



QR Code for
Handouts



Welcome to Diabetes in 21st Century
Thank you for inviting me!
2023

Coach Beverly Thomassian, RN, MPH, BC-ADM, CDCES
President, Diabetes Education Services
www.DiabetesEd.net



Diabetes Education
SERVICES

DiabetesEd.net Website Orientation

The screenshot shows the DiabetesEd.net website homepage. At the top, there is a navigation bar with links for MAIN WEBSITE, ONLINE UNIVERSITY, CONFERENCES, ONLINE STORE, and STUDENT LOGIN. A search icon and links for 'Free Med PocketCards' and 'Get Coach Bev's eNews' are also present. Below the navigation bar is the Diabetes Education SERVICES logo, a '25 years growth, connection, inspiration' anniversary banner, and a 'Ready to get certified? Get our Free CDCES Coach App' button. A green navigation bar contains links for HOME, EXAM PREP, ABOUT US, TRAININGS, ONLINE COURSES, BOOKS + STUDY, FREE RESOURCES, BLOG BYTES, and CONTACT US. The main content area features a large purple background with the text 'Start your journey Celebrating 25 Years in Diabetes Education'. Below this is a list of services: 'Online University & Live Seminars', 'Certification Tools & Resources', and 'Accredited Continuing Education'. A green 'GET STARTED' button is positioned below the list. To the right of the text is a circular portrait of Coach Beverly Thomassian, with her name 'Coach Beverly' written in cursive below it.

Beverly Thomassian, RN, MPH, CDCES, BC-ADM
CEO, coach, instructor, cheerleader, mentor

PocketCards



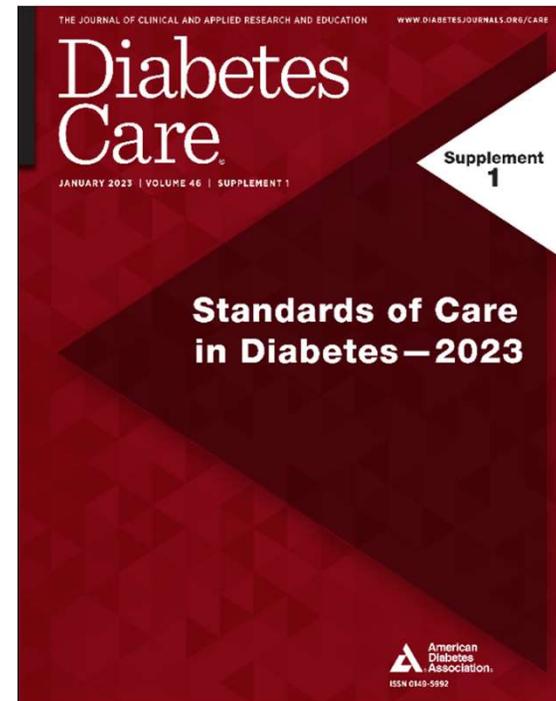
CDCES Coach App

The screenshot shows the CDCES Coach App interface. At the top, there is a navigation bar with links for HOME, THE APP, HOW IT WORKS, ABOUT US, REVIEWS, and CONTACT. Below the navigation bar is a large purple background with the text 'It's like having a coach in your pocket!' and 'CDCES Coach App'. Below this text are two buttons: 'Download on the App Store >>' and 'Download on Google Play >>'. To the right of the text is a smartphone displaying the app's interface, which includes the DiabetesEd.net logo, a 'Loading... SUCCESS!' message, and a navigation menu with icons for home, search, and other features.

www.DiabetesEd.net | info@diabetesed.net | 530-893-8635

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 Hyperglycemia
 - ✚ 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



<https://diabetesed.net/diabetes-in-21st-century-for-kaiser-permanente-handouts-and-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

World Diabetes Day

November 14

The right education
for all



Diabetes:
protect our future

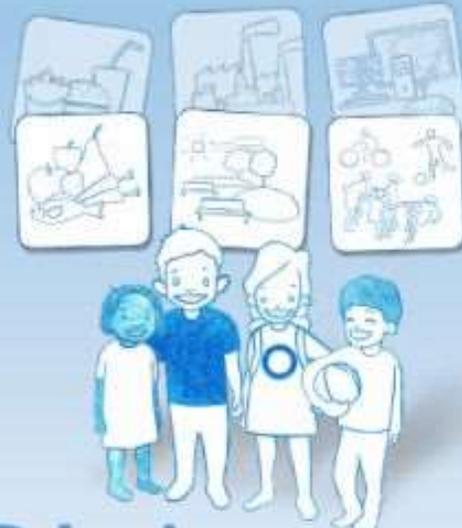


world diabetes day
14 November



www.worlddiabetesday.org

The right environment
for all



Diabetes:
protect our future

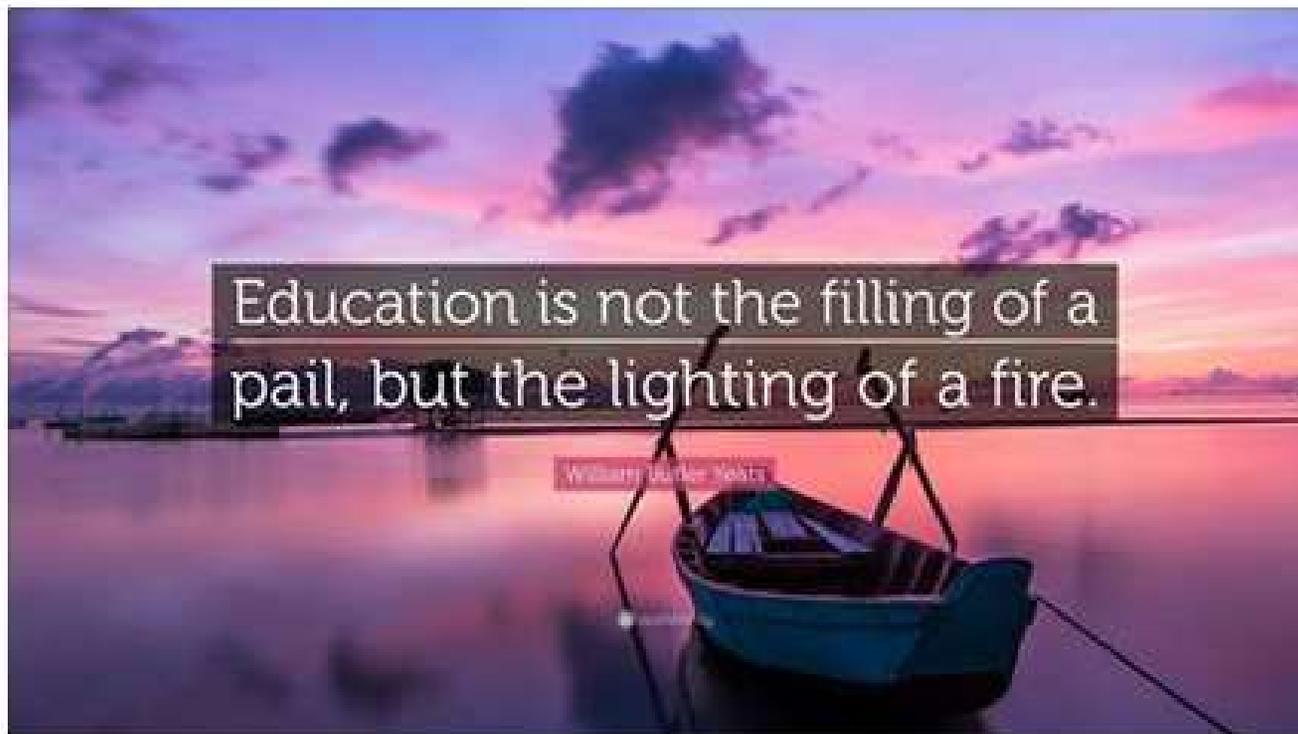


world diabetes day
14 November



www.worlddiabetesday.org

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

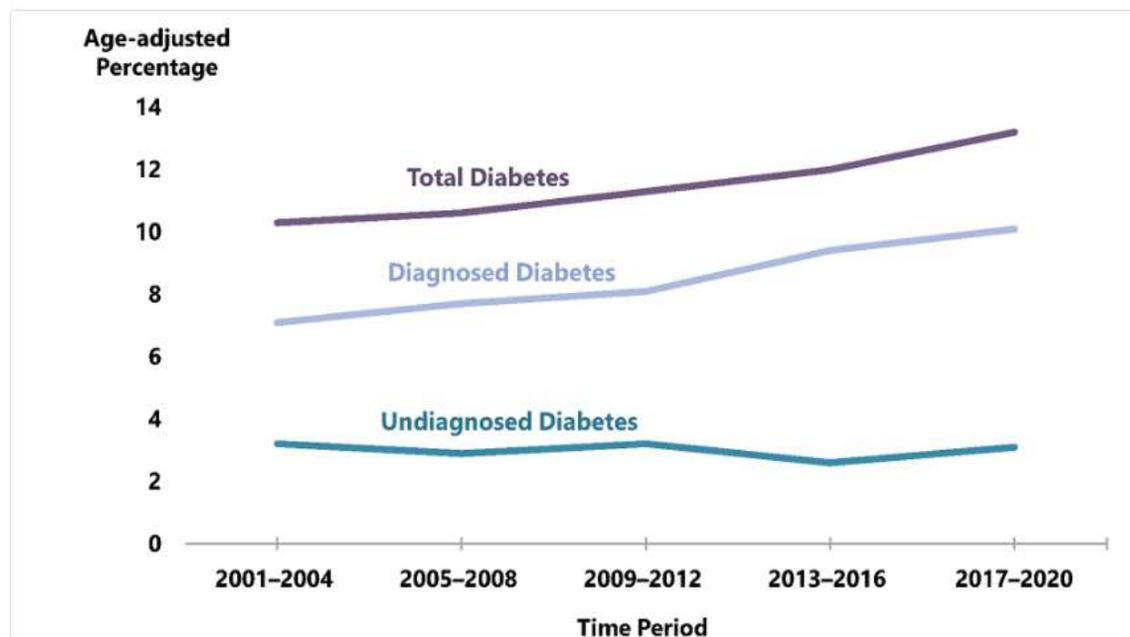
Quick Question 1

- ▶ What percent of adults in America currently live with type 2 diabetes?
 - ▶ A. 11%
 - ▶ B. About 50%
 - ▶ C. 25%
 - ▶ D. 30%

Diabetes in America 2023 - CDC

- ▶ 11.3% of adults have diabetes (37.3 mil)
 - ▶ 23% of those don't know they have diabetes
- ▶ 38% of adults have prediabetes (96 mil)
 - ▶ 19% of reported being told they have prediabetes.

Figure 1. Trends in age-adjusted prevalence of diagnosed diabetes, undiagnosed diabetes, and total diabetes among adults aged 18 years or older, United States, 2001–2020.



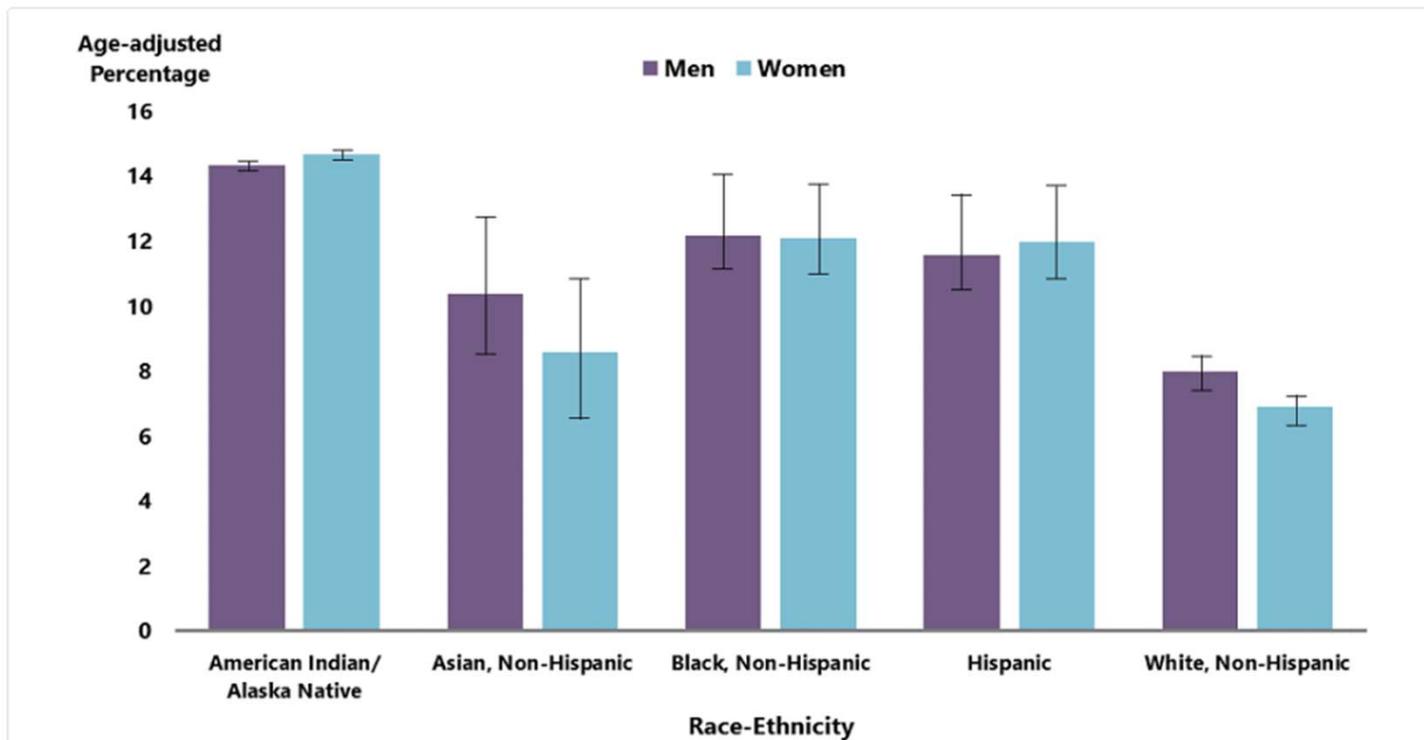
CDC 2022 Report
<https://www.cdc.gov/diabetes/data/statistics-report/diagnosed-diabetes.html>

www.DiabetesEd.net

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



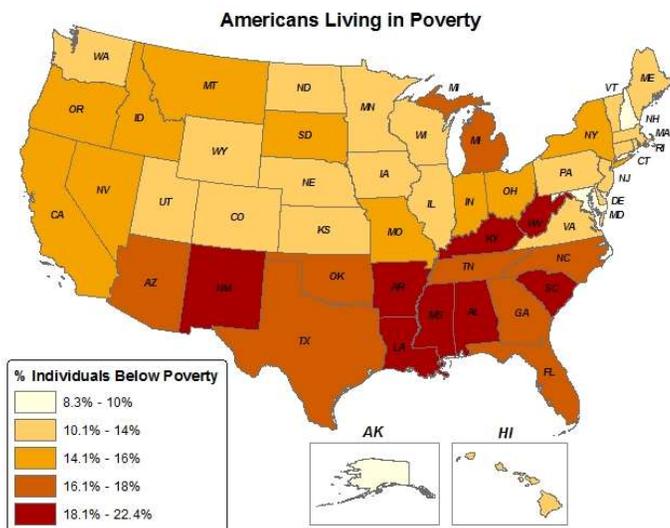
Socioeconomics – Diabetes Prevalence

- ▶ Prevalence of diabetes varied significantly by education level, an indicator of SES status
 - ▶ 7.1% - More than high school education
 - ▶ 9.2% - High school education
 - ▶ 13.4% - Less than high school education
- ▶ 13.7 – 14.4% of men and women with income below federal poverty level have highest prevalence of diabetes.



CDC 2023

Geography of Diabetes, Poverty, Weight



Source: U.S. Census 2010

Created by Social Science Research Center, DePaul University, April 2012

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

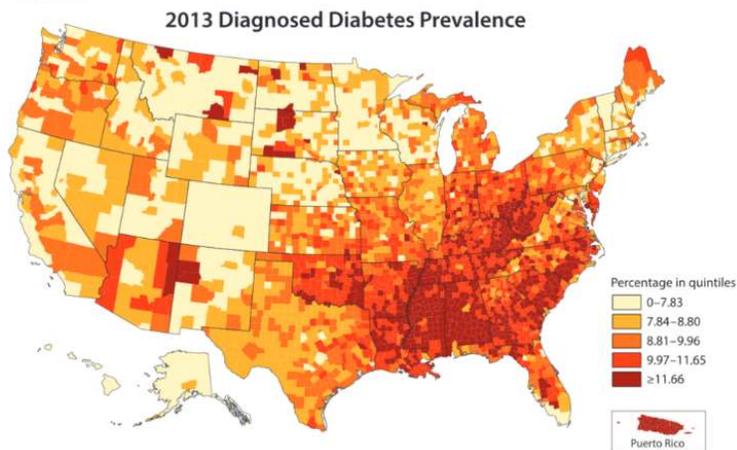
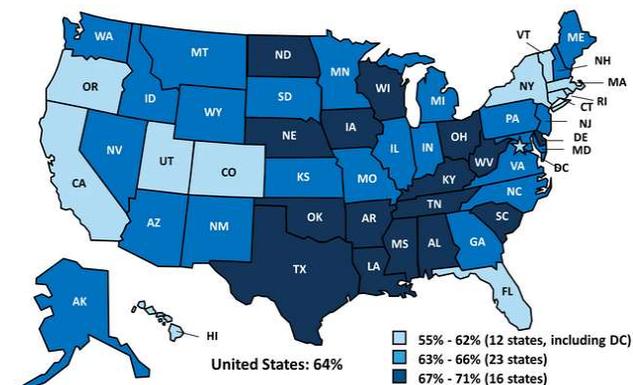


Figure 6

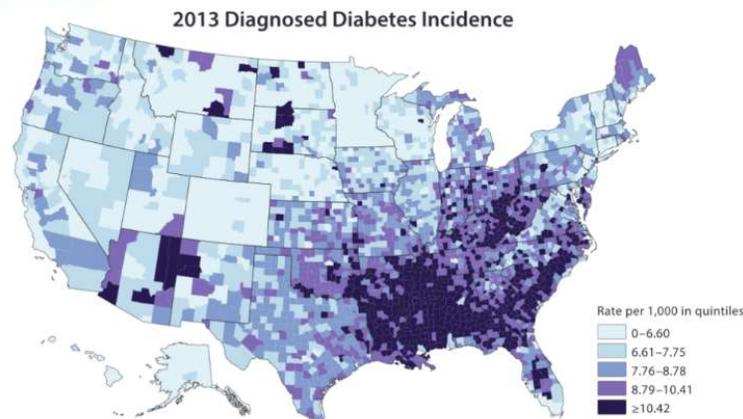
Percent of Adults Who are Overweight or Obese, 2014



Source: KCMU analysis of the Center for Disease Control and Prevention (CDC)'s Behavioral Risk Factor Surveillance System (BRFSS) 2014 Survey Results.



