QR Code for Handouts

Welcome to Diabetes in 21st Century
Thank you for inviting me!
2024

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Coach Bev has no conflict of interest

- Not on any speaker's bureau
- Does not invest in pharmaceutical or device companies
- Gathers information from reading package inserts, research and standards

Schedule

Diabetes in the 21st Century Seminar Schedule

7:00 – 8:00am Welcome and Registration

8:00 – 9:45 **Diabetes Overview**
- Current State of Diabetes
- Pathophysiology and Diagnostic Criteria
- Natural History of Diabetes
- Types of Diabetes

9:45 – 10:00 **Break**

10:00 – 11:30 **Management Goals, Prevention Strategies**
- Prevention, Exercise and Education
- Management Goals – Control Matters

11:30 – 12:30 **Lunch**

12:30– 2:00 **Preventing Crisis, Feet and Insulin Therapy**
- Preventing Hypo and Hyperglcyemia
- Lower Extremity Care
- Basics of insulin therapy

2:00 – 2:15 **Break**

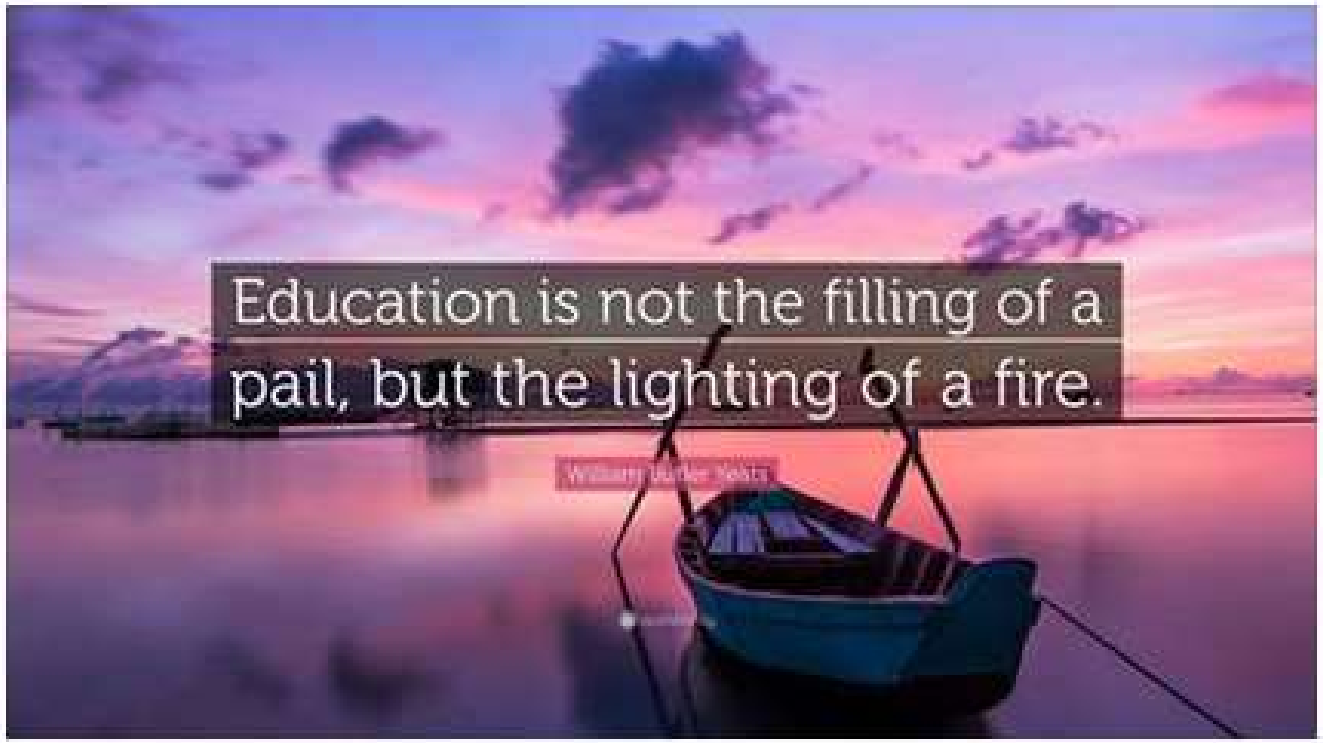
2:15 – 4:00 **Pattern Management, Gut Health, Nourishment**
- Insulin Pattern Management
- Gut Bacteria and Health
- Nourishing our Bodies
- Conclusion

Diabetes in 21st Century Resources

Diabetes in the 21st Century:
A Clinical and Educational Update

1. Describe impact of diabetes
2. Discuss prevention, management strategies
3. Discuss different types of diabetes
4. Describe insulin therapy
5. Gain understanding of Type 2 Meds.
6. Review glucose patterns and determine how to adjust therapy to improve glucose.
7. Describe carb counting
8. Discuss gut bacteria and healthy eating
9. Demonstrate successful teaching strategies

1. Improving Care and Promoting Health in Populations



What we say and how we say it matters.

CDC Announces

35% of Americans will have Diabetes by 2050

Boyle, Thompson, Barker, Williamson

2010, Oct 22:8(1)29

www.pophealthmetrics.com

Quick Question 1

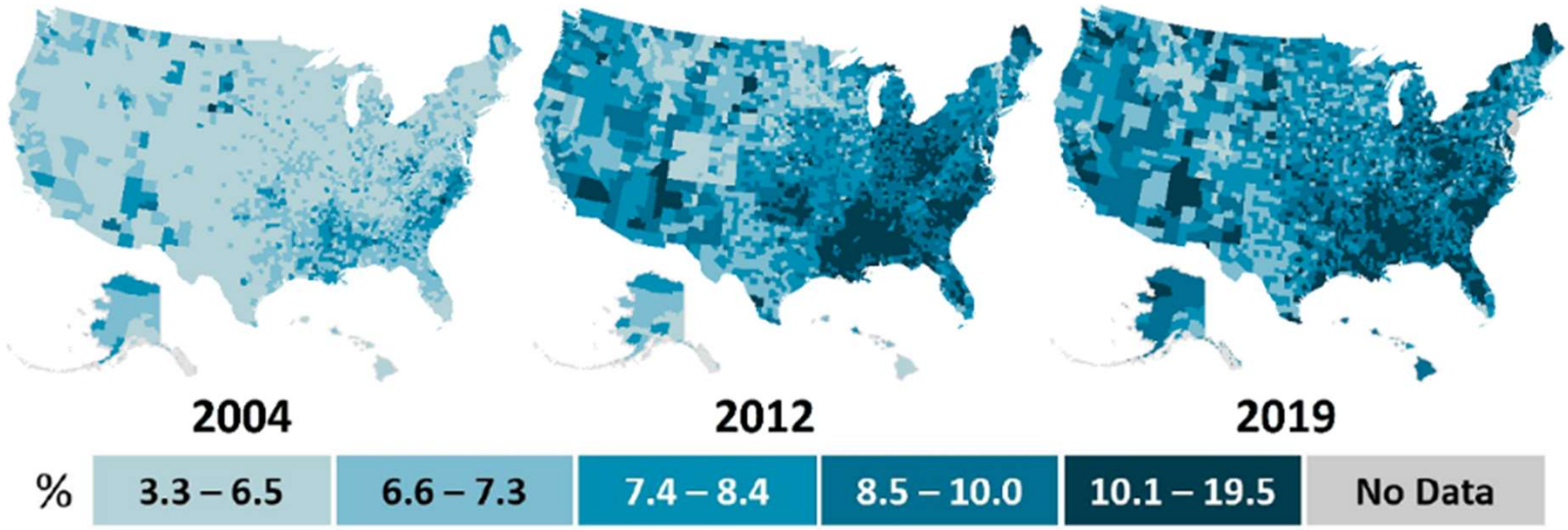
- What percent of adults in America currently live with type 2 diabetes?

- A. 11%
- B. About 50%
- C. 25%
- D. 30%

Type 2 Diabetes in America 2024

- 11.3% with Diabetes - 37 million adults
  - 23% don't know they have it
- 38% with Prediabetes – 96 million adults

Figure 3. Age-adjusted, county-level prevalence of diagnosed diabetes among adults aged 20 years or older, United States, 2004, 2012, and 2019



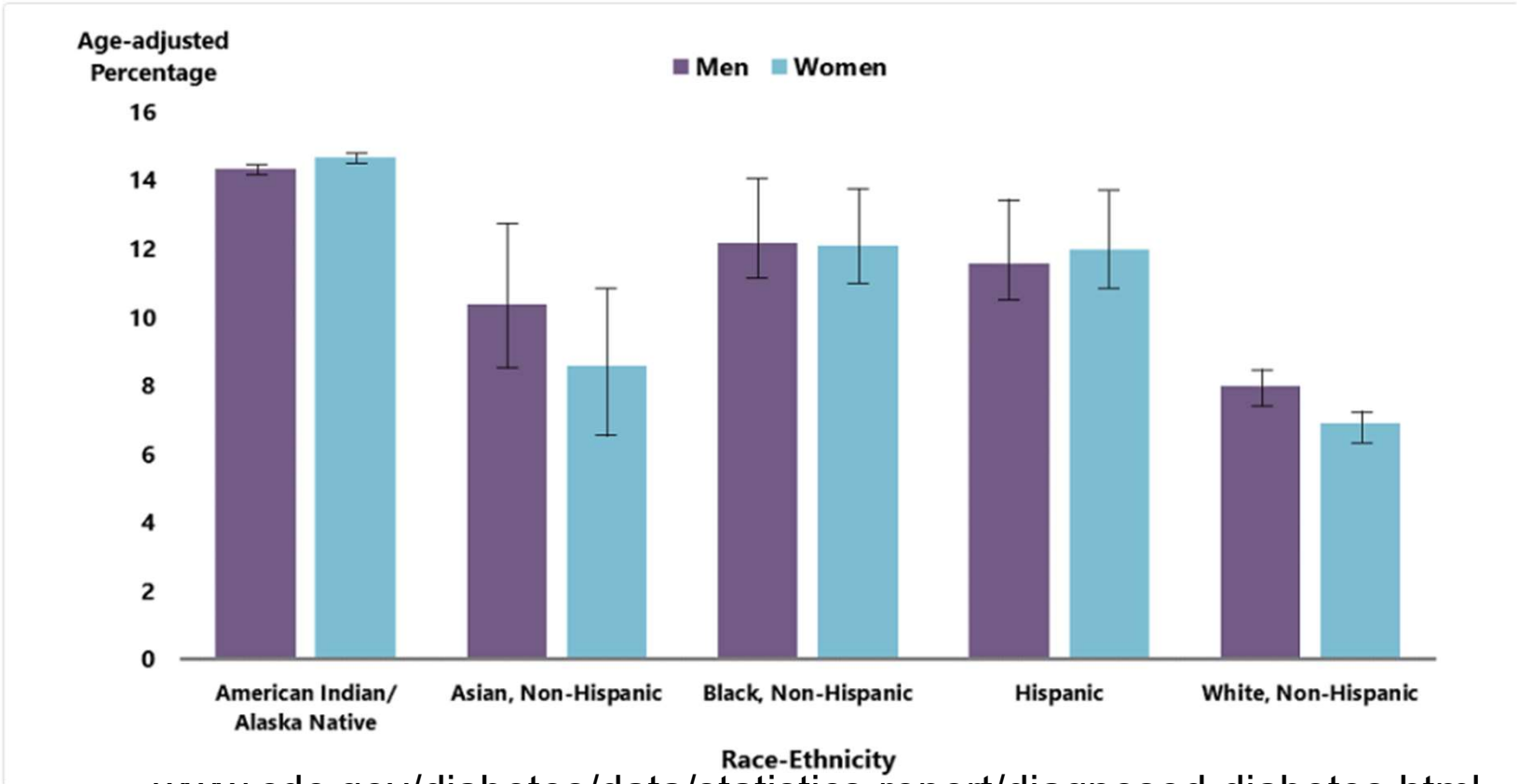
Data sources: US Diabetes Surveillance System; Behavioral Risk Factor Surveillance System.

Centers for Disease Control and Prevention. National Diabetes Stats Report https://www.cdc.gov/diabetes/data/statistics-report/index.html. Accessed 1/23

Diabetes Prevalence by Ethnic Group

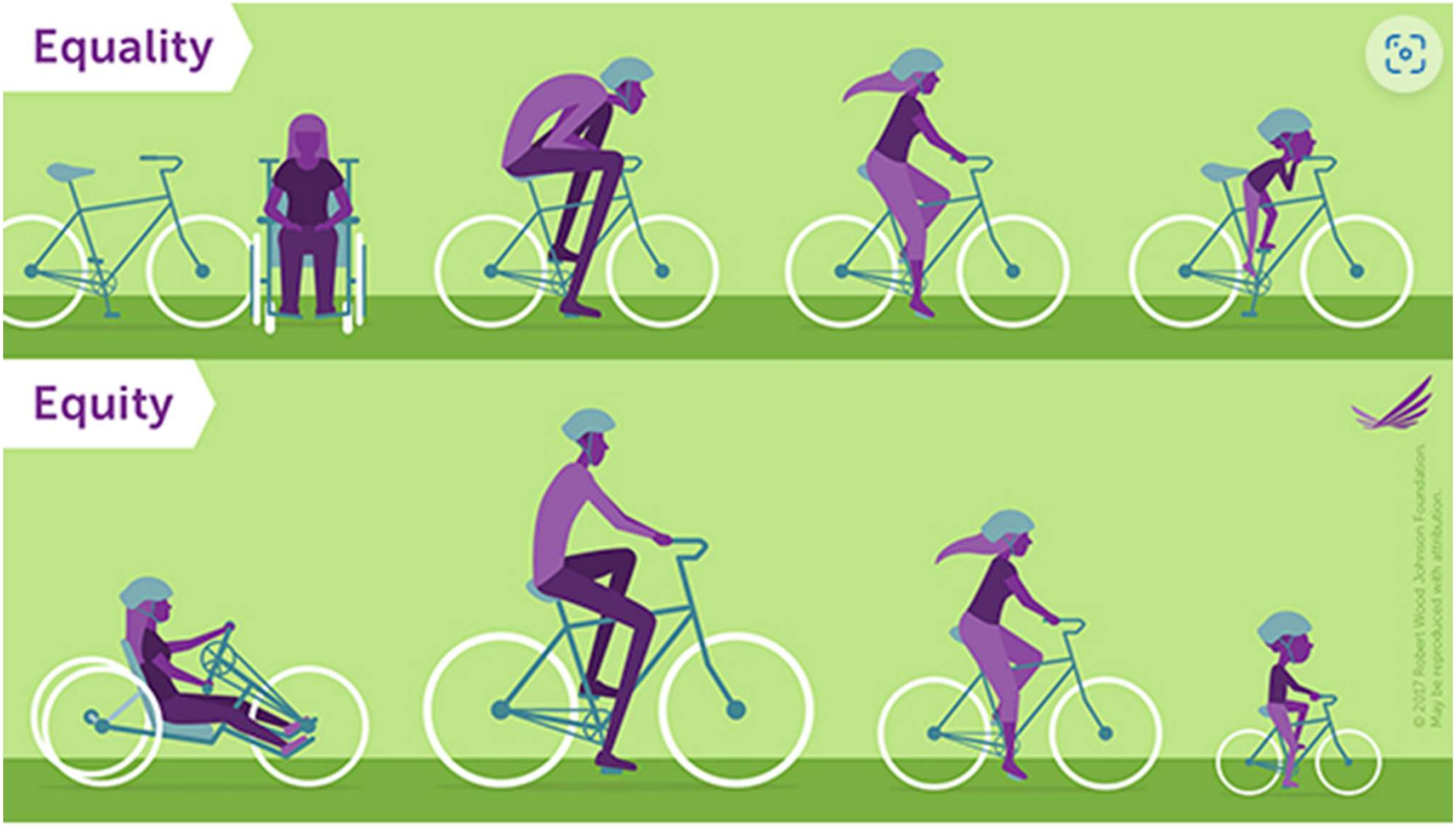
- For adults, diabetes prevalence highest among:
  - American Indians and Alaska Natives (14.5%),
  - Non-Hispanic Blacks (12.1%),
  - People of Hispanic origin (11.8%),
  - Non-Hispanic Asians (9.5%)

Figure 2. Age-adjusted estimated prevalence of diagnosed diabetes by race/ethnicity group and sex for adults aged 18 years or older, United States, 2018–2019



www.cdc.gov/diabetes/data/statistics-report/diagnosed-diabetes.html

Equality vs Equity

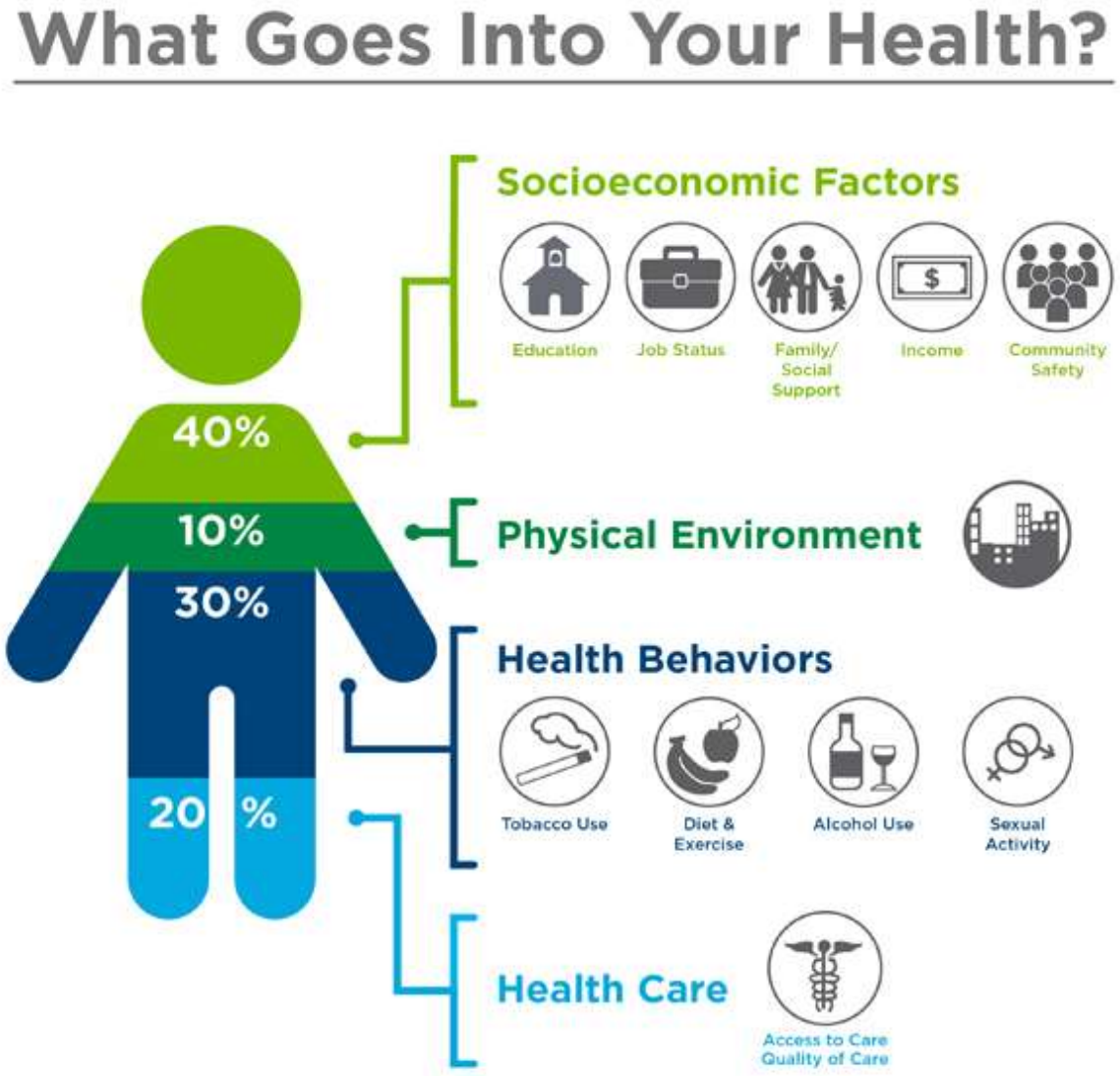


Design and deliver diabetes care with goal of **health equity** across all populations.

https://coveragetoolkit.org/health-equity/defining-health-equity/

Address Barriers to Self Management

- **Barriers exist** within health system, payer, health care professional & individual.
- **Address barriers** through innovation, including community health workers, telehealth, other digital health solutions.
- **Consider social determinants of health** in the target population when designing care.



