



**Welcome to
Diabetes MiniSeries – Class 1**

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Program Info

- ▶ **Handouts and resources** – We emailed a link to all the handouts and resources for this program.
- ▶ Sign in link for each broadcast - keep an eye on your incoming email for important email from Beverly with a subject line: **Confirmation - Diabetes Mini-Series.** Please store it for safe keeping!
- ▶ Plan on checking in 5-10 minutes before the program starts. However, you can join in at any time.
- ▶ **DiabetesEducationUniversity.com** *Can't make it live? No worries,* the recorded versions will be available to you through your Student Center through December 31, 2014.
- ▶ To receive CE credit, just complete the post-test and survey. Then, print out your CE certification! Than you.

Mini-Series – Class 1
A Clinical and Educational Update

1. Describe impact of diabetes
2. Pathophysiology made easy
3. Latest updates on the different types of diabetes.

CDC Announces



35% of
Americans will
have Diabetes
by 2050

Boyle, Thompson, Barker, Williamson
2010, Oct 22:8(1)29
www.pophealthmetrics.com



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Diabetes in America 2014

- ▶ 25.8 million or > 8.3%
- ▶ 12.6 million are women
- ▶ 79 million have pre diabetes

Diabetes



Legend: No Data, <4.5%, 4.5-5.9%, 6.0-7.4%, 7.5-8.9%, ≥9.0%



CDC's Division of Diabetes Translation. National Diabetes Surveillance System available at <http://www.cdc.gov/diabetes/statistics>



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Type 2 in Kids



- ▶ 7 fold increase 1990
- ▶ 1 in 6 overweight kids (age 12- 19) have prediabetes.
- ▶ ~2,500 to 3,700 new cases in U.S. annually.
- ▶ Highest risk: very obese, minority, female, low socioeconomic status, limited education
- ▶ In age range 12-19, less than 1% have Type 2 – NHANES
- ▶ Environmental changes to urgently needed



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Global Epidemic

- ▶ Every 10 seconds
 - ▶ 1 person dies with diabetes
 - ▶ 2 people develop diabetes
- ▶ Every year
 - ▶ 3 million deaths
 - ▶ 6 million new cases
- ▶ World Diabetes Day is November 14
- ▶ March is ADA Sound the Alert Day “find people w/ undetected diabetes”



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World Diabetes Day

November 14



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Why Should Zip Code Determine Life Expectancy?



California Endowment – look up your zip code at www.measureofamerica.org



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Age-adjusted Diabetes Prevalence

20 yrs or older, by race/ethnicity— U.S. 2008

- ▶ Native Americans 16.5%
- ▶ Alaska Natives 16.5%
- ▶ Blacks 11.8%
- ▶ Hispanics 10.4%
- ▶ Asian Americans 7.5%
- ▶ Whites 6.6%



In 2002, Native Hawaiians and Japanese and Filipino residents of Hawaii aged twenty years or older were approximately 2 times as likely to have diagnosed diabetes as white residents of Hawaii



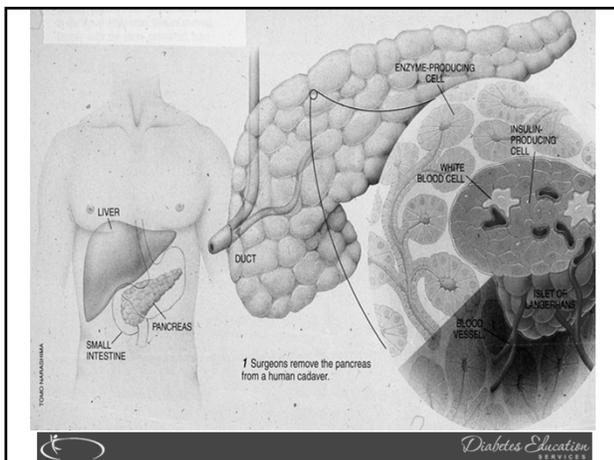
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Engaging and supporting Kids to help slow the epidemic