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

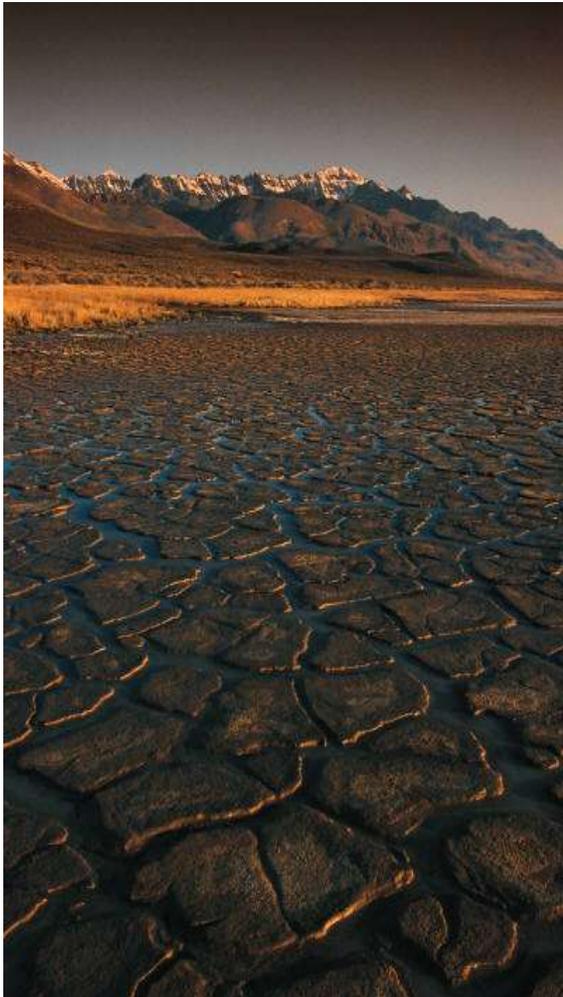


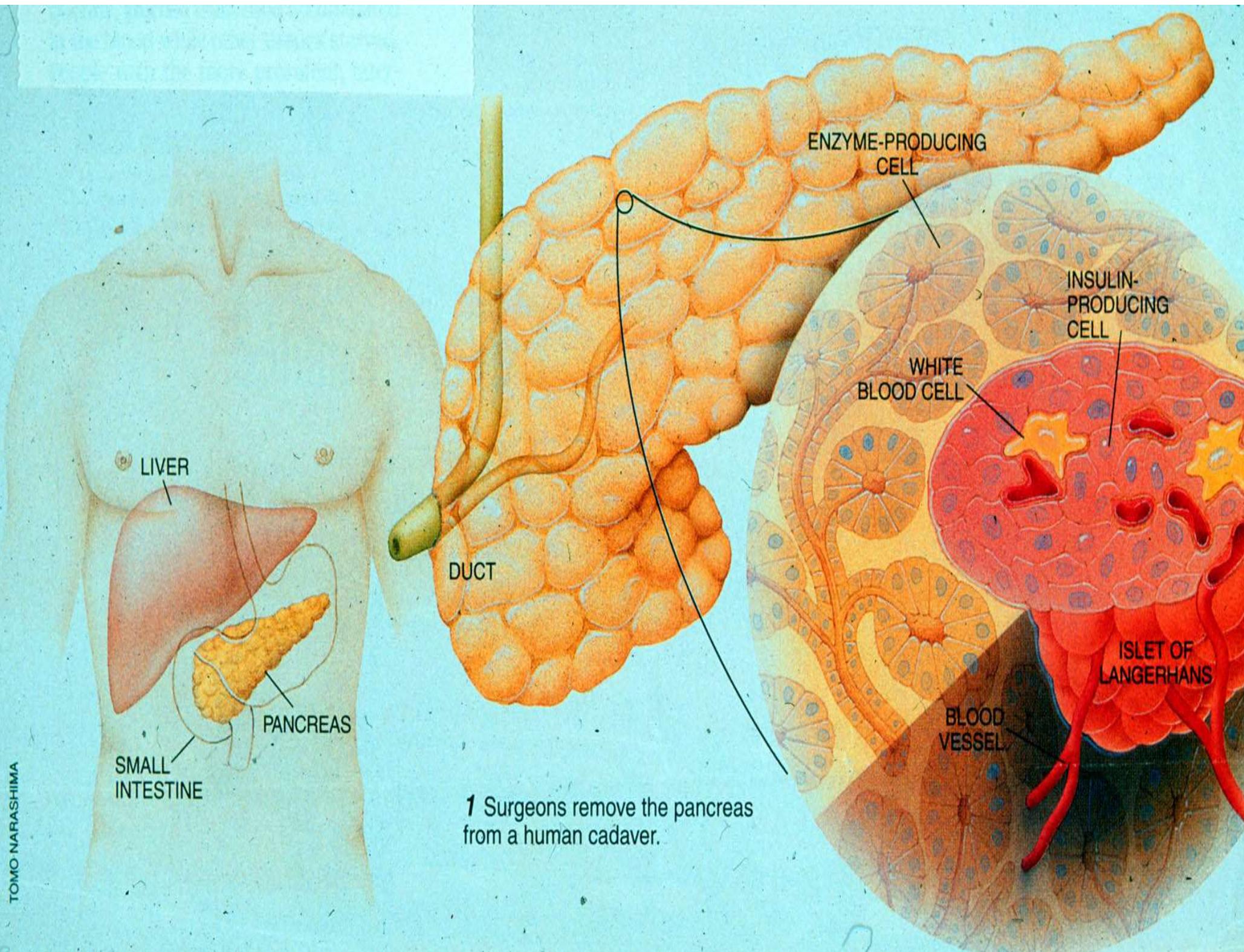
Social Determinants of Health

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



Now, let's get to the Nitty Gritty





LIVER

PANCREAS

SMALL
INTESTINE

DUCT

ENZYME-PRODUCING
CELL

INSULIN-
PRODUCING
CELL

WHITE
BLOOD CELL

ISLET OF
LANGERHANS

BLOOD
VESSEL

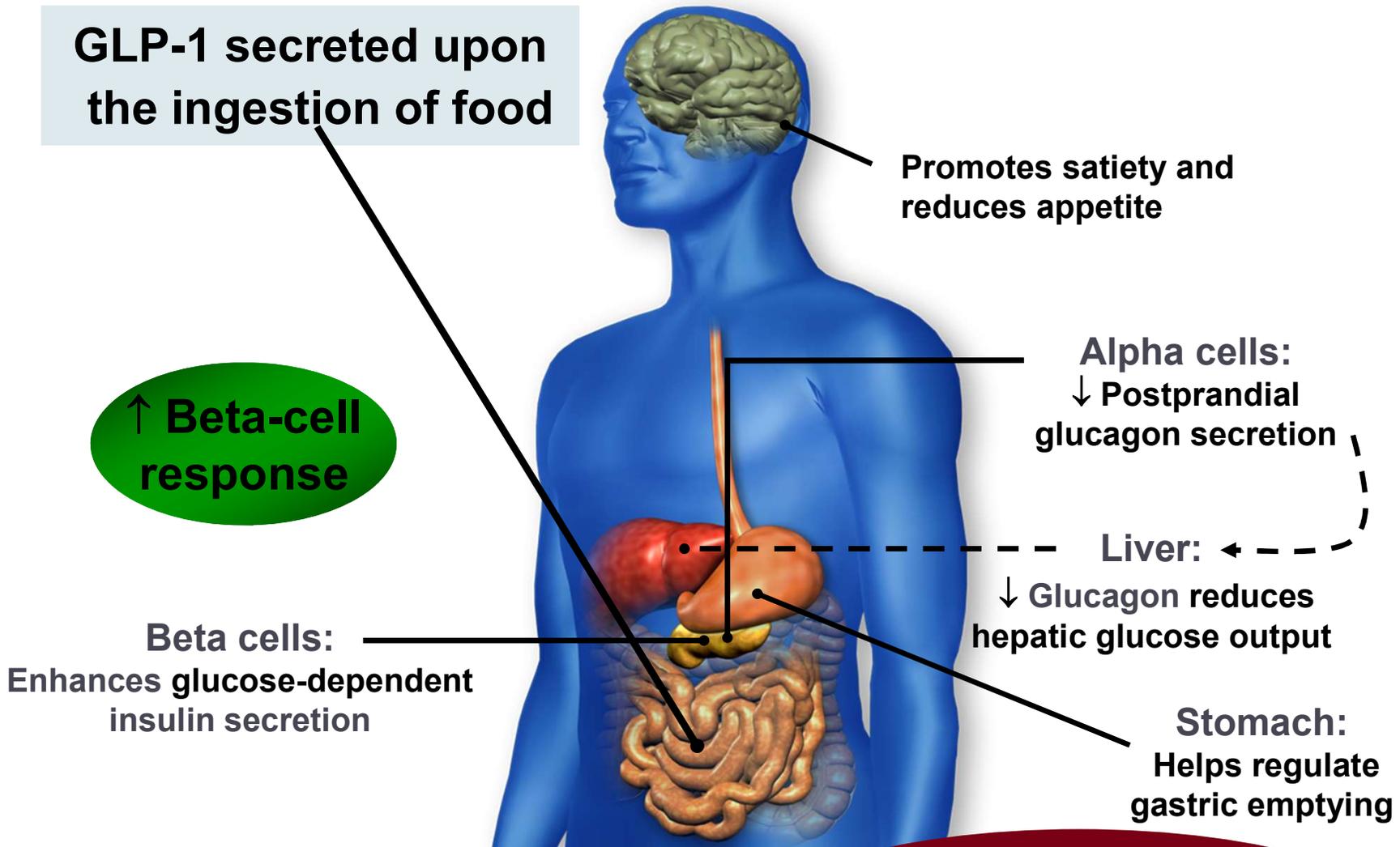
1 Surgeons remove the pancreas
from a human cadaver.

Hormones Effect on Glucose

<u>Hormone</u>	<u>Effect</u>
▶ 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



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

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

GLP-1 & GIP Receptor Agonists

Class/Main Action	Name	Dose Range	Considerations
GLP-1 RA - Glucagon Like Peptide Receptor Agonist “Incretin Mimetic” <ul style="list-style-type: none"> Increases insulin release with food Slows gastric emptying Promotes satiety Suppresses glucagon 	exenatide (Byetta)	5 and 10 mcg BID	Side effects for all: Nausea, vomiting, weight loss, injection site reaction. Report signs of acute pancreatitis (severe abdominal pain, vomiting), 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 include: nausea, diarrhea, injection site reaction. Report pancreatitis. 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 interventions is most likely to decrease the prevalence of diabetes in the U.S.?
- a. Public health campaigns that encourage diabetes screenings.
 - b. Community health programs that address social inequities and improve access to care.
 - c. Funding to encourage daily exercise in high-risk communities.
 - d. Increasing access to centers that offer metabolic surgery.



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

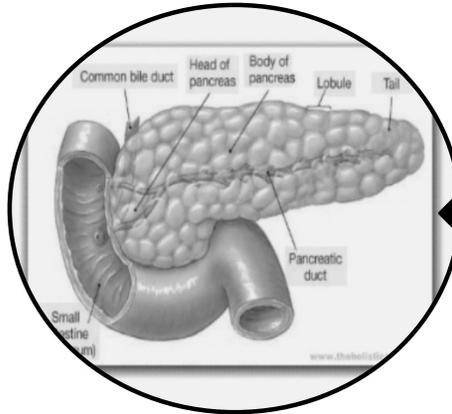


Quick Question 3

- ▶ 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



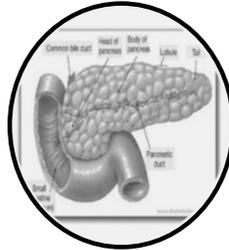
No Diabetes

FBG <100

Random <140

A1c <5.7%

Yes!



Prediabetes

FBG 100-125

Random 140 - 199

A1c ~ 5.7- 6.4%

**50% working
pancreas**

NO



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, H₂O losses
 - ➔ Dehydration
 - ➔ Fuel Depletion
 - ➔ Loss of body tissue, H₂O
 - ➔ Poor energy utilization
 - ➔ Hyperglycemia increases incidence of infection
 - ➔ Osmotic changes

Diabetes Classifications

- ▶ Type 1
- ▶ Type 2
- ▶ Gestational
- ▶ Secondary

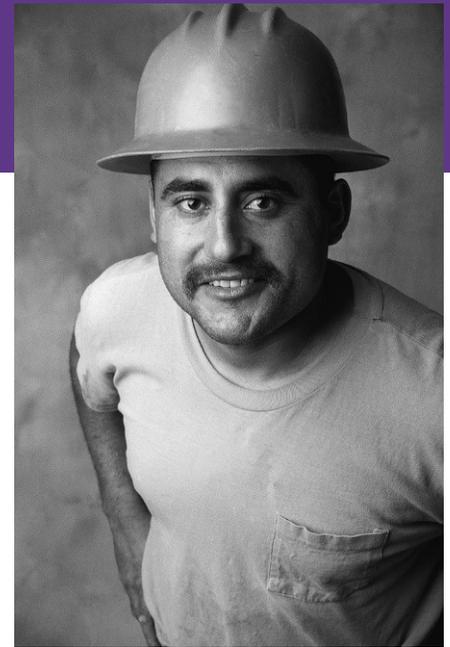


Case Study

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?

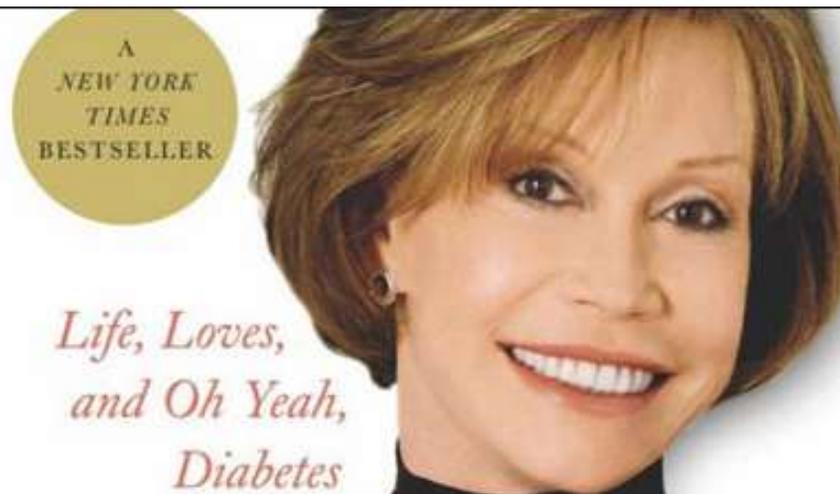


- ▶ AJ, 22 yr old admitted to the ICU with a blood glucose of 476 mg/dl, pH of 7.1. Recently lost 13 pounds.

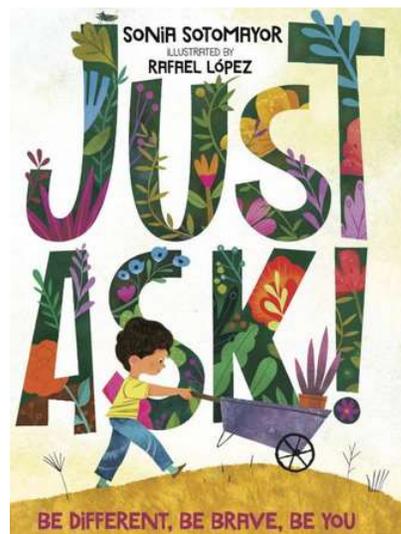
Type 1 Most Discriminative Features

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

What Does Type 1 Look Like?



Mary Tyler Moore



Justice Sonia Sotomayor

Kate Moss' daughter Lila praised for wearing insulin pump on the catwalk: 'An inspiration to so many living with Type 1 diabetes'

The catwalk showcased a joint collection by Versace and Fendi on Sunday

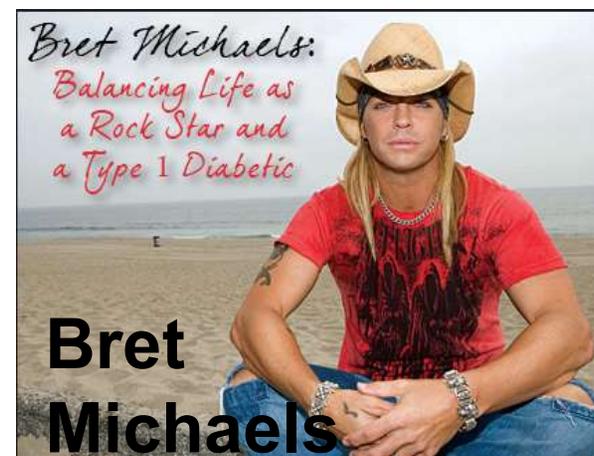
Saman Javed • Tuesday 28 September 2021 17:32 • Comments



Lila Grace Moss



Nick Jonas



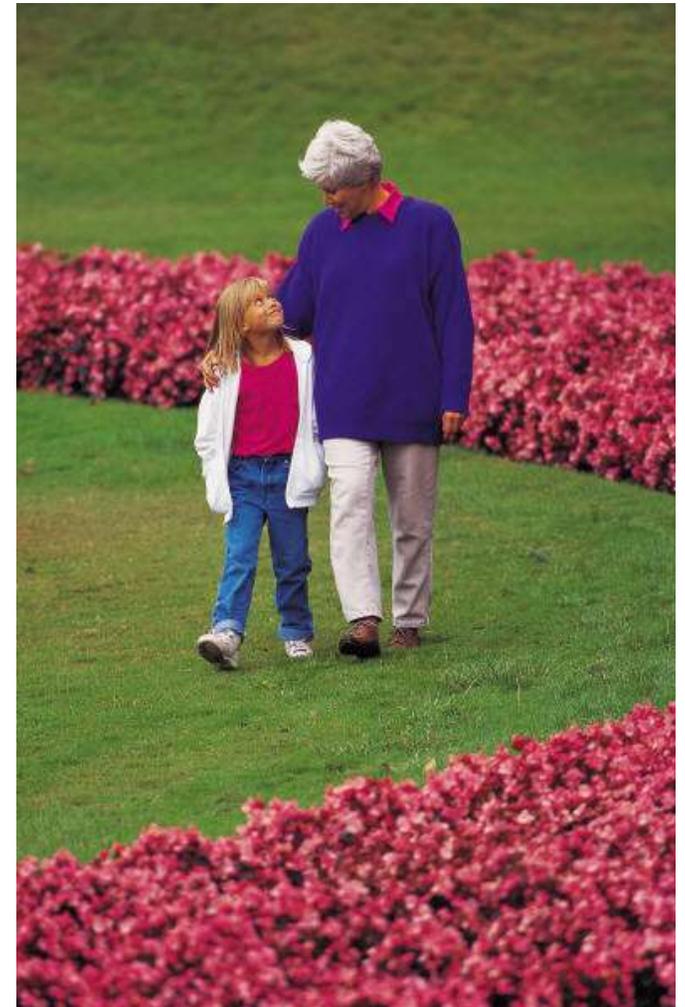
Bret Michaels

Type 1 Diabetes Progression

	Stage 1	Stage 2	Stage 3
Characteristics	• Autoimmunity	• Autoimmunity	• Autoimmunity
	• Normoglycemia	• Dysglycemia	• Overt hyperglycemia
	• Presymptomatic	• Presymptomatic	• Symptomatic
Diagnostic criteria	<ul style="list-style-type: none"> • Multiple islet autoantibodies <ul style="list-style-type: none"> - GAD, glutamic acid decarboxylase (primary) - islet antigen 2, or - Zinc transporter 8 (ZnT8) 	<ul style="list-style-type: none"> • Islet autoantibodies Dysglycemia: Elevated IFG and/or IGT <ul style="list-style-type: none"> • FPG 100–125 mg/dL • 2-h PG 140–199 mg/dL • A1C 5.7–6.4% or $\geq 10\%$ increase in A1C 	<ul style="list-style-type: none"> • Autoantibodies may disappear over time (5-10% may not express antibodies) • Diabetes diagnosed by standard criteria

