Welcome to
Diabetes in 21st Century

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www.DiabetesEd.net

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. Review glucose patterns and determine how to adjust therapy to improve glucose.
6. Discuss medical nutrition therapy
7. Gain understanding of Type 2 Meds.
8. Demonstrate successful teaching strategies

CDC Announces

35% of Americans will have Diabetes by 2050

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

Diabetes in America 2014

- 29 million or > 9.3%
- 27% don't know they have it
- 37% of US adults have pre diabetes

Diabetes

1994	2000	2009

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

Diabetes Education SERVICES

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"

Diabetes Education SERVICES

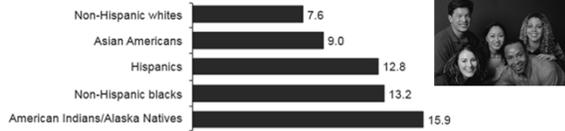## World diabetes day – November 14

The right education for all

The right environment for all

Diabetes: protect our *future*

Diabetes: protect our *future*

world diabetes day
www.worlddiabetesday.org

world diabetes day
www.worlddiabetesday.org

Diabetes Education SERVICES

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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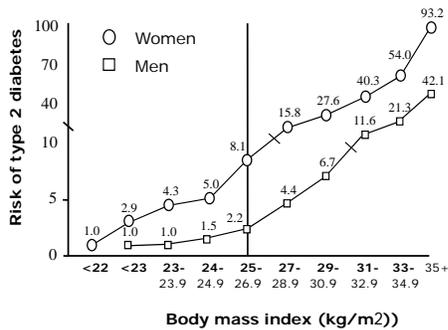

Why Should Zip Code Determine Life Expectancy?

STOCKTON
95202
Life Expectancy
73

IRVINE
92606
Life Expectancy
88

Measureofamerica.org

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The relationship between BMI and the risk of developing type 2 diabetes

Risk of type 2 diabetes vs. Body mass index (kg/m²)

○ Women: 1.0, 2.9, 4.3, 5.0, 8.1, 15.8, 27.6, 40.3, 54.0, 93.2
□ Men: 1.0, 1.0, 1.5, 2.2, 4.4, 6.7, 11.6, 21.3, 42.1

BMI categories: <22, <23, 23-23.9, 24-24.9, 25-26.9, 27-28.9, 29-30.9, 31-32.9, 33-34.9, 35+

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Type 2 in Kids

TODAY — Treatment Options for type 2 Diabetes in Adolescents & Youth

- 7 fold increase since 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
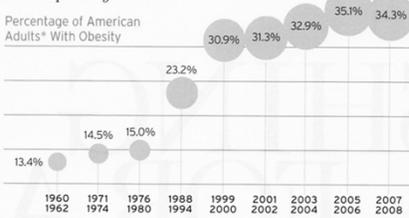- Environmental changes urgently needed

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Obesity in America

Over the past 50 years

Percentage of American Adults* With Obesity

Year	Percentage
1960 1962	13.4%
1971 1974	14.5%
1976 1980	15.0%
1988 1994	23.2%
1999 2000	30.9%
2001 2002	31.3%
2003 2004	32.9%
2005 2006	35.1%
2007 2008	34.3%

Source: Centers for Disease Control and Prevention
*Adults ages 20 to 74

- 34% BMI 30 +, 34% BMI 25-29
- We burn 100 cals less a day at work
- 1/3 of all overwt people don't get diabetes

Thoughts on Diabetes, Weight, Social Change

- "The only way on a societal basis to reduce the prevalence of obesity is through community action" – Dr. Frieden, CDC
- In the past 20 yrs:
  - the price of soda has gone up 20%
  - Fruits and vegetables have gone up 100+%
- Obesity (BMI 30+) prevalence 22% to 40%
- Poverty, Obesity, Diabetes inter-related

New and Early Research on Gut Bacteria

- Leaner people appear to have 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
  - **Newsweek. Don't Just Blame Calories – July 6, 2010 DM Forecast – Feb 2011**

Diabetes Education
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Free Live Webinars and Live Seminars at DiabetesEd.net

- Free Webinars
  - Preparing to take CDE
  - New Frontiers
  - New Medications
  - BC-ADM

Diabetes Education
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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
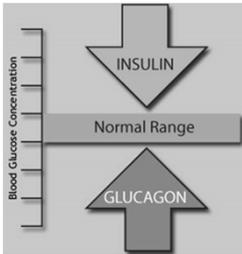- increases protein synthesis, fat storage
- powerful hypoglycemic

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

Diabetes Education SERVICES

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)

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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

Diabetes Education SERVICES

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

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 Diabetes – Genetics and Risk Factors

- 1- 400 to 1-1000 = Risk of type 1 in gen pop
- 1-20 to 1-50 in offspring of diabetes parents
- Combo of genes and disease susceptibility
- Risk Factors:
  - Autoimmunity tends to run in families
  - Higher rates in non breastfed infants
  - Viral triggers: congenital rubella, coxsackie virus B, cytomegalovirus, adenovirus and mumps.

