Welcome to Diabetes in the 21st Century

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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. Discuss gut bacteria and healthy eating
8. Demonstrate successful teaching strategies

Foundations of Care

▸ Education
▸ Nutrition
▸ Monitoring
▸ Physical Activity
▸ Psychosocial Care
▸ Medications
▸ Reducing Risk
▸ Getting to Best Possible Health

CDC Announces

35% of Americans will have Diabetes by 2050

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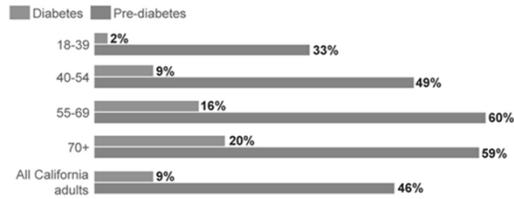*www.pophealthmetrics.com*

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Diabetes in America 2017

Diabetes cases by age group

A new analysis from UCLA finds that 55% of adults in California have either diabetes or pre-diabetes.

■ Diabetes ■ Pre-diabetes

Age group	Diabetes	Pre-diabetes
18-39	2%	33%
40-54	9%	49%
55-69	16%	60%
70+	20%	59%
All California adults	9%	46%

Source: UCLA Center for Health Policy Research   @latimesgraphics

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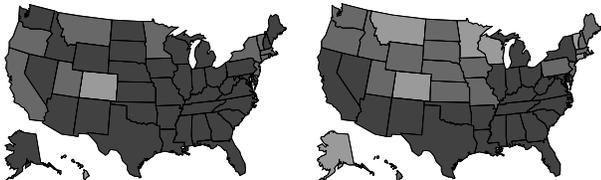

Age-Adjusted Prevalence of Obesity and Diagnosed Diabetes Among US Adults

2013

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Type 2 in Kids

- 7 fold increase 1990
- 1 in 6 overwt 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

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"

World Diabetes Day
November 14

The right education for all

The right environment for all
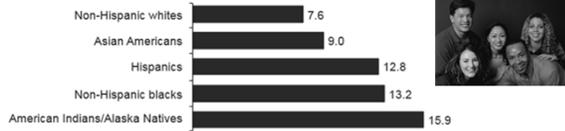
Diabetes: protect our future

Diabetes: protect our future

Age-adjusted Diabetes Prevalence
20 yrs or older, by race/ethnicity— U.S. 2014

Age-adjusted* percentage of people aged 20 years or older with diagnosed diabetes, by race/ethnicity, United States, 2010–2012

Race/Ethnicity	Percentage
Non-Hispanic whites	7.6
Asian Americans	9.0
Hispanics	12.8
Non-Hispanic blacks	13.2
American Indians/Alaska Natives	15.9

*Based on the 2000 U.S. standard population.
Source: 2010–2012 National Health Interview Survey and 2012 Indian Health Service's National Patient Information Reporting System.

- Among Hispanic adults, the age-adjusted rate of diagnosed diabetes was 8.5% for Central and South Americans, 9.3% for Cubans, 13.9% for Mexican Americans, and 14.8% for Puerto Ricans.
- Among Asian American adults, the age-adjusted rate of diagnosed diabetes was 4.4% for Chinese, 11.3% for Filipinos, 13.0% for Asian Indians, and 8.8% for other Asians.
- Among American Indian and Alaska Native adults, the age-adjusted rate of diagnosed diabetes varied by region from 6.0% among Alaska Natives to 24.1% among American Indians in southern Arizona.

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Why Should Zip Code Determine Life Expectancy?

STOCKTON
95202
Life Expectancy
73

IRVINE
92606
Life Expectancy
88

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

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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
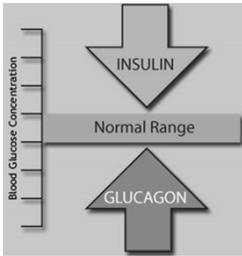- Type 2 make less than normal amounts

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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

Blood Glucose Concentration

INSULIN

Normal Range

GLUCAGON

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

GLP-1 secreted upon the ingestion of food

Promotes satiety and reduces appetite

↑ Beta-cell response

Alpha cells:
↓ Postprandial glucagon secretion

Liver:
↓ Glucagon reduces hepatic glucose output

Beta cells:
Enhances glucose-dependent insulin secretion

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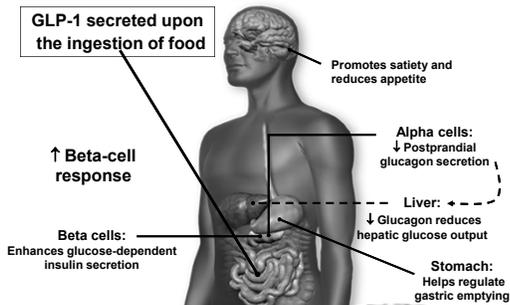
Adapted from Flint A, et al. *J Clin Invest.* 1998;101:515-520
Adapted from Larsson H, et al. *Acta Physiol Scand.* 1997;160:413-422
Adapted from Nauck MA, et al. *Diabetologia.* 1996;39:1546-1553
Adapted from Drucker DJ. *Diabetes.* 1998;47:159-169

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

Incretin Mimetics
Byetta, Bydureon, Trulicity, Tanzeum

- **Action (synthetic gut hormone)**
  - Insulin release in response to meal
  - Slows gastric emptying
  - Causes Satiety – promotes wt loss
  - Preserves Beta Cells
- **Details:**
  - Daily and long acting version - 1x week injection
  - **Efficacy:** Decreases A1c by 0.5 – 1.6%, wt by 3lbs +
- **Benefits/Issues** – wt loss, no hyp. Expensive, N/V
  - □ Pancreatitis Warning – report signs immediately

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Get it on Google play

Download on the App Store

Loading...
SUCCESS!

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

Normal	Prediabetes	Diabetes
FBG <100	FBG 100-125	FBG 126 +
Random <140	Random 140 - 199	Random 200 +
A1c <5.7%	A1c ~ 5.7- 6.4%	A1c 6.5% or +
	50% working pancreas	20% working pancreas

Development of type 2 diabetes happens over years or decades
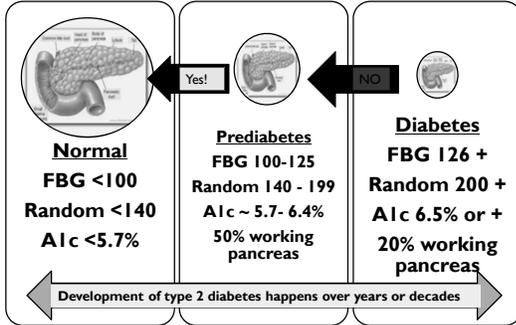
Signs of Diabetes

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

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

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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. 5'6", 108 lb female
On insulin 3u Regular before meals, 10u NPH at bedtime
What type of DM and how do you know?