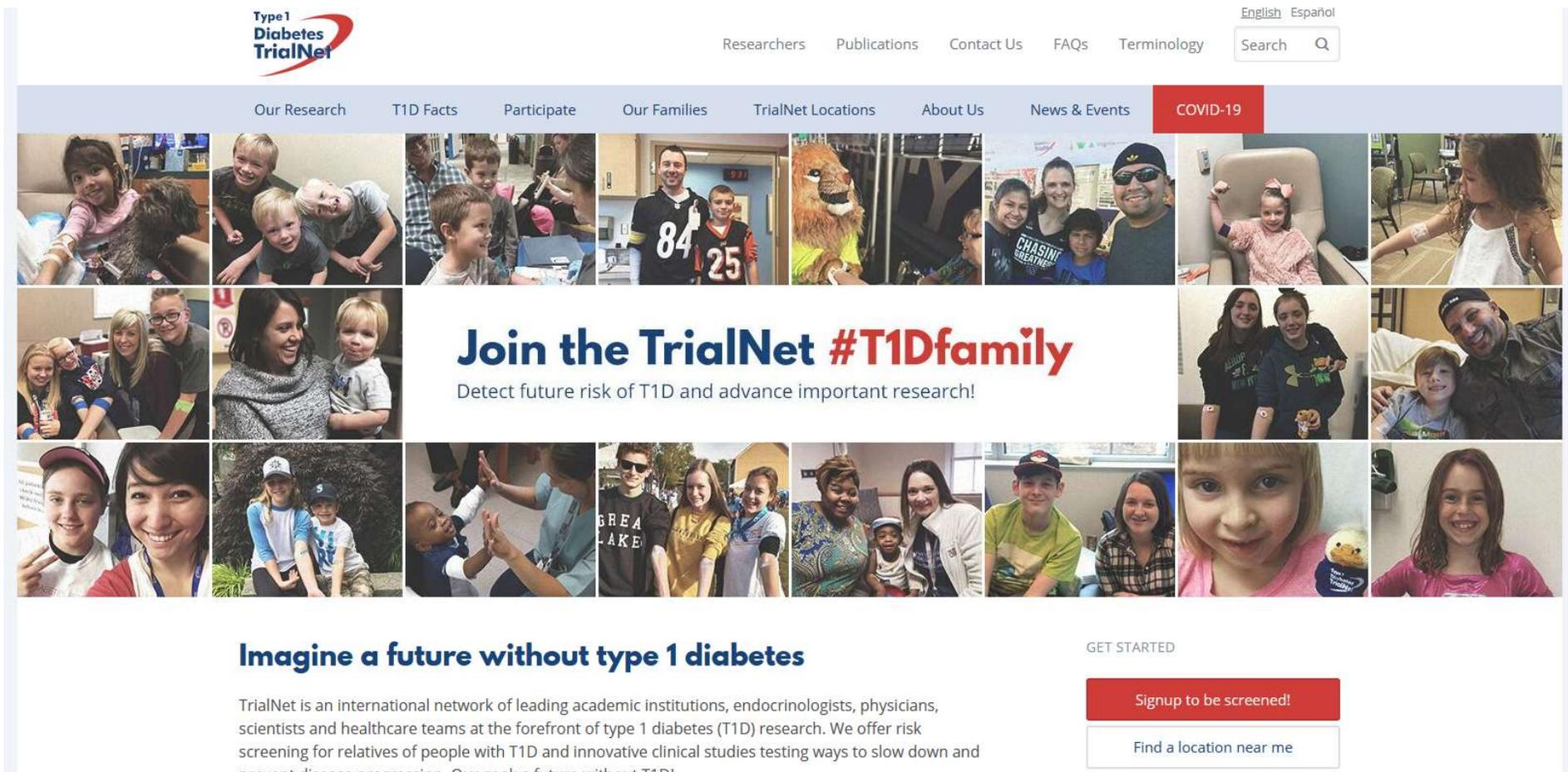
How do we know someone has Type 1 vs Type 2?

- ▶ 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
- ▶ Younger people develop quickly
- ▶ Older people take longer to develop
- ▶ Genetics - Several alleles of HLA-DQB1 are associated with an increased risk of developing type 1 diabetes



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

► How to get families linked to screening?



The screenshot shows the homepage of the Type 1 Diabetes TrialNet website. At the top left is the logo for Type 1 Diabetes TrialNet. To the right are navigation links for Researchers, Publications, Contact Us, FAQs, and Terminology, along with a search bar. Below the navigation is a horizontal menu with tabs for Our Research, T1D Facts, Participate, Our Families, TrialNet Locations, About Us, News & Events, and COVID-19. The main content area features a large grid of photos showing diverse families and individuals. In the center of this grid is a white box with the text: "Join the TrialNet #T1Dfamily" and "Detect future risk of T1D and advance important research!". Below the grid, on the left, is the heading "Imagine a future without type 1 diabetes" followed by a paragraph of text. On the right, under the heading "GET STARTED", are two buttons: "Signup to be screened!" and "Find a location near me".

Type 1 Diabetes TrialNet

English Español

Researchers Publications Contact Us FAQs Terminology Search

Our Research T1D Facts Participate Our Families TrialNet Locations About Us News & Events COVID-19

Join the TrialNet #T1Dfamily
Detect future risk of T1D and advance important research!

Imagine a future without type 1 diabetes

TrialNet is an international network of leading academic institutions, endocrinologists, physicians, scientists and healthcare teams at the forefront of type 1 diabetes (T1D) research. We offer risk screening for relatives of people with T1D and innovative clinical studies testing ways to slow down and prevent disease progression. Our goal: a future without T1D!

GET STARTED

Signup to be screened!

Find a location near me

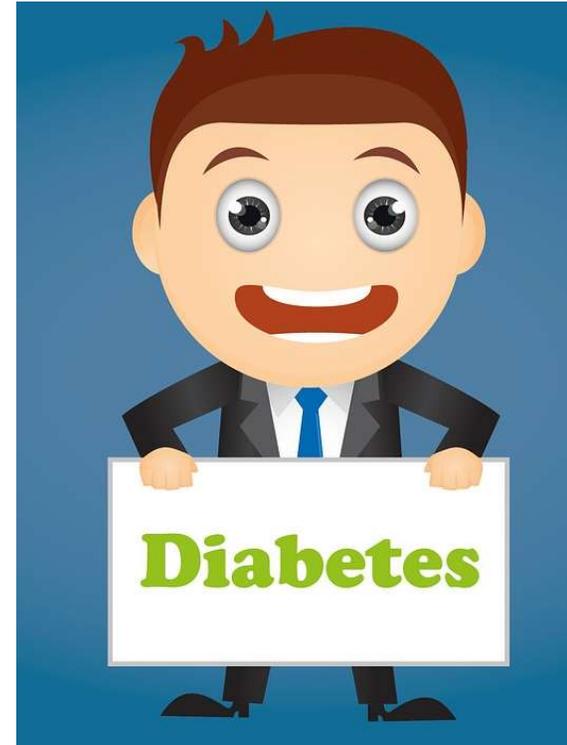
Type 1 Diabetes Associated with other immune conditions

- ▶ 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.



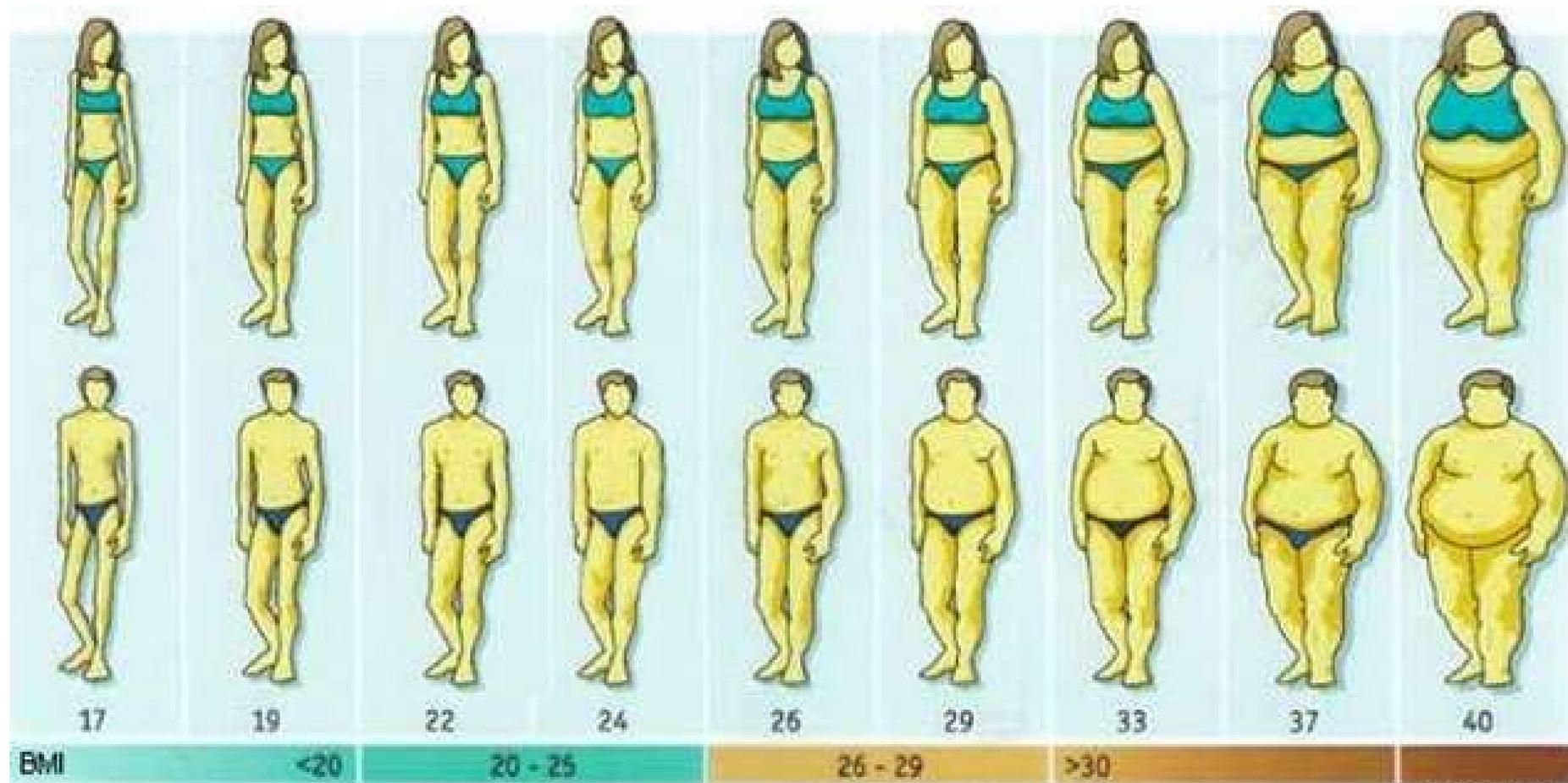
Patti LaBelle

"divabetic"

**"I have diabetes, it
doesn't have me"**



Updated BMI Categories



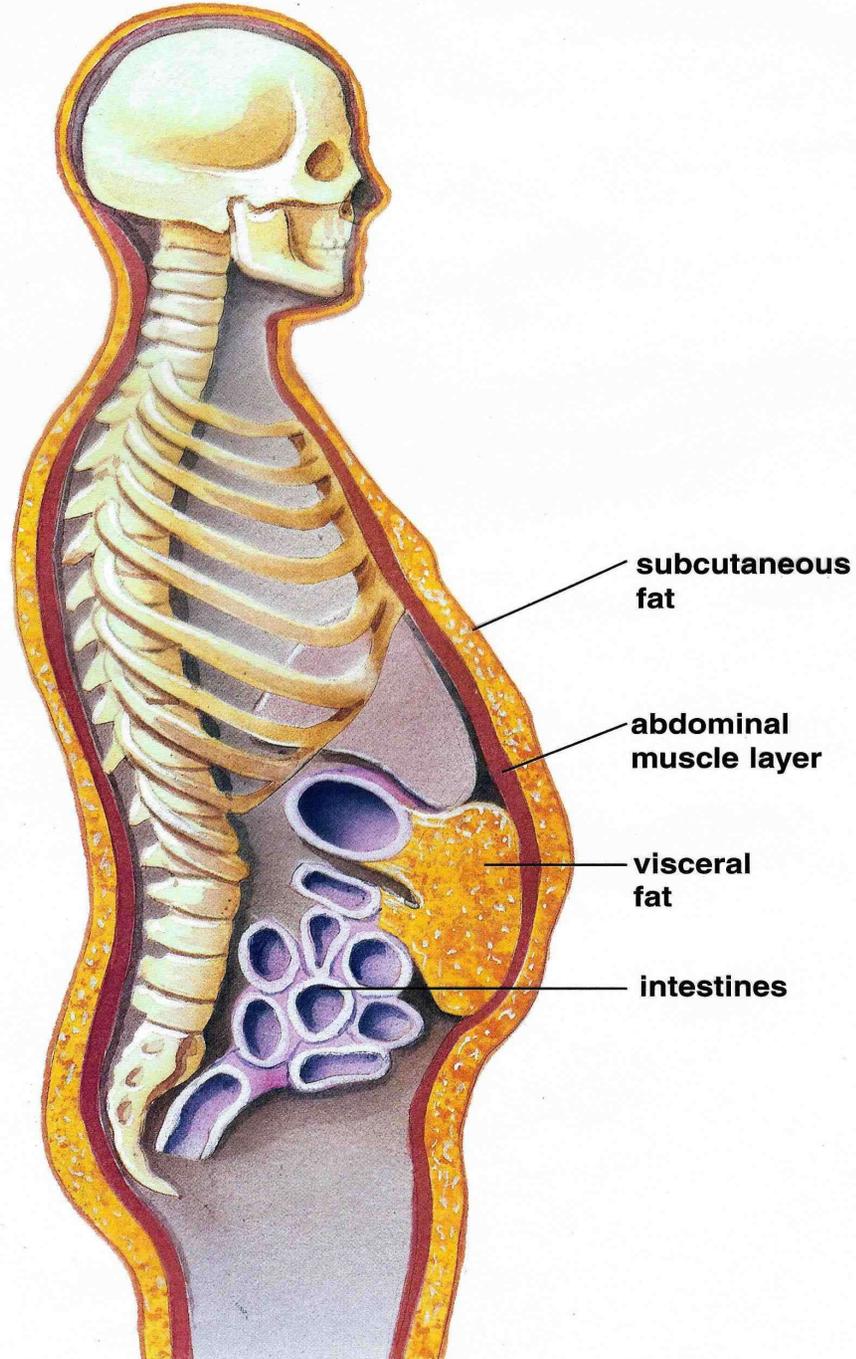
Experiencing Underwt

Healthy weight

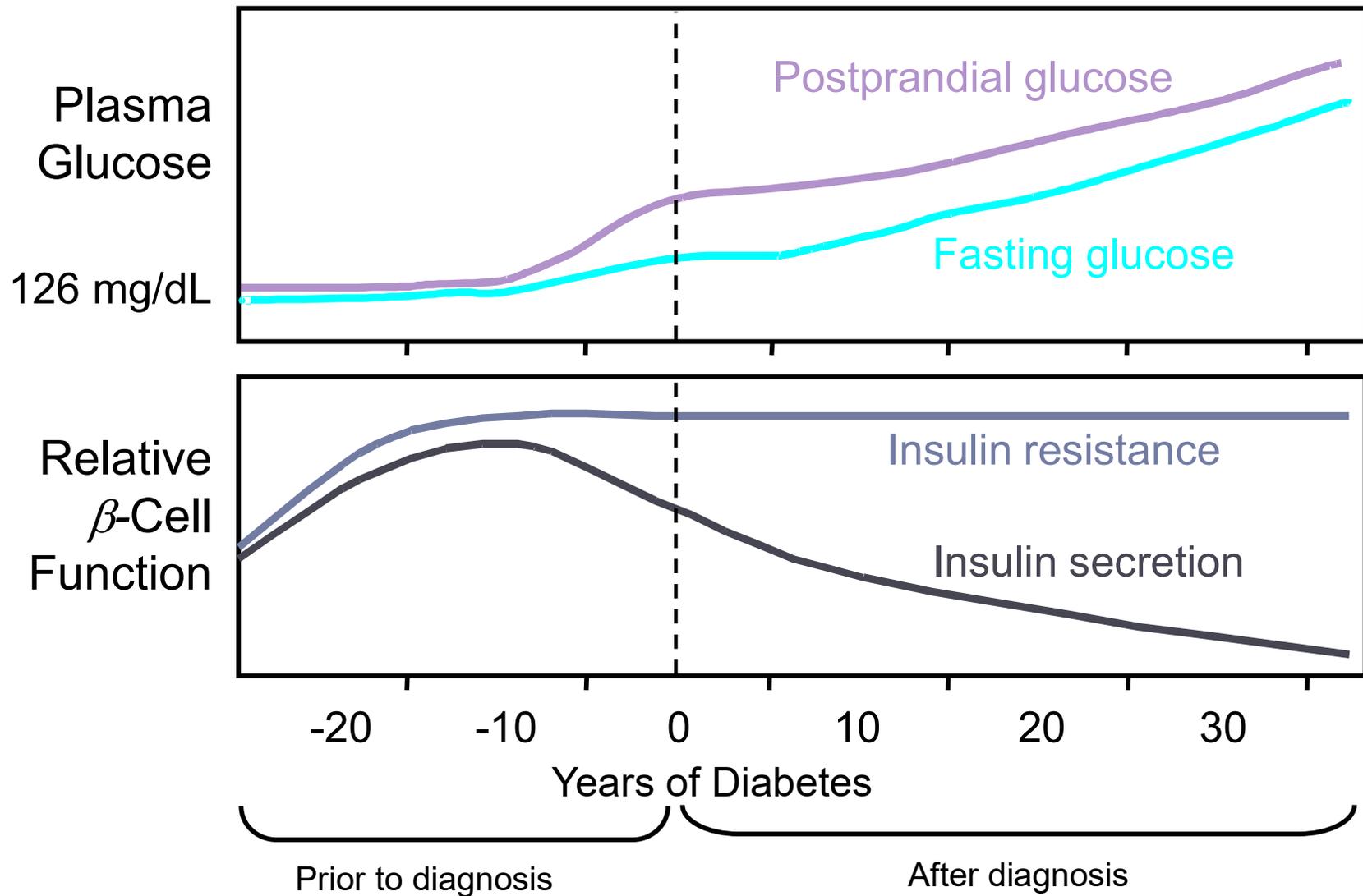
Experiencing overwt

Experiencing obesity

Visceral Fat and Subcutaneous Fat



Natural Progression of Type 2 Diabetes



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 2023 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*
 - ▶ HIV on antiretroviral meds*
 - ▶ History of heart disease



Diabetes 2 - Who is at Risk?

(ADA Clinical Practice Guidelines)



Screen using A1c,
Fasting Blood Glucose
or OGTT.

If negative, repeat
screening at least every
3 years.

*If prediabetes, on
antiretroviral meds,
recheck yearly

Risk factors cont'd

- ▶ HTN - BP > 140/90
- ▶ HDL < 35 or triglycerides > 250
- ▶ History of Gestational Diabetes Mellitus
- ▶ Polycystic ovary syndrome (PCOS)
- ▶ Other conditions assoc w/ insulin resistance:
 - ▶ Elevated BMI, acanthosis nigricans (AN)

RECOMMENDATIONS FOR DIAGNOSIS AND CLASSIFICATION OF DIABETES – 2023

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

DIABETES TYPE	RISK FACTORS and FREQUENCY OF SCREENING and TESTING FOR DIABETES
<i>Type 1</i>	Screening for presymptomatic type 1 diabetes, by testing autoantibodies to insulin, GAD, islet antigen 2, or ZnT8 is recommended in research study setting or for those with first-degree family members with type 1 diabetes.
<i>Type 2</i>	<ol style="list-style-type: none"> 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: <ul style="list-style-type: none"> • History of cardiovascular disease • Physical inactivity • First degree relative with diabetes • History of GDM (repeat test at least every 3 years) • People with HIV* • Hypertension $\geq 140/90$ or on therapy for HTN • HDL ≤ 35 mg/dl or triglyceride ≥ 250 mg/dl • A1c $\geq 5.7\%$ or Impaired Fasting Glucose (test yearly) • Other clinical conditions associated with insulin resistance (PCOS, Acanthosis Nigricans) • High risk ethnicity (African American, Latino, Native American, Asian American, Pacific Islanders) 3. If results normal, repeat test at a minimum of 3-year intervals or more frequently based on risk status. 4. *Screen those w/ HIV with FPG before starting & during antiretroviral therapy. If FPG normal, check yearly.