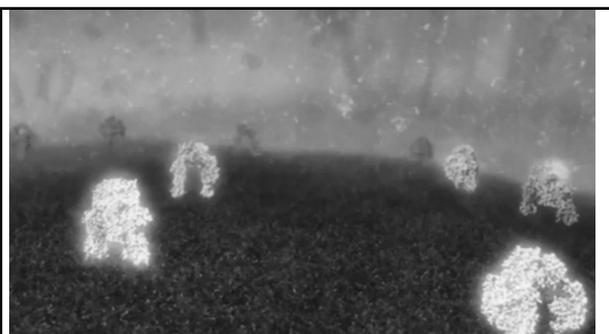
- ▶ Phases of Life
 - ▶ During Childhood



- ▶ Environment
 - ▶ Access to safe places to exercise
 - ▶ Access to healthy foods
 - ▶ Access to learning rich environments
 - ▶ Access to health care
- ▶ LifeStyle
 - ▶ Limit screen time to 2 hours a day
 - ▶ 1 hour a day of activity
 - ▶ Healthy Snacks
 - ▶ Limit junk food, sugary beverages
 - ▶ Fruits and Veggies



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Images shows insulin (blue) molecules binding with insulin receptors (yellow) Jan 2013

The international research team was led by scientists from the Walter and Eliza Hall Institute (WEHI) in Melbourne, with collaborators from La Trobe University, the University of Melbourne, Case Western Reserve University, the University of Chicago, the University of York and the Institute of Organic Chemistry and Biochemistry in Prague.



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Role of the Pancreas Endocrine Functions

Beta Cells - Insulin

- Anabolic hormone - helps store glucose as glycogen in muscle, liver
- ▶ secreted in response to elevated glucose
- ▶ halts breakdown of glycogen in liver
- ▶ increases protein synthesis, fat storage
- ▶ powerful hypoglycemic

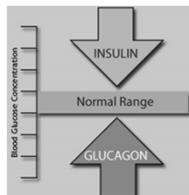
Beta Cells - Amylin

- ▶ secreted in 1:1 ratio with insulin
- ▶ Causes satiety
- ▶ Lowers post-prandial glucagon response
- ▶ Slows gastric emptying
- ▶ Type 1 make none
- ▶ Type 2 make less than normal amounts



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Role of the Pancreas Endocrine Functions



Alpha cells - Glucagon

Opposes action of insulin at the liver

- stimulated in response to low glucose levels
- stimulates liver to convert glycogen to glucose
- inhibits liver from glucose uptake
- causes hyperglycemia



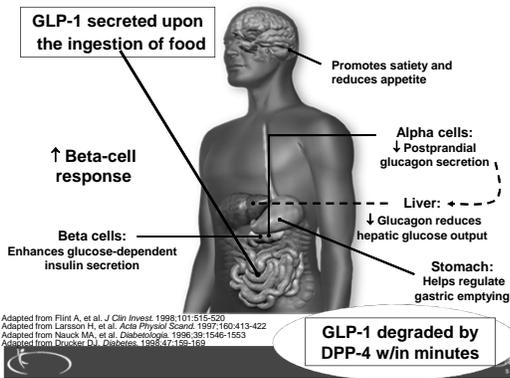
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Hormones Effect on Glucose

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



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

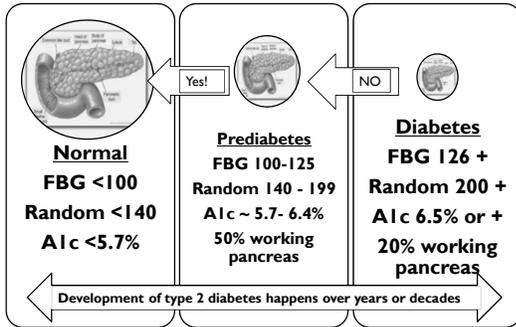


Bariatric Surgery

- ▶ Consider on diabetes pts w/ BMI >35, esp with comorbidities
- ▶ Remission (BG normalized)
 - ▶ rates range from 40 – 95%
 - ▶ Better results with newer diabetes (more beta cell mass)
 - ▶ Due to increase incretins (gut hormones)
- ▶ Still researching long term benefits, cost effectiveness and risk



Natural History of Diabetes



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



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Diabetes Classifications

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



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Case Study

1. Pt profile: 5'8", 192 lb male

Diabetes 12 years, on insulin 3 yrs

What type of DM and how do you know?



