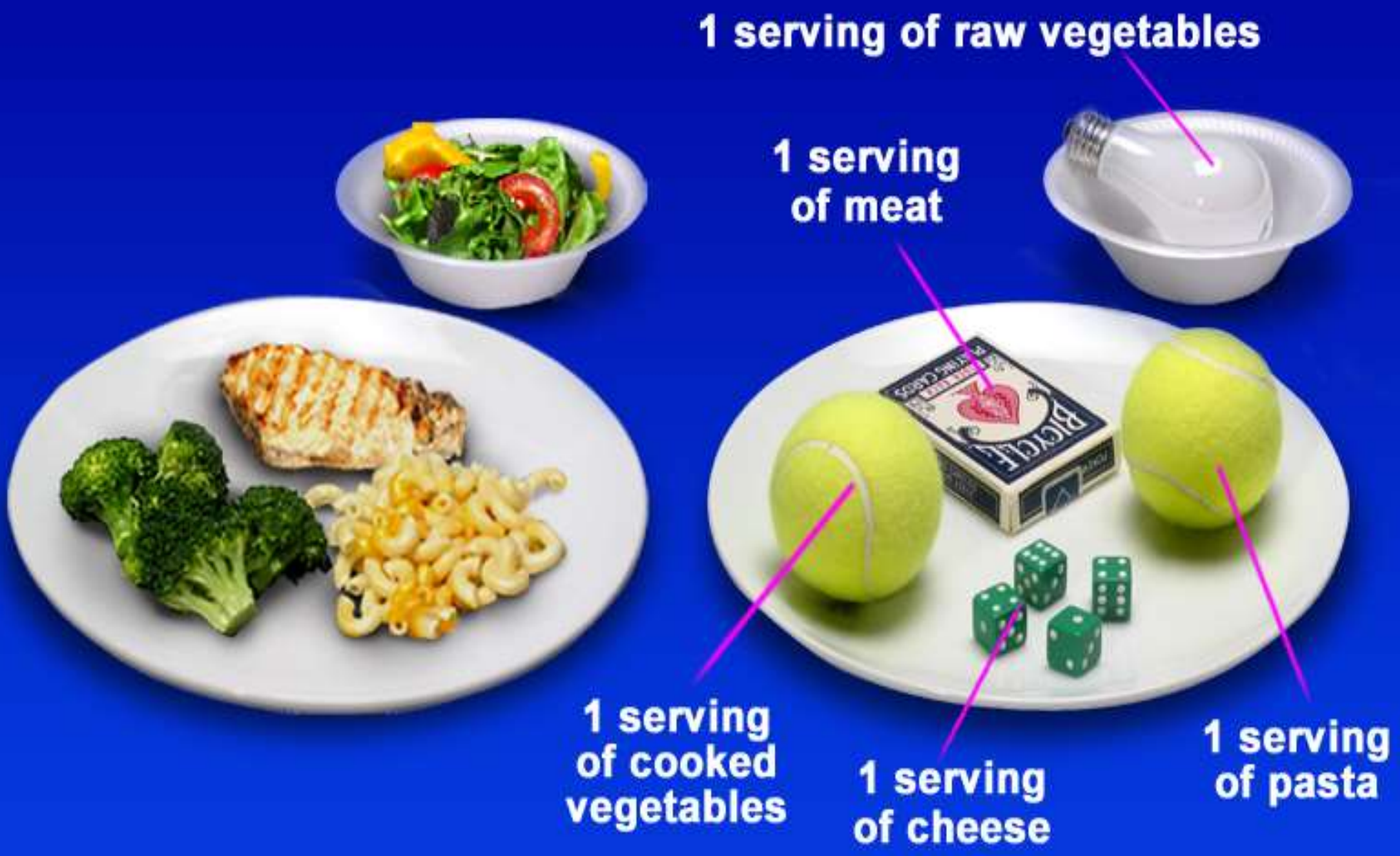
Where Carbs are Found

Starchy vegetables- lets name 'em
What about beans?
Dairy products- let name 'em
What about cheese?
Grains/ breads- let's name 'em
Snack foods?
Fruits- All fruits have some sugar/energy with various amounts of fiber
?Others?- let's name 'em

Carb Counting/ Management

- Portion Is a measure
  15 grams = 1 Carb Portion (CHO)
- Serving Is an amount determined by manufacturer (or your Aunt)
  Is term used from food groups at USDA
  Is labeled by weight
- Exchange Is an ADA method of carb counting very last century