TESTS TO DIAGNOSE DIABETES - TABLE 2

STAGE	For all the below tests, in the absence of unequivocal hyperglycemia, Confirm results by repeat testing.			
	A1C <i>NGSP certified & standardized assay</i>	Fasting* Plasma Glucose (FPG) <i>*No intake 8 hrs.</i>	Random Plasma Glucose	Oral Glucose Tolerance Test (OGTT) 75-g <i>(Carb intake of ≥ 150 g/day for 3 days prior to test.)</i>
Diabetes	A1C $\geq 6.5\%$	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

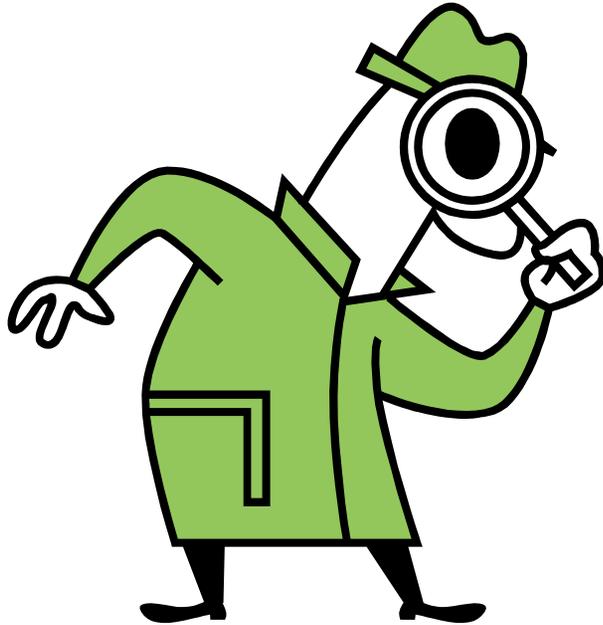


Risk based Screening Criteria PreDiabetes & T2 Kids & Adolescents

- ▶ 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)

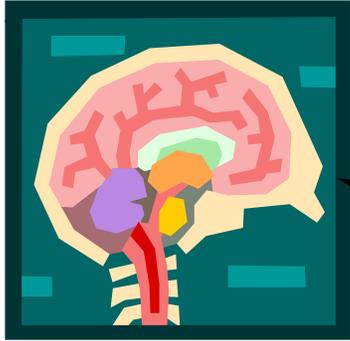


Diabetes Detectives Needed

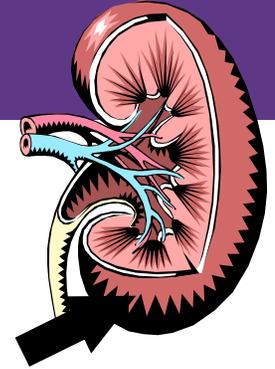


- ▶ On average – takes 6.5 years to diagnose diabetes
- ▶ 1/4 of all people with diabetes don't know they have it
- ▶ 50% of Latino and Asians are undiagnosed

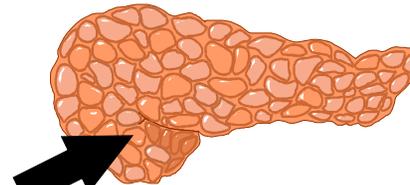
Ominous Octet



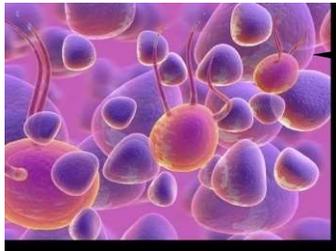
Decreased satiation neurotransmission



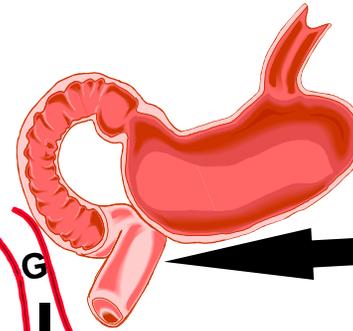
Increased renal glucose reabsorption



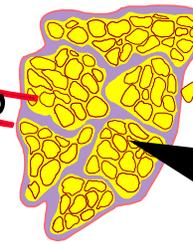
**Decreased amylin, β -cell secretion
80% loss at dx**



Increased glucagon secretion

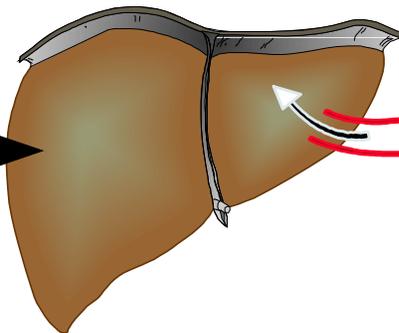


Decreased Gut hormones

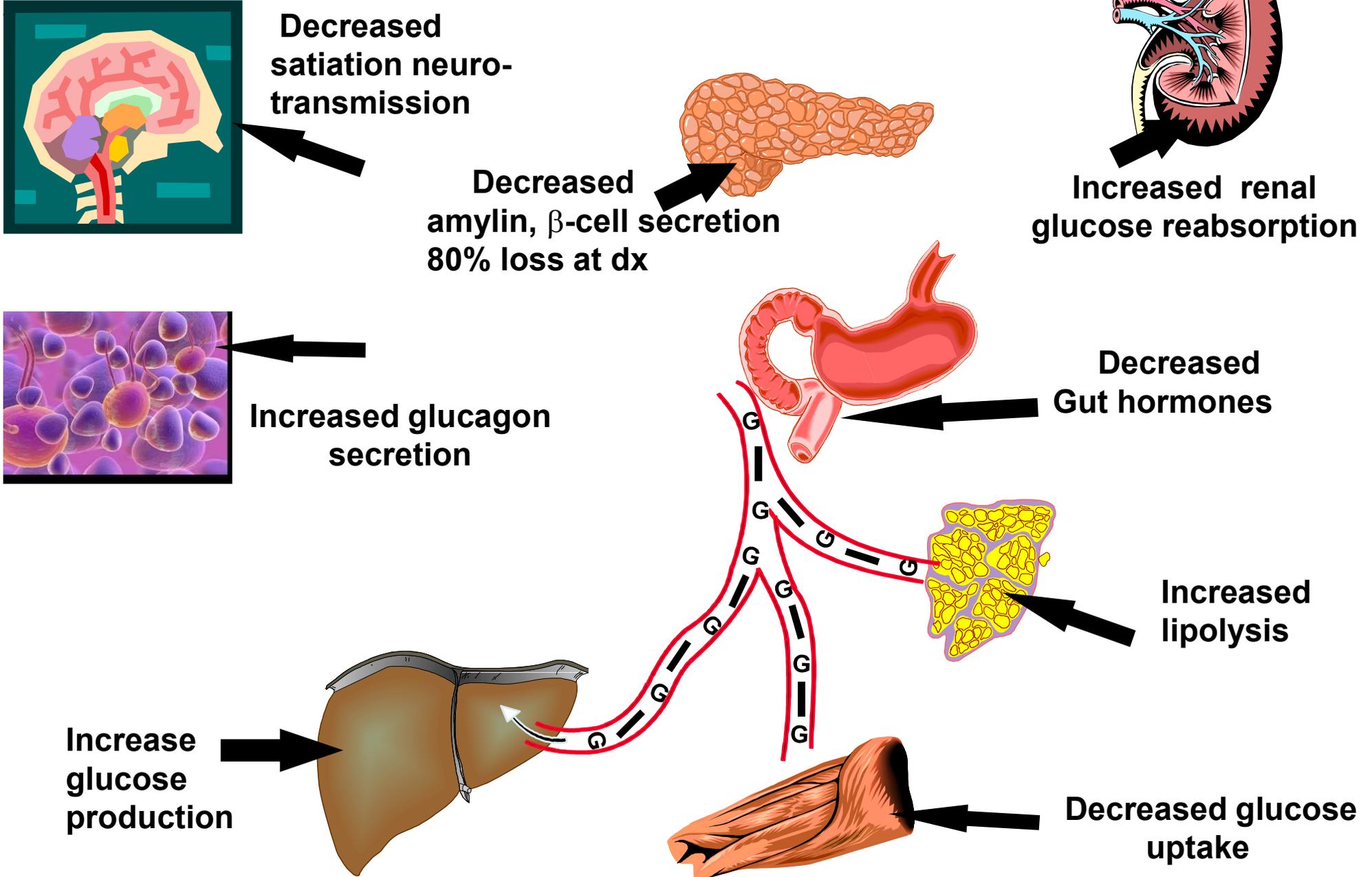


Increased lipolysis

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.
- ▶ AWP: ~\$650 a month



Class/Main Action	Name(s)	Daily Dose Range	Considerations
SGLT2 Inhibitors “Glucoretic” • Decreases glucose reabsorption in kidneys	Canagliflozin* (Invokana)	100 - 300 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%.
	Dapagliflozin* (Farxiga)	5 - 10 mg 1x daily	
	Empagliflozin*† (Jardiance)	10 - 25 mg 1x daily	
	Ertugliflozin (Steglatro)	5 – 15 mg 1x daily	
	Bexagliflozin (Brenzavvy)	20 mg 1x daily	

Quick Question 5

- ▶ A potential side effect of SGLT-2 Inhibitors is:
 - a. Genital Infections
 - b. Hypertension
 - c. Kidney tenderness
 - d. Increased uric acid



Comparison of Type 1 and Type 2

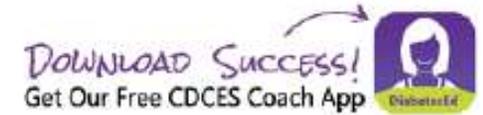
Feature	Type 1	Type 2
▶ Excess weight	x	xxx
▶ Insulin dependence	xxx	30%
▶ Respond to oral agents	x	xxx
▶ Antibodies present	xxx	0
▶ Typical age of onset	puberty	40-65
▶ Insulin Resistance	x	xxx

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

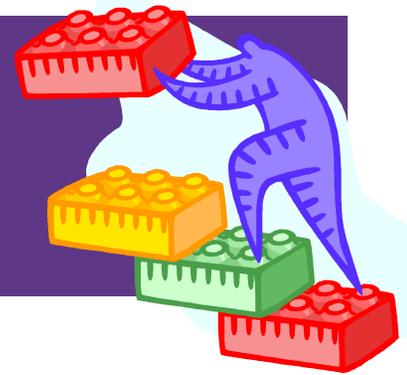


Class/Main Action	Name(s)	Daily Dose Range	Considerations
Biguanides <ul style="list-style-type: none"> Decreases hepatic glucose output First line med at diagnosis of type 2 	metformin (Glucophage)	500 - 2500 mg (usually BID w/ meal)	Side effects: nausea, bloating, diarrhea, B12 deficiency. To minimize GI Side effects, use XR and take w/ meals. Obtain GFR before starting. <ul style="list-style-type: none"> If GFR <30, do not use. If GFR <45, don't start Metformin 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%.
	Riomet (liquid metformin)	500 - 2500mg 500mg/5mL	
	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 2023



- ▶ **Step 1** – 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** - If A1c target not achieved after 3 months, add another med
 - ▶ If ASCVD, CHF, or CKD, consider adding a second 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, 3 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



Evaluating Kidney Function - Albumin

▶ Urinary Albumin Creatinine Ratio (UACR)

▶ UACR can be assessed with a urinary spot collection.

- ▶ Evaluates ratio of urine albumin /creatinine in mg/g
- ▶ Target range less than 30mg/g
- ▶ If elevated, repeat test to verify

www.DiabetesEd.net

Results are viewed by lab short description

Collection Date & Time	01/13/2022 07:59
ALBUMIN, RANDOM...	
ALBUMIN, URINE	2.9
ALBUMIN/CREATININ...	32
CREATININE, RANDO...	91

$2.9 / 91 = 0.0318$ mg/mg or 31.8 (32) in mg/g

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 +

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

Poll question

- ▶ Which of the following groups of meds for a month supply are cheapest? (multiple)
 - a. Actos and Avandia \$5 & \$324
 - b. Glipizide, Glyburide, Glimepiride \$10 for 3 mo's
 - c. Metformin and Metformin XR \$10 for 3 mo's
 - d. Januvia and Onglyza (DPP-IV) 549 & \$596
 - e. Exenatide (GLP-1) \$909, \$1022
 - f. Empagliflozin (SGLT-2s) \$658



See Table 9.3 in ADA Standards on Median Monthly Average Wholesale Price (AWP) 2023

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

- ▶ Fatty liver disease
- ▶ Obstructive sleep apnea
- ▶ Alzheimer's
- ▶ Distress
- ▶ Cancer; pancreas, liver, breast



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

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

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

- ▶ Can't, shouldn't, don't, have to
- ▶ Regimen
- ▶ Refused
- ▶ Victim, suffer, stricken

New Way

- ▶ Have you tried..."
- ▶ What about..."
- ▶ May I make a suggestion..."

- ▶ Plan, choices
- ▶ Declined, Chose not to
- ▶ ..lives with diabetes
- ▶ ...has diabetes

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

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?



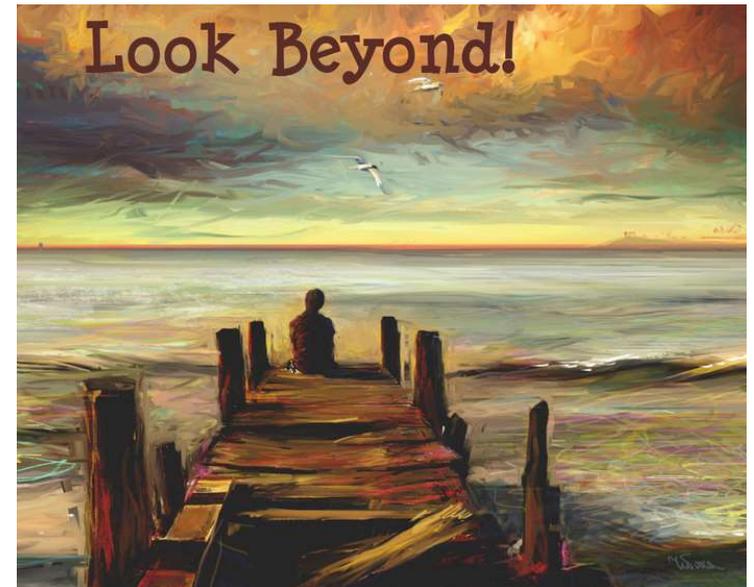
Mrs. Jones asks you What Do You Say?

- ▶ 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 is 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
- ▶ Depression, anxiety
- ▶ Mental illness
- ▶ Addiction issues



6. Glycemic Targets

Individualize Targets – ADA

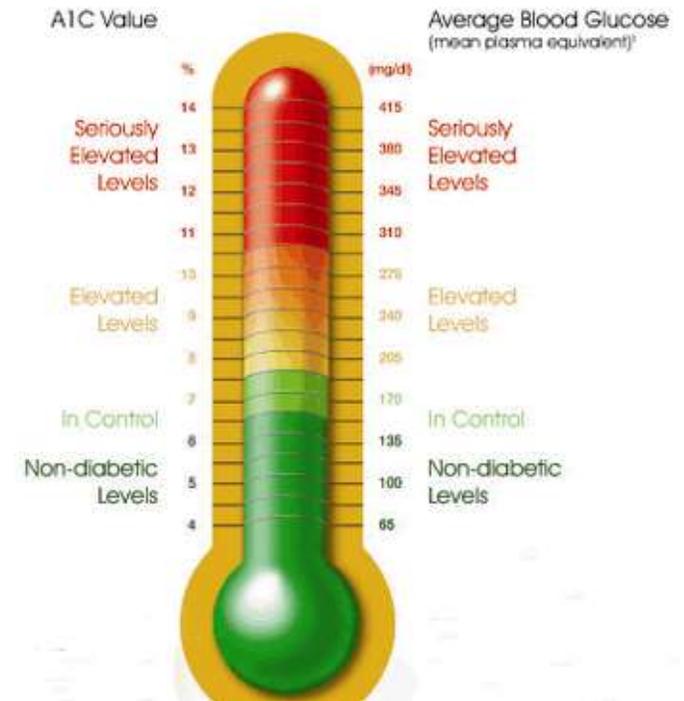


- ▶ Pre-Prandial BG 80- 130
- ▶ 1-2 hr post prandial < than 180
*for nonpregnant adults
- ▶ Time in Range (CGM) 70%

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)

<u>A1c (%)</u>	<u>eAG</u>
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)

$eAG = 28.7 \times A1c - 46.7 \sim 29 \text{ pts per } 1\%$
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 $\sim 0.26\%$ (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 Report

- ▶ 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 under 25 years, with A_{1c} goal is < 7.5%, time-in-range target is set to about 60%.



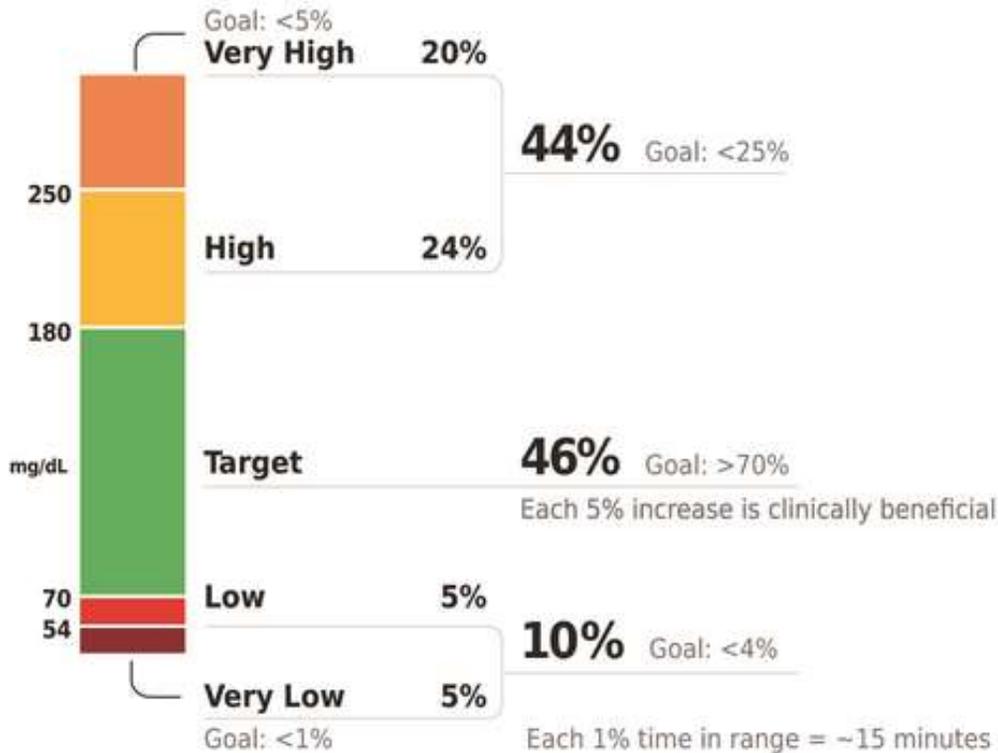
AGP Report

Name _____

MRN _____

AGP Report: Continuous Glucose Monitoring

Time in Ranges Goals for Type 1 and Type 2 Diabetes



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.