Source: Institute for Clinical Systems Improvement, Going Beyond Clinical Walls: Solving Complex Problems (October 2014)

https://coveragetoolkit.org/health-equity/defining-health-equity/

5. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Social Determinants of Health

- The conditions in which people:
  - Play
  - Live
  - Work
  - Learn
  - Pray
- Directly affects their health risks and outcome

AADE Population Health & Diabetes Educators Evolving Role 2019

Geography of Diabetes, Income, Weight

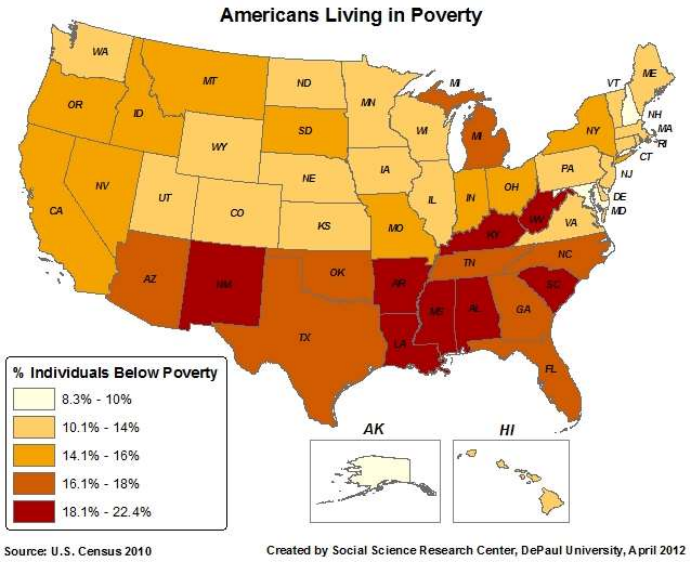
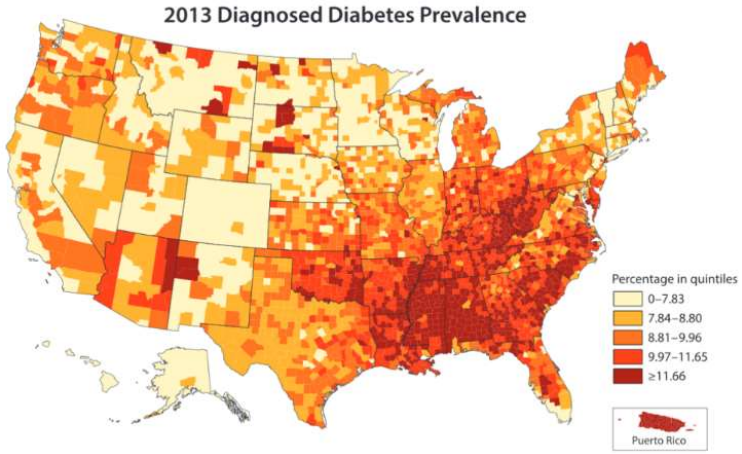


Figure 2. Age-adjusted, county-level prevalence of diagnosed diabetes among adults aged ≥20 years, United States, 2013



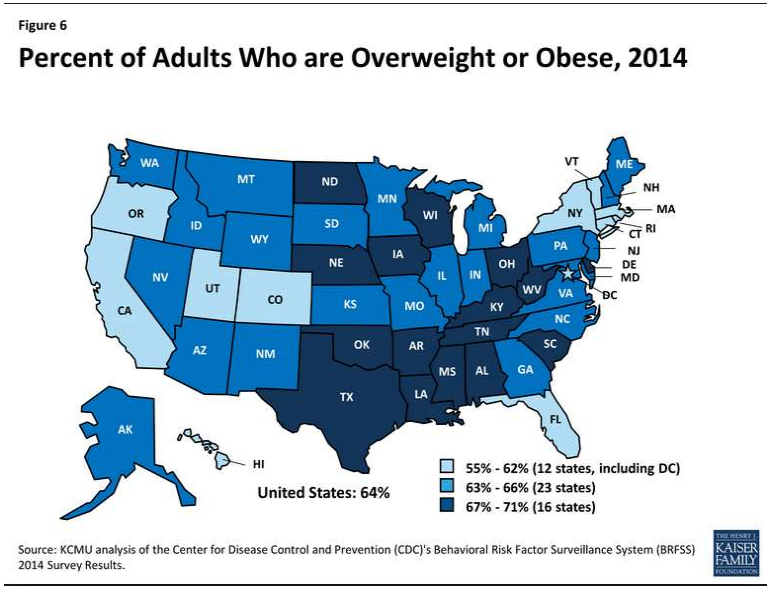
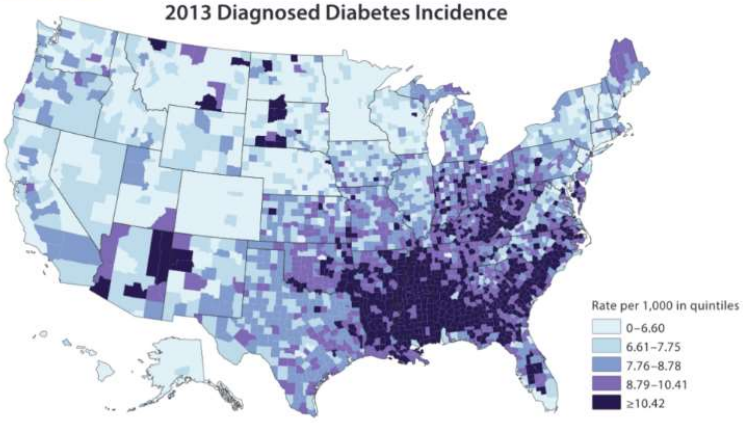


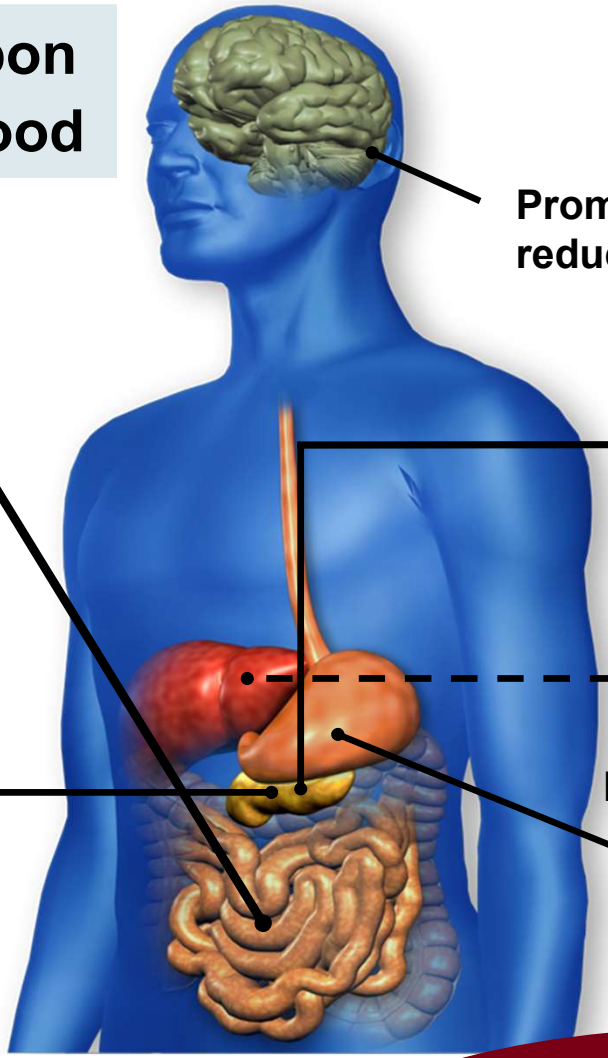
Figure 3. Age-adjusted, county-level incidence of diagnosed diabetes among adults aged ≥20 years, United States, 2013



Hormones Effect on Glucose

Hormone	Effect
Glucagon (pancreas)	↑
Stress hormones (kidney)	↑
Epinephrine (kidney)	↑
Insulin (pancreas)	↓
Amylin (pancreas)	↓
Gut hormones - incretins (GLP-1 & GIP) released by L cells of intestinal mucosa, beta cell has receptors)	↓

GLP-1 Effects in Humans
Understanding the Natural Role of Incretins



GLP-1 secreted upon the ingestion of food

↑ Beta-cell response

Promotes satiety and reduces appetite

Alpha cells:
↓ Postprandial glucagon secretion

Liver:
↓ Glucagon reduces hepatic glucose output

Beta cells:
Enhances glucose-dependent insulin secretion

Stomach:
Helps regulate gastric emptying

GLP-1 degraded by DPP-4 w/in minutes

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

Pocket Card: GLP-1 & GIP RA

GLP-1 & GIP Receptor Agonists

Class/Main Action	Name	Dose Range	Considerations
GLP-1 RA - Glucagon Like Peptide Receptor Agonist **"Incretin Mimetic"** • Increases insulin release with food • Slows gastric emptying • Promotes satiety • Suppresses glucagon	exenatide (Byetta)	5 and 10 mcg BID	**Side effects:** nausea, vomiting, weight loss, injection site reaction. Report signs of acute pancreatitis or intestinal blockage (ileus) and stop med. Increase dose monthly to achieve targets. **Black box warning:** Thyroid C-cell tumor warning (avoid if family history of medullary thyroid tumor). *Significantly reduces risk of CV death, heart attack, and stroke. †Approved for pediatrics 10-17 yrs Lowers A1C 0.5 – 1.6% Weight loss: 4-6% body weight loss.
	exenatide XR† (Bydureon)	2 mg 1x a week Pen injector - Bydureon BCise	
	liraglutide (Victoza)*†	0.6, 1.2 and 1.8 mg daily	
	dulaglutide* (Trulicity)†	0.75, 1.5, 3.0 and 4.5 mg 1x a week pen injector	
	semaglutide* (Ozempic)	0.25, 0.5, 1.0 and 2.0 mg 1x a week pen injector	
	(Rybelsus) Oral tablet	3, 7, and 14 mg daily in a.m. Take on empty stomach with sip of water	
GLP-1 & GIP Receptor Agonist Activates receptors for GLP-1 (see above) & Glucose-dependent Insulinotropic Polypeptide (GIP).	Tirzepatide (Mounjaro)	2.5, 5.0, 7.5, 10, 12.5 and 15 mg 1x a week prefilled single dose pen Increase dose by 2.5 mg once monthly to reach targets.	**Side effects:** nausea, diarrhea, injection site reaction. Report pancreatitis, signs of intestinal blockage. **Black box warning:** Avoid if family history of medullary thyroid tumor. Lowers A1C ~ 1.8 - 2.4% Weight loss: 7-13% body weight loss at max dose.

Poll Question 2

- Which of the following is accurate statement regarding Glucagon Like Peptides (GLP-1)?
  - A. Main action is inhibition of DPP-IV enzyme
  - B. Increases post prandial glucagon secretion
  - C. Promotes gastric motility
  - D. Decreases hepatic glycogenolysis

What is Type 2 Diabetes?

- Complex metabolic disorder ….

  (Insulin resistance and deficiency)

with social, behavioral and environmental risk factors unmasking the effects of genetic susceptibility.

New Diagnosis?
Call 800 – DIABETES to request “Getting Started Kit”
www.Diabetes.org

American Diabetes Association

Bariatric Surgery

- Consider on diabetes ind's w/ BMI >35, esp with comorbidities
- Remission (BG normalized)
  - Due to increase incretins (gut hormones)
  - For an average 6 years
  - Less death and CV complications
- Still researching long term benefits, cost effectiveness and risk

Quick Question 3

- Which of the following level is considered pre-diabetes range:

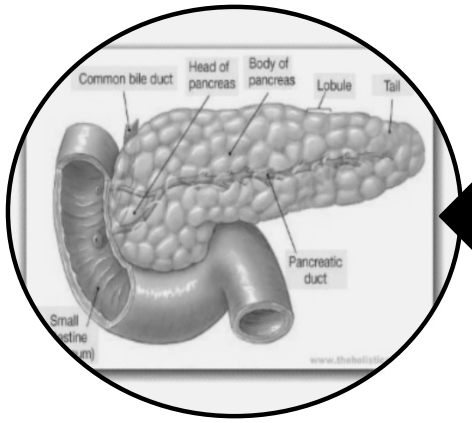
a. Fasting BG of 62

b. A1c of 5.9 %

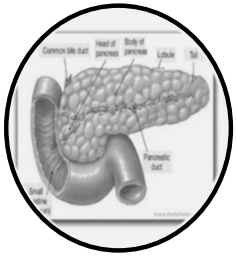
c. After meal BG of 137

d. A1c of 7.1 %

Natural History of Diabetes



Yes!



NO

No Diabetes

FBG <100

Random <140

A1c <5.7%

Prediabetes

FBG 100-125

Random 140 - 199

A1c ~ 5.7- 6.4%

50% working pancreas

Diabetes

FBG 126 +

Random 200 +

A1c 6.5% or +

20% working pancreas

Development of type 2 diabetes happens over years or decades

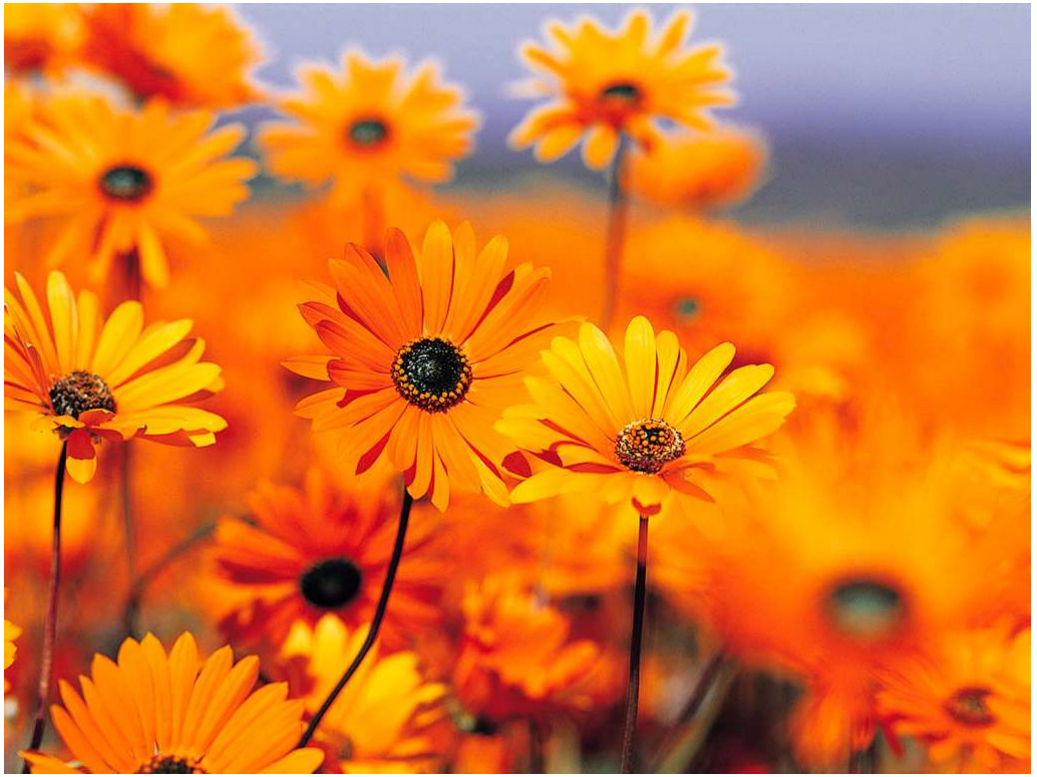
Signs of Diabetes

- Polyuria
- Polydipsia
- Polyphasia
- Weight loss
- Fatigue
- Skin and other infections
- Blurry vision

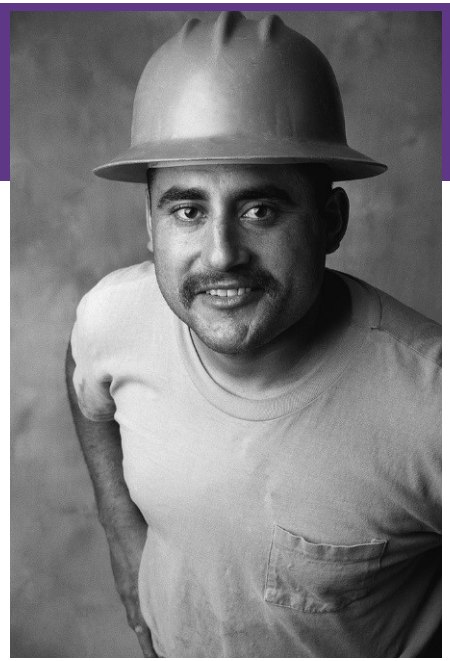
- Glycosuria, H_2O losses
- Dehydration
- Fuel Depletion
- Loss of body tissue, H_2O
- Poor energy utilization
- Hyperglycemia increases incidence of infection
- Osmotic changes

Diabetes Classifications

- Type 1
- Type 2
- Gestational
- Secondary



Case Study



Profile: 5’8”, 192 lb male

Diabetes 12 years, on insulin 3 yrs

What type of DM and how do you know?

2. 5’6”, 108 lb female

On insulin 3u bolus before meals,

10u basal insulin at bedtime

What type of DM and how do you know?

Incidence of Type 1 in Youth

- **General Pop 0.3%**
- **Sibling 4%**
- **Mother 2-3%**
- **Father 6-8%**
- Rate doubling every 20 yrs
- Many trials underway to detect and prevent (Trial Net)

Type 1 Rates Increasing Globally

- 23% rise in type 1 diabetes incidence from 2001-2009
- Why?
  - Autoimmune disease rates increasing over all
  - Changes in environmental exposure and gut bacteria?
  - Hygiene hypothesis
  - Excess weight?

Type 1 – 10% of all Diabetes

- Auto-immune pancreatic beta cells destruction
- Most commonly expressed at age 10 - 14
- Insulin sensitive (require 0.5 - 1.0 units/kg/day)
- Expression due to a combo of genes and environment:
  - Autoimmunity tends to run in families
  - Exposure to virus or environmental factors
- Signs can include:
  - Increased thirst and hunger
  - Frequent urination or new bed-wetting at hs
  - Unintended weight loss
  - Fatigue and irritability

Type 1 Diabetes Features?

- AJ, 22 yr old admitted to the ICU with a blood glucose of 476 mg/dl, pH of 7.1. Recently lost 13 pounds.

Type 1 Most Discriminative Features

- Younger than 35 years at diagnosis
- Lower BMI (<25 kg/m^2)
- Unintentional weight loss
- Ketoacidosis
- Glucose 360 mg/dl or greater.

CONSENSUS REPORT | OCTOBER 18 2021

The Management of Type 1 Diabetes in Adults. A Consensus Report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD) FREE

Type 1 Diabetes Progression

	Stage 1	Stage 2	Stage 3
Characteristics	• Autoimmunity	• Autoimmunity	• Autoimmunity
	• Normoglycemia	• Dysglycemia	• Overt hyperglycemia
	• Presymptomatic	• Presymptomatic	• Symptomatic
Diagnostic criteria	• Multiple islet autoantibodies - GAD, glutamic acid decarboxylase (primary) - islet antigen 2, or - Zinc transporter 8 (ZnT8)	• Islet autoantibodies Dysglycemia: Elevated IFG and/or IGT • FPG 100–125 mg/dL • 2-h PG 140–199 mg/dL • A1C 5.7–6.4% or ≥10% increase in A1C	• Autoantibodies may disappear over time (5-10% may not express antibodies) • Diabetes diagnosed by standard criteria

STANDARDS OF CARE | DECEMBER 12 2022

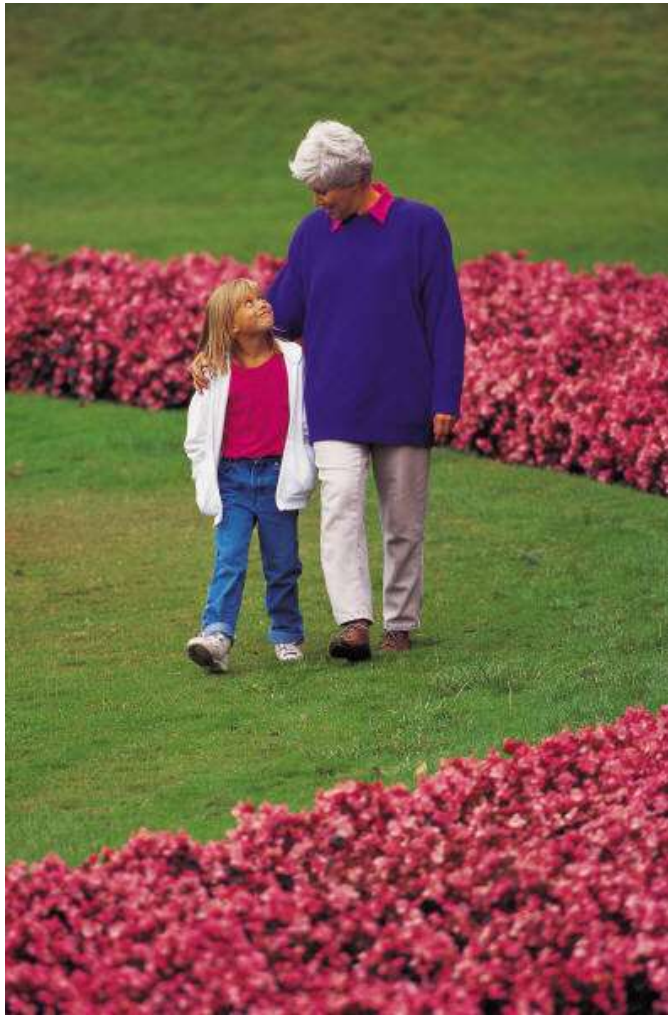
2. Classification and Diagnosis of Diabetes: *Standards of Care in Diabetes—2023* FREE

Diabetes Education SERVICES 25 years

www.DiabetesEd.net

How do we know someone has Type 1 vs Type 2?