Control Portion Sizes



Using a Food Label

Nutrition Facts

Serving Size 1 Cup (239g)
Servings Per Container About 2

Amount Per Serving	
Calories 150	Calories from Fat 60
	% Daily Value*
Total Fat 6g	**9%**
Saturated Fat 1.5g	**8%**
Trans Fat 0g	
Polyunsaturated Fat 1.5g	
Monounsaturated Fat 2.5g	
Cholesterol Less than 5mg	**1%**
Sodium 250mg	**10%**
Total Carbohydrate 19g	**6%**
Dietary Fiber Less than 1g	**3%**
Sugars 0g	
Protein 3g	

Vitamin A	0%	• Vitamin C	0%
Calcium	2%	• Iron	6%

*Percent Daily Values are based on a 2,000 calorie diet

Cut Down on Fat and Cholesterol

High Calories

Weight Gain

High Cholesterol & Saturated Fat

Heart Attack Risk

Messaging to the Patient

- People feel better when they eat a healthy diet and have improved blood sugars
- Deciding to improve
  - one meal at a time
  - one event at a time
  - one day at a time
- Defining an achievable goal
  - Keep it simple
- Self-recognition for goals met

How You Can Help

- Teaching not telling
  - Encouraging choices (offer healthy foods first)
  - Avoid being the "Food Police"
- Helping them start
  - Adjusting portion sizes rather than eliminating favorite foods, when able
  - Slowly adding new foods (fruits/ vegs if not already eating)
- Small changes big rewards

Make Healthier Food Choices

Instead of this:

Try this:

Tips for Healthier Eating Dining Out

Order:

- An appetizer as an entrée
- Sauces and dressings on the side
- Half-size portions

Cultural Culprits: Our Fast Food Nation

Large Soda (32 oz.)
300 calories
19 tsp. sugar

Large Fries
520 calories
25 g fat
4.5 g saturated fat

Double Cheeseburger
770 calories
47 g fat
20 g saturated fat

Apple Pie
260 calories
13 g fat
3.5 g saturated fat

The average fast-food meal has close to a full day's calories

McDonald's ™

	Calories (no cheese)	**Fat gm**	**Carb gm/ CHO port.**	**Sodium gm/** **+/- cheese** (no salt)
Egg McMuffin	300 (250)	12 (5)	**32gm 2 portions**	780
Grilled Chicken	350	9	**42gm 3 portions**	1040
Value Burger (99c)	300 (250)	12 (9)	**33** (31) **2 portions**	750/ 520
Medium Fry	380	19	**48/ 3**	270 **(175)**
Small Fry	230	11	**29/ 2**	160 **(101)**

Tortilla Reference

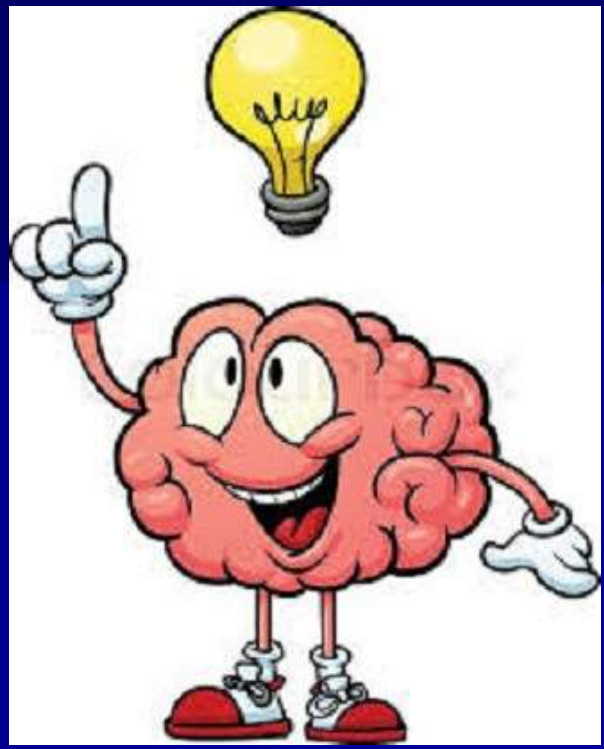
Tortilla Reference

Tortilla	Calories	Fat gm	Carb gm/ carb portion	Fiber gm
6” Corn	56	1	**9** gm/ **0.5**	1
6” Flour	100	2.5	**16** gm/ **1**	1
7” Multi-grain	150	4.5	**23** gm/ **1.5**	5
7” Flour (homestyle)	180	4	**31** gm/ **2**	3
7” Whole Wheat	139	2.5	**25** gm/ **1.5**	4
10” Flour (burrito)	210	5	**36** gm/ **2.5**	1
11” Multi-grain	210	6	**32** gm/ **2**	7