Getting Blood Glucose to Goal Matters

- ▶ **Prevention**
- ▶ **Trials**
- ▶ **Practice Recommendations**



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)



Weight loss and Prevention

- ▶ For every 2.2 pounds of weight loss, risk of type 2 diabetes was reduced by 13%.



Subcutaneous
adipose tissue

Visceral
adipose tissue

- 5-10% weight loss
- 30% visceral adipose tissue loss
(diet, physical activity,
pharmacotherapy)



Abdominally
obese
(high waist
measurement)

Deteriorated

Lipid
profile

Improved

Impaired

Insulin sensitivity
Insulinaemia
Glycaemia

Improved

Susceptibility
to thrombosis

Inflammation
markers

Impaired

Endothelial
function

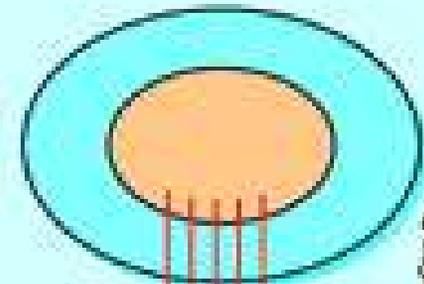
Improved

High

Risk of coronary
heart disease

Low

Reduced
obesity
(low waist
measurement)



Goals of Care



6. Glycemic Targets

A1C

Blood Pressure

Cardiovascular risk
reduction



ABCs of Diabetes – ADA 2023

▶ **A1C** less than 7%

▶ Pre-meal BG 80-130

▶ Post meal BG <180

▶ Time in Range (70-180) 70% of time

▶ **B**lood Pressure < 130/80

▶ **C**holesterol

▶ 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 (*sitagliptin*) Tradjenta (*linagliptin*)

~~Onglyza (*saxagliptin*)~~ Nesina (*alogliptin*)

DPP – 4 Inhibitors “Incretin Enhancers” <ul style="list-style-type: none"> • 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

IT TAKES 524 BURPEES

TO BURN OFF 1 LARGE FRIES

BURPEES SUCK, SO CHOOSE WISELY!

@IG.HEALTH



- ▶ 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

Best Shake For People with Diabetes



**“The only diet shake I recommend is the shake
your booty makes when you exercise.”**

From Debbie Nagata's slide collection

Diabetes Care Guidelines- ADA

<u>Test / Exam</u>	<u>Frequency</u>
▶ 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

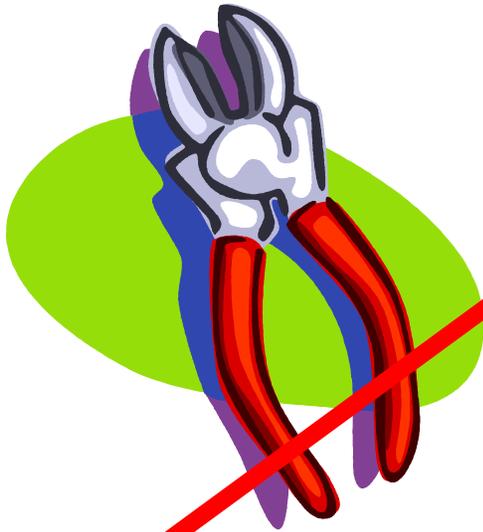
- ▶ Walks dog around block 3 x's a week
- ▶ Bowls every Friday
- ▶ 3 beers daily
- ▶ *What meds?*
- ▶ *What referrals?*
- ▶ *My foot hurts*

Lower Extremities

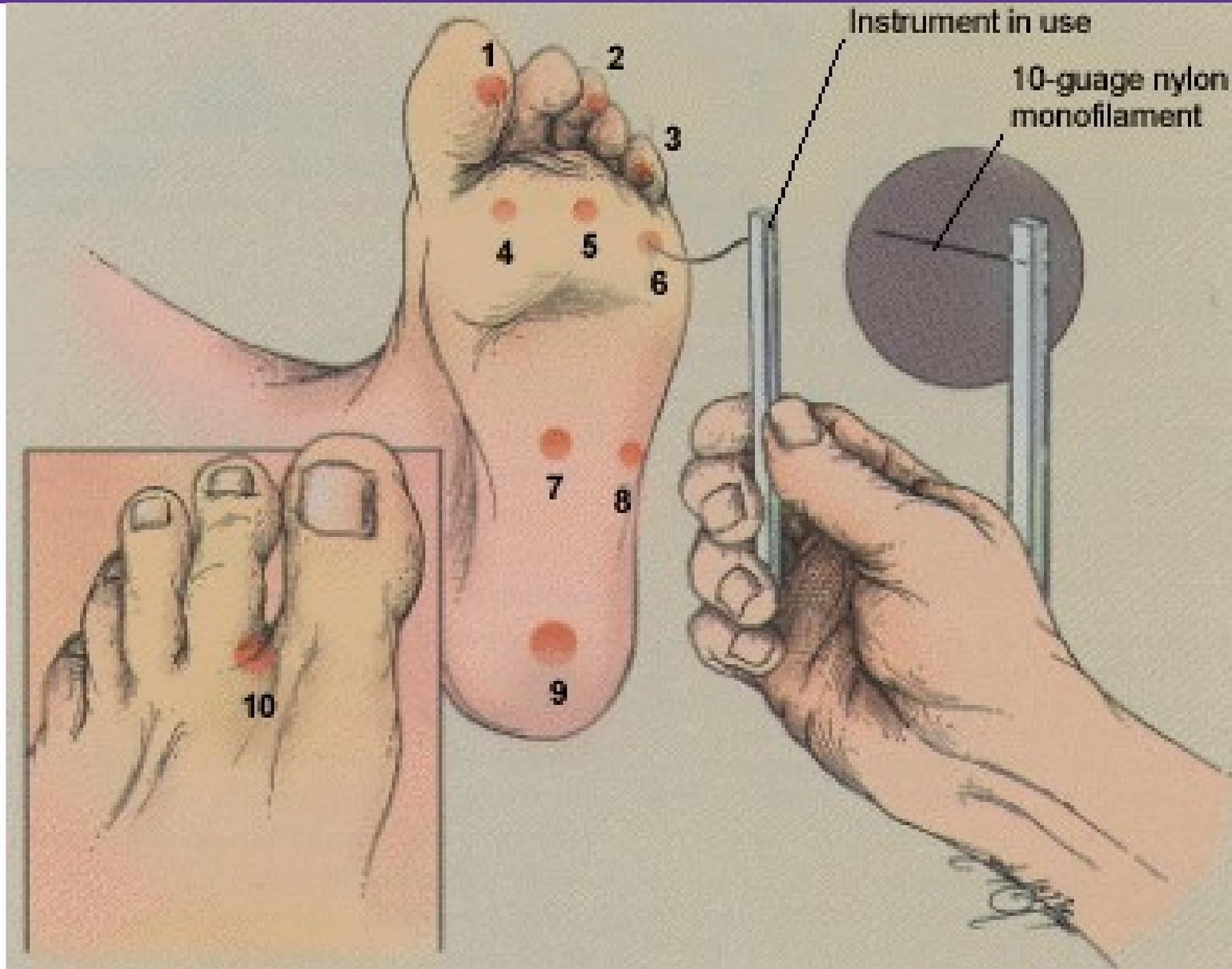
- ▶ Lift the Sheets and Look at the Feet



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.

“Getting diabetes saved my life.”

~ Sherri Sheperd

PLAN

D

How to

**LOSE WEIGHT
AND BEAT**

DIABETES

(EVEN IF YOU DON'T HAVE IT)

**SHERRI
SHEPHERD**

Emmy Award-Winning Cohost of *The View*

WITH BILLIE FITZPATRICK

READ BY THE AUTHOR



**Sherri Shepard
decided to embrace
diabetes and use it as
a motivator to improve
her health.**

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:

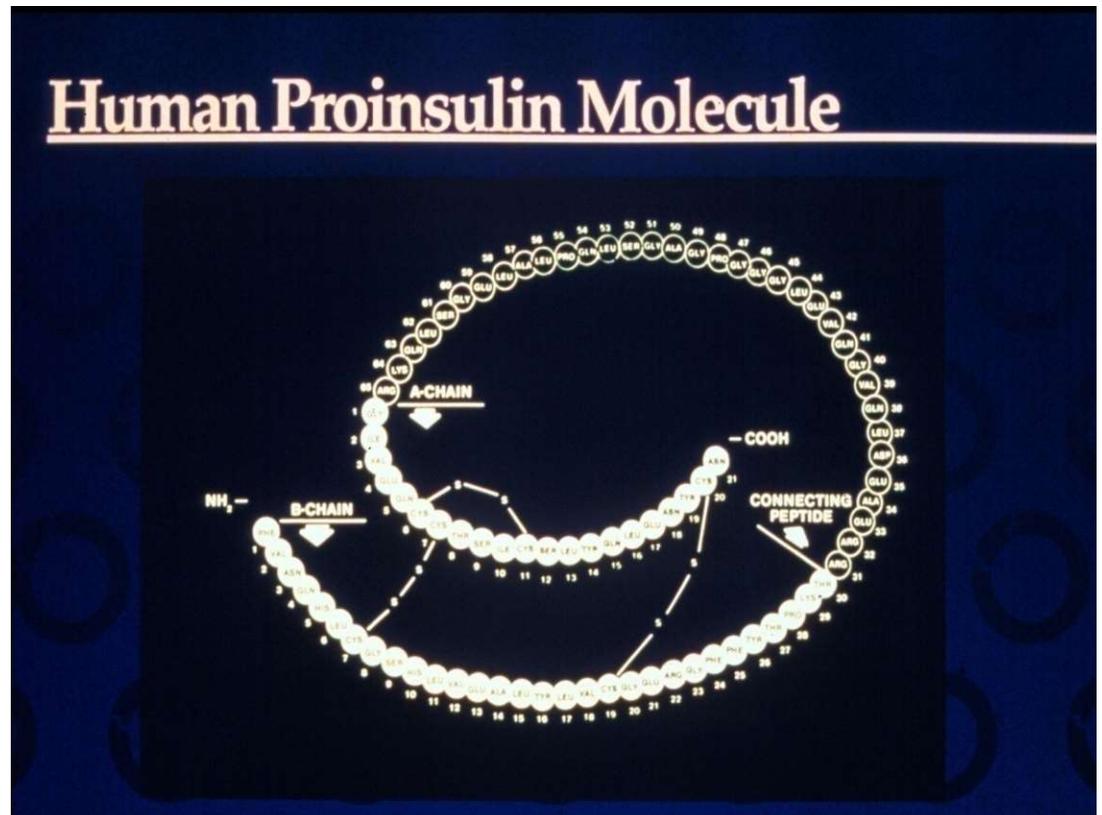
G The activity goal is to do ___ minutes on most days

G Name 3 healthy foods to include in daily meal plan

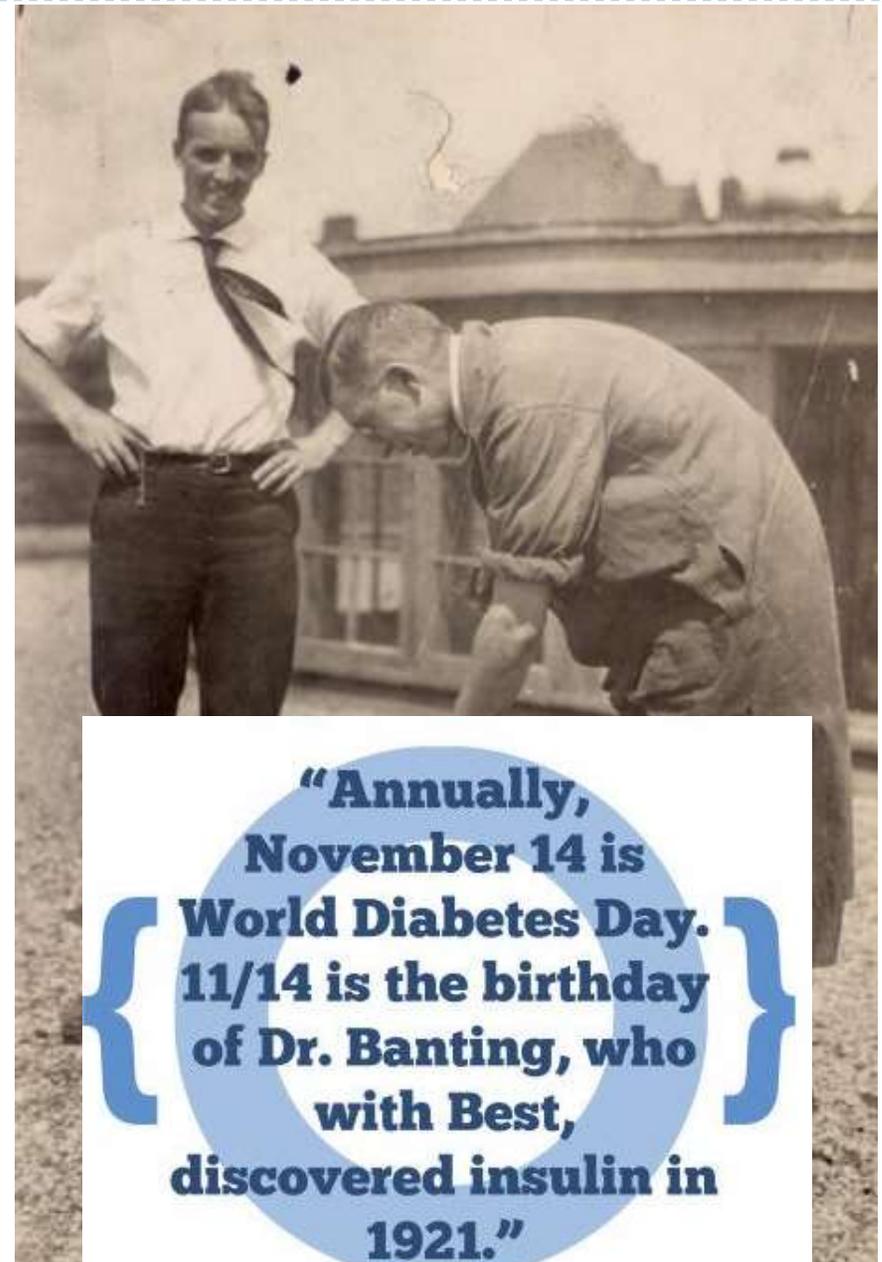
Insulin – the Ultimate Hormone Replacement Therapy

Objectives:

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



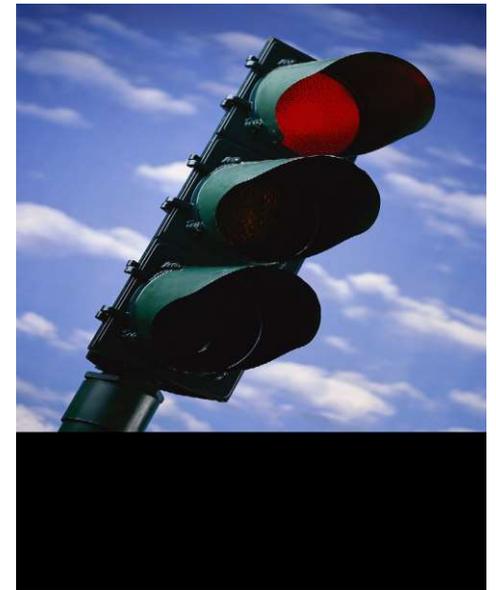
Best and Banting – U of Toronto 1921



**“Annually,
November 14 is
World Diabetes Day.
11/14 is the birthday
of Dr. Banting, who
with Best,
discovered insulin in
1921.”**

Psychological Insulin Resistance (PIR)

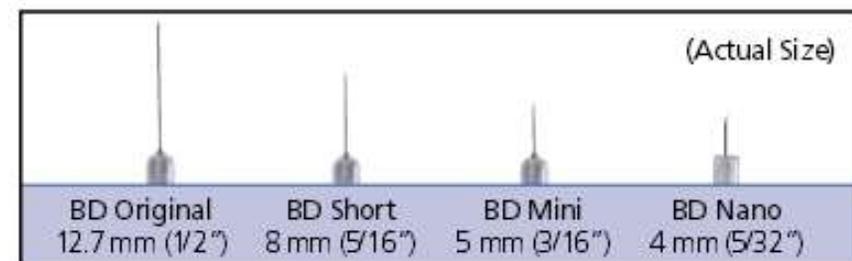
- ▶ 50% of providers in study threatened pts “with the needle”.
- ▶ Less than 50% of providers realized insulins’ positive effect on type 2 dm
- ▶ Most inds don’t believe that insulin would “better help them manage their diabetes”.
- ▶ Solutions: Find the root of PIR and address



Diabetes Attitudes, Wishes, Needs Study - Rubin

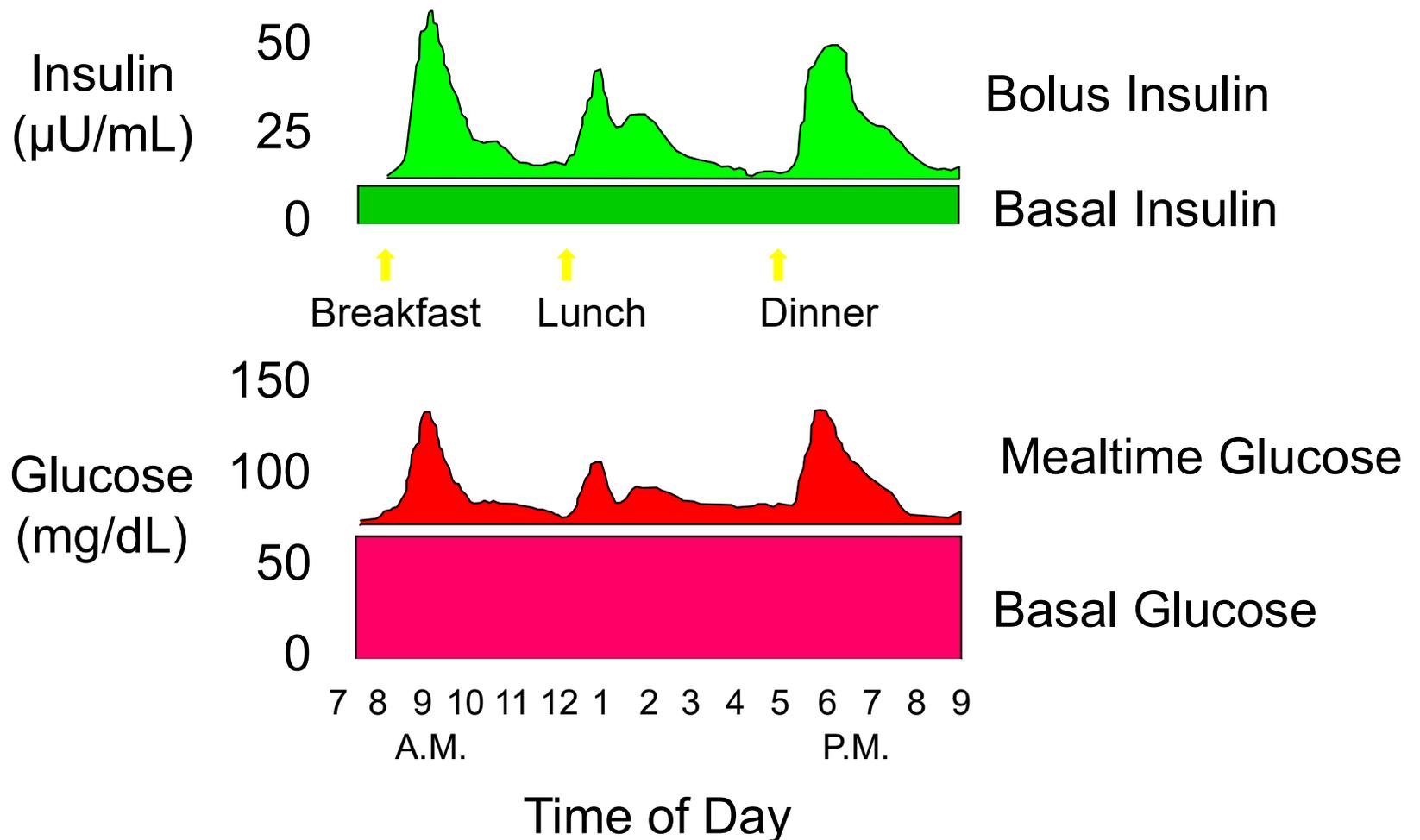
Problem Solving Tips for more comfortable injections