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?

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 – 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.

Autoantibodies Assoc w/ Type 1

Panel of autoantibodies –
- GAD65 - Glutamic acid decarboxylase –
- ICA - Islet Cell Cytoplasmic Autoantibodies
- IAA - Insulin Autoantibodies

Medalist Study – Harvard
Joslin Diabetes Center

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

Type 1 Diabetes Associated with other immune conditions

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

Type 1 Summary

- ‣ Autoimmune pancreatic destruction
- ‣ Need insulin replacement therapy
- ‣ Often first present in DKA
- ‣ At risk for other autoimmune diseases
- ‣ Eval coping strategies

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?

BMI Categories

BMI	17	19	22	24	26	29	33	37	40
	<20		20 - 25		26 - 29		>30		
	Underweight		Normal weight		Slightly Overweight		Overweight		Extremely Overweight
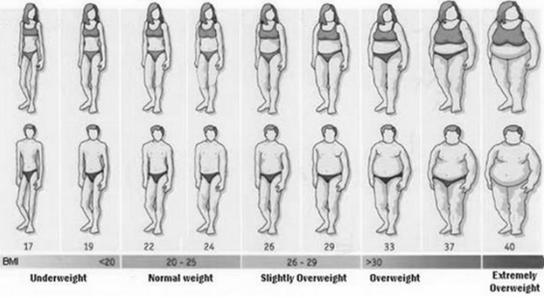
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Visceral Fat and Subcutaneous Fat

- subcutaneous fat
- abdominal muscle layer
- visceral fat
- intestines
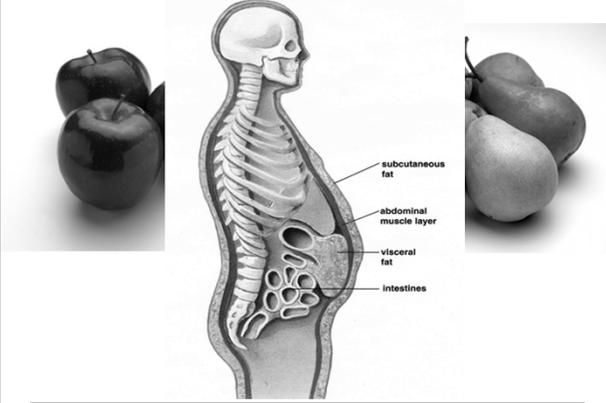
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Natural Progression of Type 2 Diabetes

Plasma Glucose

126 mg/dL

Postprandial glucose

Fasting glucose

Relative β-Cell Function

Insulin resistance

Insulin secretion

-20 -10 0 10 20 30
Years of Diabetes

Prior to diagnosis   After diagnosis
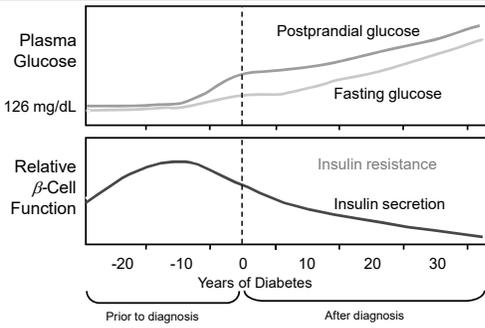
Adapted from Bergenstal et al. 2000; International Diabetes Center.

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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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2. Classification and DM Diagnosis

‣ Pre Diabetes & Type 2- Screening Guidelines
‣ Start screening at age 45 or for anyone who is overweight (BMI ≥ 25, Asians BMI ≥ 23) with one or > additional **risk factor**:

  ‣ First-degree relative w/ diabetes
  ‣ Member of a high-risk ethnic population
  ‣ Habitual physical inactivity
  ‣ PreDiabetes
  ‣ History of heart disease

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
‣ Polycystic ovary syndrome (PCOS)
‣ Other conditions assoc w/ insulin resistance:
  ‣ Severe obesity, acanthosis nigricans (AN)

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

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

Ominous Octet

Decreased satiation neuro-transmission

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

Decreased Gut hormones

Increased lipolysis

Increase glucose production

Decreased glucose uptake
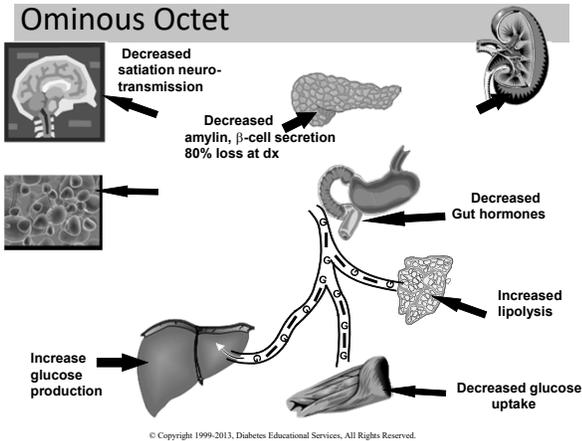
SGLT2 Inhibitors- "Glucoretics"

▸ **Action**: "Glucoretic" decreases renal glucose reabsporption (resets renal threshold and increases glucosuria)

▸ Side effects: hypotension, UTIs, increased urination, genital infections, ketoacidosis

Class/Main Action	Name(s)	Daily Dose Range	Considerations
SGLT2 Inhibitors "Glucoretic" • Decreases glucose reabsorption in kidneys	Canagliflozin (Invokana) Dapagliflozin (Farxiga) Empagliflozin (Jardiance)	100 - 300 mg 1x daily 5 - 10 mg 1x daily 10 - 25 mg 1x daily	**Side effects:** hypotension, UTIs, increased urination, genital infections, ketoacidosis. **Obtain GFR when starting and yearly:** Invokana – stop med if GFR <45 Jardiance – do not start if GFR <45 Farxiga – stop med if GFR <60. Do not use Farxiga in pts with bladder cancer. **Benefits:** no hypo or weight gain. Jardiance lowers all-cause mortality by 32%. Lowers A1c 1.0%-2.0%. Lowers wt 1-3 lbs.