- Type 1 - Positive antibodies
  - GAD - glutamic acid decarboxylase (primary)
  - IA2 - islet antigen 2, or
  - ZnT8 - zinc transporter 8
- Can also check C-peptide levels to determine endogenous insulin production
- Can use teplizumab for type 1- stage to delay onset

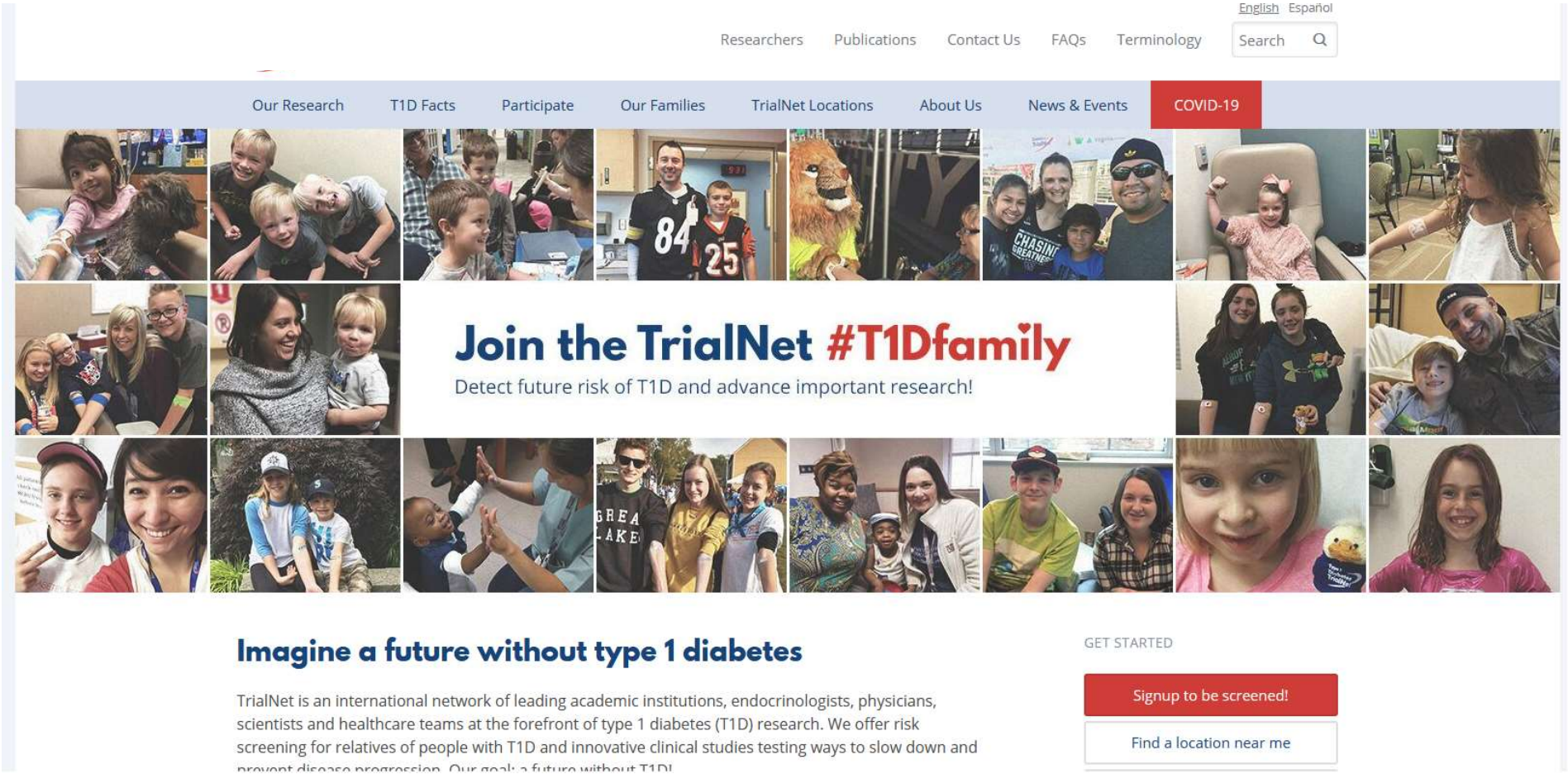


STANDARDS OF CARE | DECEMBER 12 2022

2. Classification and Diagnosis of Diabetes: *Standards of Care in Diabetes—2023* FREE

Type 1 (stage 2) Delayed with Teplizumab by 2 years www.DiabetesTrialNet.org

- **How to get families linked to screening?**



Type 1 Diabetes Associated with other immune conditions

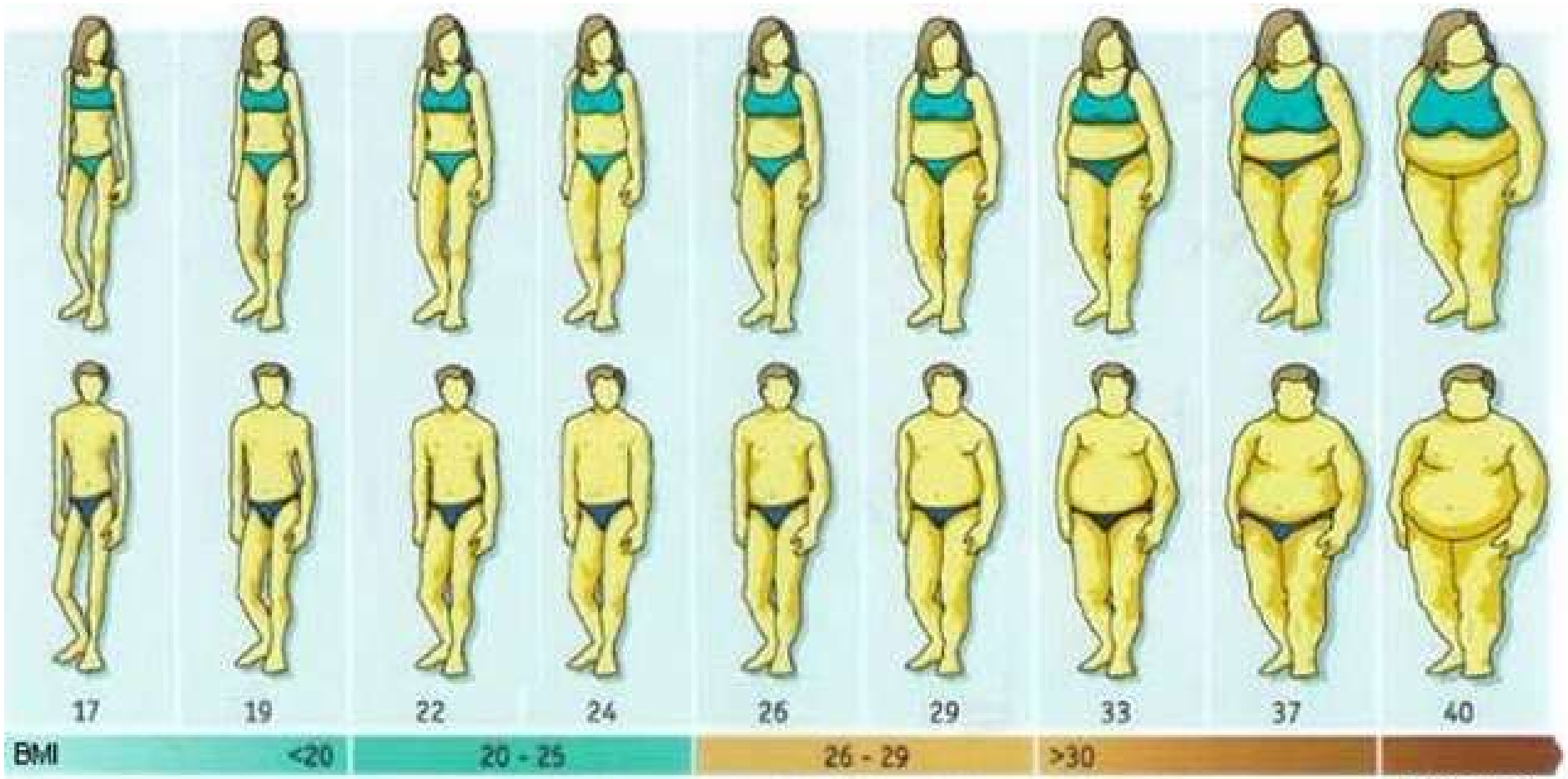
- Celiac disease (gluten intolerance)
- Thyroid disease
- Addison's Disease
- Rheumatoid arthritis
- Other

Poll 4 - Type 1 in hospital

- Before lunch blood glucose 98.
- Plans to eat 60 gms of carb for lunch.
- On insulin sliding scale that starts at 150.
- What is best response?

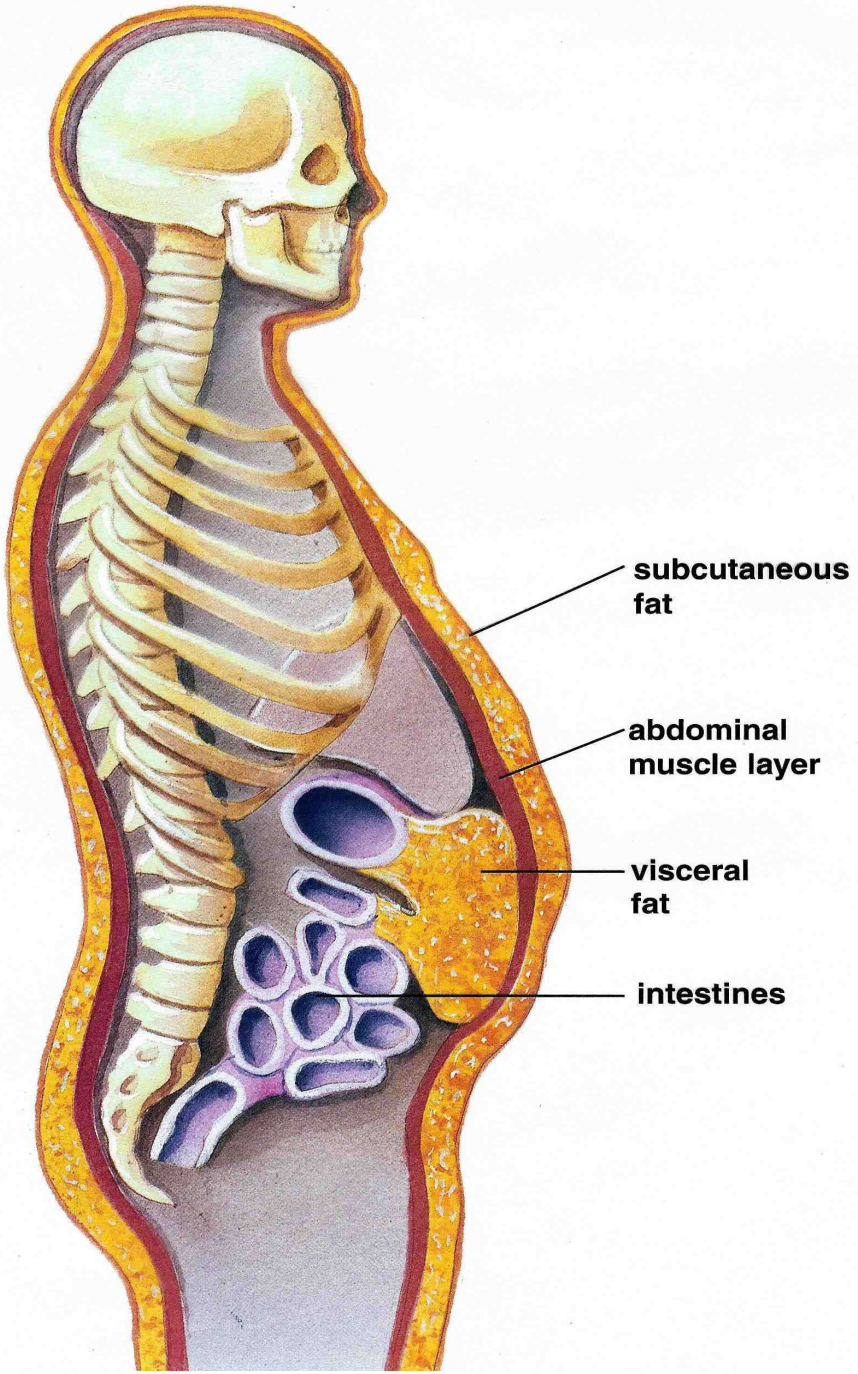
A. Sorry, that's what the order says.
B. Your blood sugars are great.
C. How much insulin would you usually take?
D. I am worried your blood sugars would go to low.

Updated BMI Categories

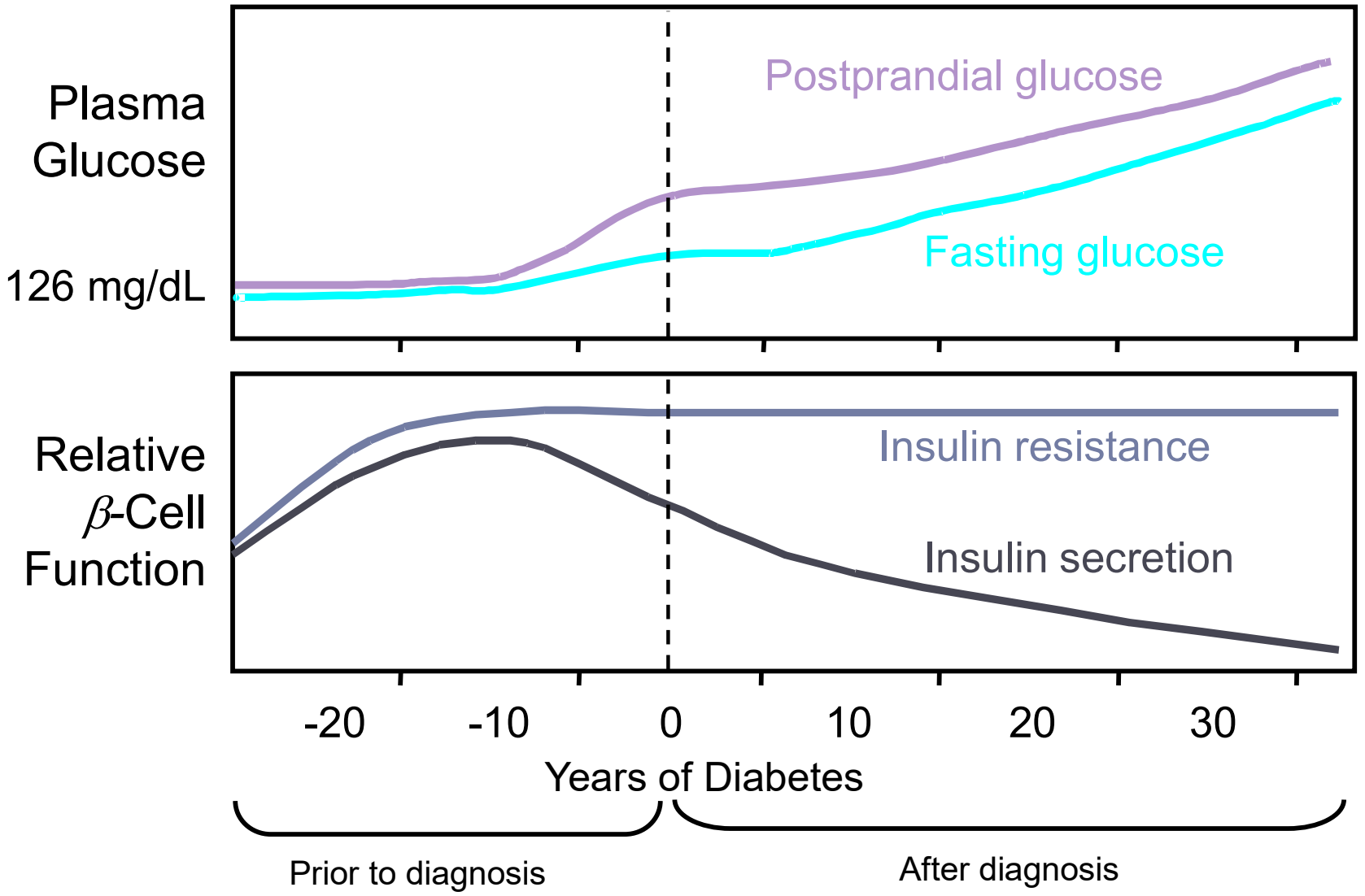


Experiencing Underwt **Healthy weight** **Experiencing overwt** **Experiencing obesity**

Visceral Fat and Subcutaneous Fat



Natural Progression of Type 2 Diabetes



Adapted from Bergenstal et al. 2000; International Diabetes Center.

Cardio Metabolic Risk - 5 Hypers -

- Hyperinsulinemia (resistance)
- Hyperglycemia
- Hyperlipidemia
- Hypertension
- Hyper”waistline”emia (35” women, 40” men)

Manifestations of Insulin Resistance

Pre Diabetes & Type 2- Screening Guidelines (ADA 2024 Clinical Practice Guidelines)

1. Start screening all people at age 35.
2. Screen at any age if BMI ≥ 25 (Asians BMI ≥ 23) plus one or > additional **risk factor**:

- First-degree relative w/ diabetes
- Member of a high-risk ethnic population
- Habitual physical inactivity
- *PreDiabetes
- History of heart disease
- *Taking high risk meds; antiretrovirals, 2nd generation antipsychotics or steroids
- History of pancreatitis

2. Diagnosis and Classification of Diabetes: *Standards of Care in Diabetes—2024* FREE

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Second-Generation Antipsychotic Meds and Diabetes Risk

- People taking these meds require frequent monitoring due to increased risk of hyperglycemia and other metabolic effects.
- There is a range of effects across second-generation antipsychotic medications;
  - Olanzapine, haloperidol, clozapine, quetiapine, and risperidone tend to have *more* metabolic effects.
  - Aripiprazole and ziprasidone tend to have *fewer* metabolic effects.
  - It taking these agents, screen for prediabetes or diabetes at baseline, rescreen at 12–16 weeks after medication initiation, and screen annually thereafter ADA 2024

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Diabetes 2 - Who is at Risk?

(ADA 2024 Clinical Practice Guidelines)

Screen using A1C, Fasting Blood Glucose or OGTT.

Repeat screening at least every 3 years if negative.

*If prediabetes or on high risk meds, recheck yearly

Risk factors cont'd

- HTN - BP > 130/80
- HDL < 35 or triglycerides > 250
- History of Gestational Diabetes Mellitus
- Polycystic ovary syndrome (PCOS)
- Other conditions associated w/ insulin resistance:
  - Elevated BMI, acanthosis nigricans (AN)

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RECOMMENDATIONS FOR DIAGNOSIS AND CLASSIFICATION OF DIABETES – 2024

CRITERIA FOR TESTING FOR DIABETES AND PREDIABETES IN ASYMPTOMATIC ADULTS – TABLE 1

DIABETES TYPE	RISK FACTORS and FREQUENCY OF SCREENING and TESTING FOR DIABETES
Type 1	Screen for presymptomatic type 1 diabetes, by testing autoantibodies to insulin, GAD, islet antigen 2, or ZnT8 is recommended. Also test antibodies for those with type 1 phenotypic risk (younger age, ketoacidosis , etc.)
Type 2	1. Test all adults starting at age **35** for prediabetes and diabetes using Fasting Plasma Glucose, A1C or OGTT. 2. Perform risk-based screening if BMI ≥ 25 or BMI ≥ 23 in Asian Americans with 1 or more risk factors: • History of cardiovascular disease • First or second degree relative with diabetes • HDL ≤ 35 mg/dl or triglyceride ≥ 250 mg/dl • If taking antipsychotic, antiretroviral meds* • Other conditions associated with insulin resistance (PCOS, Acanthosis Nigricans) • High risk ethnicity (African American, Latino, Native American, Asian American, Pacific Islanders) • Physical inactivity • History of GDM (repeat test at least every 3 years) • Hypertension ≥ 130/80 or on therapy for HTN • A1c ≥ 5.7% or Impaired Fasting Glucose (test yearly) 3. If results normal, repeat test at a minimum of 3-year intervals or more frequently based on risk status. 4. *Screen people with HIV, exposure to high-risk medicines, history of pancreatitis and re-check annually.