Type 1 Diabetes – 10% of all DM

- Auto-immune pancreatic beta cells destruction
- Most commonly expressed at age 10-14
- More rapid destruction in youth (vs. adults)
- Insulin sensitive (require 0.5 - 1.0 units/kg/day)
- Auto-immune Markers
  - Positive Glutamic Acid Decarboxylase (GAD), Insulin & Islet Cell Autoantibodies (IAA & ICA's)
  - New marker – ZnT8 (zinc transporter) antibodies to this (ZnT8) found in 60-80% of type 1
- Other clues
  - Low C-Peptide level < 0.5
  - Usually lean and present in sick state

_____

_____

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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 Diabetes Associated with other immune conditions

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

_____

_____

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Type 1 Summary

- Autoimmune and often associated w/
- Complete pancreatic destruction
- Need insulin shots
- Often first present in Diabetic KetoAcidosis (DKA)
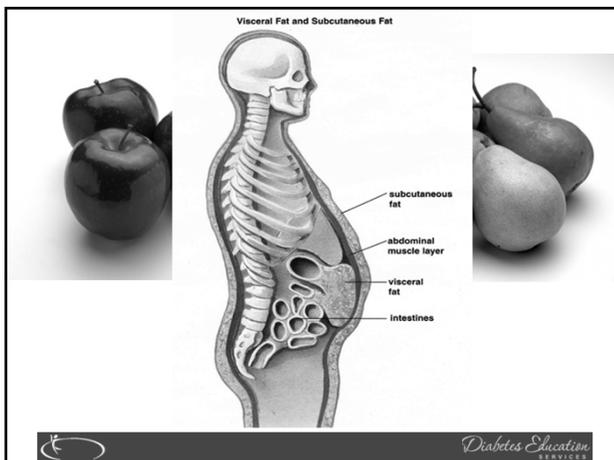
_____
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Type 1 in Hospital

- 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.
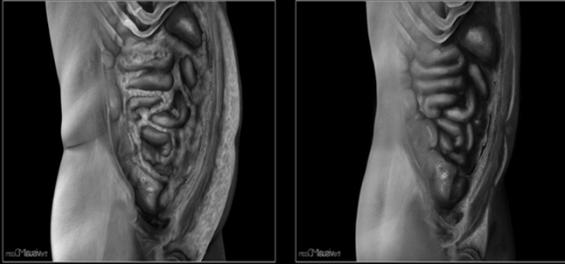
What do you say?

_____
_____
_____
_____
_____
_____
_____

Visceral Fat and Subcutaneous Fat

- subcutaneous fat
- abdominal muscle layer
- visceral fat
- intestines

_____
_____
_____
_____
_____
_____
_____

Visceral Fat – "Endocrine Organ"

Cardio Metabolic Risk -
5 Hypers -

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

Manifestations of Insulin Resistance

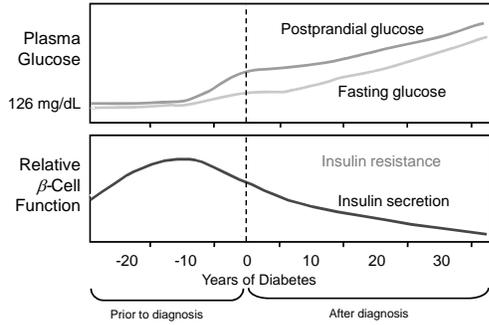## Flash Mob – World Diabetes Day to Beat It

- March R/C/R
- Fred Astaire
- Point R/L
- Arms up, down
- Shoulder Walk
- Punch down/up
- Scoot Rt/Left
- Reach up R/L
- Shoulder Walk

- Open door
- Ride Horse
- Scoot Rt/Left
- Turn R & Clap, then L
- Shoulder Walk
- Punch down/up

Natural Progression of Type 2 Diabetes

Plasma Glucose

Postprandial glucose

126 mg/dL

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.