▸ **Efficacy:**
  ▸ Weight loss of 1-3 lbs   Reduce A1C ~0.7-1.5%   'f

EMPA-REG OUTCOME®: Summary

▸ Empagliflozin used in trial for 3 years in 1,000 patients with type 2 diabetes at high CV risk:

▸ Empagliflozin reduced hospitalisation for CHF 35%

▸ Empagliflozin reduced CV death by 38%

▸ Empagliflozin improved survival by reducing all-cause mortality by 32%

▸ Need more research to determine this is a class effect

Jardiance gets special FDA CV approval

Diabetes Education Services
Published by Beverly Thomassian [?] · December 2, 2016 ·

Jardiance decreases CV Mortality by 38%. The (FDA) has approved empagliflozin (Jardiance),for the new indication of improving survival in adults with type 2 diabetes and cardiovascular disease (CVD). Important info to share!

FDA Approves Empagliflozin for Reducing CVD Death
The new indication follows the landmark EMPA-REG trial, the first to show that a diabetes drug could reduce death as well as lower blood glucose.

Comparison of Type 1 and Type 2

Feature	Type 1	Type 2
▸ Obesity	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

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.

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

Start Metformin therapy

▸ For women with PreDiabetes and History of GDM

Biguanides – Metformin (Glucophage)

▸ **Action:** decrease hepatic glucose (glycogen)
▸ **Names:**
  ▸ Metformin (Glucophage)
    ▸ Starting dose: 500 BID, max 2500mg daily
  ▸ Metformin extended release (3 different versions)
    ▸ Starting dose 500mg at dinner, max dose 2000 to 2500 mg daily
  ▸ **Efficacy:**
    ▸ Decrease fasting plasma glucose 60-70 mg/dl
    ▸ Reduce A1C 1.0-2.0%

Biguanides - Metformin

▸ Benefits
  ▸ Decrease LDL cholesterol and triglycerides
  ▸ No weight gain, possible modest weight loss
  ▸ Cancer protective?
▸ Concerns
  ▸ Diarrhea and abdominal discomfort – Use XR (may see pill shell in stool – okay)
  ▸ Lactic acidosis if improperly prescribed
  ▸ Watch for B12 deficiency
  ▸ Hold before and 48 hours after IV contrast dye studies. Resume when kidney function adequate.

Metformin – New GFR Guidelines

Class/Main Action	Name(s)	Daily Dose Range	Considerations
Biguanides • 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.** • If GFR <30, do not use. • If GFR <45, don't start Meformin • If pt on Metformin and GFR falls to 30-45, eval risk vs. benefit; consider decreasing dose.
	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	**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%.

GOAT'S RUE
Galega officinalis

Used for
○ Diabetes

Potential uses
○ Cancer
○ Chronic cysts

Uses under investigation
○ Psoriasis
○ Adrenal growth

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

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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

Diabetes is also associated with

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

DiaBingo

в Frequent skin and yeast infections

B A BMI of _____ or greater is considered overweight

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 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

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?

Strategies – One Step at a Time
Everyone can be a Diabetes Advocate

Look for
"teaching moment"
opportunities

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?

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
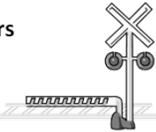
Bill Polonsky, PhD, CDE

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

How will blood glucose testing 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

How Often Should I Check?

- Be realistic!!
- Type 2 on orals – Medicare covers 100 strips for 3 months
- Based on individual - Consider:
  - Types and timing of meds
  - Goals
  - Ability (physical and emotional)
  - Finances / Insurance

"The highest form of wisdom is kindness."
The Talmud

How many times has a person arrived disheartened?

This moment of discouragement and despair provides us an opportunity.

By modeling kindness and understanding, we can encourage them to be a kinder self-coach from this day forward.

Complications - Why?

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

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Diabetes Complications

- Heart disease leading cause of death.
- CAD death rates are about 2 -4x's as high as adults without diabetes (it's not getting better)
- Risk of stroke is 2 - 4 times higher
- 60% - 65% of people with DM have HTN.
- DM accounts for 40% of new cases of ESRD
- 60 - 70% have mild - severe forms of neuropathy
- Diabetes is the leading cause of blindness
- Accounts for 50% of lower limb amputations

Control 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 Type 2 be Prevented in Older Adults?

• Physical activity (30 mins a day)
• Dietary score (higher fiber intake, low saturated fat and *trans*-fat, lower mean glycemic index)
• Not Smoking
• Alcohol use (up to 2 drinks a day);
• BMI <25 and waist circumference

Dariush Mozaffarian, MD,
Arch Intern Med. 2009;169(8):798–807.

Overall, 9 of 10 new cases of diabetes attributable to these 5 lifestyle factors.

89% risk reduction when all at goal.

35% rel risk reduction for each additional

We need your help!

DIABETES MOON WALK

Only 208,973 miles left, Join Us!

Lifespan Treadmill Desk - Amazon

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%.
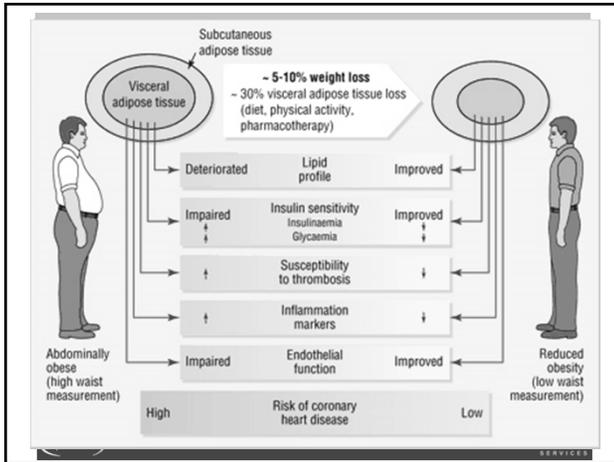
ABCs of Diabetes –

‣ A1c less than 7% (avg 3 month BG)
  ‣ Pre-meal BG 80-130
  ‣ Post meal BG <180
‣ Blood Pressure < 140/90
‣ Cholesterol
  ‣ DM and 40 yrs, start statin
  ‣ HDL >40
  ‣ Triglyceride < 150
‣ E xercise, Education
‣ H ealthy Eating