TESTS TO DIAGNOSE DIABETES - TABLE 2

STAGE	For all the below tests, in the absence of unequivocal hyperglycemia, Confirm results by repeat testing.			
	A1C *NGSP certified & standardized assay*	**Fasting* Plasma Glucose (FPG)** **No intake 8 hrs.*	**Random Plasma Glucose**	**Oral Glucose Tolerance Test (OGTT) 75-g** (Carb intake of ≥ 150 g/day for 3 days prior to test.)
Diabetes	A1C ≥ 6.5%	FPG ≥ 126 mg/dl	Random plasma glucose ≥ 200 mg/dl plus symptoms[1] [1]Random = any time-of-day w/out regard to time since last meal; symptoms include usual polyuria, polydipsia, and unexplained wt. loss.	Two-hour plasma glucose (2hPG) ≥ 200 mg/dl
Prediabetes	A1C 5.7 – 6.4%	Impaired Fasting BG (IFG) = FPG 100-125 mg/dl		Impaired Glucose Tolerance (IGT) = 2hPG 140 -199 mg/dl
Normal	A1C < 5.7%	FPG < 100 mg/dl		2hPG < 140 mg/dl

Acanthosis Nigricans (AN)

- Signals high insulin levels in bloodstream
- Patches of darkened skin over parts of body that bend or rub against each other
  - Neck, underarm, waistline, groin, knuckles, elbows, toes
  - Skin tags on neck and darkened areas around eyes, nose and cheeks.
- No cure, lesions regress with treatment of insulin resistance

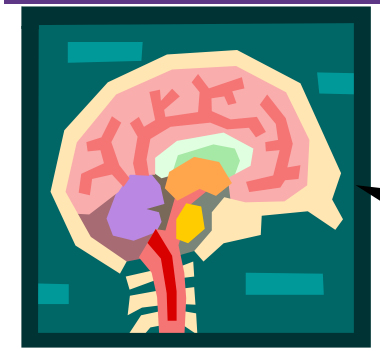
Risk based Screening Criteria PreDiabetes & T2 Kids & Adolescents

- Extra wt plus any ONE factor:
  - Maternal history of diabetes or GDM
  - Family history type 2 in 1st or 2nd degree relative
  - Race/ethnicity
  - Signs of insulin resistance or conditions associated with insulin resistance (acanthosis nigricans, HTN, dyslipidemia, PCOS, small for gestational age)

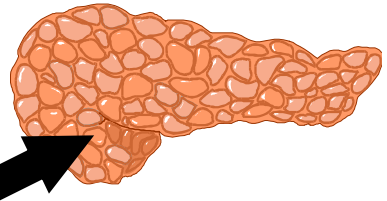
Diabetes Detectives Needed

- On average – takes 6.5 years to diagnose diabetes
- 1/4 of all people with diabetes don’t know they have it
- 50% of Latino and Asians are undiagnosed

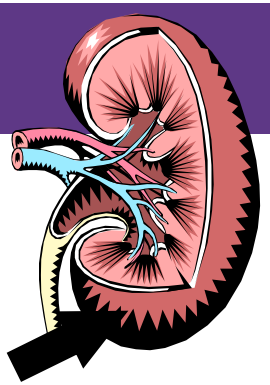
Ominous Octet



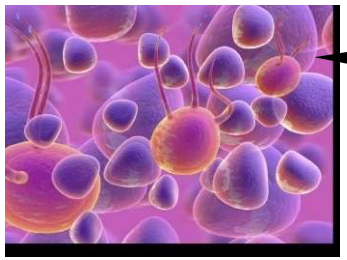
Decreased satiation neuro-transmission



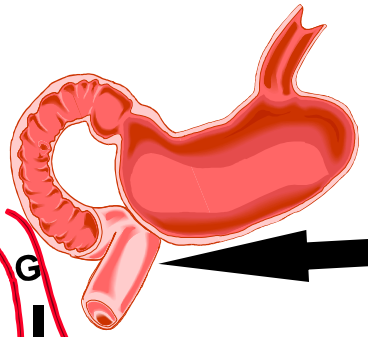
Decreased amylin, β-cell secretion
80% loss at dx



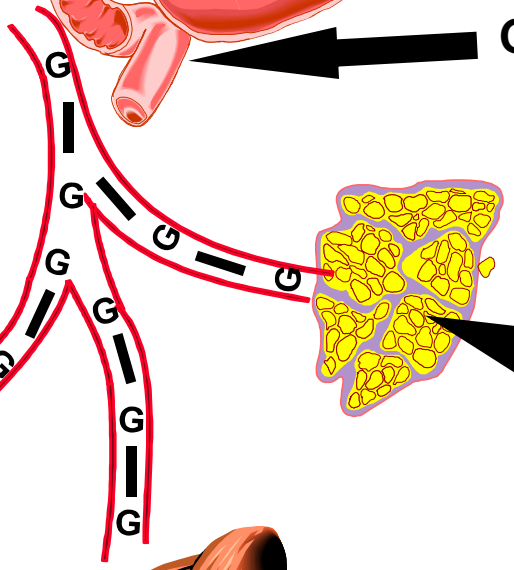
Increased renal glucose reabsorption



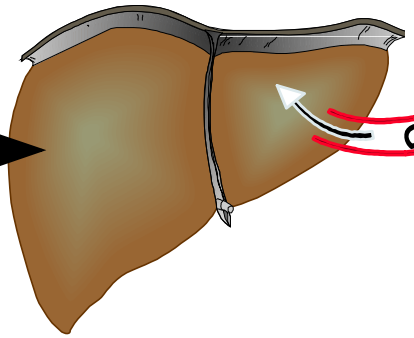
Increased glucagon secretion



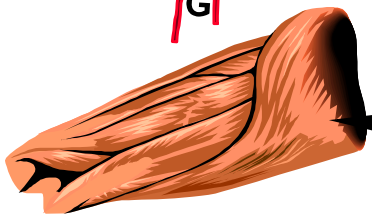
Decreased Gut hormones



Increased lipolysis



Increase glucose production



Decreased glucose uptake

SGLT2 Inhibitors- "Glucoretics"

- **Action**: decreases renal reabsorption of glucose proximal tubule of kidneys (reset renal threshold)
- **Preferred** diabetes treatment for people with heart and kidney failure. Decreases BG & CV Risk.

Class/Main Action	Name(s)	Daily Dose Range	Considerations
SGLT2 Inhibitors "Glucoretic" • Decreases glucose reabsorption in kidneys	Canagliflozin* (Invokana) Dapagliflozin*† (Farxiga) Empagliflozin*† (Jardiance) Ertugliflozin (Steglatro) Bexagliflozin (Brenzavvy)	100 - 300 mg 1x daily 5 - 10 mg 1x daily 10 - 25 mg 1x daily 5 – 15 mg 1x daily 20 mg 1x daily	**Side effects:** hypotension, UTIs, genital infections, increased urination, weight loss, ketoacidosis. **Heart Failure, CV & Kidney Protection:** 1st line therapy for Heart Failure (HF), Kidney Disease (CKD), Cardiovascular Disease, before or with metformin. **Considerations:** See Package Insert (PI) for GFR cut-offs, dosing. Limited BG lowering effect if GFR < 45, still benefits kidneys & heart at lower GFR. If CKD & GFR ≥20, use SGLT-2 to reduce CVD, HF, preserve renal function. (ADA/EASD) **Benefits:** SGLT-2s* reduce BG, CV death & HF, slow CKD. †Approved for peds, 10 yrs +. Lowers A1C 0.6% to 1.5%.

Quick Question 5

- A potential side effect of SGLT-2 Inhibitors is:

a. Genital Infections
b. Hypertension
c. Kidney tenderness
d. Increased uric acid

SGLT-2i Indications Summary

Drug	Lower BG	Reduce CV Risk?	Use to treat Heart Failure?	Slow renal disease?
Dapagliflozin (Farxiga)	Yes	Yes	Yes +/- Diabetes	Yes
Empagliflozin (Jardiance)	Yes	Yes	Yes +/- Diabetes	Yes
Canagliflozin (Invokana)	Yes	Yes	Yes w/ Diabetes	Yes
Ertugliflozin (Steglatro)	Yes	No	Yes w/ Diabetes	Yes
Bexagliflozin (Brenzavvy)	Yes	NA	NA	NA

Comparison of Type 1 and Type 2

Feature	Type 1	Type 2
Excess weight	x	xxx
Insulin dependence	xxx	30%
Respond to oral agents	x	xxx
Antibodies present	xxx	0
Typical age of onset	puberty	40-65
Insulin Resistance	x	xxx

DiaBingo

B Frequent skin and yeast infections can indicate?

B A BMI of _____ or more increases risk of diabetes

B To reduce complications, control **A**1c, **B**lood pressure, **C**holesterol

B PreDiabetes – fasting glucose level of ___ to _____

B Erectile dysfunction indicates greater risk for _____

B Diabetes – fasting glucose level_____ or greater

B Type 1 diabetes is best described as an _____ disease

B People with diabetes are _____ times more likely to die of heart dx

B Each percentage point of A1c = _____ mg/dl glucose

B At dx of type 2, about __% of the beta cell function is lost

B Diabetes – random glucose _____ or greater

Poll Question 6

- What factors do you consider when deciding what is the best medication for an individual?

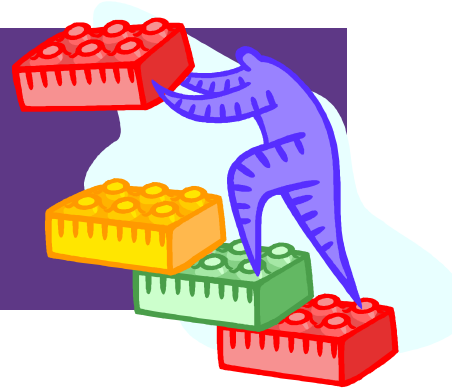
A. Cost
B. Risk of hypoglycemia
C. Impact on body weight
D. CV, CHF, CKD risk reduction
E. All of the above

Common Oral Diabetes Meds

Class/Main Action	Name(s)	Daily Dose Range	Considerations
Biguanides • Decreases hepatic glucose output • First line med at diagnosis of type 2	metformin (Glucophage) Riomet (liquid metformin)	500 - 2500 mg (usually BID w/ meal) 500 - 2500mg 500mg/5mL	**Side effects:** nausea, bloating, diarrhea, B12 deficiency. To minimize GI Side effects, use XR and take w/ meals. **Obtain GFR before starting.** • If GFR <30, do not use. • If GFR <45, don't start Meformin • If pt on Metformin and GFR falls to 30-45, eval risk vs. benefit; consider decreasing dose. **For dye study,** if GFR <60, liver disease, alcoholism or heart failure, restart metformin after 48 hours if renal function stable. **Benefits:** lowers cholesterol, no hypo or weight gain, cheap. Approved for pediatrics, 10 yrs + Lowers A1c 1.0%-2.0%.
	Extended Release-XR (Glucophage XR) (Glumetza) (Fortamet)	(1x daily w/dinner) 500 – 2000 mg 500 – 2000 mg 500 – 2500 mg	

Biguanide derived from:
Goat's Rue *Galega officinalis*,
French Lilac

ADA Step Wise Approach to Hyperglycemia 2024



- **Step 1** – Either Metformin, SGLT-2, GLP1-RA + Lifestyle
  - If A1C 8.5% or more, consider dual therapy.
  - If A1c 10% plus with symptoms, consider adding insulin or sulfonylurea

- **Step 2** - Determine which medication(s) matches individual
  - If ASCVD, CHF, or CKD, consider agent to reduce risk based on drug effects and individual factors.
    - Atherosclerotic Cardiovascular Risk/Dx - SGLT2 and GLP-1
    - Congestive Heart Failure – SGLT2
    - Chronic Kidney Disease – SGLT2s, can use GLP-1 to reduce risk of CV disease

- **Step 3** - If A1c not at target after 3 mos, add meds
  Step 4 - Add injectable therapy (GLP-1 RA *before* Basal insulin if poss)

Poll Question 7

- JR is newly diagnosed with type 2. A1c is 7.9. GFR is 58. UACR 192 mg/g. History of CHF. According to 2023 ADA Standards, what med along with lifestyle should be started first?

  a. Only Metformin, since A1c is close to target.

  b. SGLT-2i

  c. Sulfonylurea

  d. GLP-1 or Metformin

ADA 2024 Standard 11 - Chronic Kidney Disease and Risk Management

- Optimize glucose and BP to protect kidneys
- Screen Urine Albumin Creatinine ratio (UACR) & GFR
  - Type 2 at dx then yearly
  - Type 1 with diabetes for 5 years, then yearly
  - If urinary albumin ≥300 and GFR 30–60 monitor 1-4 times a year to guide therapy.
- Treat hypertension with ACEI or ARB and for elevated albumin-to-creatinine ratio of 30 -299.
- Monitor serum creat and K+
  - if on ACE, ARB or diuretics

Albuminuria Categories	Urinary Albumin Creatine Ratio (UACR)
Normal to mildly increased – A1	< 30 mg/g
Moderately increased – A2	30 – 299 mg/g
Severely increased – A3	300 mg/g +

Kidney Disease Stage	GFR
Stage 1 – Normal	90+
Stage 2 – Mild loss	89 - 60
Stage 3a – Mild to Mod	59 - 45
Stage 3b – Mod to Severe	44 - 30
Stage 4 – Severe loss	29 -15
Stage 5 – Kidney failure	14 - 0

11. Chronic Kidney Disease and Risk Management: *Standards of Care in Diabetes—2024*
FREE

Medication Taking Behaviors

- 23% of time, if A1c, B/P, lipids above target - due to med taking behavior
- Adequate medication taking is defined as 80%
- If taking meds 80% of time and goals not met, consider intensification
- Assess for barriers

Barriers include: Forgetting to fill Rx, fear, depression, health beliefs, med complexity, cost, system factors, etc. Work on targeted approach for specific barrier

Medication Cost Considerations

- Lowest cost medications - AWP for a month
  - Metformin - $3
  - Sulfonylureas $3
  - TZD – Pioglitazone $3
  - Lower cost insulin
  - Brenzavvy-$48, costplus
  - Insulin-$35
- Highest cost medications – AWP for a month
  - GLP-1 RA - $1000+
  - GLP-1/GIP RA - 1000+
  - SGLT2i - $650
  - DPP-IV's - $550-600

Other Causes of Hyperglycemia

- Steroids
- Agent Orange
- Tube feedings / TPN
- Transplant medications
- Cystic Fibrosis

Regardless of cause, requires treatment

- Insulin always works
- Sign of pancreatic malfunction

Diabetes is also associated with

- Steatosis
- Obstructive sleep apnea
- Alzheimer's
- Distress
- Cancer; pancreas, liver, breast

Self Reflective Question

- A individual is admitted and tells you they are only taking their daily insulin injection about 4 times a week.
- What feelings would that evoke?
  - Patient doesn't care
  - Non-compliant
  - Lazy
  - Better scare them
  - Exasperation
  - Other feeling

curiosity

Language of Diabetes Education

Old Way

- Control diabetes
- Test BG
- Patient
- Normal BG
- Non-adherent, compliant
- Refuse

New Way

- Manage
- Check
- Participant
- BG in target range
- Focus on what they are accomplishing
- Decided, chose

American Diabetes Association, Diabetes Care
The Use of Language in Diabetes Care and Education, 2017

Language of Diabetes Education

Old Way	New Way
Can't, shouldn't, don't, have to	Have you tried…" What about…" May I make a suggestion…"
Regimen	Plan, choices
Refused	Declined, Chose not to
Victim, suffer, stricken	..lives with diabetes …has diabetes

American Diabetes Association, Diabetes Care
The Use of Language in Diabetes Care and Education, 2017

5 M’s and Judgement Free Zone

Mood

Meals

Movement

Medicines

Minutes

Life Study – Mrs. Jones

Mrs. Jones is 62 years old, with a BMI of 36 and complains of feeling tired and urinating several times a night. She has an urinary tract infection. Her A1c is 8.3%, glucose 237.

She is hypertensive with a history of gestational diabetes. No ketones in urine.

- What are her risk factors and signs of diabetes?
- You find a few moments to teach and she asks you some questions.

Mrs. Jones asks you What Do You Say?

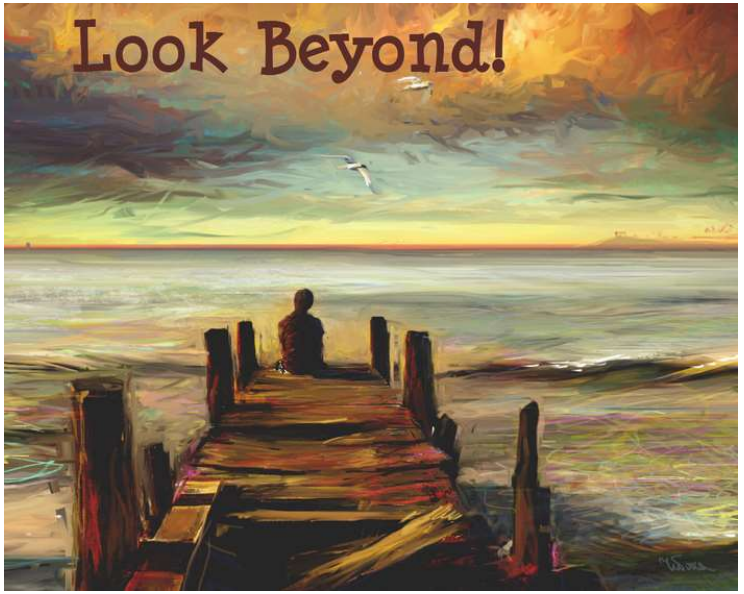
- What is diabetes?
- They say I am a diabetic because I am obese?
- How am I going to control this?
- What is a normal blood sugar?
- Do I have to test my blood sugars?
- My doctor told me to stay away from white foods. Is that true?

Mrs. Jones asks you What Do You Say?

- You are wondering if your weight caused your diabetes?
- You can manage your diabetes and improve your health at the same time.
- For people without diabetes, fasting blood sugar is less than 100 and A1c is less than 5.7%
- Checking blood sugars can help you figure out if the plan in working.