Tips to Remember

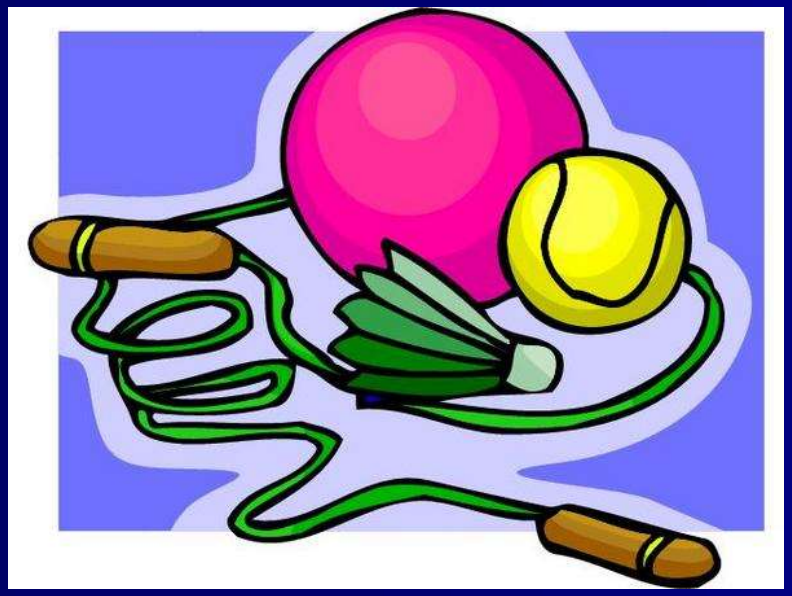
- Decide to investigate menu at a given restaurant
- Decide on weekly menu at home then make shopping list
- Decide to pay attention to one thing and build on it
- Define success and practice new rewards

Brainstorming



Being Active

Activity Recommendations



- 150 minutes a week
- Combination of aerobic and strength training
- 10,000 steps/day

Benefits of Physical Activity

- Lowers Blood Sugar, Cholesterol, Blood Pressure
- Improves health
- Lowers stress
- Feels good

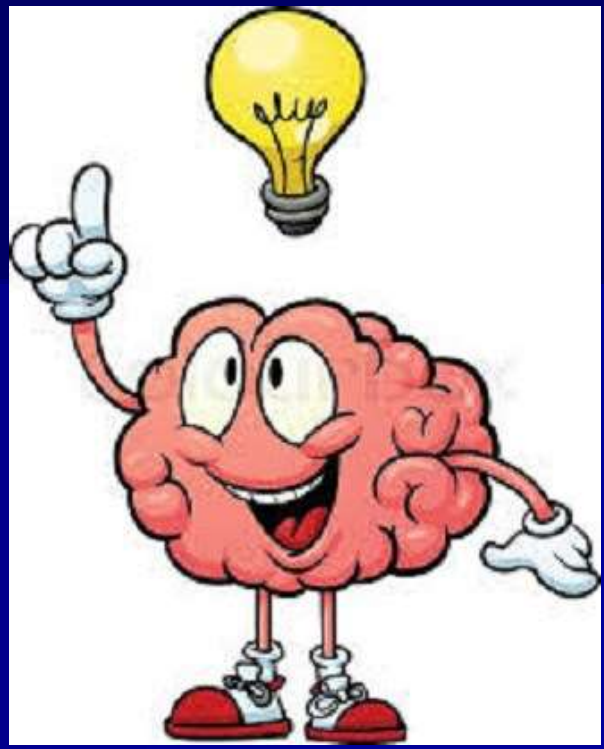
Exercise Resources

- Leslie Sansone Walking videos https://www.youtube.com/watch?v=njeZ29umqVE
- Chair exercises

https://www.youtube.com/watch?v=8mAA9qNSTo4

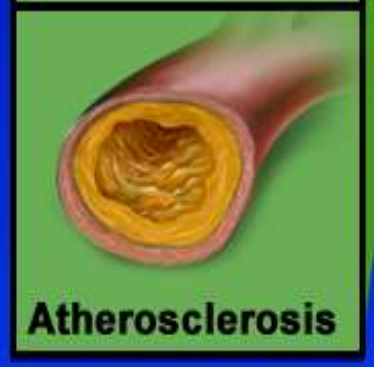
https://www.youtube.com/watch?v=4zww0h9cHu0