Glucose and BP Control Matter

‣ 1% decrease in A_1c reduces microvascular complications by 35%
‣ 1% decrease in A_1c reduces diabetes related deaths by 25%

‣ B/P control (144/82) reduced risk of:
  ‣ Heart failure (56%)
  ‣ Stroke (44%)
  ‣ Death from diabetes (32%)

Lancet 352: 837-865, 1998

6. Glycemic Targets

▸ **Adult non pregnant A1c goals**
  ▸ **A1c < 7%** - a reasonable goal for adults.
  ▸ **A1c < 6.5%** - may be appropriate for those without significant risk of hypoglycemia or other adverse effects of treatment.
  ▸ **A1c < 8%** - may be appropriate for patients with history of hypoglycemia, limited life expectancy, or those with longstanding diabetes and vascular complications.
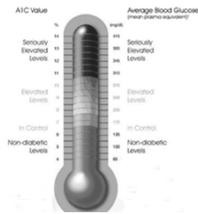
A1c and Estimated Avg Glucose (eAG) 2008

A1c (%)	eAG
5	97
6	126
7	154
8	183
9	212
10	240
11	269
12	298

Order teaching tool kit free at diabetes.org

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

Translating the A1c Assay Into Estimated Average Glucose Values – ADAG Study
Diabetes Care: 31, #8, August 2008

What are next steps?

▸ 72 yr old, thin, lives alone, A1c 7.3%. History of MI, stroke. DM for 12 yrs, "diet controlled". Limited income. Creat 1.4.

DPP-4 Inhibitors – "Incretin Enhancers"

Januvia (sitagliptin) – Tradjenta (linagliptin)
Onglyza (saxagliptin) Nesina (alogliptin)

- **Action:**
  - Increase insulin release w/ meals
  - Suppress glucagon
- **Dosing**: Januvia – 100mg a day
  - Onglyza – up to 5mg a day
  - Tradjenta – 5mg a day
  - Nesina – up to 25 mg a day
- **Efficacy:** Decreases A1c by 0.6 -0.8%
- **Benefits/ Issues**: weight neutral, no hypo, few side effects. Expensive

---

DPP-IV Inhibitor Updates

- Can cause severe, disabling join pain.
  - Contact Provider, Stop Medication

- Saxagliptin (Onglyza) and Alogliptin (Nesina) can increase risk of heart failure.
  - Notify provider for shortness of breath, edema, weakness, etc.

- Side effects: headache and flu-like symptoms
- Report signs of pancreatitis
- No wt gain or hypoglycemia
- Lowers A1c 0.6% - 0.8%

"Legacy Effect"

- For participants of DCCT and UKPDS
  - long lasting benefit of early intensive BG control prevents
    - microvascular complications
    - Macrovascular complications (15-55% decrease)
  - Even though their BG levels increased over time
  - Message – Catch early and
  Treat aggressively

Vaccinations- Immunizations

- Flu vaccine
  - every year starting 6 months
- Pneumococcal starting at 2 years.
- Hepatitis B Vaccine (ADA Stds 2013, pg s28)
  - For diabetes pts age 19 – 59 (not previously vaccinated)
  - Double risk of Hep B due to lancing devices/ glucose meter exposure

Diabetes Education SERVICES

Best Medicine

- **Exercise is the best medicine.** Structured exercise of 8 weeks duration, has been shown to lower A1c by and average of 0.66% in people with type 2, even without a significant change in BMI.

Diabetes Education SERVICES

Benefits of Exercise

- Increase muscle glucose uptake 5-fold
- Glucose uptake remains elevated for 24 - 48 hours (depending on exercise duration)
- Increases insulin sensitivity in muscle, fat, liver.
- Reduce CV Risk factors (BP, cholesterol, A1c)
- Maintain wt loss
- Contribute to well being
- Muscle strength
- Better physical mobility

Diabetes Education SERVICES

Exercise decreases:

- Sleep apnea
- Diabetic kidney disease, retinopathy
- Depression
- Sexual dysfunction
- Urinary incontinence
- Knee pain
- Need for medications
- Health care costs

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

Good Exercise Info / Quotes

- 20 % of people walk 30 mins a day
- Exercise decrease A1c 0.7%
- No change in body wt, but 48% loss in visceral fat
  - ADA PostGrad 2010

- "If you don't have time for exercise, you better make time for disease."

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

Mike Huckabee

DiaBingo- G

G ADA goal for A1c is less than _____%

G People with DM need to see their provider at least every month

<u>G</u> Blood pressure goal is less than

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

G The goal for triglyceride level is less than

G Goal for my HDL cholesterol is more than

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 urine tested yearly for _____

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

Diabetes Care Guidelines- ADA

Test / Exam	Frequency
A1c	At least twice a year
B/P	Each diabetes visit
Cholesterol (LDL, HDL, Tri)	Yearly (less if normal)
Weight	each diabetes visit
Microalbumin/GFR/Creat	Yearly
Eye exam	Yearly
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?

Patient Profile

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

Labs:
- A1c 9.3%
- HDL 37 mg/dl
- Triglyceride 260mg/dl
- Proteinuria - neg
- B/P 152/94

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*

Glucose Management and Hospitalized Patients

▸ In hospitalized patients with critical illness, hyperglycemia is a signal that warrants our attention.

Diabetes Education SERVICES

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

Diabetes Education SERVICES

WHAT SHOULD WE AIM FOR?

Critically Ill pts
  • BG > 180- Start insulin
  • BG goal 140-180

Non Critically Ill patients BG Goals
  • Premeal <140
  • Post meal <180

•Insulin therapy preferred treatment

Consensus: Inpt Hyperglycemia, Endocr Pract. 2009;15 (No.4)

Diabetes Education SERVICES

Management of Hyperglycemia and Diabetes

▸ Stop oral agents (ie) metformin & sulfonylurea on admission

▸ "The sole use of Sliding Scale insulin is discouraged" – ADA 2014

▸ For discharge, oral meds can be resumed

Start Basal/bolus therapy
  ▸ NPH and Regular insulin
  ▸ Long-acting and rapid-acting insulin
  ▸ Premixed insulin

Diabetes Education SERVICES

Now What?

▸ Nurse had an emergency and pt already ate lunch?