Diabetes Education SERVICES

Natural History of Diabetes

Yes!   NO

Normal
FBG <100
Random <140
A1c <5.7%

Prediabetes
FBG 100-125
Random 140 - 199
A1c ~ 5.7- 6.4%
50% working pancreas

Diabetes
FBG 126 +
Random 200 +
A1c 6.5% or +
20% working pancreas

Development of type 2 diabetes happens over years or decades
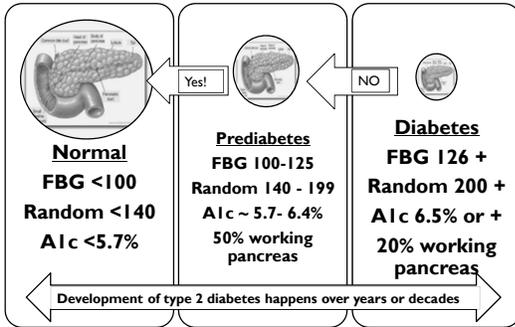
Diagnostic Criteria

▸ All test should be repeated in the absence of unequivocal hyperglycemia

▸ If test abnormal, repeat same test to confirm diagnosis

Kaiser Diabetes Screening Guidelines:

• Fasting Plasma Glucose (FPG) preferred screening test – after 8 hr fast

• A1c acceptable alternative screening test

Diabetes Education SERVICES

Diabetes 2 - Who is at Risk?
(ADA Clinical Practice Guidelines)

1. Testing should be considered in all adults who are overweight (BMI ≥ 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

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)

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

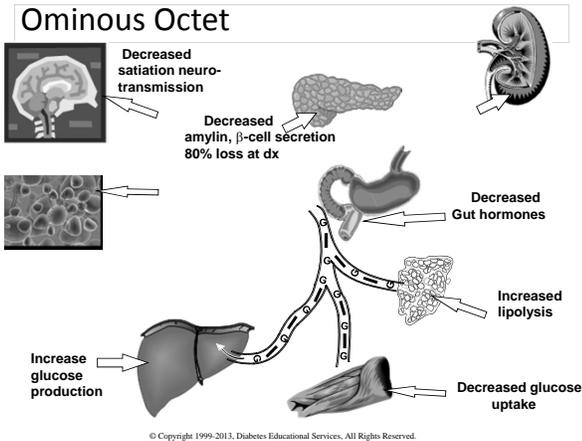## Diabetes is also associated with

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

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

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

Comparison of Type 1, Type 2, LADA

	Type 1	Type 2
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

Diabetes Education SERVICES

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.

Diabetes Education SERVICES

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

Diabetes Education SERVICES

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

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

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

Diabetes Education Services

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 Education Services

DiaBingo

B 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

Diabetes Education Services

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?

Diabetes Education
SERVICES

Unconditional Positive regard

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

‣ Help with
‣ Unconditional
‣ Guidance and Support
Anne Peters, MD, CDE
ADA Post Grad

‣ *Term coined by humanist, Carl Rogers*

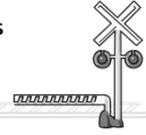## No one is Unmotivated

…. 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 1 – at least pre and post meal
- Type 2 – as often as needed to achieve goals (ADA)
- Consider:
  - Types and timing of meds
  - Goals
  - Ability (physical and emotional)
  - Finances

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.
- 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?

Preventing Pre Diabetes

Can Type 2 be Prevented in Older Adults?

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

• 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

89% risk reduction when all at goal.

35% rel risk reduction for each additional

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

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

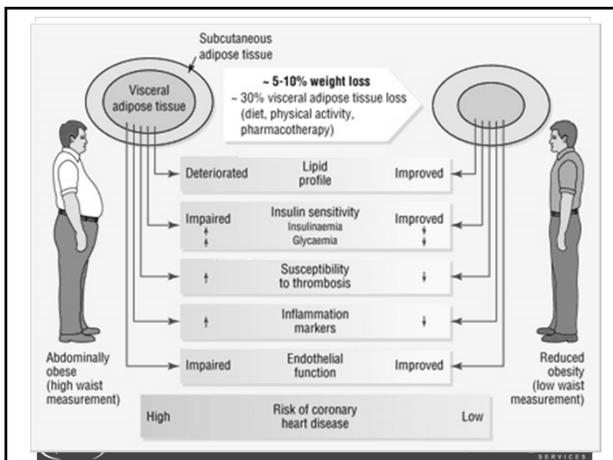▸ For every 2.2 pounds of weight loss, risk of type 2 diabetes was reduced by 13%.