Look Beyond Diabetes

- ACE – Adverse Childhood Experiences
- Feelings around their diabetes
- Cultural traditions, family system.
- Social, religious and employment influences
- Personal factors: attitudes, cognitive factors, literacy, learning styles, health beliefs
- Social Determinants of health



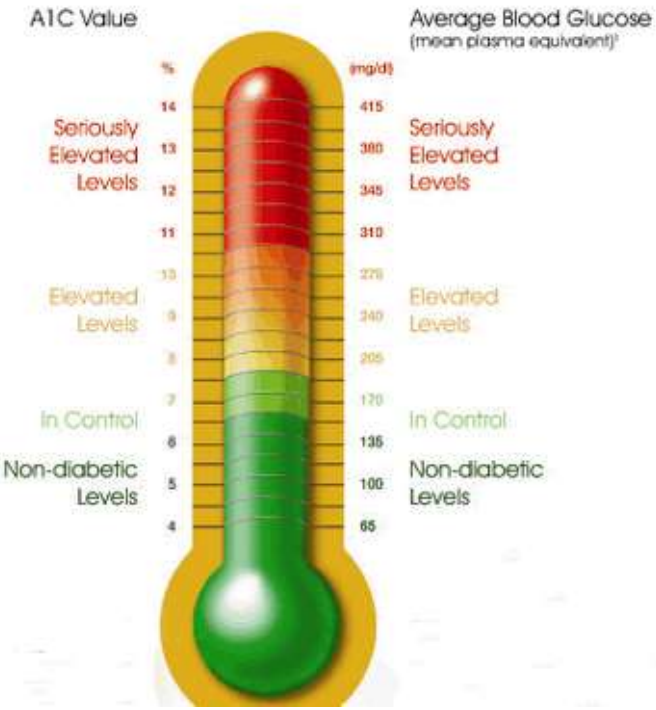
6. Glycemic Targets
Individualize Targets – ADA

- Pre-Prandial BG 80- 130
- 1-2 hr post prandial < than 180

  *for nonpregnant adults
- Time in Range 70-180 (CGM) 70% of time

6. Glycemic Targets

- **Adult non pregnant A1c goals**
  - **A1c < 7%** for most adults.
  - **A1c < 6.5%** - may be appropriate for those without significant risk of hypoglycemia
  - **A1c < 8%** - history of hypoglycemia, limited life expectancy, or those with longstanding diabetes and vascular complications.
- Check 2x a year if stable
- Check 4x a year if above target



A1c and Estimated Avg Glucose (eAG)

A1c (%)	eAG
5	**97** (76-120)
6	**126** (100-152)
7	**154** (123-185)
8	**183** (147-217)
9	**212** (170 -249)
10	**240** (193-282)
11	**269** (217-314)
12	**298** (240-347)

eAG = 28.7 x A1c-46.7 ~ 29 pts per 1%

Translating the A1c Assay Into eAG – ADAG Study

6. Glycemic Targets: *Standards of Medical Care in Diabetes—2020*

American Diabetes Association
Diabetes Care 2020 Jan; 43(Supplement 1): S66-S76.
https://doi.org/10.2337/dc20-S006

Continuous Glucose Monitoring (CGM)

- Lowers A1c ~0.26% (compared to SMBG)
- Consider CGM in children to adults on insulin, pregnancy
- Useful tool in those frequent hypoglycemia or hypoglycemia unawareness (alarm features)
- Measures percent of time in, above and below range
- Given variable adherence to CGM, assess ind readiness

CGM uses interstitial glucose – correlates with plasma glucose
Report glucose in

- Real time or
- Or intermittent scanning “flash” (isCGM) like FreeStyle Libre

Ambulatory Glucose Profile

- Standardized report with visual cues for those on CGM devices

- For most with type 1 or type 2 diabetes
  - > 70% of readings within BG range of 70-180mg/dL
  - < 4% of readings < 70 mg/dL
  - < 1% of readings < 54 mg/dL
  - < 25% of readings > 180 mg/dL
  - < 5% of readings > 250 mg/dL

For those with frailty or at high risk of hypoglycemia recommend:

- Target of 50% time in range
- Less than1% time below range

6. Glycemic Goals and Hypoglycemia: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

AGP Report

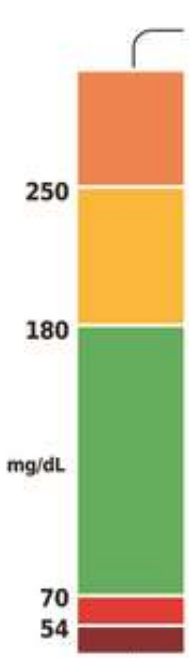
Name

MRN

AGP Report: Continuous Glucose Monitoring

Time in Ranges

Goals for Type 1 and Type 2 Diabetes



Goal: <5%

Very High 20%

44% Goal: <25%

High 24%

Target **46%** Goal: >70%

Each 5% increase is clinically beneficial

Low 5%

10% Goal: <4%

Very Low 5%

Goal: <1%

Each 1% time in range = ~15 minutes

Test Patient DOB: Jan 1, 1970

14 Days: August 8–August 21, 2021

Time CGM Active: 100%

Glucose Metrics

Average Glucose ..... **175 mg/dL**

Goal: <154 mg/dL

Glucose Management Indicator (GMI) **7.5%**

Goal: <7%

Glucose Variability **45.5%**

Defined as percent coefficient of variation

Goal: ≤36%

Ambulatory Glucose Profile (AGP)

6. Glycemic Targets: *Standards of Medical Care in Diabetes—2022*

FREE

American Diabetes Association Professional Practice Committee

Check for updates

Diabetes Care 2022;45(Supplement_1):S83–S96

https://doi.org/10.2337/dc22-S006

Diabetes Wise – Non-Profit Site

DiabetesWise.org BETA Check Up Sensors Devices Wisdom Guides

Helping You Find The Right Diabetes Devices For Your Life.

CHECKUP

DO YOUR DEVICES STILL WORK FOR YOUR LIFE?

Take a quick quiz to see what might be your next diabetes care upgrade.

Check Up

Complications - Why?

- Degree of hyperglycemia "glucose toxicity"
- Duration of hyperglycemia
- Genes
- Multiple risk factors: smoking, vascular disease, dyslipidemia, hypertension, other

Diabetes Complications

- Heart disease leading cause of death. Cancer is second.
- CAD death rates are about 2 -4x's as high as adults without diabetes (it's getting better)
- 60 - 70% have mild - severe forms of neuropathy
- Diabetes is the leading cause of blindness
- Accounts for 50% of lower limb amputations

Assess ASCVD and Heart Failure Risk Yearly

- Duration of diabetes
- BMI
- Hypertension
- Dyslipidemia
- Smoking
- Family history of premature coronary disease
- Chronic kidney disease – presence of albuminuria

Treat modifiable risk factors as described in ADA guidelines.

10. Cardiovascular Disease and Risk Management: *Standards of Care in Diabetes—2023* FREE

Getting Blood Glucose to Goal Matters

- **Prevention**
- **Trials**
- **Practice Recommend ations**

Financial Advisor

- Mid 30s, friendly, he smiles to greet you and you notice his gums are inflamed. You'd guess a BMI of 26 or so, with most of the extra weight in the waist area.
- If you could give him some health related suggestions, what would they be?

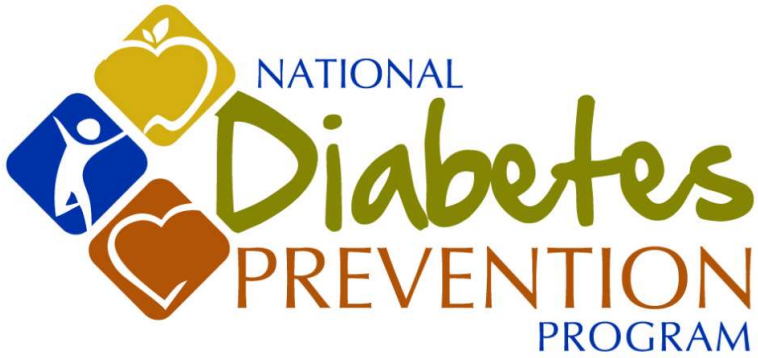
Can we stop pre diabetes from progressing?

3, 234 people w/ Pre-Diabetes randomized:

- Placebo
- Diet/Exercise or
- Metformin

over a three year period

Diabetes Prevention Program (DPP) 2001



Diabetes Prevention Program

- Standard Group - 29% developed DM
- Lifestyle Results - 14% developed DM
  - 58% (71% for 60yrs +) Risk reduction
    - 30 mins daily activity
    - 5-7% of body wt loss
- Metformin 850 BID - 22% developed DM
  - 31% risk reduction (less effective with elderly and thinner pt's)

6. Glycemic Targets

A1C

Blood Pressure

Cardiovascular risk reduction

ABCs of Diabetes – ADA 2024

- A1C less than 7%
  - Pre-meal BG 80-130
  - Post meal BG <180
  - Time in Range (70-180) 70% of time
- Blood Pressure < 130/80
- Cholesterol
  - Statin therapy based on age & risk status
  - If 40+ with ASCVD Risk, decrease 50%, LDL <70
  - If 40+ with ASCVD, decrease C 50%, LDL <55

Glycemic targets need to be woven into the overall person-centered strategy.

What are next steps?

- 72 yr old, thin, lives alone, A1c 7.3%. History of MI, stroke. DM for 12 yrs, “diet controlled”. Creat 1.4.
- Concerns
- Meds?

DPP-4 Inhibitors – "Incretin Enhancers"

Januvia (sita*gliptin*) Tradjenta (lina*gliptin*)
~~Onglyza (saxa*gliptin*)~~ Nesina (alo*gliptin*)

DPP – 4 Inhibitors "Incretin Enhancers" • Prolongs action of gut hormones • Increases insulin secretion • Delays gastric emptying	sitagliptin (Januvia)	25 - 100 mg daily – eliminated via kidney*	*If creat elevated, see med insert for dosing. **Side effects:** headache and flu-like symptoms. **Can cause severe, disabling joint pain.** Contact MD, stop med. Report signs of pancreatitis. †Saxagliptin and alogliptin can increase risk of heart failure. Notify MD for shortness of breath, edema, weakness, etc. No wt gain or hypoglycemia. Lowers A1c 0.6%-0.8%.
	linagliptin (Tradjenta)	5 mg daily – eliminated via feces	
	alogliptin (Nesina)†	6.25 - 25 mg daily – eliminated via kidney*	

Exercise Standards

- Adults – 150 min/wk moderate intensity
  - over 3 days a week.
  - Don’t miss > 2 consecutive days w/out exercise
  - Get up every 30 mins - Reduce sedentary time
  - Flexibility and balance training 2-3 xs a week (Yoga and Tai Chi)
  - T1 and T2 – resistance training 2 -3 xs a week

A hard truth

- Exercise alone doesn't cause weight loss
- But….
  - It helps keep weight off
  - Decreases visceral adiposity
  - Decreases CV Risk

- To combat the rise in body weight, we need to change the food environment
- "You cannot outrun an unhealthy diet".

Good Exercise Info / Quotes

- **"Passagiata" – take an after meal stroll**
- Exercise decreases A1c 0.7%
- No change in body wt, but 48% loss in visceral fat
  - ADA PostGrad 2010

"Every minute of activity lowers blood sugar one point."

"I don't have time to exercise, I MAKE time." Mike Huckabee

Diabetes Care Guidelines- ADA

Test / Exam	Frequency
A1c	At least twice a year
B/P	Each visit
Cholesterol (LDL, HDL, Tri)	Yearly or if med change
Vaccinations	Flu yearly, pneumonia, hep
Weight / BMI	Yearly
UACR/GFR/Creat	Yearly
Eye exam	Every 1-2 years
Dental Care	At least twice a year
Comprehensive Foot Exam	Yearly (more if high risk)
Physical Activity Plan	As needed to meet goals
Preconception counseling	As needed

Mr. Jones - What are Your Recommendations?

MJ Profile

64 yr old with type 2 for 11 yrs. Hx of CVD.

Labs:

- A1c 9.3%
- LDL 137 mg/dl
- Triglyceride 260mg/dl
- UACR 32mg/g GFR 54
- B/P 132/94

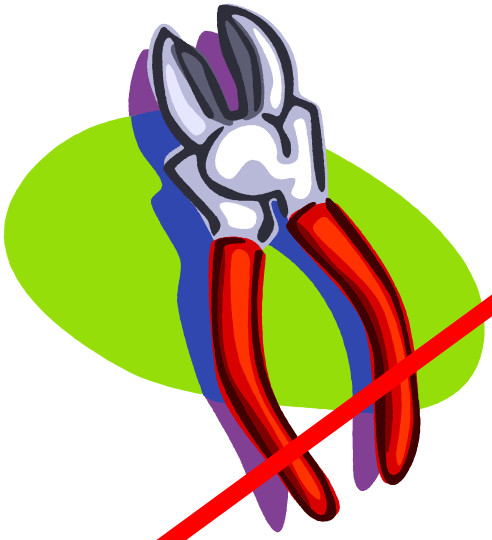
Self-Care Skills

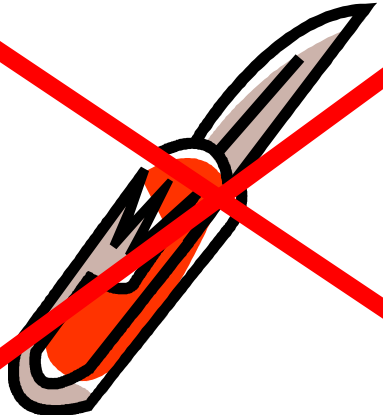
- Walks dog around block 3 x's a week
- Bowls every Friday
- 3 beers daily
- *What meds?*
- *What referrals?*
- *My foot hurts*

Lower Extremities

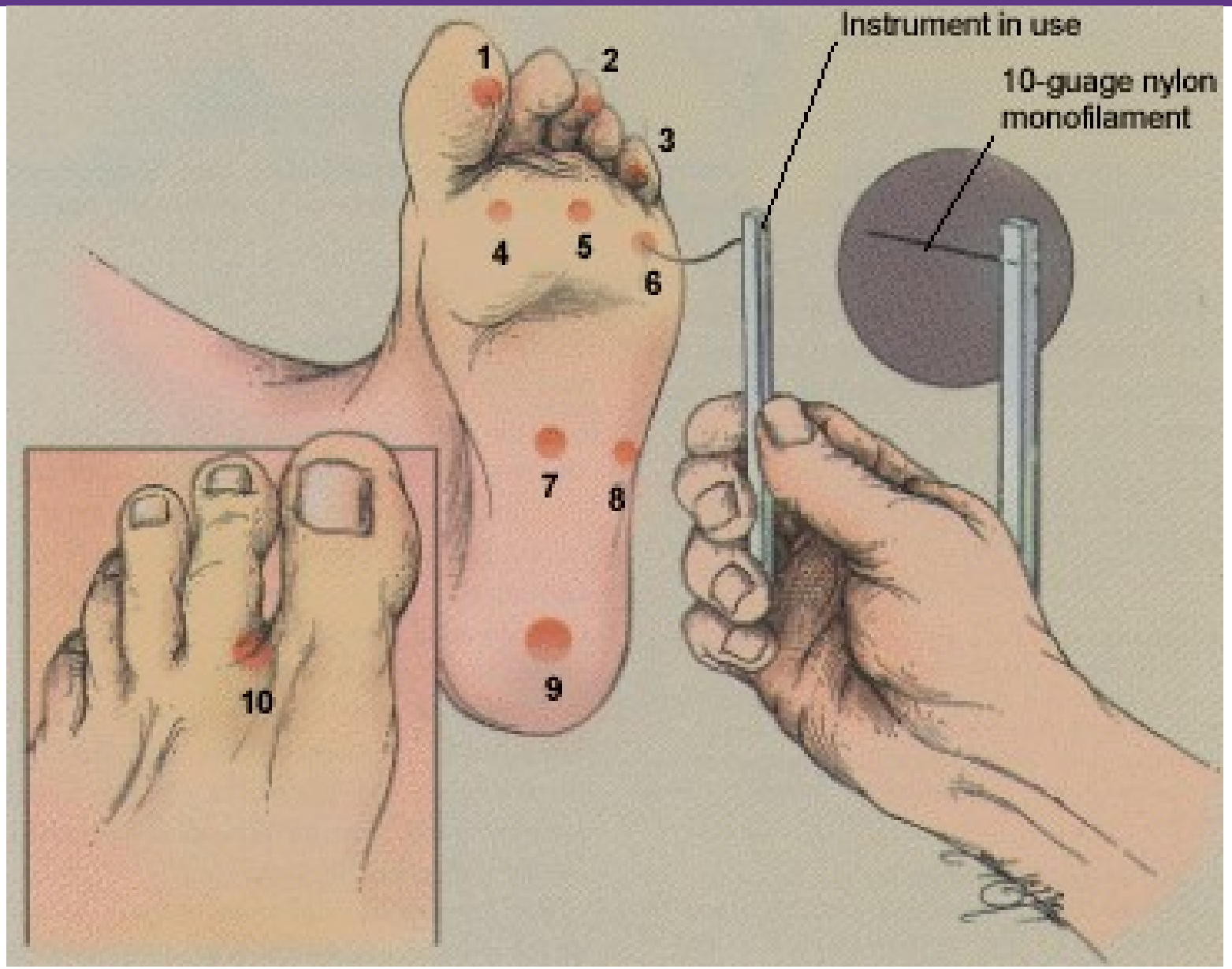
- Lift the Sheets and Look at the Feet

No Bathroom Surgery





5.07 monofilament = 10gms linear pressure



Three Most Important Foot Care Tips

- Inspect and apply lotion to your feet every night before you go to bed.
- Do NOT go barefoot, even in your house. Always wear shoes!
- Every time you see your provider, take off your shoes and show your feet.

DiaBingo- G

G ADA goal for A1c is less than ____%

G Blood pressure goal is less than

G People with DM should see eye doctor (ophthalmologist) at least

G The goal for blood sugars 1-2 hours after a meal is less than:

G People with DM should get this shot every year

G People with DM need to get these kidney tests yearly

G Periodontal disease indicates increased risk for heart disease

G The goal for blood sugar levels before meals is:

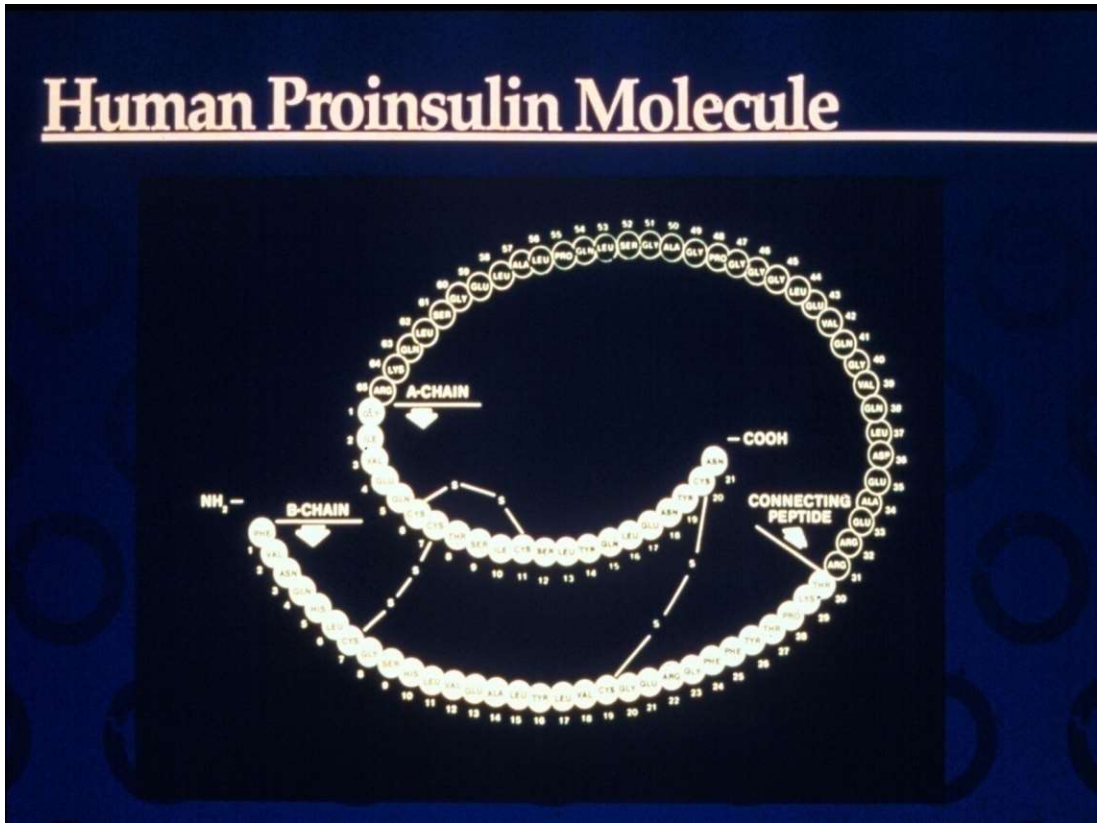
G The activity goal is to do ___ minutes on most days

G Name 3 healthy foods to include in daily meal plan

Insulin – the Ultimate Hormone Replacement Therapy

Objectives:

- Discuss the actions of different insulins
- Describe using pattern management as an insulin adjustment tool.

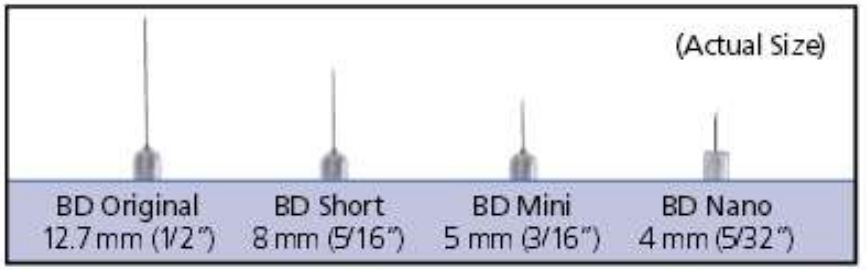


Consider the Way we Present Insulin

- Use language and images that promotes the benefit of insulin therapy.
- Ideas include:
  - “Your pancreas can’t make enough insulin, so we need to help it”.
  - “Insulin is just hormone replacement therapy”.
  - “It’s not your fault you need insulin, your pancreas just can’t make enough”.