▸ Nurse administered insulin and pt only ate a few bites of turkey and drank non sugar tea?

▸ You just gave 3 units of Regular and patient needs to go to OR NOW!

Foot Care

Lift the sheets and look at the Feets!

Diabetes Education SERVICES

Foot Wounds

Bone
Fat
Skin

Bacteria

Bacteria

Blisters
Calluses

Ulcers

Bone infection
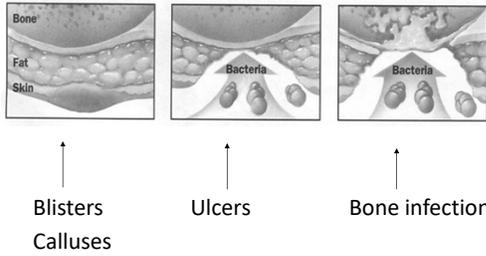
Diabetes Education SERVICES

_____

_____

_____

_____

_____

_____

No Bathroom Surgery

Dr Scholls
Corn
Removers
Salicylic Acid
Patented
Formulation
Medicated
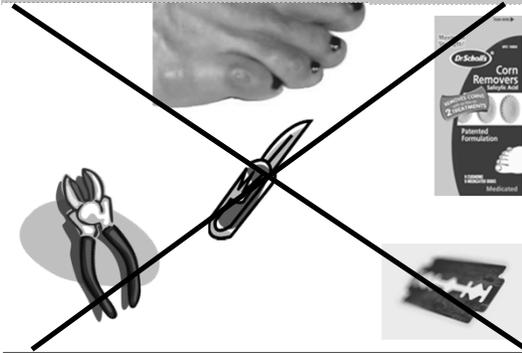
Diabetes Education SERVICES

_____

_____

_____

_____

_____

_____

5.07 monofilament = 10gms linear pressure

Instrument in use
10-guage nylon
monofilament
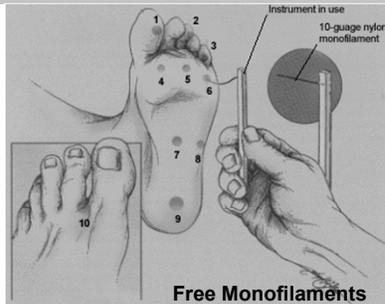
Free Monofilaments
http://www.hrsa.gov/leap/

Diabetes Education SERVICES

_____

_____

_____

_____

_____

_____

Mr. Jones - What are Your Recommendations?

Patient Profile

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

Current Status:

‣ A1c 9.3%
‣ On Metformin 500mg BID
‣ Partial foot amputation
‣ Lives alone
‣ What resources, teaching?

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 doctor, take off your shoes and show your feet.

Bottom Line

‣ 30-40% of hospitalized patients have diabetes
  ‣ 10% aren't officially diagnosed
‣ Cardiovascular disease is the leading cause of hospitalization for people with diabetes
‣ Look for patients with hyperglycemia and cardiometabolic risk factors: smokers, HTN, central obesity, abnormal lipids, Acanthosis.
‣ Provide education and promote self-advocacy

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 pts 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

Needle Size often a Barrier
Size *Does* Matter

(Actual Size)

BD Original 12.7 mm (½")   BD Short 8 mm (5/16")   BD Mini 5 mm (3/16")   BD Nano 4 mm (5/32")
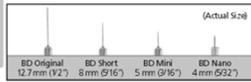
BD Nano 4mm and BD Mini 5mm only available in pen needles

- Use more short needles – 4 mm
- Effective for pts with BMI of 24- 49
- Keeps it subq
- If pt thin, inject at angle
- To avoid leakage, count to 10 before withdrawing needle
- ½ the patients who could benefit from insulin are not using it due to needle phobias

---

Physiologic Insulin Secretion:
24-Hour Profile

Insulin (µU/mL)

50
25
0

Bolus Insulin
Basal Insulin

Breakfast   Lunch   Dinner

Glucose (mg/dL)

150
100
50
0

Mealtime Glucose
Basal Glucose

7 8 9 10 11 12 1 2 3 4 5 6 7 8 9
A.M.   P.M.

Time of Day
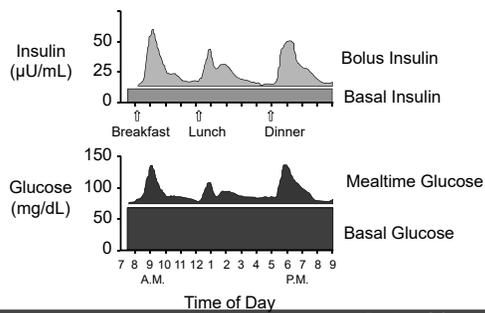
Insulin Action Teams

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

Case Study

- 70 yr old, weighs 100kg
- History of CABG, tobacco
- A1c – 11.3%, BG 400-500 for past weeks
- Insulin – 100+ units Lantus at hs (solostar)
- Oral Meds: Metformin, Invokana
- What is a better insulin dosing strategy?
- Pt can't afford insulin pen – what other option
- Diabetes Meds on a Budget - 2014 - provides practical and affordable strategies to manage hyperglycemia

Cost Per Vial in Northern CA

Per vial cost	Walmart	Walgreens	Costco
Regular Insulin	$25*	$92	$99
NPH	$25*	$92	$99
70/30	$25*	$92	$101
Humalog	$200	$220	$178
Novolog	$197	$217	$178
Apidra	$180	$246	$178
Levemir	$300	$300	$300
Lantus	$226	$221	$206

Afrezza – Inhaled Insulin – Approved 2015 – Type 1 or 2

MannKind Corporation

afrezza.

Figure 3. Baseline-Corrected Glucose Infusion Rate (A) and Baseline-Corrected Serum Insulin Concentrations (B) after Administration of AFREZZA or Subcutaneous Insulin Lispro in Type 1 Diabetes Patients*

**Only studied in adults over 18
Not indicated for pregnancy, while breastfeeding**

* Despite the faster absorption of insulin (PK) from Afrezza, the onset of activity (PD) was comparable to insulin lispro.

Diabetes Education SERVICES

Bolus Insulins
(½ of total daily dose ÷ meals)

Name	Onset	Peak Action
‣ Lispro (Humalog)	15-30 min	1-1.5 hrs
‣ Aspart (NovoLog)		
‣ Glulisine (Apidra)		
‣ Afrezza (Inhaled)		
‣ Regular	30 mins	2-4 hrs

Diabetes Education SERVICES

More than 200 units a day?