Diabetes Prevention Programs

▸ Delay or Prevent Type 2 Diabetes
▸ Save $5.7 billion over 25 years
▸ Programs
  ▸ Partnering with YMCA's
  ▸ CDC now recognizes Diabetes Prevention Programs www.cdc.gov/diabetes/prevention

Health Affairs 31, No 1 2012 p50-60

ABC's of Diabetes

A1C
Blood Pressure
Cholesterol

professional.diabetes.org

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

A1c Goals for Non Pregnant Adults
Individualize Targets – ADA

- < 7% for patients **in general**
- For individual pts, as close to normal as possible (<6%) w/out significant hypo
- < 8% for frail elderly
- *Goals based on:*
  - *Duration of diabetes*
  - *Life expectancy and Age*
  - *Co morbid conditions*
  - *Know CVD or advanced micro complications*
  - *Ind pt considerations, shared decision making*

A1c and Estimated Avg Glucose (eAG) 2008

http://professional.diabetes.org/GlucoseCalculator.aspx

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

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

"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

Glucose Goals
Individualize Targets – ADA

▸ Pre-Prandial BG 70- 130

▸ 1-2 hr post prandial < than 180
  *for nonpregnant adults

ABCs of Diabetes –

- A1c less than 7% (avg 3 month BG)
  - Pre-meal BG 70-130
  - Post meal BG <180
- Blood Pressure < 140/80
- Cholesterol
  - HDL >40
  - LDL <100 (if CHD, <70)
  - Triglyceride < 150

## BP Goal for KP NCAL

BP 139/ 89 or less

"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

How are we doing?
Reaching goal

Casagrande and Associates
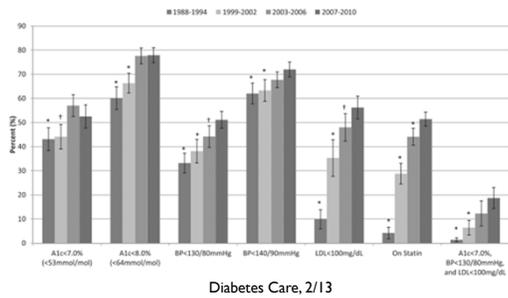
Diabetes Care, 2/13

Diabetes Education SERVICES

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

Diabetes Education SERVICES

Vaccinations- Immunizations

- Flu vaccine
  - every year starting 6 months
- Pneumococcal starting at 2 years.
  - One time Revaccination for those over 64 and had first vaccine >5 years prior
- 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

Mr. Calhoun - What are Your Recommendations for Self-Care

Patient Profile

62 yr old with newly dx type 2. History of previous MI.

Meds: Lasix, synthroid

Labs:
- A1c 9.3%
- HDL 37 mg/dl
- LDL 156 mg/dl
- Triglyceride 260mg/dl
- Proteinuria - neg
- B/P 142/92

Self-Care Skills
- Walks dog around block 3 x's a week
- Bowls every Friday
- Widowed, so usually eats out

DiaBingo- G

G ADA goal for A1c is less than _____%

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

G 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

Mr. Calhoun - 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
- LDL 114 mg/dl
- Triglyceride 260mg/dl
- Proteinuria - neg
- B/P 142/92

Self-Care Skills
- Walks dog around block 3 x's a week
- Bowls every Friday
- 3 beers daily
- Widowed, so usually eats out
- 15 lbs overweight
- "My foot hurts"

Foot Care

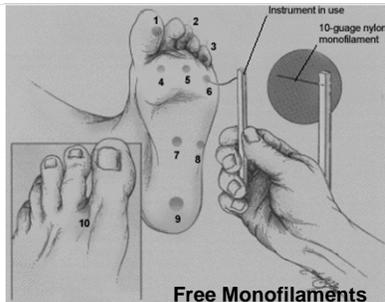# Lift the sheets and look at the Feets!

A Quick Foot Assessment

- Ask - What do you do to take care of your feet?
- Look - texture, toenails, structural deformities, lesions, corns
- Assess sensation
- Assess risk factors
- Teach, teach, teach

5.07 monofilament = 10gms linear pressure

Instrument in use
10-guage nylon monofilament

Free Monofilaments
http://www.hrsa.gov/leap/

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.

Diabetes Education SERVICES

Diabetes Self-Management

- Self Monitor Blood Glucose
- Meal Plan
- Exercise / Activity
- Medications

Diabetes Education SERVICES

Medical Nutrition Therapy – ADA 2014 Updates

- No ideal percentage of calories from protein, carbohydrate and fat for people with diabetes.
- Macronutrient distribution should be based on an *individualized assessment* of eating patterns, preferences and metabolic goals.