- ▶ 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 injection
- ▶ 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



Devices to Inject insulin



Syringe



Pen



Injector



Pump

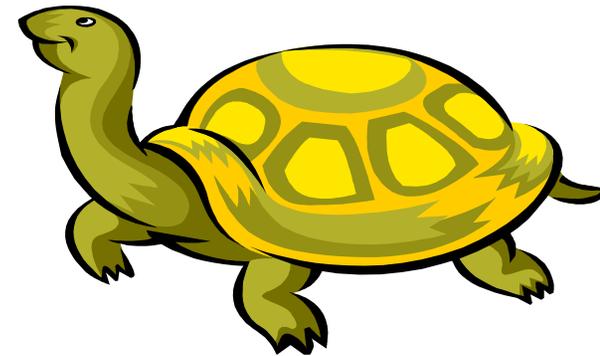
Choice of device is person centered and based on:

- Preference
- Cost
- Convenience

Insulin Action Teams



- ▶ Bolus: lowers after meal glucose levels
 - ▶ Very Rapid Acting – Aspart (Fiasp)
 - ▶ Rapid Acting
 - ▶ Aspart, Lispro, Admelog, Glulisine, Afrezza
 - ▶ Short Acting - Regular
- ▶ Basal: controls glucose between meals, hs
 - ▶ Intermediate
 - ▶ NPH
 - ▶ Long Acting
 - ▶ Detemir (Levemir)
 - ▶ 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 $\frac{1}{2}$ total daily dose
- ▶ Covers food or hyperglycemia.
- ▶ 1 unit
 - ▶ Covers \approx 10 -15 gms of carb
 - ▶ Lowers BG \approx 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



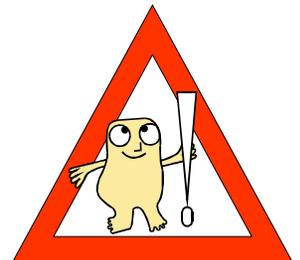
Pattern Management –AKA

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

($\frac{1}{2}$ of total daily dose)

<u>Intermediate Acting</u>	<u>Peak Action</u>	<u>Duration</u>
▶ NPH	4-12 hrs	12-24

<u>Long Acting</u>	<u>Peak Action</u>	<u>Duration</u>
▶ Detemir (Levemir)	No Peak	20 hrs
▶ 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 detemir (Levemir) at hs and 10 units aspart (Novolog) 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?
- Advise RL to eat bedtime protein/carb snack.
 - Decrease breakfast aspart by 2 units.
 - Increase breakfast carbs by 15 gms.
 - Decrease detemir (Levemir) by 10 -20%

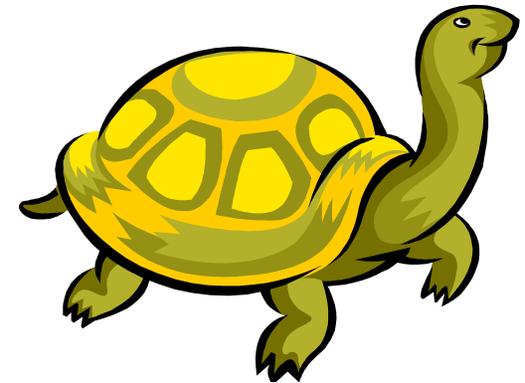
Type 2 started on glargine 10 units hs.
Newly discovered hyperglycemia.

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



Hospitals and Hyperglycemia- What's the Big Deal?

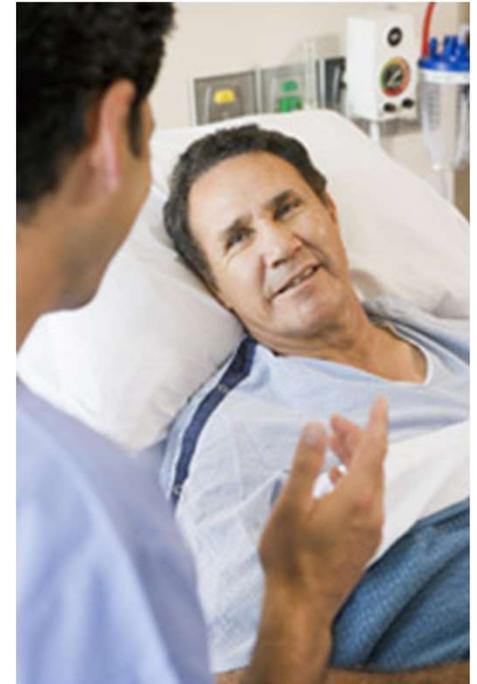
- ▶ Hyperglycemia is associated with increased morbidity and mortality in hospital settings.
 - ▶ Acute Myocardial Infarction
 - ▶ Stroke
 - ▶ Cardiac Surgery
 - ▶ Infection
 - ▶ Longer lengths of stay



16. Diabetes Care in the Hospital - ADA Goals and Treatments For Hospitalized Patients

Blood glucose goal is 140-180

- ▶ Individualize based on pt status
- ▶ Goal of 110 -140 (ie post CABG)
- ▶ **100-180** (ie non-critical care)
- ▶ Avoid hypo and hyper
- ▶ Start subq insulin if BG > 180
 - ▶ Stop oral meds
 - ▶ Basal bolus therapy if eating
 - ▶ Basal + correction scale if higher risk for hypo
- ▶ Critical Care:
 - ▶ Basal bolus or Insulin drip



ADA Standards
2023

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:

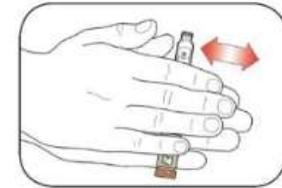
- Pre-mixed, difficult to fine tune therapy

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:

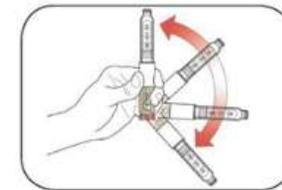
- Gently roll the Pen between your hands 10 times.



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.



Types of premix insulins

There are 2 different types of premix insulin, sometimes referred to as human and analog.

Human insulin



Novolin® 70/30

Analog insulin



NovoLog® Mix 70/30

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

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 <ul style="list-style-type: none">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

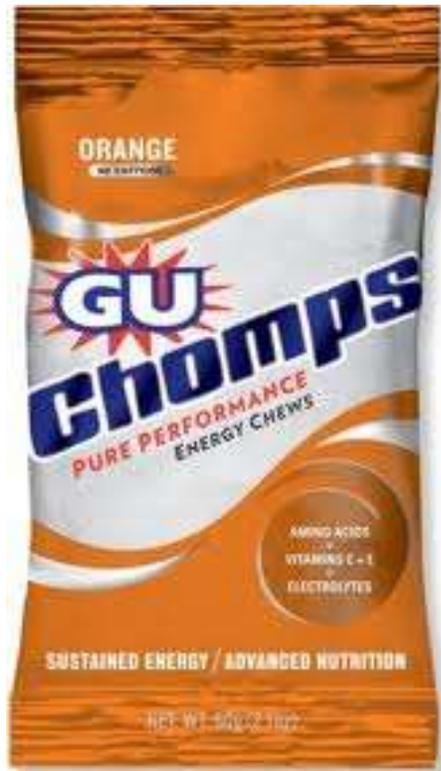
- ▶ If blood glucose **70**mg/dl or below:
 - 10-15 gms of carb to raise BG 30 - 45mg/dl
- ⌚ Retest in 15 minutes, if still low, treat again, even without symptoms
- ⌚ Follow with usual meal or snack
- ⌚ If non responsive, give D50 IV or glucagon Emergency Kit
- ⌚ Figure out how to prevent in future



15 - 20 Gms Carb Sources

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





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/1.0mg prefilled syringe or 0.5mg/1.0mg HypoPen auto-injector	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.

Glucagon Emergency Kit



Store 68-77 degrees prior to reconstitution
single use only

Nasal Glucagon - Baqsimi

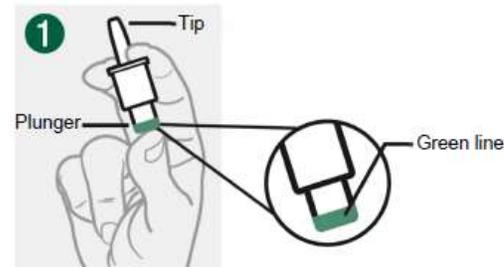
- ▶ Approved for ages 4 +
- ▶ Absorbed nasally
- ▶ No reconstitution or refrigeration needed
- ▶ Kept in temps up to 86
- ▶ Raises BG 67-73 mg/dl
- ▶ Don't use in those with
 - ▶ Pheochromocytoma
 - ▶ insulinoma


baqsimi™
(glucagon) nasal powder 3mg

Keep tube sealed until ready to use.



Giving the Dose



- Hold Device between fingers and thumb.
- Do not push Plunger yet.



- Insert Tip gently into one nostril until finger(s) touch the outside of the nose.



- Push Plunger firmly all the way in.
- Dose is complete when the Green Line disappears.

Gvoke HypoPen – Single dose injector

Gvoke HypoPen™
(glucagon injection)

0.5 mg per 0.1 mL

NDC 72065-120-11 **R** Only

Contains 1 Single-Dose Auto-Injector

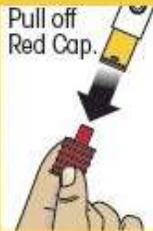
FOR LOW BLOOD SUGAR EMERGENCY

1. Prepare

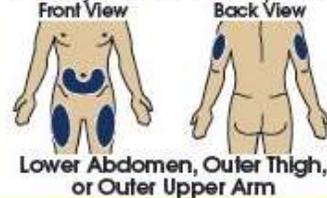
Tear Open Pouch at Dotted Line. Remove Auto-Injector.



Pull off Red Cap.



Choose Injection Site and Expose Skin.



Lower Abdomen, Outer Thigh,
or Outer Upper Arm

2. Inject

Push Down on Skin to Start. Hold Down for 5 Seconds. Wait for Window to Turn Red.



Hold Down for 5 Sec.

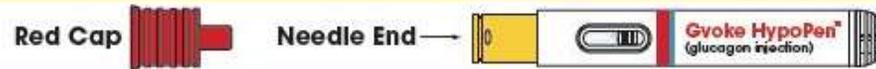


3. Assist

Turn Patient on Side. Call Emergency Medical Help.



After the Injection, Put the Used Pen in a Safe Place Until It Can Be Disposed of Into a FDA Cleared Sharps Container.



Gvoke HypoPen™
(glucagon injection)

1 mg per 0.2 mL

NDC 72065-121-11 **R** Only

Contains 1 Single-Dose Auto-Injector

FOR LOW BLOOD SUGAR EMERGENCY

1. Prepare

Tear Open Pouch at Dotted Line. Remove Auto-Injector.



Pull off Red Cap.



Choose Injection Site and Expose Skin.



Lower Abdomen, Outer Thigh,
or Outer Upper Arm

2. Inject

Push Down on Skin to Start. Hold Down for 5 Seconds. Wait for Window to Turn Red.



Hold Down for 5 Sec.



3. Assist

Turn Patient on Side. Call Emergency Medical Help.



After the Injection, Put the Used Pen in a Safe Place Until It Can Be Disposed of Into a FDA Cleared Sharps Container.



Dasiglucagon (Zegalogue)



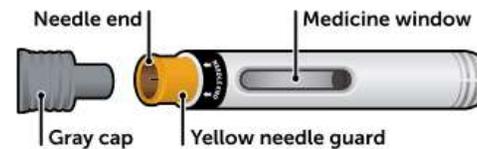
Red protective case



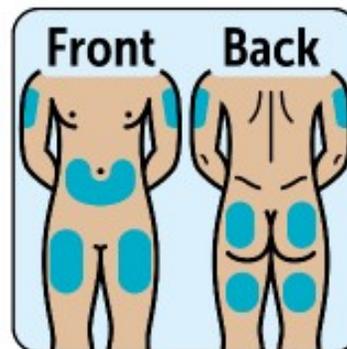
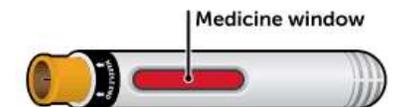
ZEGALOGUE

Autoinjector

Before injection



After injection



Hypoglycemia: Identify, Treat, & Prevent



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 GI
Day 2	81 7R	87 5R	170 8R	133 22u GI
Day 3	73 7R	94 5R	194 8R	110 22u GI
Day 4	62 7R	83 5R	211 8R	127 22u GI

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 GI
Day 2	81 6R	97 7R	107 7R	133 20u GI
Day 3	79 6R	104 7R	124 7R	110 20u GI
Day 4	69 6R	103 7R	208 7R	193 20u GI

More than 200 units a day?

Mockscape



Source: Am J Health-Syst Pharm © 2010 American Society of Health-System Pharmacists

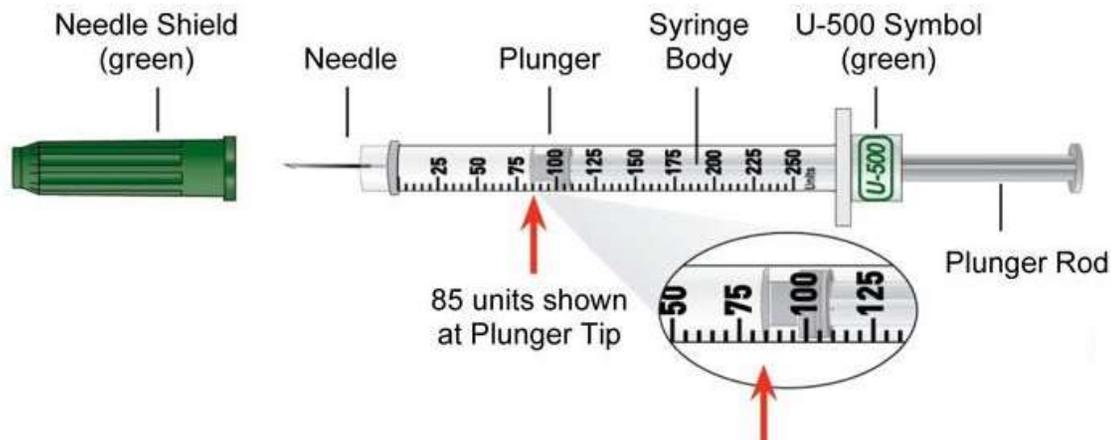
Your patients injecting more than 200 units of insulin per day may be ready for a change

LEARN MORE >

UNITS OF INSULIN

210 260 335

- Maria* has type 2 diabetes with severe insulin resistance
- Her A1C is not at goal
- She is taking multiple insulin injections per day
- Approximately half of her current TDD of insulin is mealtime insulin and half is long-acting insulin



Concentrated Insulins

Concentrated & Inhaled Insulins

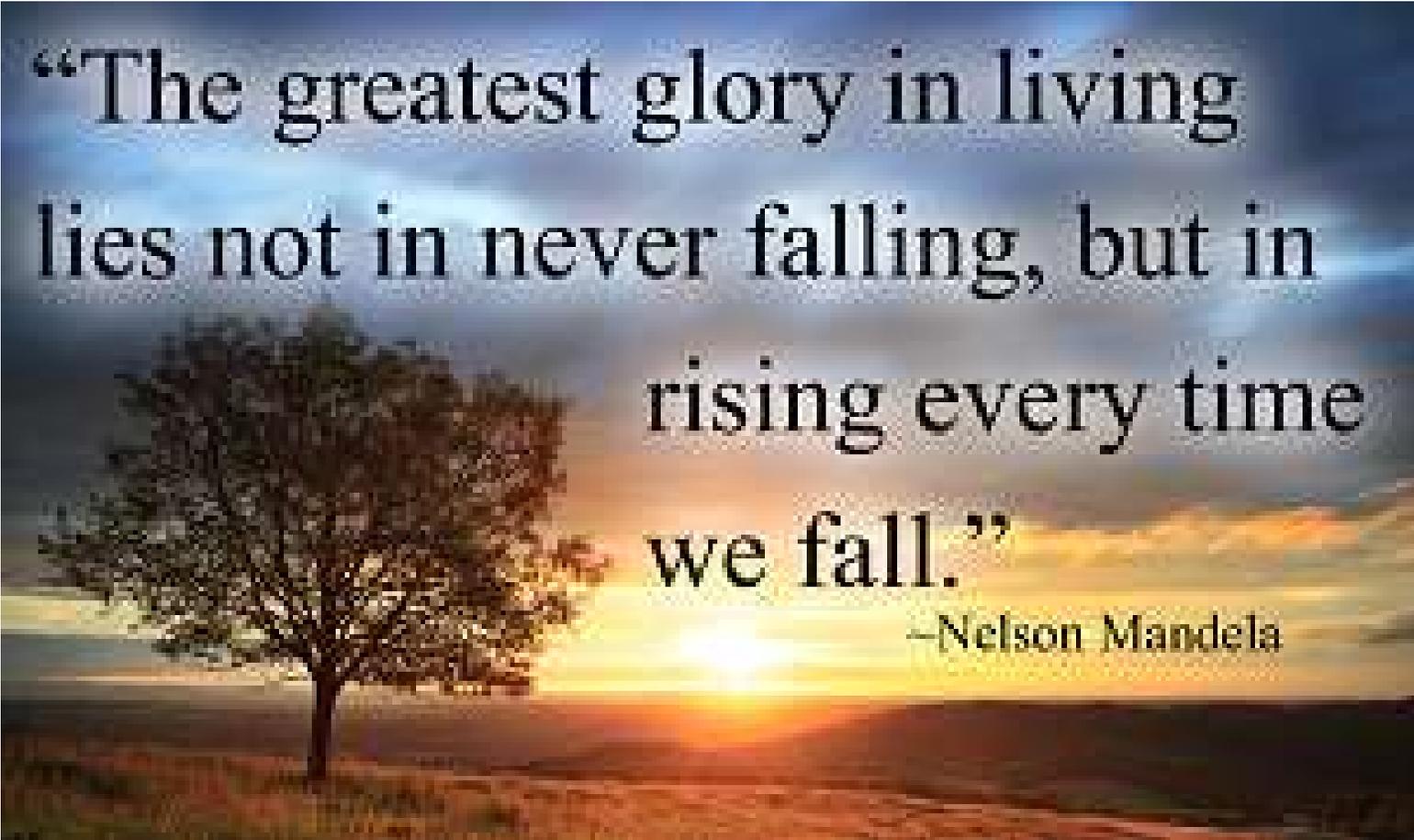
Name/Concentration	Insulin/Action	Considerations
Humulin Regular U-500 <ul style="list-style-type: none">• 500 units insulin/mL• KwikPen or Vial	Regular Bolus / Basal	Indicated for those taking 200+ units daily. 3 mL pen holds 1,500 units. Max dose 300 units. Once opened, good for 28 days. 20 mL vial 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.