2. Pt profile: 5'6", 108 lb female

On insulin 3u Novolog before meals,
10u Lantus at bedtime

What type of DM and how do you know?



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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
- ▶ Obesity?



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Type 1 Diabetes Facts

- As many as **3 million Americans** may have type 1 diabetes.
- Each year, approximately **80 people per day** are diagnosed with type 1 diabetes in the U.S.
- Approximately **85 percent** of people living with type 1 diabetes are adults, and **15 percent** are children.
- The rate of type 1 diabetes incidence among children under age 14 is estimated to **increase by 3 percent annually** worldwide.
- Type 1 diabetes accounts for **\$14.9 billion** in healthcare costs in the U.S. each year.

Source: JDRF



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Type 1 – 10% of all Diabetes Genetics and Risk Factors

- Auto-immune pancreatic beta cells destruction
- Most commonly expressed at age 10-14
- Insulin sensitive (require 0.5 - 1.0 units/kg/day)

- Combo of genes and environment:
 - Autoimmunity tends to run in families
 - Higher rates in non breastfed infants
 - Viral triggers: congenital rubella, coxsackie virus B, cytomegalovirus, adenovirus and mumps.



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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)



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Autoantibodies Assoc w/ Type 1

Panel of autoantibodies –

- ▶ GAD65 - Glutamic acid decarboxylase –
- ▶ ZnT8 - Zinc Co-Transporter 8
- ▶ ICA - Islet Cell Cytoplasmic Autoantibodies
- ▶ IA-2A - Insulinoma-Associated-2 Autoantibodies
- ▶ IAA - Insulin Autoantibodies



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Type 1 Diabetes Associated with other immune conditions

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



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Medalist Study – Harvard Joslin Diabetes Center

- ▶ After 50 years with diabetes
 - ▶ Many still produced some insulin
 - ▶ Many had no eye disease



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Type 1 Summary

- ▶ Autoimmune
- ▶ Complete pancreatic destruction
- ▶ Need insulin shots
- ▶ Often first present in DKA



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Type 1 in Hospital

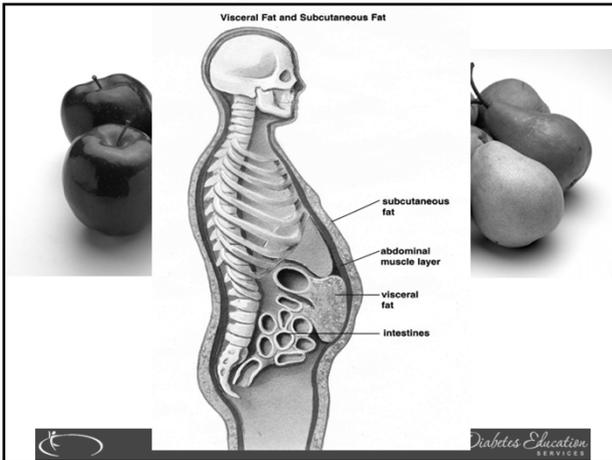
- ▶ 43 yr old admitted to evaluate angina.
- ▶ Morning blood sugar is 92.
- ▶ Based on Regular insulin sliding scale, no insulin required.
- ▶ Breakfast tray shows up and patient says, I need my insulin shot before I eat.



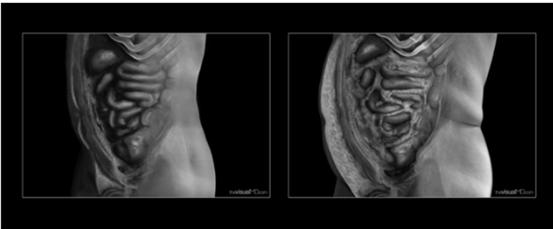
What do you say?