Diabetes Education SERVICES

Medical Nutrition Therapy 2014 - 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

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.*

- Wt loss goal ½ pound to 1 lb a week
  - Decrease intake 250-500 cals daily + exercise

- 2013 – Try and keep less than 2,300 mg a day
- Vitamin and mineral supplements not recommended - lack of evidence.
- Fiber 25 -38 gms a day

Obesity in America

- 68% overweight or obese
  - 34% BMI 30 +, 34% BMI 25-29
- 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 of Agriculture (Per Capita) Data System.
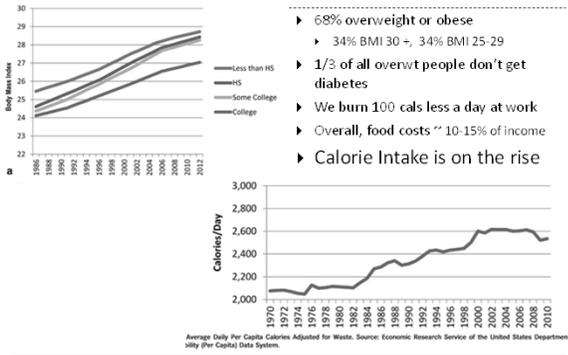
Diabetes Education Services

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

- Warning label on sodas proposed
- One soda has 12 teaspoons soda
- 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

BMI – Visual Image

BMI 17.5	BMI 18.5	BMI 22.0	BMI 24.9	BMI 30	BMI 40
Underweight	Normal	Normal	Normal	Overweight	Overweight
← Anorexia	Lowest Normal	Middle Normal	Highest Normal	Obesity	Morbid Obesity →
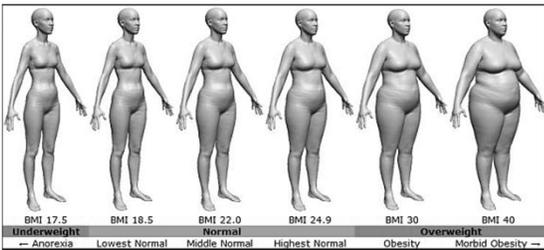
Diabetes Education Services

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 Education Services

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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

Diabetes Education Services

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Move toward the Tomato

Diabetes Education Services

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Health Campaigns

ADA recommendation
Eat Less Junk Food & Sugary Drinks –

- Less Processed Foods
- Less Sugary Beverages
  - increase visceral adiposity
  - With sugar or
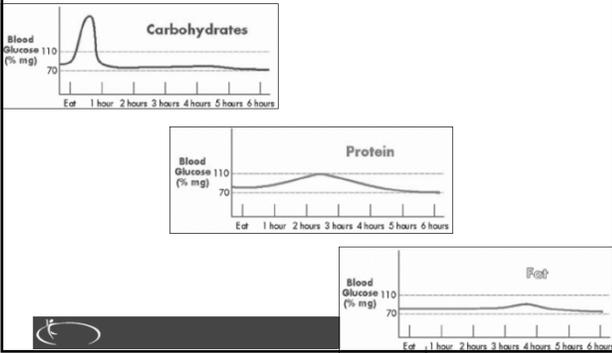 - High fructose corn syrup

- Soda Tax?
- Junk Food Tax?

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

How nutrients affect blood sugar

Carbohydrates

Blood Glucose 110 (% mg) 70

Eat 1 hour 2 hours 3 hours 4 hours 5 hours 6 hours

Protein

Blood Glucose 110 (% mg) 70

Eat 1 hour 2 hours 3 hours 4 hours 5 hours 6 hours

Fat

Blood Glucose 110 (% mg) 70

Eat 1 hour 2 hours 3 hours 4 hours 5 hours 6 hours

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Teaching About Eating Healthy

Major food groups

"Handy Diet"

Plate Method

Exchange Lists

Food Diaries / Glucose Records

Carbohydrate Counting

Assess what is best for the situation.

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USDA Food Pyramid
www.myplate.gov

Balancing Calories

▸ Enjoy your food, but eat less.

▸ Avoid oversized portions.

Foods to Increase

▸ Make half your plate fruits and vegetables.

▸ Make at least half your grains whole grains.

▸ Switch to fat-free or low-fat (1%) milk.

Foods to Reduce

▸ Compare sodium in foods like soup, bread, and frozen meals — and choose the foods with lower numbers.

• Drink water instead of sugary drinks.