Diabetes Vacations

A landscape photograph featuring a single tree on the left side, silhouetted against a bright sunset. The sun is low on the horizon, creating a warm, golden glow that transitions into a darker blue sky. The foreground shows a field of grass. Overlaid on the right side of the image is a quote in a serif font.

“The greatest glory in living
lies not in never falling, but in
rising every time
we fall.”

—Nelson Mandela

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 ____ %

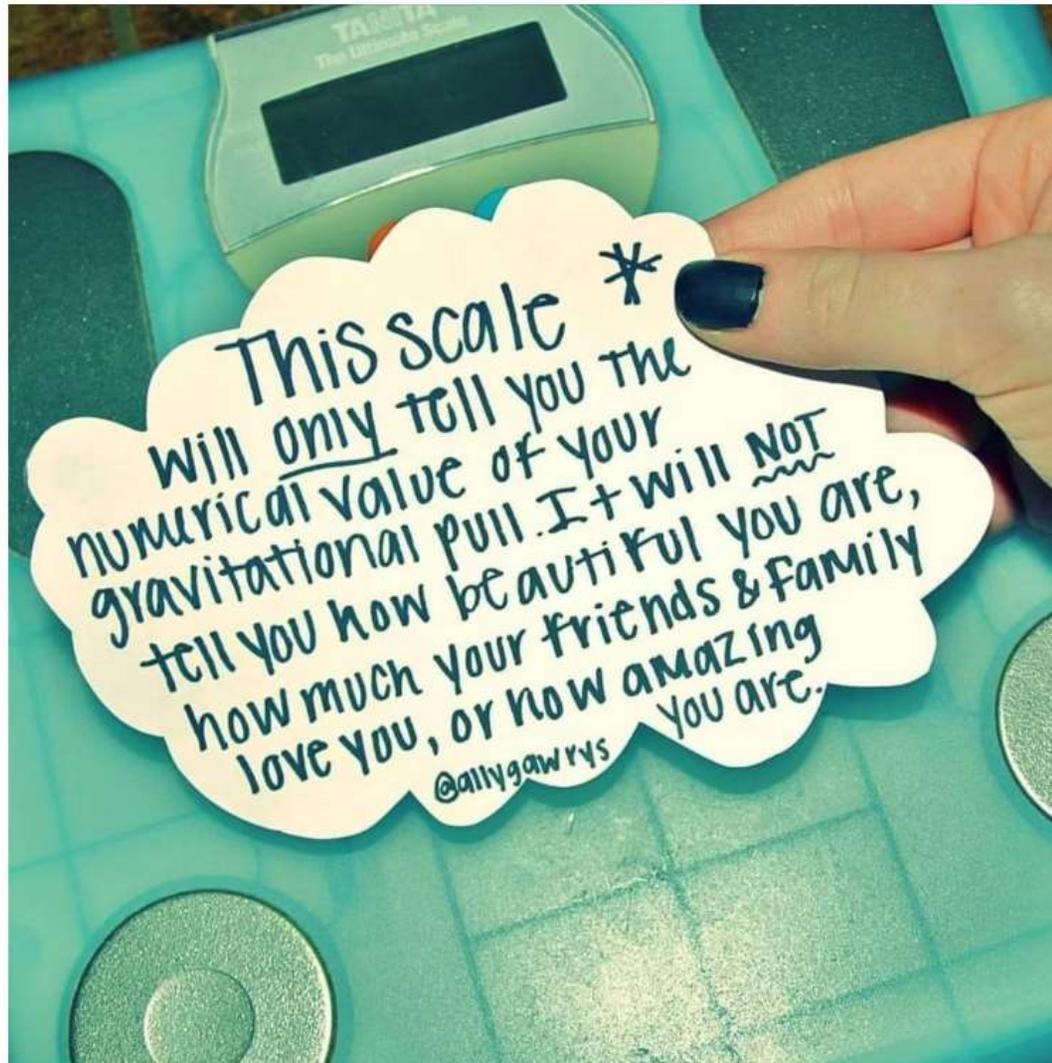
N 1 gm of fat equal _____kilo/calories

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

ADA MNT Standards 2023

Until there is more evidence:

- ▶ Emphasize non starchy vegetables
- ▶ Minimize added sugars and refined grains
- ▶ Choose whole foods over highly processed foods to the extent possible
- ▶ Healthful approaches include:
 - ▶ Mediterranean-style, low-carb and plant based or vegetarian, DASH
- ▶ Plate method good getting started approach
- ▶ Refer to RD/RDN





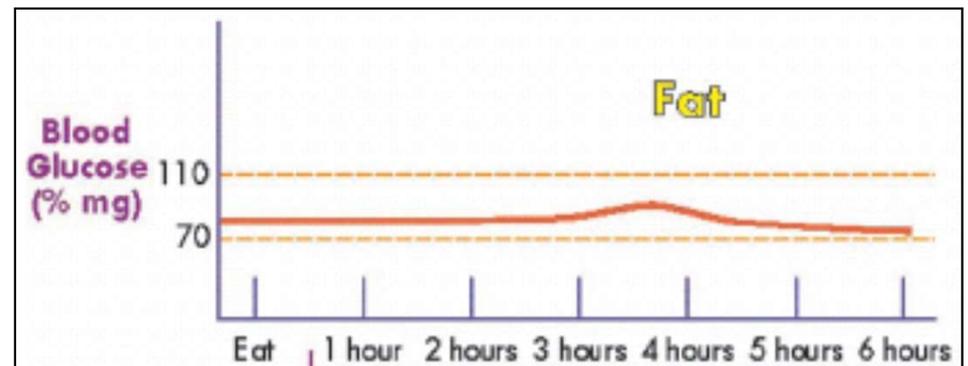
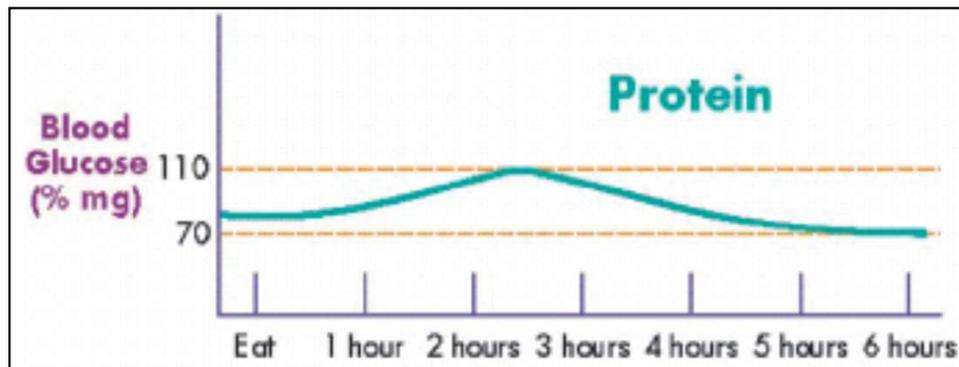
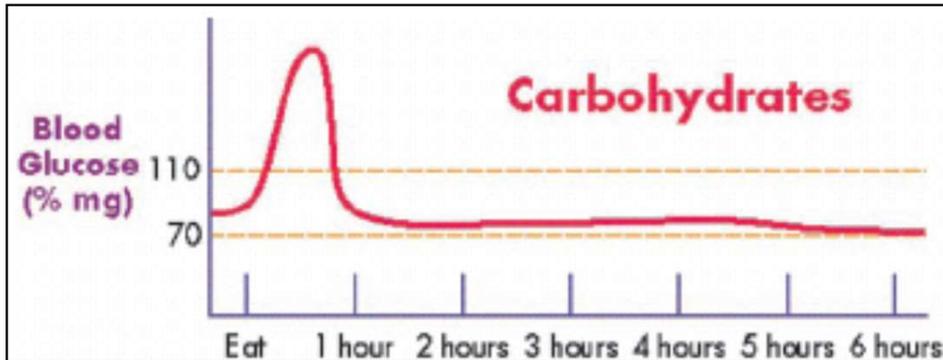
Guatemala: The Mendozas of Todos Santos - Food expenditure for one week: 573 Quetzales or \$75.70. Family Recipe: Turkey... [VIEW MORE](#)
Peter Menzel, from the book, "Hungry Planet: What the World