Brainstorming



Reducing Risks Of Diabetes Complications

Diabetes Increases the Risk of Large Blood Vessel Damage



Macrovascular complications:

- Stroke
- Heart attack
- Poor circulation

Over time, fatty deposits can clog large blood vessels

Hyperglycemia Can Cause Serious Long-Term Problems

Chronic complications of diabetes

Blindness

Kidney disease

Nerve damage

Amputation

Cardiovascular disease:

Stroke

Heart attack

Loss of circulation in arms and legs

Good News for Type 2 Diabetes

Keeping A1C in target range reduces:

Heart attack

as much as 16%

Eye damage

as much as 21%

Kidney disease

as much as 34%

United Kingdom Prospective Diabetes Study

Co-morbidity Management

- Blood pressure control
- Cholesterol control
- Complication screening and prevention
  - Yearly eye exam
  - Yearly foot exam and daily foot care
  - Yearly blood and kidney tests
  - Vaccines
  - Medic alert
  - Regular dental care
  - Education

Cholesterol and Diabetes

- LDL or “bad cholesterol” should be lower than 100
- HDL or “good cholesterol” should be higher than 45
- Triglyceride level should be lower than 150
- Diet and exercise can help improve cholesterol

High Blood Pressure and Diabetes

- Goal blood pressure
  - Lower than 130/80
- Medications recommended because they also can protect kidneys
- Many people need 2 or 3 medications to reach goal
- Diet and exercise can help improve blood pressure

The Good News About Diabetes

Avoid diabetes complications by:

- Keeping blood glucose as near normal as possible
- Learning self-care skills
- Getting support from family and diabetes care team
- Taking medication, as needed

People with diabetes can lead full, productive lives!

New Technology

- "Smart" insulin pumps
- Continuous glucose monitoring
- Closed-loop ("Artificial Pancreas") pump
- Pancreas transplants
- Gastric bypass surgery

Some Available Pumps

Animus with "Ping"

Omni Pod with PDM

Medtronic with CGM

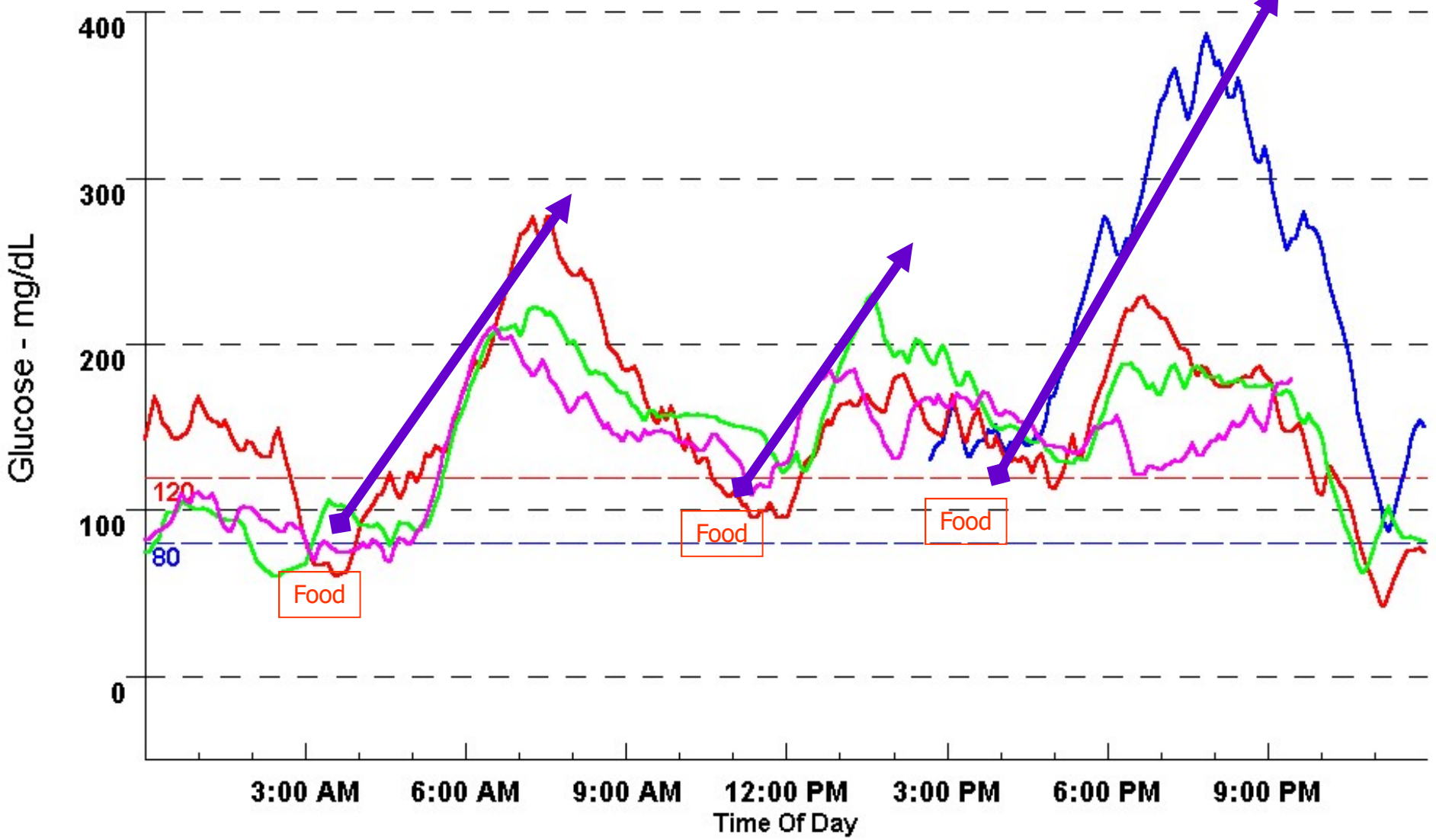
t:slim
(touch simplicity)