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Another plate example

Mindful Eating

Label Lessons

Carbs affect Post meal Blood Glucose

starchy foods

o Starch
o Fruit
o Milk
o Desserts

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Diabetes Education SERVICES

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

Diabetes Education SERVICES

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

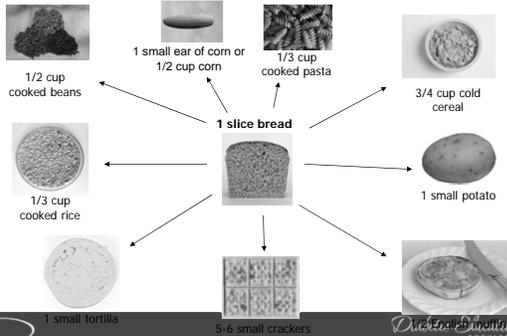Diabetes Education SERVICES

Handy Meal Plan

- Per Meal Serving
  - Each finger = 15 gms carb (can have 3-4 servings/meal)
  - Palm of hand = 3 oz's protein
  - Thumbnail = 1 tsp fat serving

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
- 1/3 cup cooked rice
- **1 slice bread**
- 1 small potato
- 1 small tortilla
- 5-6 small crackers

Carb counting- fruit

Each Food has:
60 Calories
15 grams carb

- 1 small fresh fruit
- ½ cup fruit juice
- ½ banana
- ½ cup unsweetened apple sauce
- 17 small grapes
- **1 slice bread**
- 1 cup melon
- ¼ cup dried fruit
- 2 tbsp raisins
- strawberries

Carb counting- milk

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

1 packet diet hot cocoa

8 oz buttermilk

1 slice bread

6 oz plain yogurt

8 oz milk

8 oz soy milk

6 oz light fruit yogurt
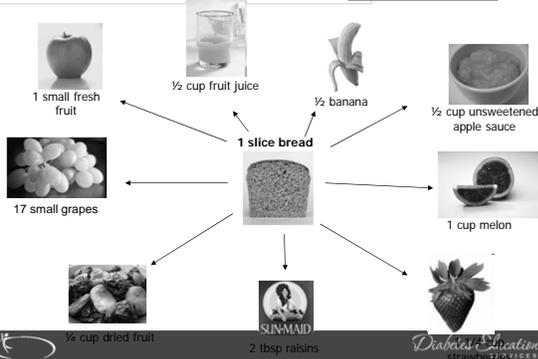
Diabetes Education SERVICES

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

Diabetes Education SERVICES

Go Lean with Protein

BICYCLE RIDER BACK PLAYING CARDS

o Choose lean protein
  o Poultry, fish, egg, lean beef
  o Plant sources- beans, lentils, nuts
  o Low fat cheese- cottage cheese, mozzarella cheese

o Limit high fat protein
  o Bacon & sausage
  o High fat cuts of beef
  o Whole milk cheese

o Serving size
  o 1 oz = ¼ cup
  o 3 oz = deck of cards

Diabetes Education SERVICES

Fats- Aim for heart health

- **Saturated fats (LIMIT)**
  - **Solid**
  - **Animal**
  - **Tropical (palm, coconut)**
  - **Trans fats (deep fried)**

- Monounsaturated
  - Olive & canola oils
  - Nuts
  - Avocado

- Polyunsaturated
  veg oils: canola, corn, walnut,
  safflower, soybean

Serving sizes
- 1 tsp butter, margarine, oil, mayonnaise
- 1 Tbsp salad dressing, cream cheese, seeds
- 2 Tbsp avocado, cream, sour cream
- 1 slice bacon

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

Ms. Gonzales' General Diet Pattern

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**

Resources

- www.eatright.org American Dietetic Association website for nutrition information, resources, and access to Registered Dietitians
- www.diabetes.org American Diabetes Association website, advocates to prevent, cure and improve the lives of all people affected diabetes
- www.americanheart.org American Heart Association website; resources, recipes and tips; learn about efforts to reduce death caused by cardiovascular disease
- www.dce.org/publications/education-handouts/

Resources

- www.nhlbi.nih.gov contains information for professionals and the general public about heart and vascular diseases, lung diseases, blood diseases.
- www.niddk.nih.gov National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) information and resources clearinghouse.
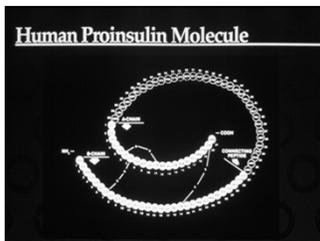
Insulin – the Ultimate Hormone Replacement Therapy