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



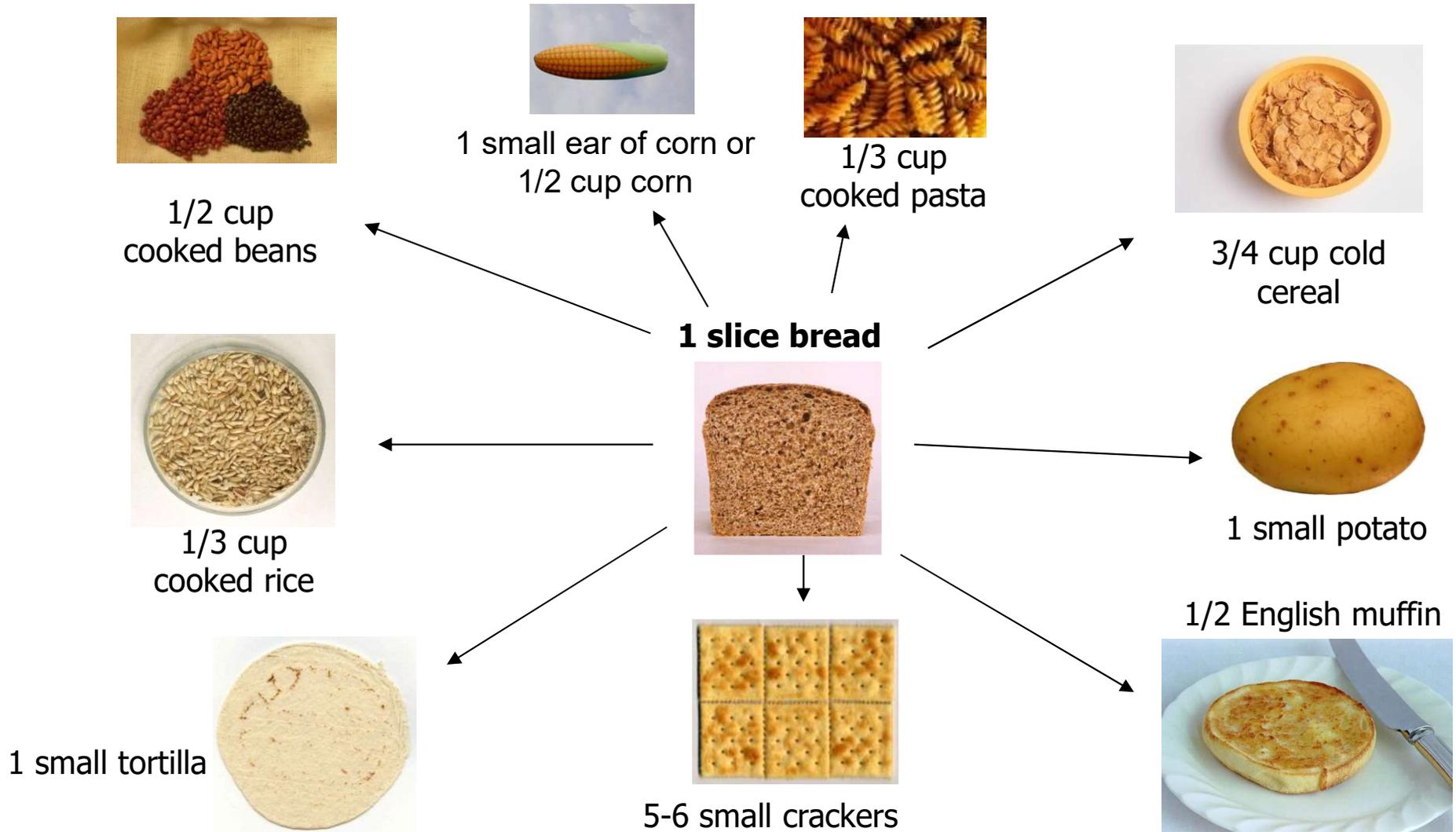
How nutrients affect blood sugar



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

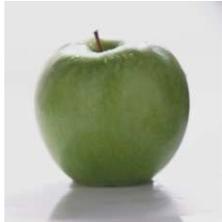
Carb Counting - Starch

Each Food has:
80 Calories
15 grams carb



Carb counting- fruit

Each Food has:
60 Calories
15 grams carb



1 small fresh fruit



1/2 cup fruit juice

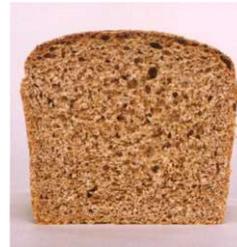


1/2 banana

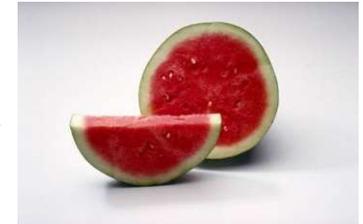


1/2 cup unsweetened apple sauce

1 slice bread



17 small grapes



1 cup melon

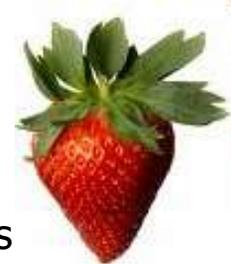
1/4 cup dried fruit



2 tbsp raisins

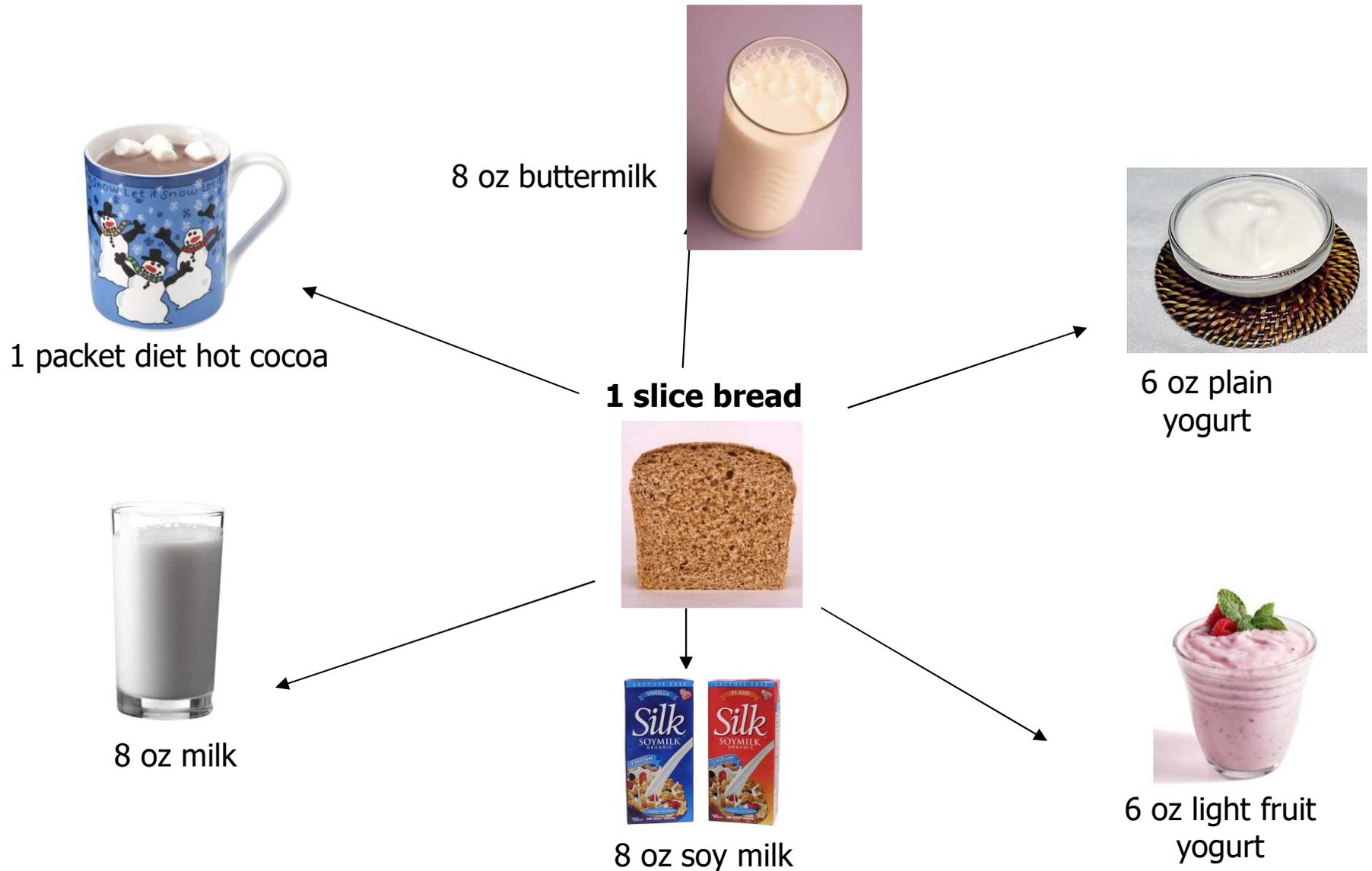


1 1/4 cup strawberries



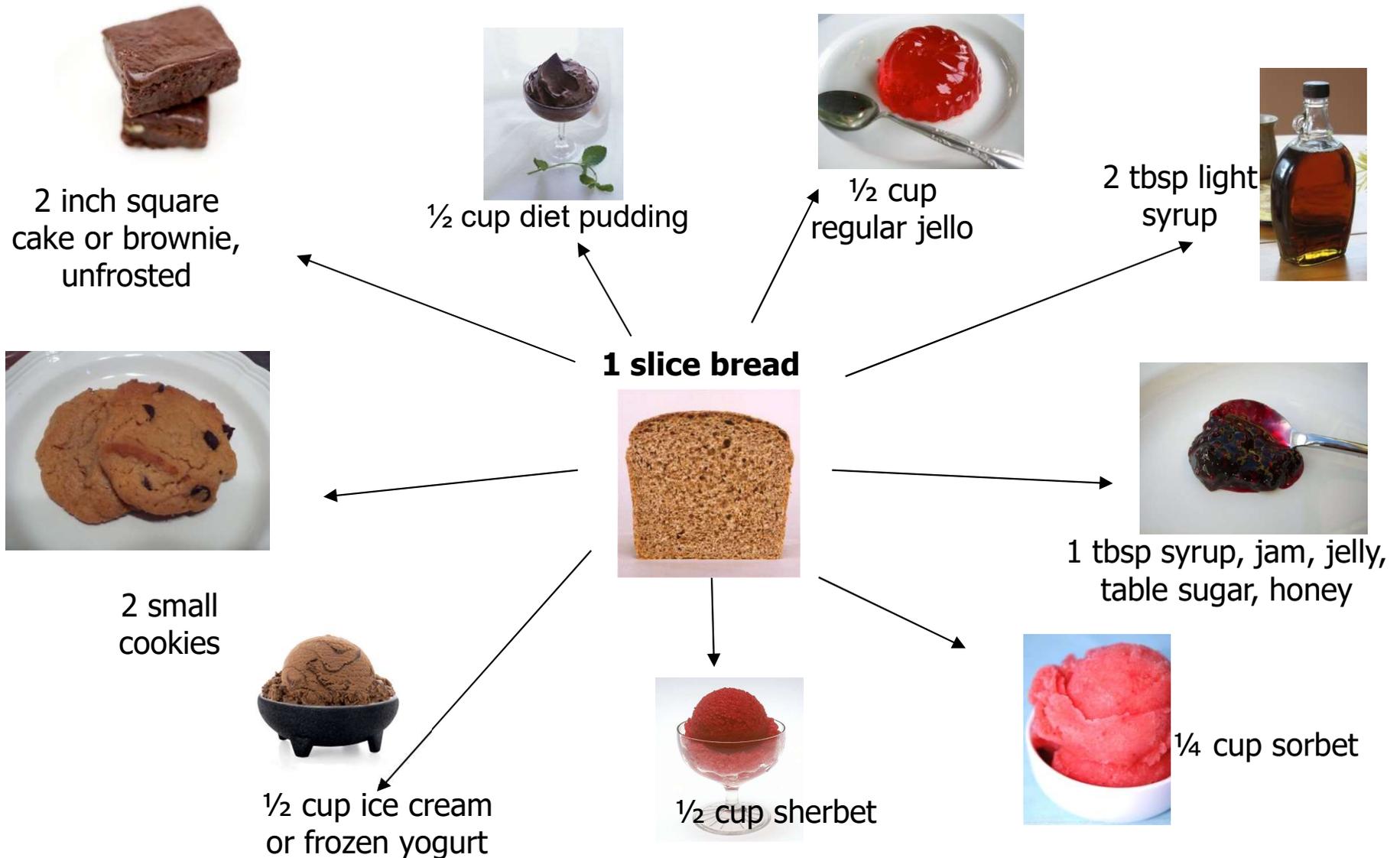
Carb Counting - Milk

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



Carb Counting - Sweets

Each Food has:
Calories vary
15 grams carb



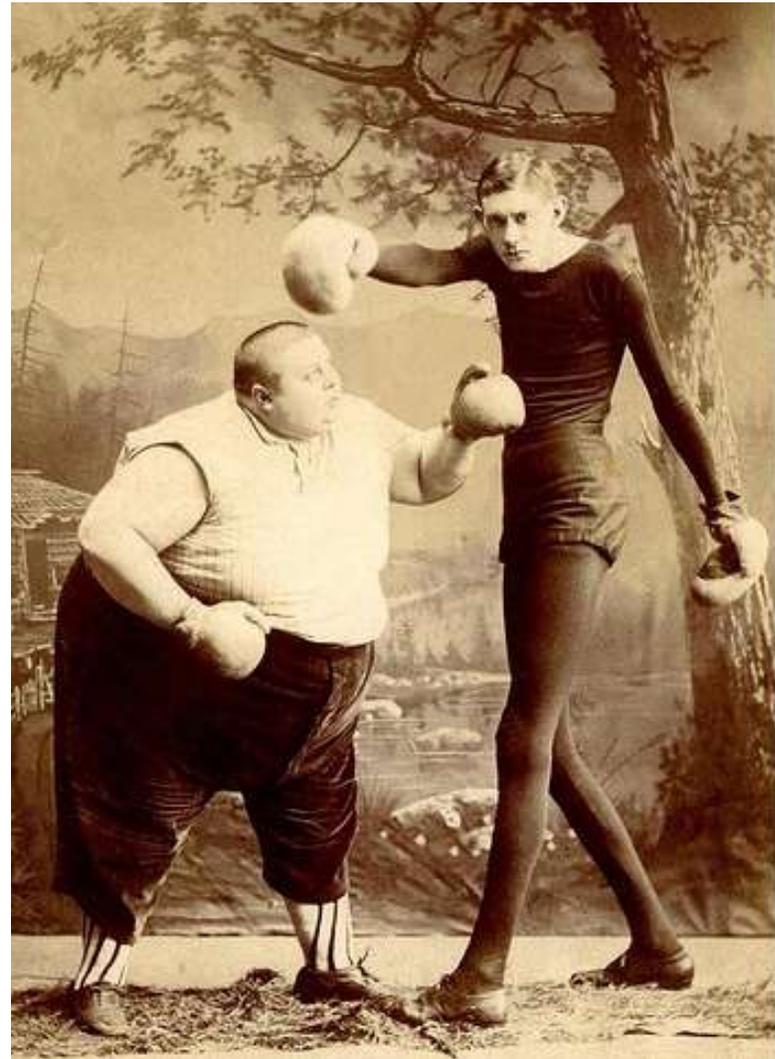
Using Alcohol Safely

- ▶ 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



Approach Depends on Individual

- New Type 2
 - Portion Control
 - Plate Method
 - Record Keeping
 - Education
- On Insulin?
 - Carb counting
 - Post prandial checks



Plan Your Portions

NONSTARCHY VEGETABLES

- Asparagus
- Broccoli
- Broccoli sprouts
- Cabbage (cole slaw)
- Cauliflower
- Cucumbers
- Dark leafy greens
- Eggplant
- Mushrooms
- Onions
- Pea pods
- Peppers
- Radishes
- Salad greens
- Tomatoes
- Zucchini

CARBOHYDRATES

- Corn
- Corn tortilla
- Fruit
- Berries
- Whole grains
- Winter squash
- Beans, lentils and peas
- Milk and yogurt

PROTEIN

- Chicken
- Eggs and chicken
- Fish, salmon, tuna, etc.
- Lean beef
- Pork
- Butter
- Steak
- Tofu

Use a 9-inch plate to help guide your portions.

Mediterranean Diet Pyramid

A contemporary approach to delicious, healthy eating

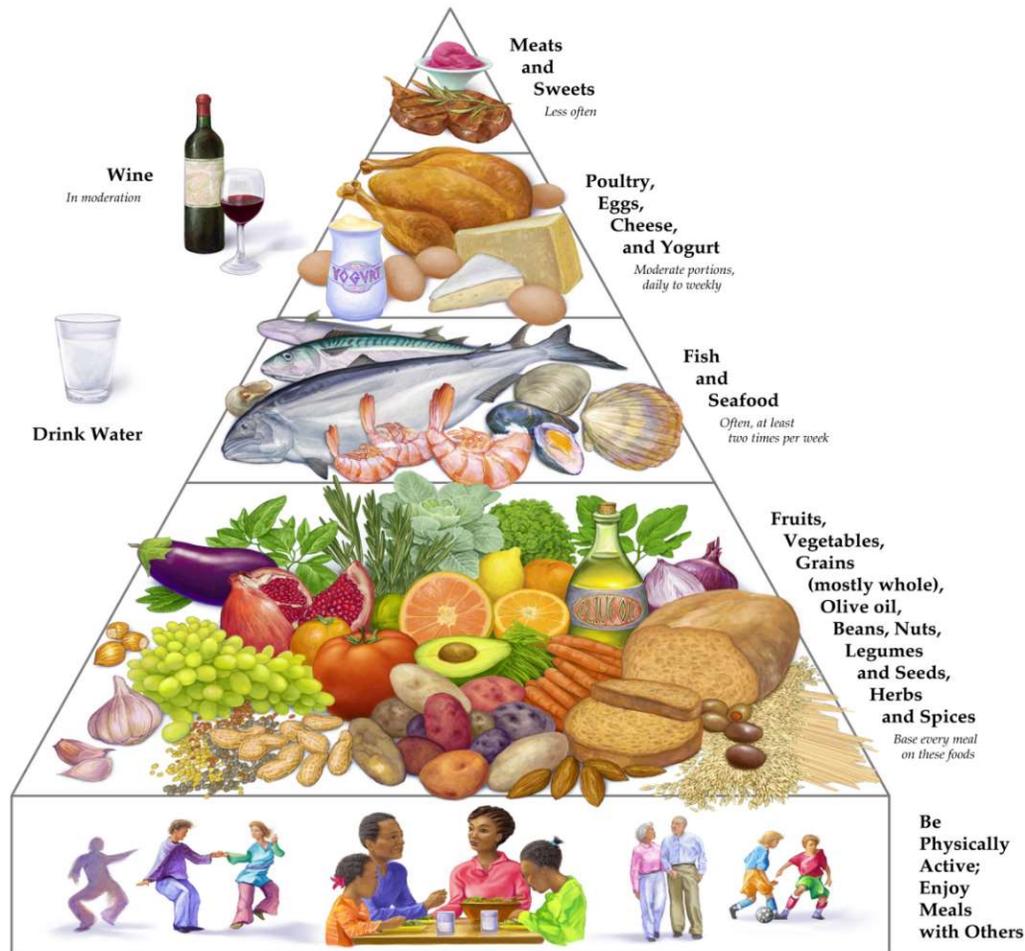
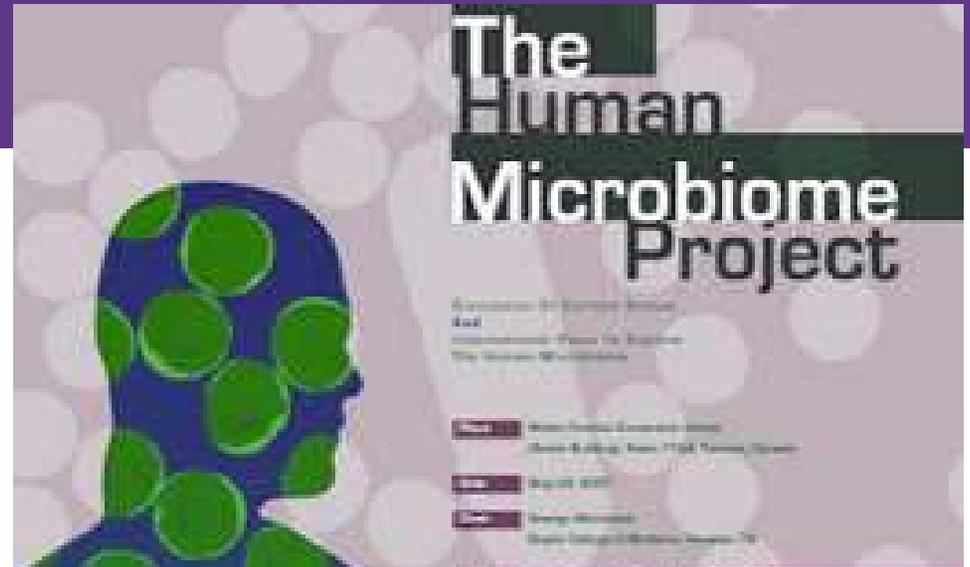
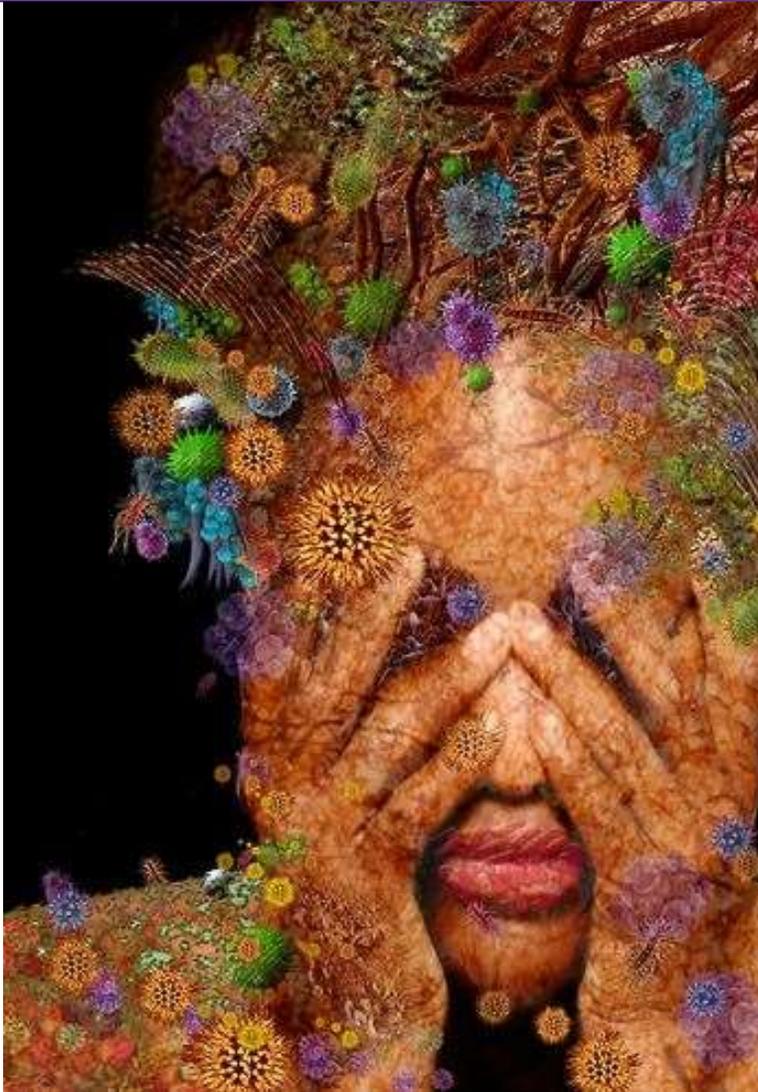


Illustration by George Middleton

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Bacterial Cells Outnumber Human Cells 10 to 1

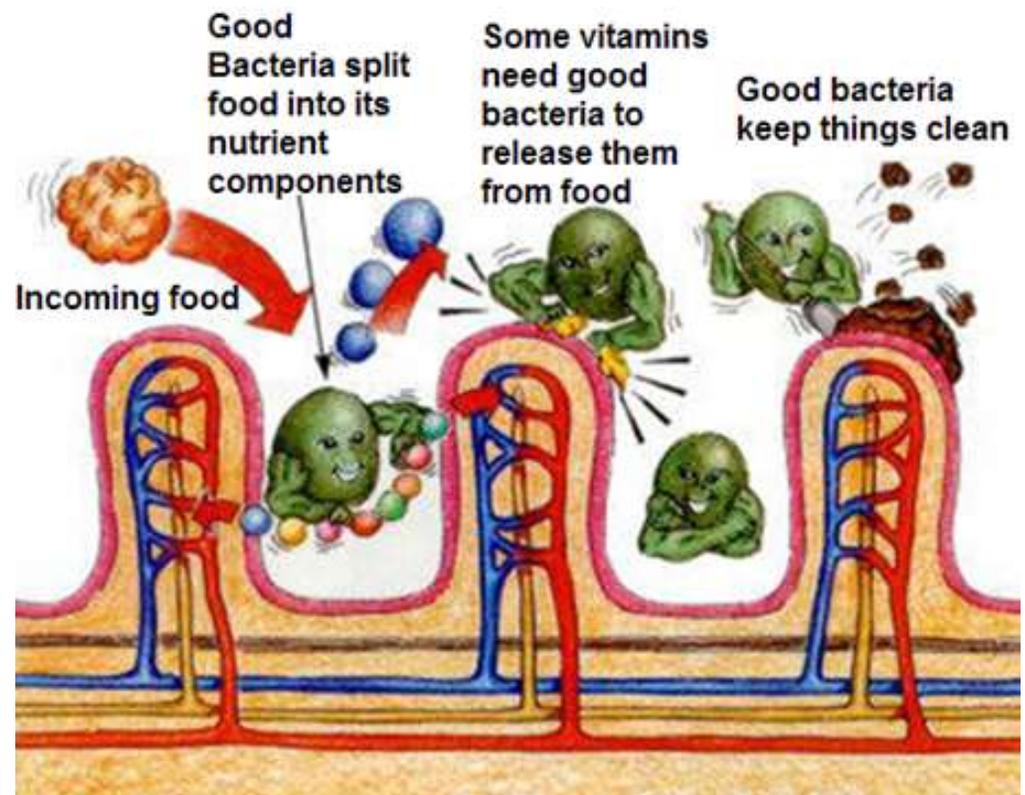


10 trillion human cells
Host 100 trillion bacterial
and fungal cells

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



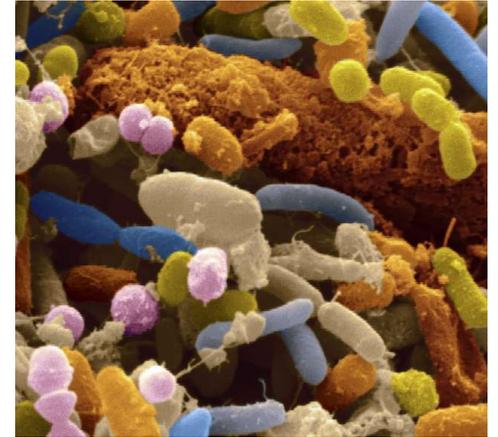
Poll Question 9

- ▶ 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

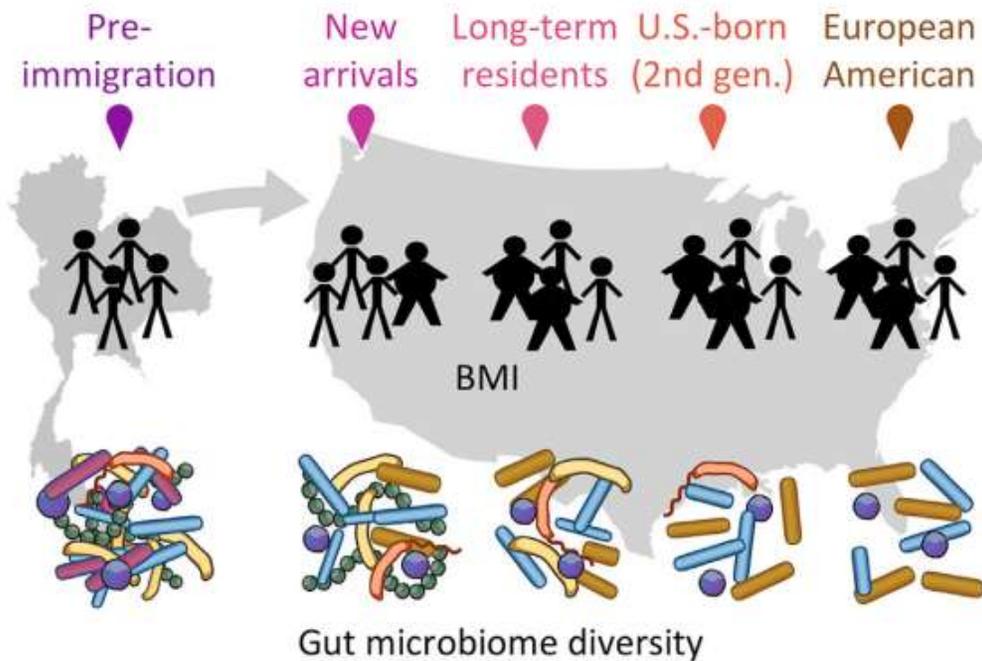


A Hmong woman carries grass in Vietnam. (NGUYEN HUY KHAM / REUTERS)

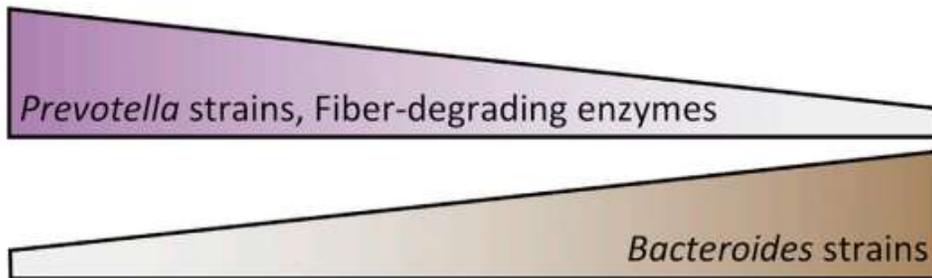
From Vietnam to America – Hmong immigrants microbiome shifts associated with worse health

- ▶ 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



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.



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 Veggies
- ▶ 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](https://www.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



Our belief in people makes a difference



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