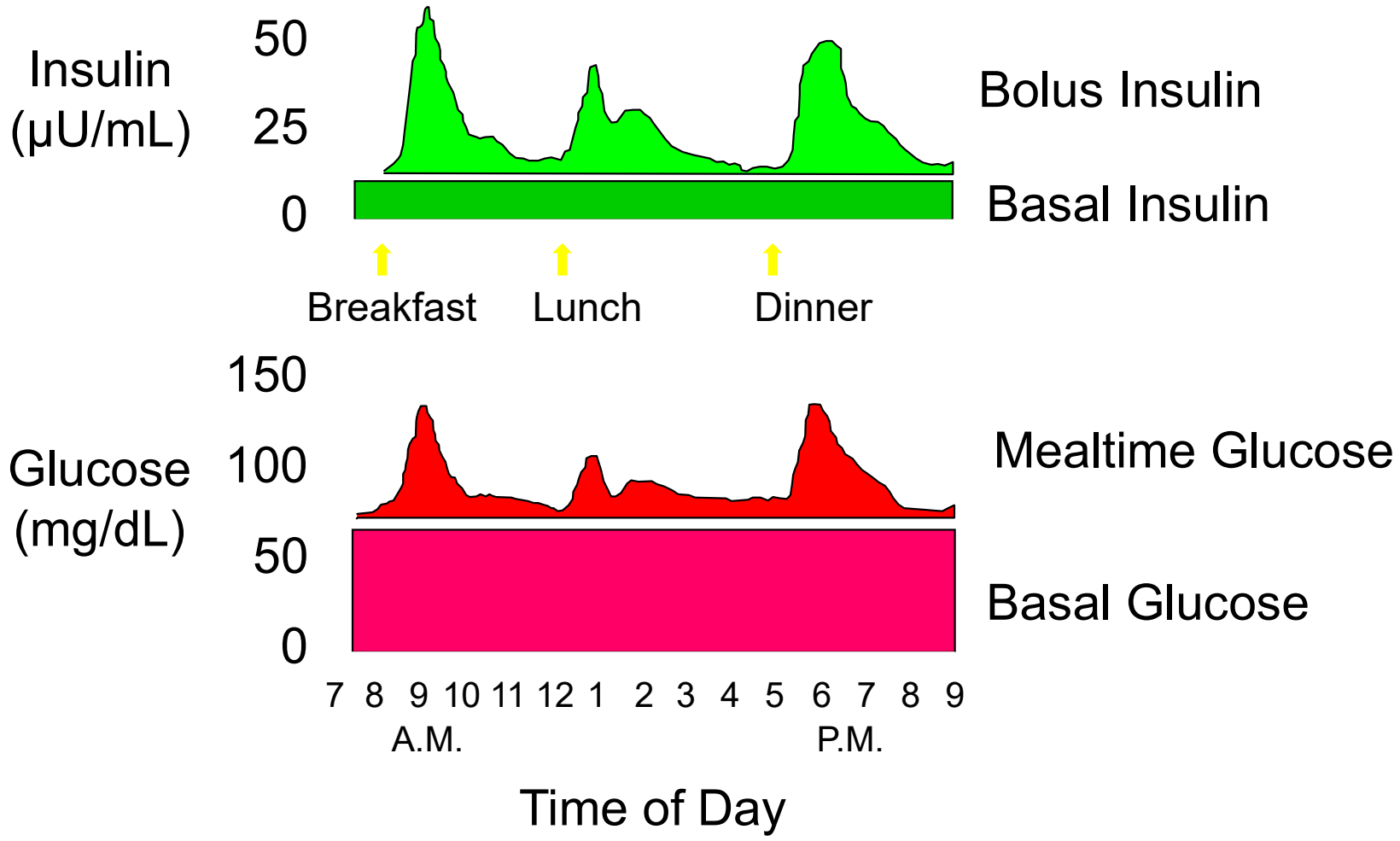
Problem Solving Tips for more comfortable injections

- Short, fine needles hurt less
- Make sure they are injecting subcutaneously, not in muscle
- If participant thin, inject at an angle
- Avoid areas with scar tissue
- Use needle once and toss in sharps container
  - Needle gets duller with each injections
- To avoid leakage, count to 5-10 before withdrawing needle from skin
- Use pen needles and injectors



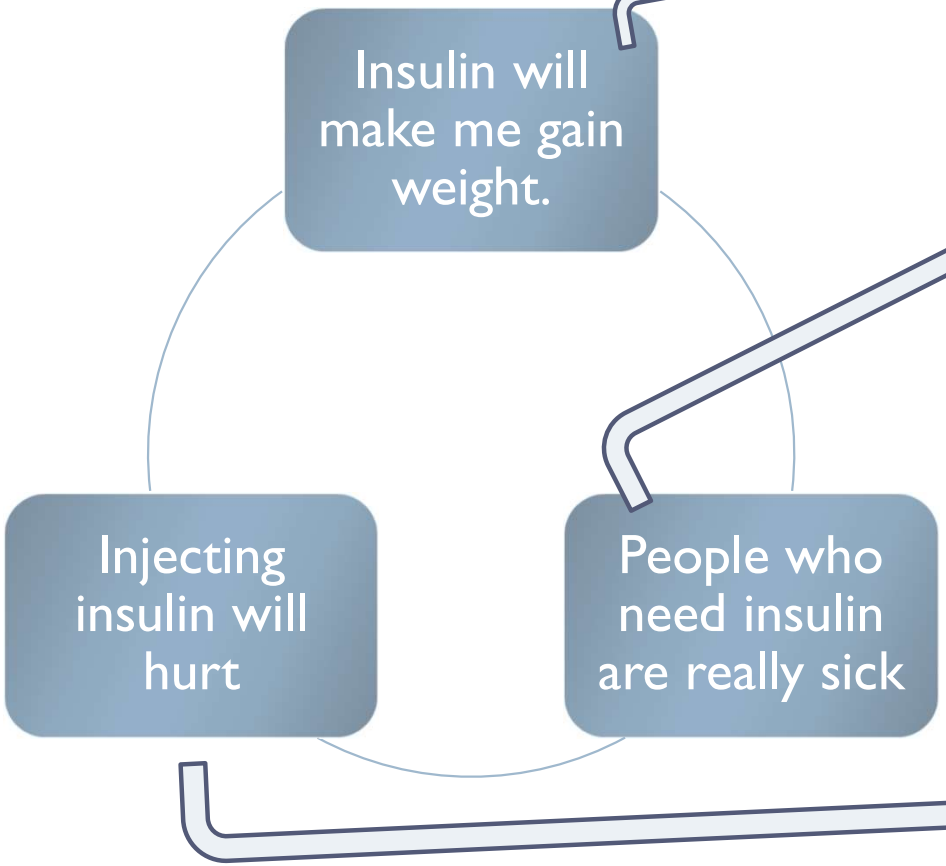
BD Nano 4mm and BD Mini 5mm only available in pen needles

Physiologic Insulin Secretion: 24-Hour Profile



Common Barriers and Responses

Barrier



Response

- Yes, you may gain a few pounds, but that is a sign your body is healing
- It only means your pancreas can't make enough, so you can help it by injecting insulin
- Most people are surprised that they barely feel the injections

Devices to Inject insulin

Syringe

Pen

Injector

Pump

Choice of device is person centered and based on:

- Preference
- Cost
- Convenience

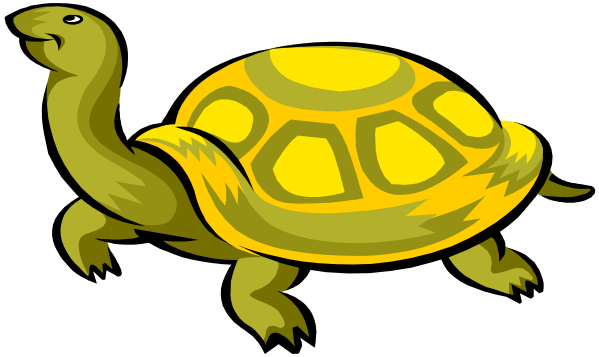
Insulin PocketCard™

Action		Insulin Name	Effective Onset	Effective Peak	Effective Duration	Considerations
Bolus	Very Rapid Acting Analogs	Aspart (Fiasp)	16 - 20 min	1 - 3 hrs	5 - 7 hrs	Bolus insulin lowers after-meal glucose. Post meal BG reflects efficacy. Basal insulin controls BG between meals and nighttime. Fasting BG reflects efficacy. Side effects: hypoglycemia, weight gain. Typical dosing range: 0.5-1.0 units/ kg body wt/day. Discard most open vials after 28 days. For pen storage guidelines, see package insert.
		Lispro-aabc (Lyumjev)	15 - 17 min	2 - 3 hrs	5 - 7 hrs	
	Rapid Acting Analogs	Aspart (Novolog)	20 - 30 min	1 - 3 hrs	3 - 7 hrs	
		Lispro (Humalog*/ Admelog)	30 min	2 - 3 hrs	5 - 7 hrs	
		Glulisine (Apidra)	15 - 30 min	1 - 3 hrs	3 - 4 hrs	
	Short Acting	Regular*	30 - 60 min	2 - 4 hrs	5 - 8 hrs	
Basal	Intermediate	NPH	2 - 4 hrs	4 - 10 hrs	10 - 16 hrs	
	Long Acting	Glargine (Lantus*/Basaglar/Semglee/Rezvoglar)	2 - 4 hrs	No Peak	20 - 24 hrs	
		Degludec (Tresiba)*	~ 1 hr		< 42 hrs	
Basal + Bolus	Intermediate + short	Combo of NPH + Reg 70/30 = 70% NPH + 30% Reg 50/50 = 50% NPH + 50% Reg	30 - 60 min	Dual peaks	10 - 16 hrs	
	Intermediate + rapid	Novolog® Mix - 70/30 Humalog® Mix - 75/25 or 50/50	5 - 15 min		24 hrs	

Concentrated insulins available - see Concentrated Insulin Card for details. Insulin action times vary; time periods are general guidelines only.

Insulin Action Teams

- Bolus: lowers after meal glucose levels
  - Very Rapid Acting – Aspart, lispro
  - Rapid Acting
    - Aspart, Lispro, Admelog, Glulisine, Afrezza
  - Short Acting - Regular
- Basal: controls glucose between meals, hs
  - Intermediate
    - NPH
  - Long Acting
    - Glargine (Lantus, Basaglar, Semglee)
    - Degludec (Tresiba)



Bolus Insulin Summary

- Regular, aspart, lispro, glulisine,
- Starts working fast (15-30 mins)
- Gets out fast (3-6 hours)
- Post meal BG reflects effectiveness
- Should comprise about ½ total daily dose
- Covers food or hyperglycemia.
- 1 unit
  - Covers ≈ 10 -15 gms of carb
  - Lowers BG ≈ 30 – 50 points

Bolus Insulin Timing

- How is the effectiveness of bolus insulin determined?
  - 2 hour post meal (if you can get it)
  - Before next meal blood glucose

- Glucose goals for non-pregnant adults (ADA) – may be modified by provider or individual
  - 1-2 hours post meal <180
  - Before next meal – 80 - 130

Poll Question 7

- Mary takes 4 units lispro (Humalog) before breakfast. Which BG result reflects that the dose was the right dose?

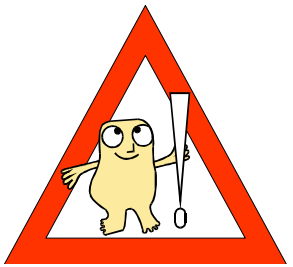
A. Before breakfast BG of 97
B. 1 hour post breakfast BG of 153
C. Before lunch BG of 69
D. 2 hour post breakfast BG of 183

Pattern Management –AKA

How to think like a pancreas

Pattern Management

- Safety 1st!! - Evaluate 3 day patterns
- **Hypo:** eval 1st and fix:
  - If possible, decrease medication dose
  - Timing of meals, exercise, medications
- **Hyperglycemia:** evaluate 2nd
  - Identify patterns
  - Before increase insulin, make sure not missing something (carbs, exercise, omission)



Bolus – Insulin Sliding Scale

Starts at 150, 2 units for every 50 mg/dl >150

	Break	Lunch	Dinner	HS
Day 1	94 no insulin	212 4 uR	148 no insulin	254 6 uR
Day 2	243 4uR	254 6 uR	201 4uR	199 no insulin
Day 3	189 2uR	243 4uR	162 2uR	244 4uR
Day 4	66 No insulin	287 6uR	144 none	272 6uR

Basal Insulins
(½ of total daily dose)

Intermediate Acting	Peak Action	Duration
NPH	4-12 hrs	12-24

Long Acting	Peak Action	Duration
Glargine (Lantus)		24 hrs
Glargine (Basaglar)		24 hrs
Degludec (Tresiba)		42 hrs

Fasting BG reflects efficacy of basal

Poll Question 8

- RL takes 42 units of glargine at hs and 10 units bolus insulin at each meal. His BMI is 28 and his A1C is 6.9%. His pre breakfast BG levels are ranging from 70-90s. What is the best action?

a. Advise RL to eat bedtime protein/carb snack.
b. Decrease breakfast bolus by 2 units.
c. Increase breakfast carbs by 15 gms.
d. Decrease glargine by 10 -20%

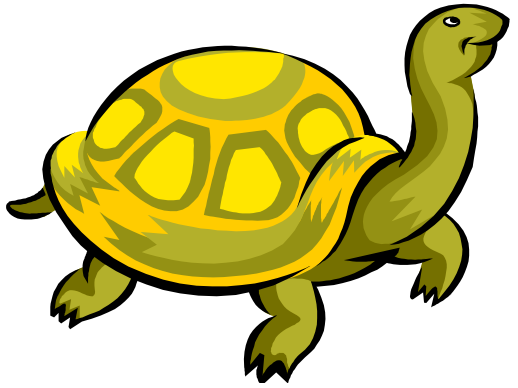
Type 2 started on glargine 10 units hs. Newly discovered hyperglycemia.

- Blood Sugars

	AM	Lunch	Dinner	HS
Day 1	137	178	203	193
Day 2	96	154	167	182
Day 3	73	127	153	169
Day 4	61	193	133	152
Day 5?				

Basal Insulin Summary

- NPH, Glargine, Degludec
- Covers in between meals, through night
- Starts working slow (4 hours)
- Stays in long (12-24 hours)
  - NPH 12 hrs
  - Glargine 20-24 hrs
  - Degludec – up to 42 hrs
- Fasting blood glucose reflects effectiveness



Hospitals and Hyperglycemia- What's the Big Deal?

- Hyperglycemia is associated with increased morbidity and mortality in hospital settings.
  - Acute Myocardial Infarction
  - Stroke
  - Cardiac Surgery
  - Infection
  - Longer lengths of stay

ADA Goals and Treatments For Critically Ill (ICU) Hospitalized Patients

Once insulin therapy initiated, blood glucose goal is 140-180

- Individualize based on pt status
- More stringent goals of 110 -140 may be appropriate in ICU, with careful consideration of preventing hypoglycemia.

- Critical Care:
  - Basal bolus or Insulin drip

16. Diabetes Care in the Hospital: *Standards of Care in Diabetes—2024* FREE

American Diabetes Association Professional Practice Committee

Combo Sub-Q Insulin

Insulin Type	Onset	Peak
Humalog Mix 75/25: 75% NPL, 25% lispro 50/50: 50% NPL, 50% lispro	0.25 - 0.5 hr	0.5-6.5 hrs
NovoLog Mix 70/30: 70% NPA, 30% aspart	0.25 - 0.5 hr	1 – 4 hrs
NPH + Reg Combo 70/30: 70%N /30%R 50/50: 50%N /50%R	0.5 – 1.0 hr	2 - 16 hrs

Considerations:

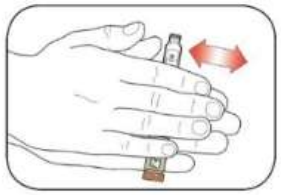
- Pre-mixed, difficult to fine tune therapy

70/30 Insulin

- Gently roll to mix insulin
- Prime pens – give 2 unit “air shot” to make sure pen and needle functional
- After injecting insulin, count to 5 before pulling needle out
- Use new needle with each injection

Step 2:

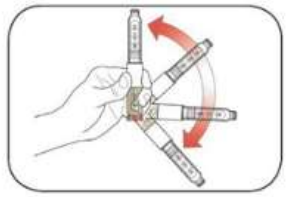
- Gently roll the Pen between your hands 10 times.

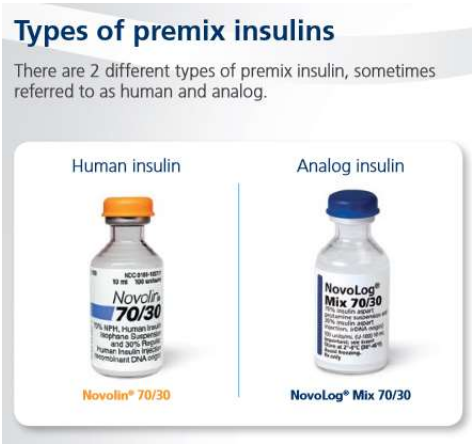


Step 3:

- Move the Pen up and down (invert) 10 times.

  Mixing by rolling and inverting the Pen is important to make sure you get the right dose.





Basal + Metformin
Type 2, 80kg – A1c 8.7%

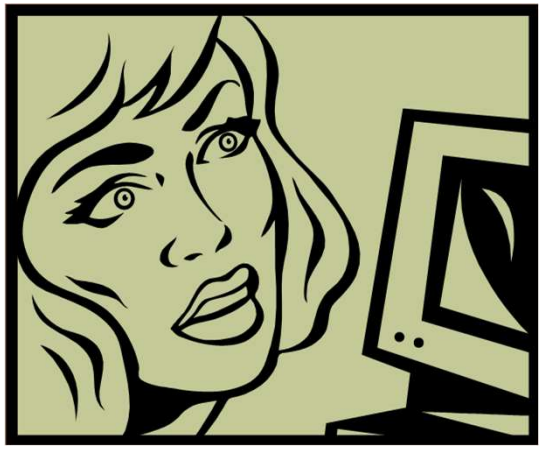
	Break	Lunch	Dinner	HS
Mo 1	170s			298 10u Det
Mo 2	160s			233 20u Det
Mo 4	140s	283	265	206 40u Det

24u 70/30 am, 16 u 70/30 pm
Patterns? Changes needed?

	Break	Lunch	Dinner	HS
Day 1	102	63	92	181
Day 2	112	67	106	195
Day 3	98	56	112	201
Day 4	99	71	132	211

What Medications Cause Hypoglycemia?