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

Human Proinsulin Molecule

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

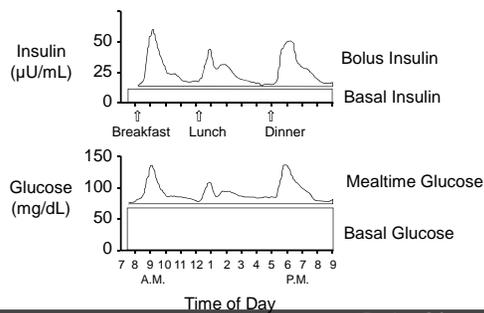## Needle Size often a Barrier
Size *Does* Matter

- 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

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Physiologic Insulin Secretion:
24-Hour Profile

Insulin Action Teams

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

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)		
Regular	30 mins	2-4 hrs

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 – 70 - 130

Inhaled insulin – Approved 2014

afrezza

Afrezza Inhaler – Bolus Regular Ins

Know your AFREZZA® inhaler:

- removable purple mouthpiece cover
- white mouthpiece
- cartridge
- white cartridge cup
- top of inhaler
- purple base
- bottom of inhaler
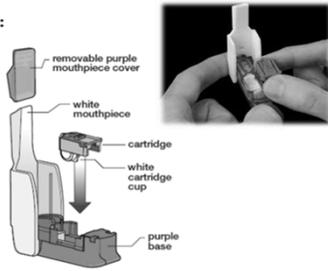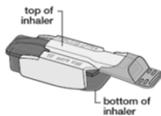
Replace inhaler every 15 days

Bolus – Reg 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	354 10uR
Day 4	58 carbs	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)	peakless	20 hrs
▸ Glargine (Lantus)	No peak	24 hrs

Fasting BG reflects efficacy of basal

Diabetes Education Services

Basal Insulin Summary

- ▸ NPH, Levemir, Lantus
- ▸ Covers in between meals, through night
- ▸ Starts working slow (4 hours)
- ▸ Stays in long (12-24 hours)
  - ▸ NPH/ Lente 12 hrs
  - ▸ Levemir, Lantus 20-24 hrs
- ▸ Fasting blood glucose reflects effectiveness

Diabetes Education Services

Basal Only
Type 2, 60kg

	Break	Lunch	Dinner	HS
Mo 1	170s	254	276	298 10uNPH
Mo 2	160s	233	247	233 20uNPH
Mo 3	140s	213	265	206 30uNPH

Diabetes Care 32:193-203, 2009

Combination SQ 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

10u 70/30 BID
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

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Pattern Management

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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:
  - ▸ fix fasting first, r/o Somogyi (check 3am BG)
- ▸ QA: check meter, insulin, meds

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Type 2 – New diagnosis – No meds Patterns?
Questions

	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

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Type 2 – Glucotrol 20mg AM,
10u NPH 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

Diabetes Education Services

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Basal Bolus – What Adjustments?
Pt weighs 80kg

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

Diabetes Education Services

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Intensive Diabetes Therapy
Insulin Dosing Strategy

50/50 Rule
- 0.5-1.0 units/kg day

- Basal = 50% of total

- Bolus = 50% of total
  - 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 at each meal

Diabetes Education SERVICES

Intensive Diabetes Therapy
Insulin Dosing Strategy

50/50 Rule
- 0.5-1.0 units/kg day

- Basal = 50% of total

- Bolus = 50% of total divided into 3 meals

Example – You Try
- Wt 60 kg x 0.5 = ____ units of insulin/day

- Basal dose: _____ units

- Bolus dose: _____ units
  - at each meal

Diabetes Education SERVICES

Basal Bolus – <u>Using 50/50 Rule</u> –
Pt weighs 80kg A = Aspart

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

Diabetes Education SERVICES

Type 1 and a Teen

- ‣ Cindy is trying to carb count and adjust her insulin, but is still having trouble. She weighs 60kg.
- ‣ What is her daily dose of insulin?
- ‣ What is her basal dose?
1. Pre meal target BG is 120
2. Post meal goal < 180.
3. Carb ratio: 1 unit for every 15 gms
4. Hyperglycemic correction factor is one unit for every 50 above goal

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Correction Bolus – Add to mealtime insulin

Rapid/Fast Acting Insulin (1 unit:50 mg/dl>120)

70-120 mg/dl	0 units
121-170 mg/dl	1 unit
171-220 mg/dl	2 units
221-270 mg/dl	3 units
271-320 mg/dl	4 units
321-400 mg/dl	5 units

Grams of Carb per meal?