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

Indication for Humulin® R U-500

Humulin R U-500 (Concentrated) is indicated as an adjunct to diet and exercise to improve glycemic control in adults and children with type 1 and type 2 diabetes mellitus.

Diabetes Education SERVICES

Concentrated & Inhaled Insulins

DiabetesEd.net

Name/Concentration	Insulin/Action	Considerations
Humulin Regular U-500 • 500 units insulin/mL • KwikPen or Vial	Regular Bolus / Basal	5 xs concentration of u-100 insulin. Indicated for pts taking 200+ units insulin daily. 3 mL Pen – Once opened, good for 28 days. 20 mL Vial – Once opened, good for 40 days. Use designated U-500 insulin syringe.
Humalog KwikPen U-200 200 units insulin/mL	Lispro (Humalog) Bolus	2 xs concentration of u-100 insulin. 3 mL Pen. Once opened, good for 28 days
Toujeo Solostar U-300 Pen 300 units insulin/mL	Glargine (Lantus) Basal	3 xs concentration of u-100 insulin 1.5 mL Pen. Once opened, good for 42 days
Tresiba FlexTouch U-200 Pen 200 units insulin/mL	Degludec (Tresiba) Ultra basal	2 xs concentration of u-100 insulin 3 mL Pen. Once opened, good for 8 weeks

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.

Inhaled Insulin

Action	Insulin Name	Dose Range	Onset	Peak	Duration	Considerations
Bolus – Rapid-acting	Afrezza Inhaled regular human insulin	4, 8, and 12 unit cartridges before meals	15 min	1 hr	3 hrs	Assess lung function. Avoid in lung disease — bronchospasm risk. Side effects: hypo, cough, throat irritation.

The information listed here are not guidelines. Please consult prescribing information for details.　　　REV 10/2016　©2016

Consider U-500 High Potency Insulin

5 x's the concentration of u100

▸ 500 units per mL vs 100 units per mL

CAUTION

   ▸ 20 mL a vial. 500 units per mL= 10,000 unit

   ▸ Costs ~ ~~$400~~ $1,200 per vial

   ▸ Less volume

Bolus Insulin Summary

▸ Regular, Novolog, Humalog, Apidra,

▸ Starts working fast (15-30 mins)

▸ Gets out fast (3-6 hours)

▸ Post meal BG reflects effectiveness

▸ Should comprise about ½ total daily dose

▸ Covers food or hyperglycemia.

▸ 1 unit

   ▸ Covers ≈ 10 -15 gms of carb

   ▸ Lowers BG ≈ 30 – 50 points

Bolus Insulin Timing

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

▸ Glucose goals (ADA) – may be modified by provider/pt
  ▸ 1-2 hours post meal <180
  ▸ Before next meal – 80 - 130

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)

Type 2 – BMI 32. New diagnosis, No meds. What Patterns? Recommendations? Meds?

	Break	Lunch	Dinner	HS
Day 1	164			181
Day 2		124	106	195
Day 3	149		102	242
Day 4	151	81		211

Diabetes Education SERVICES

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

Diabetes Education SERVICES

Basal Insulins
(½ of total daily dose)

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

Long Acting	Peak Action	Duration
▸ Detemir (Levemir)	No Peak	20 hrs
▸ Glargine (Lantus)		24 hrs
▸ Glargine (Basaglar)		24 hrs
▸ Degludec (Tresiba)		42 hrs

Fasting BG reflects efficacy of basal

Diabetes Education SERVICES

Degludec

▸ Degludec (Tresiba)
- ▸ An ultra long acting insulin - lasts up to 42 hours
- ▸ Takes 3-4 days to reach steady state
- ▸ Available in u-100 and u-200 pens
- ▸ Seems to cause less hypo
- ▸ Adjust dose every 3-4 days
- ▸ Wait at least 8 hours between doses
- ▸ Good at room temp for 8 wks

▸ Ryzodeg 70/30
- ▸ mixture of insulin degludec and aspart

Basal Insulin Summary

▸ NPH, Levemir, Lantus, Degludec

▸ Covers in between meals, through night

▸ Starts working slow (4 hours)

▸ Stays in long (12-24 hours)
- ▸ NPH 12 hrs
- ▸ Levemir, Lantus 20-24 hrs
- ▸ Degludec – 42 hours

▸ Fasting blood glucose reflects effectiveness

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

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

Initiate Basal Insulin
Usually with metformin +/- other noninsulin agent

Start: 10 U/day or 0.1-0.2 U/kg/day
Adjust: 10-15% or 2-4 units once or twice weekly to reach FBG target
For hypo: Determine & address cause; if no clear reason for hypo, ↓ dose by 4 units or 10-20%

If A1C not controlled, **consider combination injectable therapy**

| Add 1 rapid-acting insulin injection before largest meal | Add GLP-1 RA | Change to premixed insulin twice daily (before breakfast and supper) |

American Diabetes Association Dia Care 2017;40:S64-S74

Next Steps

▸ At max basal dose
  ▸ 80 x 0.5 = 40 units
▸ Start bolus insulin at largest meal
▸ Or switch to 70/30 Insulin

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

Next Steps – Switch from 40 units basal to 70/30 Insulin

▸ Switch to 70/30 Insulin
▸ Take current dose and give 2/3 in am and 1/3 in pm.
  ▸ 2/3 of basal in am
    ▸ 40 units x 0.6 = 24 units 70/30
  ▸ 1/3 of basal in *pm
    ▸ 40 units x 0.4 = 16 units 70/30
  ▸ *pm = before dinner

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

Type 2 – Glyburide 20mg AM, 10u Lantus pm

	Break	Lunch	Dinner	HS
Day 1	164	94	66	162
Day 2	169		59	195
Day 3		84	81	242
Day 4	159		43	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

Hypoglycemia = "Limiting Factor"

‣ Defined as glucose of 70mg/dl or below
‣ 50% of episodes occur during the night
‣ Higher mortality rate with severe hypoglycemia secondary to sulfonylureas
  ‣ Especially (glyburide) Micronase°, Diabeta°
‣ Blood glucose levels don't describe severity, response is individual

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 BG less than 40, allow recovery time

15 - 20 Gms Carb Sources

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

Basal Bolus – What Adjustments?
Pt weighs 80kg

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

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
  ● Glargine 13 units QD
  ● NPH/Detemir 6u BID