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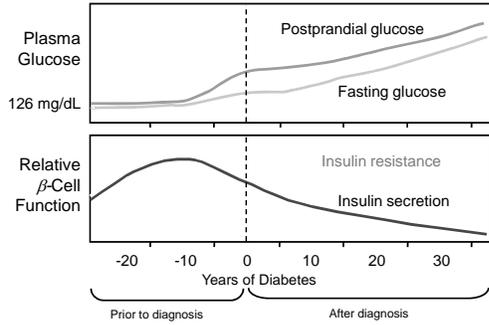


Visceral Fat – “Endocrine Organ”



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Natural Progression of Type 2 Diabetes



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Cardio Metabolic Risk - 5 Hypers -

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



Manifestations of Insulin Resistance



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Diabetes 2 - Who is at Risk?

(ADA Clinical Practice Guidelines)

1. Testing should be considered in all adults who are overweight (BMI \geq 25) and have additional **risk factors**:
 - ▶ First-degree relative w/ diabetes
 - ▶ Member of a high-risk ethnic population
 - ▶ Habitual physical inactivity
 - ▶ PreDiabetes
 - ▶ History of heart disease



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Diabetes 2 - Who is at Risk?

(ADA Clinical Practice Guidelines)



Risk factors cont'd

- ▶ HTN - BP > 140/90
- ▶ HDL < 35 or triglycerides > 250
- ▶ baby >9 lb or history of Gestational Diabetes Mellitus (GDM)
- ▶ Polycystic ovary syndrome (PCOS)
- ▶ Other conditions assoc w/ insulin resistance:
 - ▶ Severe obesity, acanthosis nigricans (AN)



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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



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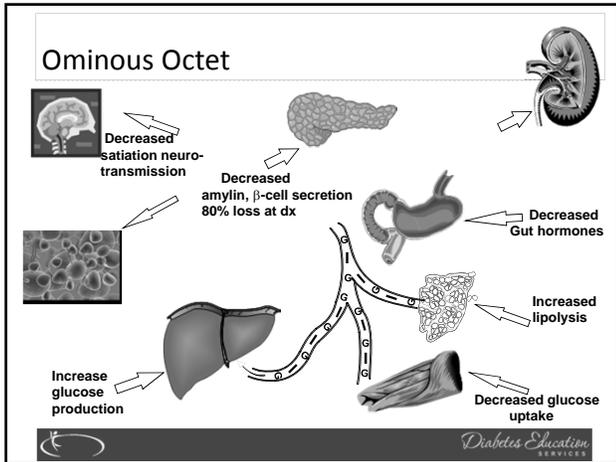
Diabetes Detectives Needed



- ▶ On average – takes 6.5 years to diagnose diabetes
- ▶ 1/4 of all people with diabetes don't know they have it



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Comparison of Type 1 and Type 2

	<u>Type 1</u>	<u>Type 2</u>
Obesity	x	xxx
Insulin dependence	xxx	30%
Respond to oral agents	0	xxx
Ketosis	xxx	x
Antibodies present	xxx	0
Typical Age of onset	teens	adult
Insulin Resistance	0	xxx

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Diabetes is also associated with:

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

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Gestational DM ~ 7% of all Pregnancies

- ▶ GDM prevalence increased by
 - ▶ ~10–100% during the past 20 yrs
- ▶ Native Americans, Asians, Hispanics, African-American women at highest risk
- ▶ Immediately after pregnancy, 5% to 10% of GDM diagnosed with type 2 diabetes
- ▶ Within 5 years, 50% chance of developing DM in next 5 years.



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Diabetes in pregnant mothers associated with ...