- Insulin
- Sulfonylureas
- Meglitinides
- Or any combo medication that includes these



Sulfonylureas - Squirts

- Action: Increase endogenous insulin secretion throughout day
- Efficacy:
  - Decrease FPG 60-70 mg/dl
  - Reduce A1C by 1.0-2.0%
- Side Effects:
  - Weight gain, hypoglycemia
- Benefits:
  - Cheap, effective

Sulfonylureas - Squirts

Sulfonylureas • Stimulates sustained insulin release	glyburide: (Diabeta) (Glynase PresTabs)	 1.25 – 20 mg 0.75 – 12 mg	Can take once or twice daily before meals. Low cost generic. **Side effects**: hypoglycemia and weight gain. Eliminated via kidney. **Caution**: Glyburide most likely to cause hypoglycemia. Lowers A1c 1.0% – 2.0%.
	glipizide: (Glucotrol) (Glucotrol XL)	2.5 – 40 mg 2.5 – 20 mg	
	glimepiride (Amaryl)	1.0 – 8 mg	

Hypoglycemic Symptoms

- Autonomic
  - Anxiety
  - Palpitations
  - Sweating
  - Tingling
  - Trembling
  - Hypoglycemic Unawareness

- Neuroglycopenia
  - Irritability
  - Drowsiness
  - Dizziness
  - Blurred Vision
  - Difficulty with speech
  - Confusion
  - Feeling faint

Treatment of Hypoglycemia

- If blood glucose **70**mg/dl or below:
  - 10-15 gms of carb to raise BG 30 - 45mg/dl
- Retest in 15 minutes, if still low, treat again, even without symptoms
- Follow with usual meal or snack
- If non responsive, give D50 IV or glucagon Emergency Kit
- Figure out how to prevent in future

15 - 20 Gms Carb Sources

- 4 ounces apple juice
- 3 - 4 Glucose Tablets
- 8 - 10 Lifesavers candy
- 8 - 10 Hard candies
- 2 Tablespoons Raisins
- 4 - 6 oz's Nondiet soda
- 4 - 6 oz's Fruit Juice
- 8 oz Milk (non fat)


glutose 15
glutose 15
glutose 15


SUN-MAID
NATURAL CALIFORNIA
RAISINS


ORANGE
GU
Chomps
PURE PERFORMANCE
ENERGY CHEWS
SUSTAINED ENERGY / ADVANCED NUTRITION


GLUCOSE TABLETS
GLUCOSE TABLETS
Orange
GLUCOSE TABLETS
GLUCOSE TABLETS

Glucagon Rescue Medications for Diabetes-Related Hypoglycemia

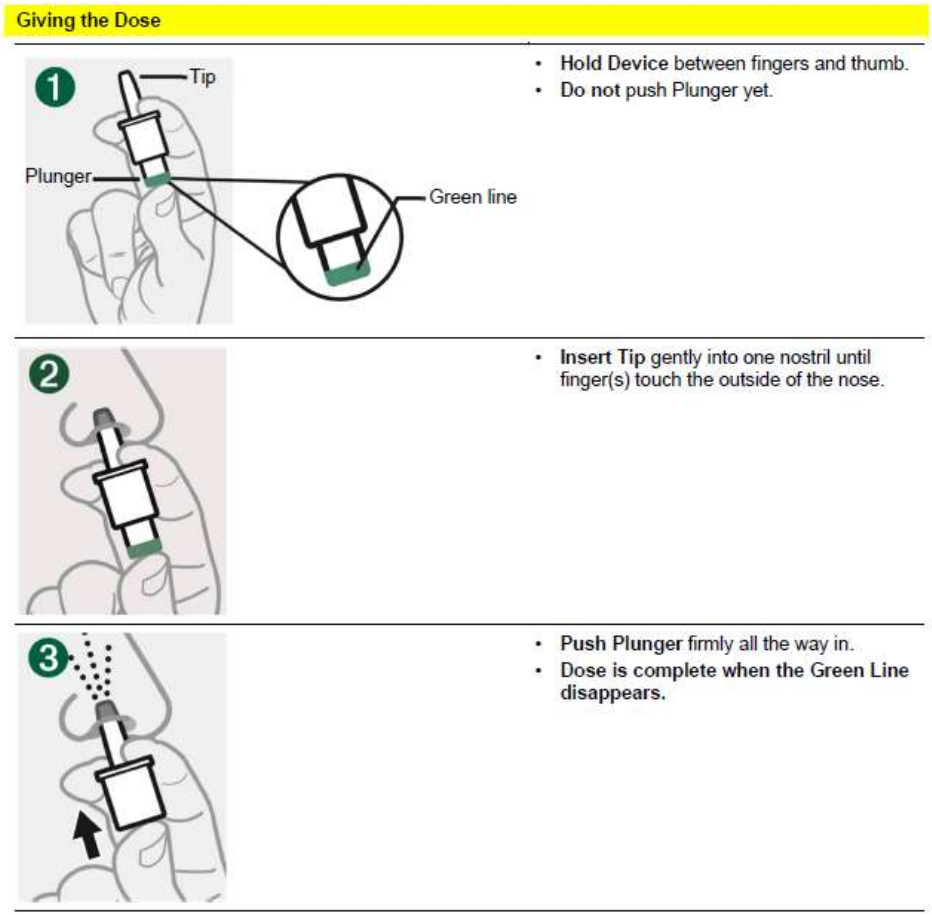
Name/Delivery	Supplied	Dose Range		Age / Route / Storage
		Adult	Peds / Age WT Dosing	
Glucagon Emergency Kit Injection requires mixing glucagon powder	1mg / 1mL vial + syringe	1mg	0.03mg/kg or < 6yrs or < 25 kgs | 0.5mg ≥ 6yrs or > 25kgs | 1mg	All ages approved SubQ or IM admin Expires in 2 years at room temp.
Baqsimi Nasal glucagon powder	3 mg intranasal device	3 mg	< 4 yrs: not recommended 4 yrs or older | 3mg dose	Approved Age 4+ Nasal admin Expires ~ 2 years at room temp (keep in shrink-wrapped tube).
Gvoke Injectable liquid stable glucagon solution	0.5mg or 1.0mg in -Prefilled syringe -HypoPen auto-injector -Kit with vial and syringe	1 mg	< 2yrs: not recommended 2- 12 yrs < 45kg | 0.5mg ≥ 45kg | 1mg 12 yrs or older | 1mg	Approved Age 2+ SubQ admin in arm, thigh, abdomen Expires in 2 years at room temp (keep in foil pouch).
Dasiglucagon (Zegalogue) Stable liquid glucagon analog	0.6mg/0.6mL Prefilled syringe Autoinjector	0.6mg	< 6yrs: not recommended 6 yrs or older | 0.6mg	Approved Age 6+ SubQ in abdomen, buttocks, thigh outer upper arm Expires in 1 year at room temp. (store in red protective case).

All raise BG 20+ points. Can cause nausea, vomiting. After admin, roll person on side. Seek medical help. If no response after 1st dose, give 2nd dose in 15 mins. When awake, give oral carbs ASAP when safe to swallow. Please consult package insert for detailed info.

All PocketCard content is for educational purposes only. Please consult prescribing information for detailed guidelines.

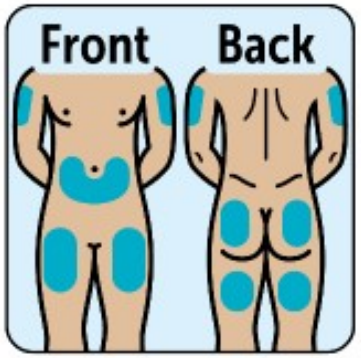
Nasal Glucagon - Baqsimi

- Approved for ages 4 +
- Absorbed nasally
- No reconstitution or refrigeration needed
- Kept in temps up to 86
- Raises BG 67-73 mg/dl
- Don’t use in those with
  - Pheochromocytoma
  - insulinoma



Dasiglucagon (Zegalogue)

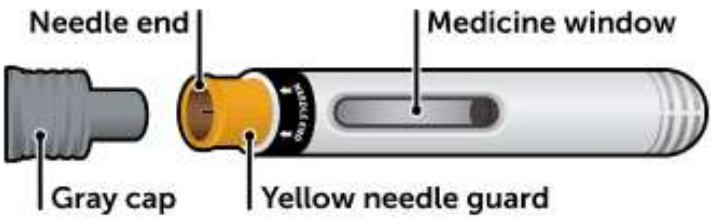
Red protective case



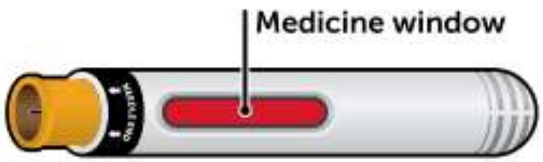
ZEGALOGUE

Autoinjector

Before injection



After injection



Hypoglycemia: Identify, Treat, & Prevent

PocketCards are updated twice yearly. Scan QR code to download or order the latest version.

SCAN ME

Step 1

Identify your signs of hypoglycemia or low blood sugar:

- Sweaty
- Shaky
- Hungry
- Can't think straight
- Headache
- Irritated, grouchy
- Other

Step 2

If have signs of hypo, treat with carbs until glucose reaches 70+, then eat usual meal.

- Sugary drink, 4–8oz
- Piece of fruit
- Raisins, handful
- Glucose tabs, 4+
- Honey/glucose gel
- Skittles candy, 15+

Step 3

Have glucagon rescue meds available.

In case of severe hypo, identify someone (ahead of time) who can get medical help & give a glucagon rescue medication.

Notify your provider of low blood sugar events.

Hypoglycemia Levels:

Level 1 – Glucose less than 70
Level 2 – Glucose less than 54
Level 3 - Severe, needs assistance

Identify Causes of Hypo & Problem Solve to Prevent Future Episodes

» Low carb meal
» Extra activity
» Drinking alcohol
» Delayed, missed meal
» Too much insulin/meds
» Insulin timing

Basal Bolus – What Adjustments?
Pt weighs 80kg

	Break	Lunch	Dinner	HS
Day 1	69 7R	79 5R	245 8R	190 22u Gl
Day 2	81 7R	87 5R	170 8R	133 22u Gl
Day 3	73 7R	94 5R	194 8R	110 22u Gl
Day 4	62 7R	83 5R	211 8R	127 22u Gl

Intensive Diabetes Therapy
Insulin Dosing Strategy

50/50 Rule

- 0.5-1.0 units/kg day
- Basal = 50% of total
  - Glargine QD
  - NPH or Detemir BID
- Bolus = 50% of total
  - usually divided into 3 meals

Example

- Wt 50kg x 0.5 = 25 units of insulin/day
- Basal dose: 13 units
- Bolus dose: 12 units
  - 4 units each meal

Intensive Diabetes Therapy
Insulin Dosing Strategy

50/50 Rule

- 0.5-1.0 units/kg day
- Basal = 50% of total
  - Glargine QD
  - NPH or Detemir BID
- Bolus = 50% of total
  - usually divided into 3 meals

Example – You Try

- Wt 60 kg x 0.5 = ___ units of insulin/day
- Basal dose: ____ units
- Bolus dose: ____ units
  ___ units each meal

Intensive Diabetes Therapy
Insulin Dosing Strategy

50/50 Rule

- 0.5-1.0 units/kg day
- Basal = 50% of total
- Bolus = 50% of total
  - usually divided into 3 meals

Example – You Try

- Wt 60 kg x 0.5 = 30 units of insulin/day
- Basal dose: 15 units
- Bolus dose: 15 units

  5 units each meal

Basal Bolus – Using 50/50 Rule - Pt weighs 80kg

	Break	Lunch	Dinner	HS
Day 1	84 6R	89 7R	145 7R	190 20 u Gl
Day 2	81 6R	97 7R	107 7R	133 20u Gl
Day 3	79 6R	104 7R	124 7R	110 20u Gl
Day 4	69 6R	103 7R	208 7R	193 20u Gl

Concentrated Insulins

Concentrated & Inhaled Insulins

Name/Concentration	Insulin/Action	Considerations
Humulin Regular U-500 • 500 units insulin/mL • KwikPen or Vial	Regular Bolus / Basal	Indicated for those taking 200+ units daily. 3 mL pen holds 1,500 units. Max dose 300 units. Once opened, good for 28 days. 20 mL vial holds 10,000 units. Max dose 250 units using U-500 syringe. Once opened, good for 40 days.
Humalog KwikPen U-200 200 units insulin/mL.	Lispro (Humalog) Bolus	3 mL pen holds 600 units. Max dose 60 units. Once opened good for 28 days.
Lyumjev KwikPen U-200 200 units insulin/mL.	Lispro (Lyumjev) Bolus	3 mL pen holds 600 units. Max dose 60 units. Once opened good for 28 days.
Toujeo Solostar U-300 Pen 300 units insulin/mL.	Glargine (Lantus) Basal	1.5 mL pen holds 450 units. Max dose 80 units. 3 mL Max Solostar pen holds 900 units. Max dose 160 units. Once opened good for 56 days.
Tresiba FlexTouch U-200 Pen 200 units insulin/mL.	Degludec (Tresiba) Ultra basal	3 mL pen holds 600 units. Max dose 160 units. Once opened good for 56 days.

All concentrated insulin pens and the U-500 syringe automatically deliver correct dose (in less volume). No conversion, calculation or adjustments required. For example, if order reads 30 units, dial the concentrated pen to 30 units or draw up 30 units on the U-500 syringe. **Important – never withdraw concentrated insulin from the pen using a syringe.**

Insulin Teaching Keys

- Abdomen preferred injection site
- Stay 1” away from previous site
- Don’t re-use syringes
- Keep unopened insulin in refrigerator
- Look for:
  - Lipodystrophy
  - Lipohypertrophy
- Make sure insulin isn’t expired
- Proper disposal
- Review patients ability to withdraw and inject.

DiaBingo - N

N DPP demonstrated that exercise and diet reduced risk of DM by__%

N Average A1c of 7% = Avg BG of ____

N An _____a day can help prevent heart attack and stroke

N Scare tactics are effective at motivating behavior

N Losing ___ % of body weight, can improve blood glucose, BP, lipids

N Drugs that can cause hyperglycemia

N 2/3 cups of rice equals _____ serving carbohydrate

N One % drop in A1c reduces risk of complications by ___ %

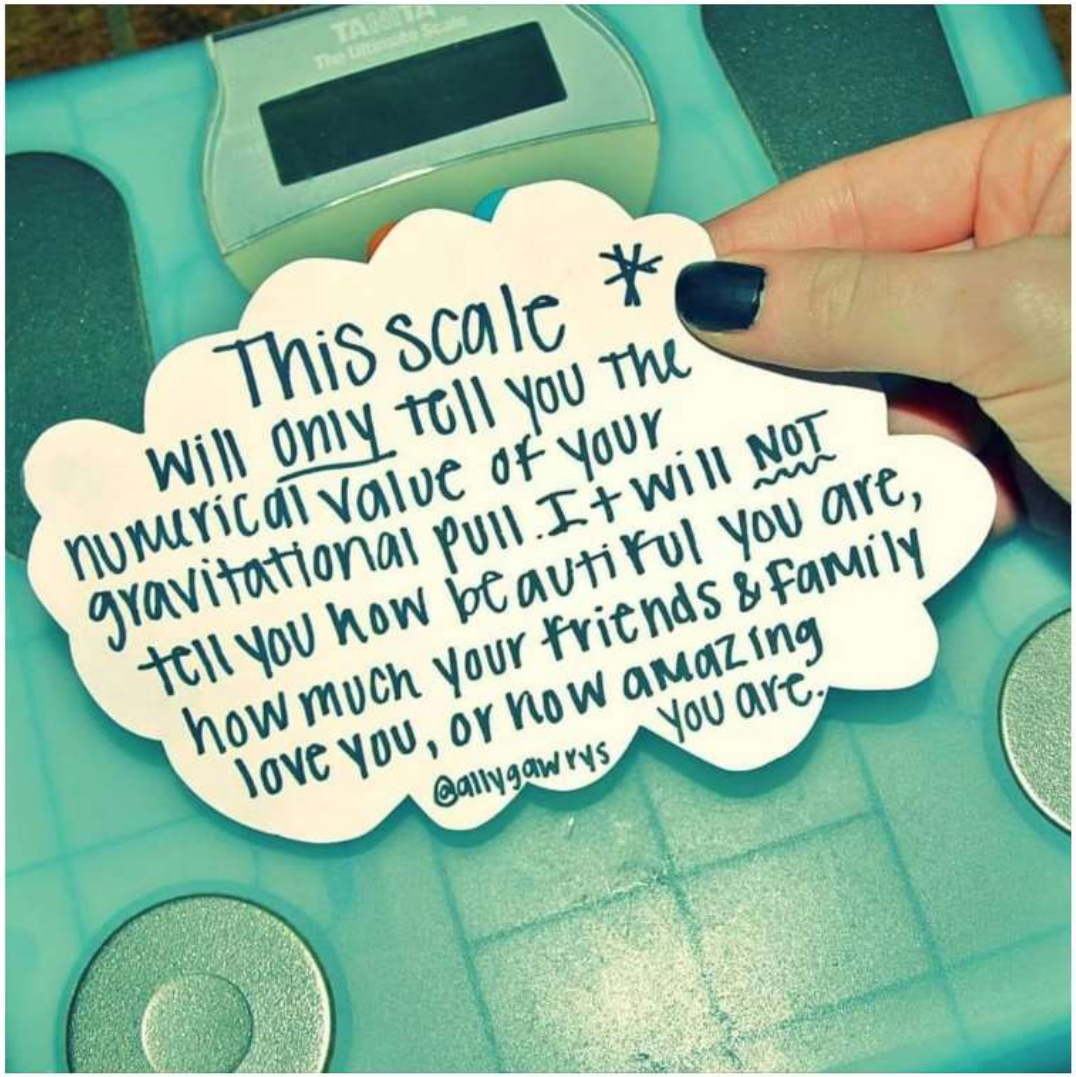
N 1 gm of fat equal _____kilo/calories

N Metabolic syndrome = hyperinsulinemia, hyperlipidemia, hypertension

N Average American consumes 15 teaspoons of sugar a day.

N Medication that was derived from the saliva of the Gila Monster

Weight is a Heavy Issue



Standard American Diet is SAD

- 70% of food consumed is processed
- Low fiber, high sugar
- Intake of fruit and veggies decreasing
- We are starving our good bacteria

Reduce refined Carbs, Added Sugars - ADA

- Reduce risk of CVD and fatty liver disease
- ADA strongly discourages consumption of:
  - Sugar sweetened beverages
  - Processed “low-fat” or “non-fat” foods with high amounts of refined grains & added sugar

Sugary and processed foods can displace healthier, more nutrient dense food choices

United States: The Revis family of North Carolina. Food expenditure for one week: $341.98. Favorite foods: spaghetti, potatoes, sesame chicken.
Peter Menzel, from the book, "Hungry Planet: What the World Eats."

Guatemala: The Mendozas of Todos Santos - Food expenditure for one week: 573 Quetzales or $75.70. Family Recipe: Turkey... VIEW MORE
Peter Menzel, from the book, "Hungry Planet: What the World

19 of 27

Choose Healthy Carbs

- Carbs have fiber, vitamins, minerals and phytonutrients
- 25 gms of fiber a day
- Power Carbs include:
  - Beans
  - Veggies
  - Fruits
  - Whole grain foods

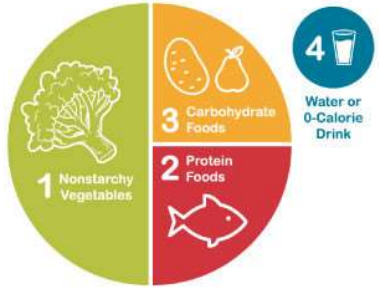
Healthy Eating Patterns/Approaches

Eating Patterns:

- Carb-Restricted
- Mediterranean Diet
- Plant based eating
- DASH (Dietary Approaches to Stop Hypertension)
- Structured low-calorie

Approaches:

- Diabetes Plate Method
- Carbohydrate Counting
- Intermittent fasting/time restricted
- Meal replacements



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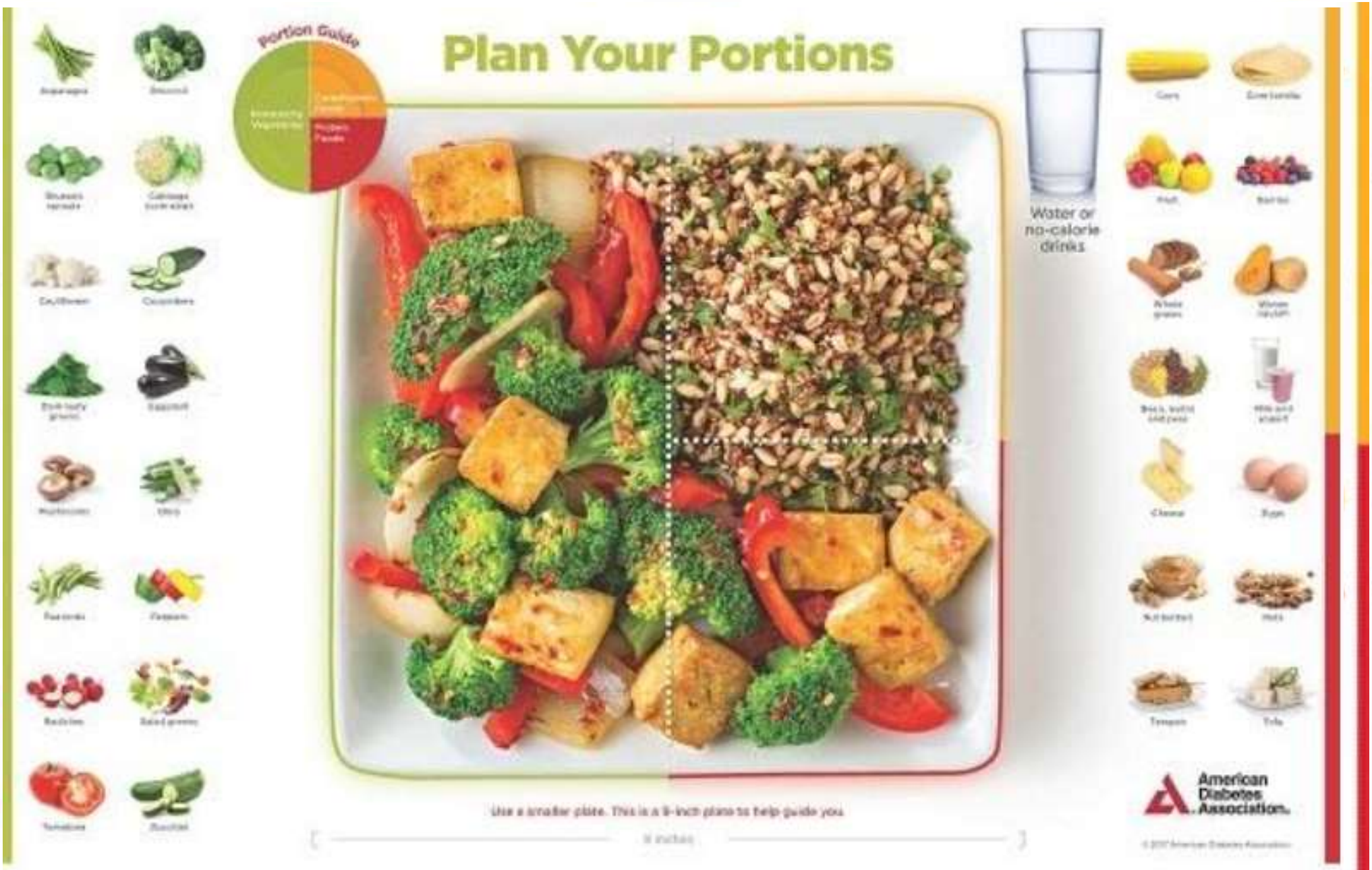
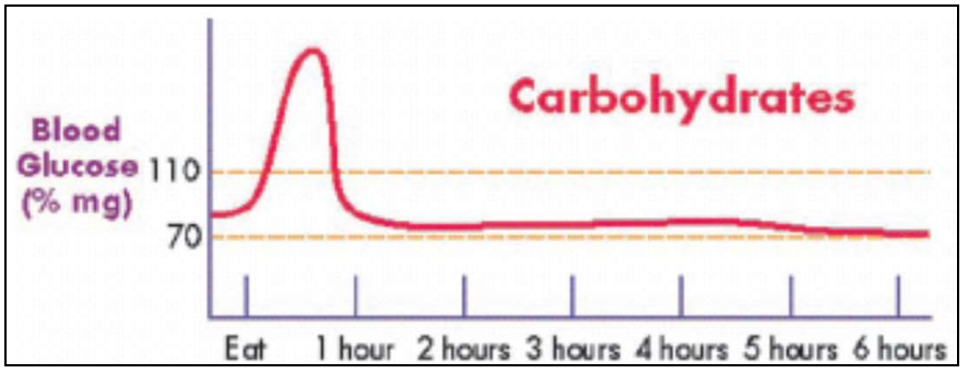
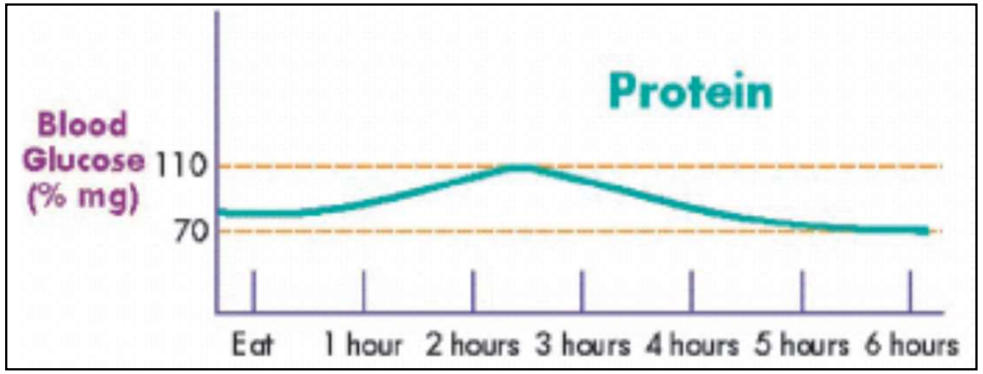
Plan Your Portions