▸ Bolus dose: 12 units
  ▸ 4 units NovoLog, Apidra Humalog, Regular 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
  - Glargine ____ QD
  - NPH/Detemir __ BID
- Bolus dose: ____ units
  - ____units NovoLog, Apidra Humalog, Reg 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 60kg x 0.5 = 30 units of insulin/day
- Basal dose: 15 units
  - Glargine **15** QD or
  - NPH/Detemir **7u** BID
- Bolus dose: 15 units
  - **5** NovoLog, Apidra, Humalog, Reg each meal

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

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

Insulin Teaching Keys

- Bolus insulin with meals
- Basal 1-2xs daily
- Abdomen preferred injection site
- Stay 1" away from previous site
- Don't re-use ultra fine syringes
- Keep unopened insulin in refrigerator

- Toss opened insulin vial after 28 days
- Proper disposal
- Review patients ability to withdraw and inject.
- Side effects include hypoglycemia/wt gain
- Insulin pens –
  - Prime needle to assure accurate insulin dose given
  - Hold needle in for 5 seconds after injection
  - Roll 70/30 pens

Diabetes Education SERVICES

Sharps Disposal: Product and Info

- Look in the Government section white pages for a household hazardous waste listing for your city or county.
- Call 1-800-CLEANUP (1-800-253-2687)
- Search for collection centers on the California Integrated Waste Management Board (CIWMB) Web site: http://www.ciwmb.ca.gov/HHW/HealthCare/Collection/
-

Diabetes Education SERVICES

DiaBingo - N

N DPP demonstrated that exercise and diet reduced risk of DM by ___%
N An _____ a day can help prevent heart attack and stroke
N Rebound hyperglycemia
N Scare tactics are effective at motivating patients to change 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 A1c of 7% equals glucose of
N One % drop in A1c reduces risk of complications by ___ %
N 1 gm of fat equal _____ kilo/calories

N Metabolic syndrome = hyperglycemia, hyperlipidemia, hypertension

N Average American consumes 25 teaspoons of sugar a day.

Diabetes Education SERVICES

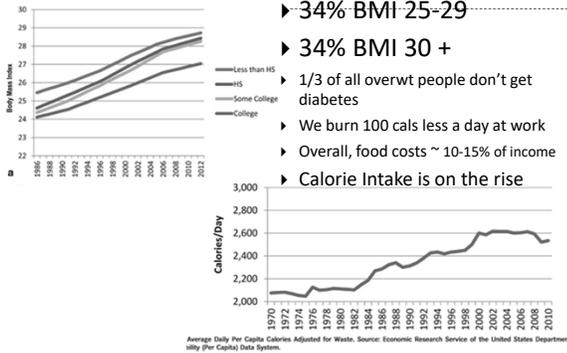## U.S. Weight - 68% overweight or obese

- 34% BMI 25-29
- 34% BMI 30 +
- 1/3 of all overwt people don't get diabetes
- We burn 100 cals less a day at work
- Overall, food costs ~ 10-15% of income
- Calorie Intake is on the rise

Average Daily Per Capita Calories Adjusted for Waste. Source: Economic Research Service of the United States Department - sility (Per Capita) Data System.

Diabetes Education SERVICES

Average American Consumes
25 teaspoons of sugar a day (400 cals)

- Warning label on sodas proposed
- One soda has 12 teaspoons sugar
- On avg, 1 person consumes 40 gallons of soda each year
- ADA guidelines "limit sodas and beverages with sugar, High Fructose Corn Syrup, (HFCS)

Diabetes Education SERVICES

Bacterial Cells Outnumber Human Cells 10 to 1

The Human Microbiome Project

- 10 trillion human cells
- Host 100 trillion bacterial and fungal cells

Diabetes Education SERVICES

Poll Question 1

‣ How much does your gut bacteria weigh?

  A. 24 ounces

  B. 3 pounds

  C. Less than 1 pound

  D. 1.5 pounds

  E . Not sure

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?
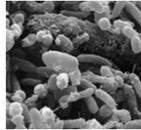
Gut Microbiome

‣ Part of endocrine axis

‣ Stabilized by 3 years of age

‣ Influenced by:
  ‣ Birth method
  ‣ Breast fed
  ‣ Early Antibiotic use
  ‣ Environment
  ‣ Travel

‣ Help us
  ‣ utilize energy
  ‣ fight off invaders

Microbes maketh man
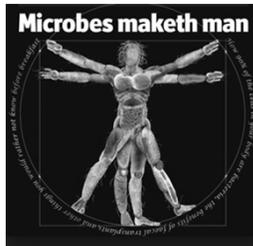
C-Section – Consider Gauze in Vagina

Eat a **healthy, balanced diet** during pregnancy.

If possible, **avoid a C-section** delivery.

Avoid **unnecessary antibiotics.**

Breast-feed baby for the first 12 months.

If you need a C-section, try the **"gauze-in-the-vagina technique."**

▸ early research by Dr. Maria Gloria Dominguez-Bello, an associate professor in the Human Microbiome Program at the NYU School of Medicine. She is testing a fast and easy work-around called the "**gauze-in-the-vagina technique**."

Human Intestine Friends

▸ The majority belong 2 major phyla:
▸ Firmicutes
  ▸ includes *Clostridium*, *Enterococcus*, *Lactobacillus* and *Ruminococcus*
▸ Bacteroidetes
  ▸ includes *Bacteroides* and *Prevotella*

in proportions determined in part by birth, breastfeeding, diet

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Weight and Gut Bacteria
New and Early Research

▸ Leaner people appear to have more bacterial diversity and a higher proportion of bacteroidetes
  ▸ Gut bacteria less efficient at converting food to calories
▸ Obese people appear to have higher levels of firmicutes
  ▸ Gut bacteria very efficient at calorie extraction
▸ Bacteria tend to run in families

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

Diabetes Education SERVICES

Follow Your Gut – Dr. Rob Knight

THE GARDEN OF YOU
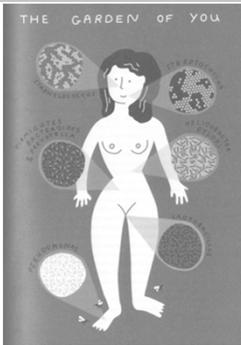
Check out Dr. Knight's:

‣ TED Talk
‣ Website – AmericanFoodProject.org
‣ Articles in Nature and all over

Diabetes Education SERVICES

Take Home Message

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

THE BEST WAY TO STRENGTHEN YOUR CHILD'S IMMUNE SYSTEM

Diabetes Education SERVICES

Medical Nutrition Therapy – ADA

- Focus on the Individual
- Maintain pleasure of eating
- Provide positive messages about food
- Limit food choices only when backed by science
- Provide practical tools
- Refer to a RD and Diabetes Education – Lowers A1c by 1-2%

Approach Depends on Patient

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

Losing 2-8kg Early in diagnosis Type 2 Helpful
ADA 2014

- Weight Loss –
  - *The optimal macronutrient intake to lose weight not known*
  - *The literature does not support one particular nutrition therapy to reduce weight, but rather a spectrum of eating patterns that result in reduced energy intake.*

- To lose one pound – avoid 3,500 cals
  - Decrease intake 250-500 cals daily + exercise

Successful weight loss strategies include

‣ Weekly self-weighing
‣ Eat breakfast
‣ Reduce fast food intake.
‣ Decrease portion size
‣ Increase physical activity
‣ Use meal replacements
‣ Eat healthy foods

Diabetes Prevention Program
Focus on fat = wt loss success

To help you lose weight and improve your health, stay as close as possible to your fat and calorie goals.
Find your starting weight below. Your fat and calorie goals are in the same row. Circle your fat and calorie goals.

Weight (lb)	Fat Goal (grams)	Calorie Goal
120-174	33	1,200
175-219	42	1,500
220-249	50	1,800
>250	55	2,000

http://www.cdc.gov/diabetes/prevention/recognition/curriculum.htm

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How nutrients affect blood sugar
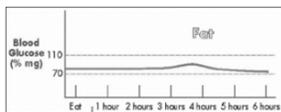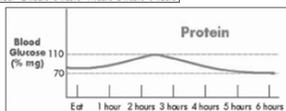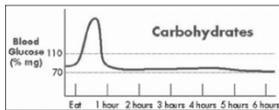
Carbohydrate Needs for Most Adults

	Grams	Servings
Each Meal	45-60 gm	3 - 4
Snacks	15-30 gm	1- 2

Carbs affect Post Meal Blood Glucose

Choose Healthy Carbs

o Carbs have fiber, vitamins, minerals and phytonutrients

o 25 gms of fiber a day

o Power Carbs include:
  o Beans
  o Veggies
  o Fruits
  o Whole grain foods

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10 Superfoods

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

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

Another plate example

Mi planificador de plato
Una comida saludable sabe buenísima

1/4 de proteína. 1/4 de almidón. 1/2 de vegetales.   Plato de 9 pulgadas.

Ms. Gonzales' Daily Meal plan

Break	Lunch	Dinner	Night
5 corn tortillas, 1/2 c. beans, salsa, peppers, egg beaters	Sandwich, low fat potato chips, 1c. juice, 2-4 lowfat cookies	Lg bowl low salt soup, 1c. rice, BBQ meat, salad & cooked vegs 1 glass wine	1 bowl of cereal
Avg BG 120's	**Avg BG 200's**	**Avg BG 200's**	**Avg BG 180's**

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

Carb Counting - Starch

Each Food has:
80 Calories
15 grams carb

1/2 cup cooked beans

1 small ear of corn or 1/2 cup corn

1/3 cup cooked pasta

3/4 cup cold cereal

1 slice bread

1/3 cup cooked rice

1 small potato

1 small tortilla

5-6 small crackers

1/2 English muffin

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Carb counting- fruit

Each Food has:
60 Calories
15 grams carb

1 small fresh fruit

½ cup fruit juice

½ banana

½ cup unsweetened apple sauce

1 slice bread

17 small grapes

1 cup melon

¼ cup dried fruit

2 tbsp raisins

1 1/4 cup strawberries

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Carb Counting - Milk

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

8 oz buttermilk

1 packet diet hot cocoa

1 slice bread

6 oz plain yogurt

8 oz milk

8 oz soy milk

6 oz light fruit yogurt

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Carb Counting - Sweets

Each Food has:
Calories vary
15 grams carb

2 inch square cake or brownie, unfrosted

½ cup diet pudding

½ cup regular jello

2 tbsp light syrup

1 slice bread

2 small cookies

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

½ cup ice cream or frozen yogurt

½ cup sherbet

¼ cup sorbet
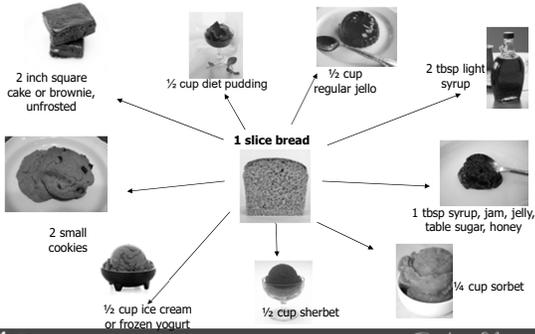
Give the gift of Non-Judgment

out beyond ideas
of wrongdoing
and rightdoing,
there is a field.

i'll meet you there
-rumi
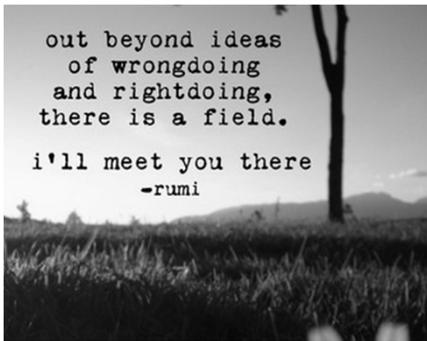
Thank You

▸ Questions?
▸ Email bev@diabetesed.net
▸ Web www.diabetesed.net

Diabetes Education
SERVICES

DiaBingo - I

I Injected hormone that is an analog of amylin

I Glargine, Detemir, NPH are types of

I Breakdown of glycogen into glucose

I Anabolic hormone

I Insulin is released when glucose levels are low

I Once opened, insulin vials are good for one _____

I Elevated post-prandial glucose indicate need for pre-meal

I Epinephrine increases insulin resistance

I Creation of glucose from amino acids and lactate

I Decreasing renal function for people on insulin can cause

I Bolus insulins

I A hormone that increases blood glucose levels