Continuous Glucose Sensors/ Monitors

Dexcom G5/G6
Medtronic MiniMed Connect

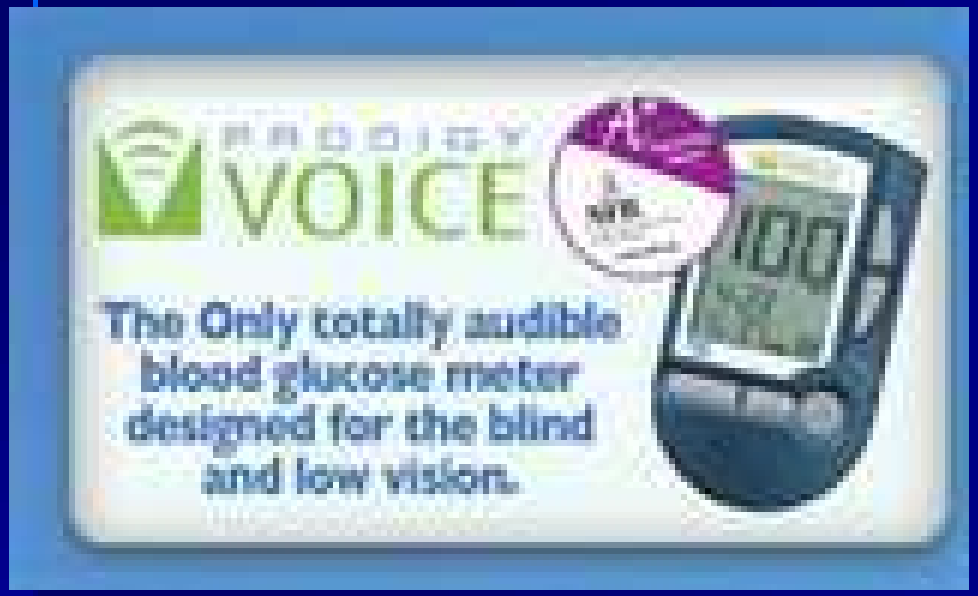
Freestyle Libre

Postprandial Excursions



Other Diabetes Assistive Devices

"Talking" Blood Glucose Monitors



Alternate Site Testing

Insulin Injection Aids

Magniguide

i-Port

Final Questions, Comments, Experiences to Share……

Resources

- https://www.diabetes.org.uk/resources-s3/2018-02/Improving%20care%20for%20peeople%20with%20diabetes%20and%20a%20learning%20disability%20-%20Fact%20sheet%204.pdf
- https://diabetes-resources-production.s3.eu-west-1.amazonaws.com/resources-s3/2018-03/Top%20tips.pdf
- https://www.england.nhs.uk/rightcare/wp-content/uploads/sites/40/2017/11/rightcare-pathway-diabetes-reasonable-adjustments-learning-disability-2.pdf

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