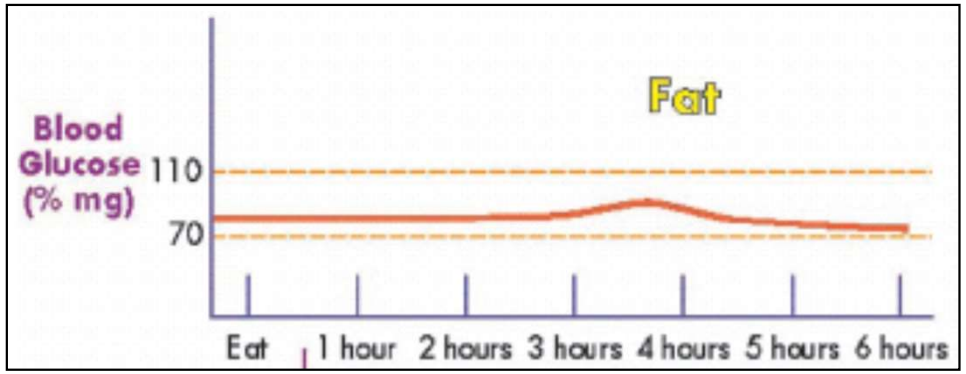


How nutrients affect blood sugar





If type 1, may need some insulin coverage for high fat / protein meals



Carb Counting - Starch

Each Food has:
80 Calories
15 grams carb

1/2 cup
cooked beans

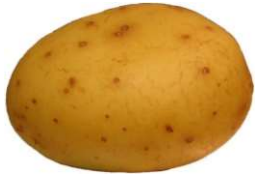
1 small ear of corn or
1/2 cup corn

1/3 cup
cooked pasta

3/4 cup cold
cereal

1 slice bread

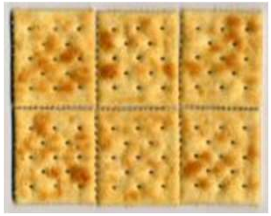
1/3 cup
cooked rice



1 small potato

1/2 English muffin

1 small tortilla



5-6 small crackers

Carb counting- fruit

Each Food has:
60 Calories
15 grams carb

1 small fresh fruit

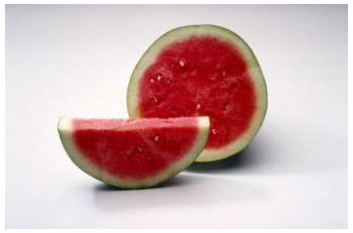
½ cup fruit juice

½ banana

½ cup unsweetened apple sauce

17 small grapes

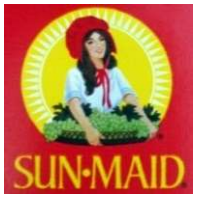
1 slice bread



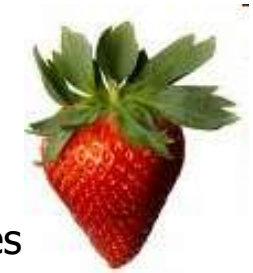
1 cup melon

¼ cup dried fruit

2 tbsp raisins



1 1/4 cup strawberries



Carb Counting - Milk

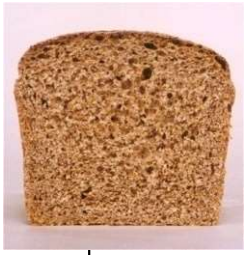
Each Food has:
90-150 calories
12-15 grams carb

1 packet diet hot cocoa

8 oz buttermilk

6 oz plain yogurt

1 slice bread



8 oz milk

8 oz soy milk

6 oz light fruit yogurt

Carb Counting - Sweets

Each Food has:
Calories vary
15 grams carb

2 inch square cake or brownie, unfrosted

½ cup diet pudding

½ cup regular jello

2 tbsp light syrup

2 small cookies

1 slice bread

1 tbsp syrup, jam, jelly, table sugar, honey

½ cup ice cream or frozen yogurt

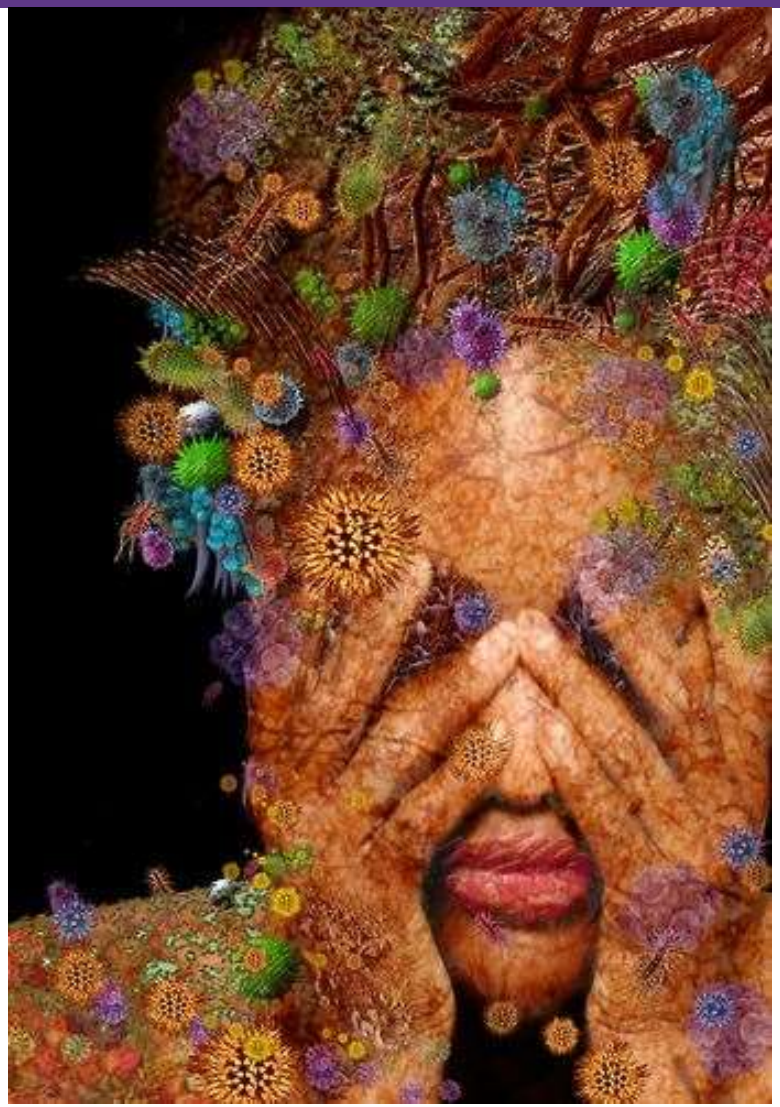
½ cup sherbet

¼ cup sorbet

Using Alcohol Safely

- Women- 1 or fewer alcoholic drinks a day
- Men 2 or fewer alcoholic drinks a day
  - 1 alcoholic drink equals
    - 12 oz beer, 5 oz glass of wine, or 1.5 oz distilled spirits (vodka, gin etc)
- If drink, limit amount and drink w/ food.
- Ask HCP if safe for you to drink. Tell them your usual quantity and frequency.
- Can cause hypo and worsen neuropathy

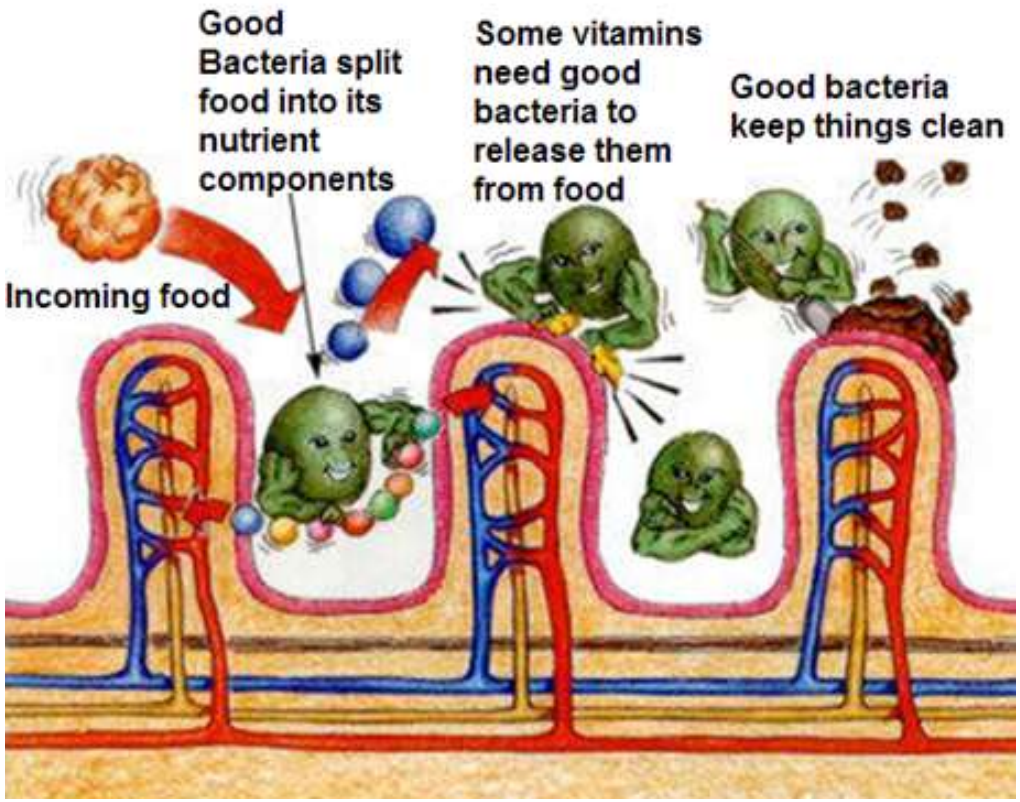
Bacterial Cells Outnumber Human Cells 10 to 1



How do our bacteria help us?

- Maintain physiological homeostasis and metabolism.
- Other benefits
  - pathogen displacement
  - immune system development
  - barrier fortification
  - vitamin production
  - nutrient absorption

- Forgotten organ



Poll Question 9

- How much does your gut bacteria weigh?

  A. 24 ounces

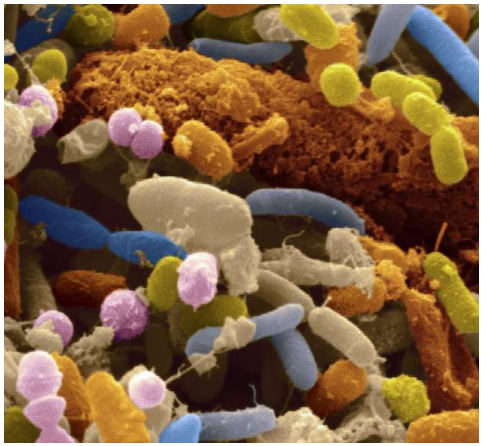
  B. 3 pounds

  C. Less than 1 pound

  D. 1.5 pounds

3 lbs of Microbes in our Gut

- This community of bacteria can be thought of as an extra 'organ' "microbiome".
- We have evolved together with our microbiome over millions of years.
- Ratios of these communities has changed over the past 30 years
- Mirrors global spikes in obesity, diabetes, allergic and inflammatory diseases
- What are we doing to change these bacteria?



Quick Question 10

- In general, how does immigrating to the U.S. impact individual's gut microbiota?

A. Increased diversity due to new food exposure.
B. A generational decline in bacterial diversity
C. They experience a sudden increase in Akkermansia muciniphila
D. Decrease in helicobacter pylori.

HEALTH

Just Months of American Life Change the Microbiome

Immigrants' gut bacteria "westernize" soon after they move to the U.S., which might influence obesity in immigrants and Americans alike.

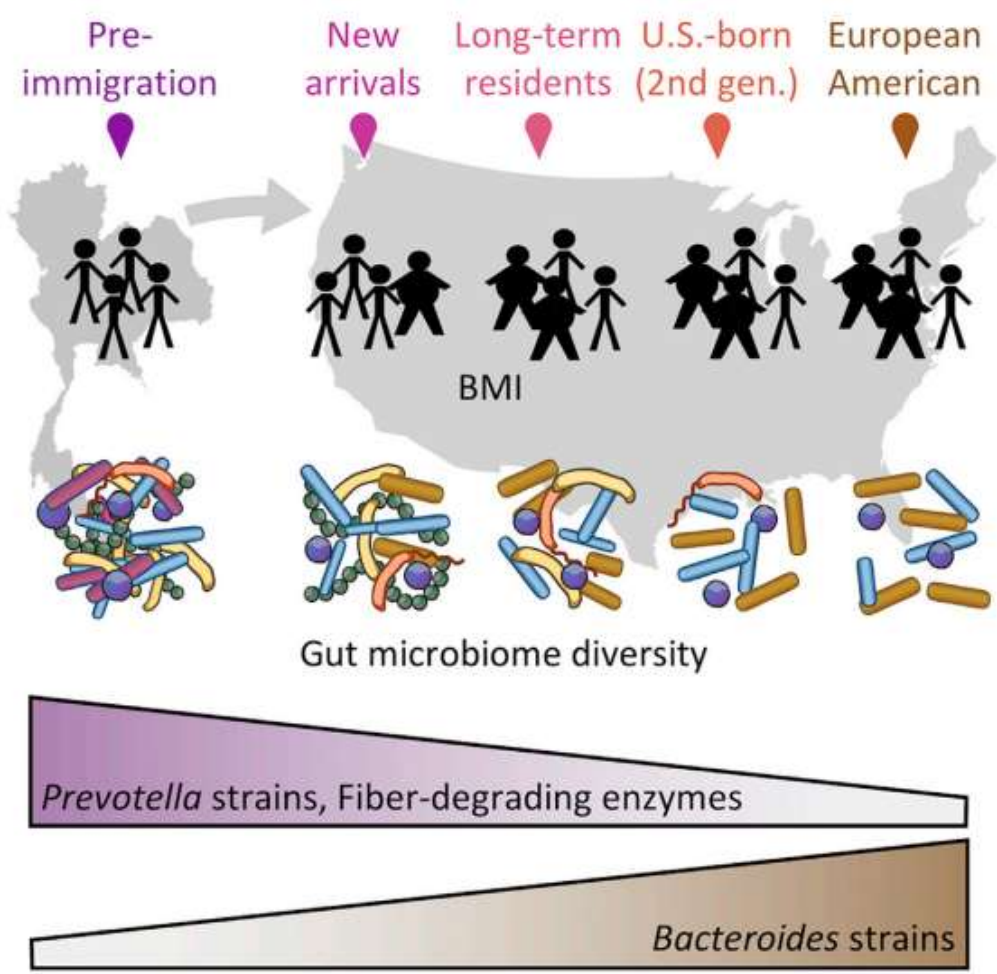
OLGA KHAZAN NOV 1, 2018 Atlantic.com Nov 2018

A Hmong woman carries grass in Vietnam. (NGUYEN HUY KHAM / REUTERS)

From Vietnam to America – Hmong immigrants microbiome shifts associated with worse health

- In Minneapolis—scientists followed a group of Hmong immigrants for 9 months.
- Increased intake of protein, sugar, and fat and processed food.
- Researchers found that the immigrants' gut microbiomes "westernized" and became less diverse
- Within a generation, Hmong women experiencing a BMI of >30 increased from 5% to 30%.

Moving to America isn't good for your health



Cell

Researchers don't know if eating a less-healthy diet increases the rate of obesity *and* changes the microbiome, or if a less healthy diet changes the microbiome *so* it makes people experience higher BMI.

Atlantic.com Nov 2018

Getting to Better Gut Bacterial Health

Eat more PREbiotics

- Foods with indigestible fibers that nourish the good bacteria:
  - High fiber foods like, whole grains, fruits, veggies, nuts
  - High in prebiotic fibers include: Jerusalem artichokes, onions, kale, Brussels sprouts, bananas, dandelion greens & more

PRObiotics

- These foods contain healthy bacteria like *Bifidobacterium* and *lactobacillus.*
  - Yogurt, Kefir – look for "live or active cultures"
  - Fermented foods like: Sauerkraut, Kimchi, Miso soup, kombucha

Fiber – the New "F" Word

- Goal:
  - 14 gms / 1000 calories ~ 30 gms a day
- How?
  - Whole, intact grains, beans, fruits, veggies, nuts, avocados
- Why?
  - Associated with lower mortality for people with type 2.
  - Fiber intake inversely associated with type 2 diabetes
- Avoid highly processed foods
  - If label says 0-2gms of fiber per serving, low fiber food.

Nutrition Facts

99% Fat Free Vegetarian Chili with Beans

Serving Size 1.00 cup(247g)

Serving Per Container about 2

	Amount Per Serving	
Calories		190
Calories from Fat		10
		%DV
Total Fat	1g	2%
Saturated Fat	0g	0%
Trans Fat	0g	
Cholesterol	0mg	0%
Sodium	780mg	33%
Total Carbohydrate	35g	12%
Dietary Fiber	10g	40%
Sugars	6g	
Protein	11g	
Vitamin A 25%		Vitamin C 0%
Calcium 6%		Iron 15%

*Percentage Daily values are based on a 2,000 calorie diet.Your Daily values may be higher or lower depending on your calorie needs

10 SuperFoods

- Beans
- Dark Green Leafy Vegs
- Citrus Fruit
- Sweet Potatoes
- Berries

- Tomatoes
- Fish High in Omega-3 Fatty Acids
- Whole Grains
- Nuts
- Fat-Free Milk and Yogurt

As posted on diabetes.org website

Take Home Message

- Get Dirty
- Limit Unnecessary C-Sections
- Breastfeed if possible
- Limit early antibiotics
- Eat a wide variety of fiber foods

Thank You & Evaluation

- Email info@diabetesed.net
- www.diabetesed.net
- 530/893-8635
- Take eval online

SCAN ME