- ▶ Offspring
 - ▶ Fetal Complications
 - ▶ Obesity and diabetes later in life
- ▶ Mother
 - ▶ More complicated pregnancy and delivery
 - ▶ Diabetes later in life
- ▶ Intrauterine environment is important



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Screen Pregnant Women Before 13 weeks

- ▶ Screen for undiagnosed Type 2 at the first prenatal visit using standard risk factors.
- ▶ Women found to have diabetes at their initial prenatal visit treated as “Diabetes in Pregnancy”
- ▶ If normal, recheck at 24-28 weeks



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Increasing Prevalence – A public health perspective

- ▶ Body weight before and during pregnancy influences risk of GDM and future diabetes
- ▶ Children born to women with GDM at greater risk of diabetes
- ▶ Focus on prevention



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Postnatal Health: Maternal Behavior

- ▶ Encourage breastfeeding for one year
 - ▶ (25% of women achieving this goal)
- ▶ Screening 6-12 weeks post partum using non-pregnant OGTT criteria (50%)
- ▶ Repeat at 3 yr intervals or signs of DM
- ▶ Encourage weight control and exercise
- ▶ Make sure connected with health care
- ▶ Preconception counseling



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Start Metformin therapy

- ▶ For women with PreDiabetes and History of GDM



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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



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Life Study – Mrs. Jones

Mrs. Jones is 62 years old, overweight and complaining of feeling tired and urinating several times a night. She is admitted with a urinary tract Infection. Her WBC is 12.3, glucose 237. She is hypertensive with a history of gestational diabetes. No ketones in urine.

- ▶ What are her risk factors, signs of diabetes
- ▶ What type of diabetes does she have?
- ▶ Does she have insulin resistance?



What Do You Say? Mrs. Jones asks you

- ▶ What is type 2 diabetes?
- ▶ Will this go away?
- ▶ Will I get complications?
- ▶ Will I need to take diabetes medication for the rest of my life?
- ▶ How come I got diabetes?
- ▶ Do I have to check my blood sugars?



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Running into Roadblocks?

▶ HUG Patients

- ▶ Help with
- ▶ Unconditional
- ▶ Guidance and Support

Anne Peters, MD, CDE
ADA Post Grad

▶ **Unconditional Positive Regard –**
involves showing complete support and acceptance of a person no matter what that person says or does.
Carl Rogers



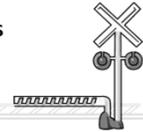
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No one is Unmotivated

... to lead and long and healthy life

▶ These are the 3 usual Critical Barriers

- ▶ Perceived worthlessness
- ▶ Too many personal obstacles
- ▶ Absence of support and resources



Bill Polonsky, PhD, CDE



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Overcoming barriers

- ▶ Confront the key misbelief. Ask the question, does dm cause complications?
- ▶ Offer pts evidence based hope message –
- ▶ Frequent contact
- ▶ Paired glucose testing
- ▶ Ask pt, “Tell me 1 thing that is driving you crazy about your diabetes”
- ▶ Discuss medication beliefs
- ▶ To improve outcomes, see pts more often

Bill Polonsky, PhD, CDE



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How will it help me?

- ▶ See if your treatment plan is working
- ▶ Make decisions regarding food and/or med adjustment when exercising
- ▶ Find out how that pizza affected your BG
- ▶ Avoid unwanted weight gain
- ▶ Enhanced athletic performance
- ▶ Find patterns
- ▶ Manage illness



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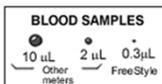
How Often Should I Check?

- Be realistic!!
- Type 1 – as often as needed
- Type 2 – as needed
- Consider:
 - ↳ Types and timing of meds
 - ↳ Goals
 - ↳ Ability (physical and emotional)
 - ↳ Finances



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New Meters – a little goes a long way



- 0.3 microliters of blood
- minimal pain



Customer Service (toll-free): Look for 800 number



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DiaBingo

- Frequent skin and yeast infections
- B** A BMI of ____ or greater is considered overweight
- B** To reduce complications, control **A1c**, **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** Elevated triglycerides, < HDL, smaller dense LDL
- 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



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Thank You



- ▶ Questions?
- ▶ Email
bev@diabetesed.net
- ▶ Web
www.diabetesed.net



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