- ‣ Morning - BG 173
  - ‣ Breakfast – slice cold pizza, ½ c. juice
- ‣ Lunch BG 69
  - ‣ Menu- ham sandwich, pear, diet 7-up, mini snickers bar.
- ‣ 2 hrs after lunch, BG 148 - ran track
- ‣ Before dinner - BG 98
  - ‣ Cheeseburger, small fries, chocolate chip cookie
- ‣ At bedtime, BG 173

Carbs? How much Insulin?

- Morning - BG 173
  - Breakfast – slice cold pizza, ½ c. applesauce
  - 45 gms
- Lunch BG 69
  - Menu- ham sandwich, pear, diet 7-up, mini snickers
  - 60 gms
- 2 hours after lunch, BG 148 – ran track
- Before dinner - BG 98
  - Cheeseburger, small fries, chocolate chip cookie
  - 75 gms
- At bedtime, BG 173 – 15 unit Lantus

Insulin Teaching Keys

- Bolus insulin with meals
- Basal 1-2xs daily
- Can't mix Glargine or Detemir with other insulins
- 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

Medical Waste Management Act Effective Sept 1, 2008

- CA Senate Bill 1305
- New law requires proper disposal of home generated syringes, needles, lancets
- Disposal in solid waste containers no longer permitted
- EPA in 2004 also discourages sharps disposal in trash.

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/

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

Action/Classes of Type 2 Meds

1. Suppressor	Biguanide – Metformin
2. Squirter	Sulfonylureas Meglitinides
3. Satiators	AmylinoMimetics Incretin Mimetics DPP-4 Inhibitors
4. Sensitizer	Thiazolidinediones (TZD)
5. Glucoretics	SGLT2 Inhibitors
6. Circadian Switchers	Dopamine Receptor Agonists
7. Slower	Alpha-glucosidase inhibitors

Approach to management of hyperglycemia:

Figure 1
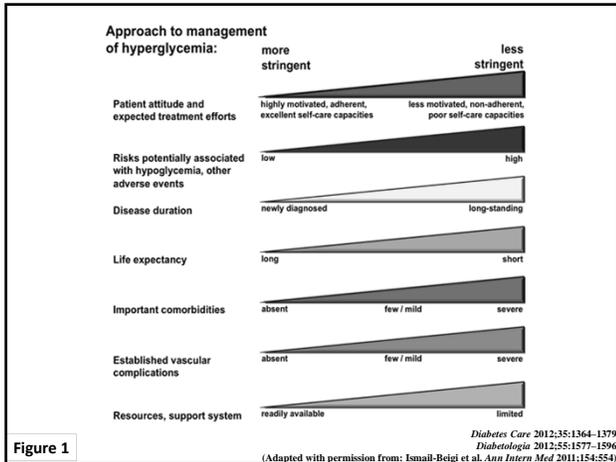
Diabetes Agents Considerations

‣ Diabetes medications can be used as monotherapy, in combo or with insulin

‣ Combining agents from different classes has additive effect

‣ Most reduce A1c 0.5 – 2.0%

‣ Not to be used during preconception, pregnancy or when breastfeeding

Diabetes Education SERVICES

ADA-EASD Position Statement: Management of Hyperglycemia in T2DM

Patient-Centered Approach

"...providing care that is respectful of and responsive to individual patient preferences, needs, and values - ensuring that patient values guide all clinical decisions."

• **Gauge patient's preferred level of involvement.**

• **Explore, where possible, therapeutic choices.**

• **Utilize decision aids.**

• **Shared decision making – final decisions re: lifestyle choices ultimately lie with the patient.**

Diabetes Education SERVICES
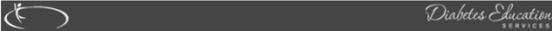
Ideal Diabetes Medication -

- ‣ No hypoglycemia
- ‣ No weight gain
- ‣ Affordable
- ‣ Lowers CV risk
- ‣ Most people can tolerate /use

Biguanides - Metformin

- ‣ **Action:** decrease hepatic glucose (glycogen)
- ‣ **Names:**
  - ‣ Metformin (Glucophage)
    - ‣ Starting dose: 500 BID, max 2500mg daily
    - ‣ Metformin XR - extended release – less GI upset
    - ‣ 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
  - ‣ Lactic acidosis if improperly prescribed
  - ‣ Watch for B12 deficiency
  - ‣ Hold prior to IV contrast dye studies and use caution during acute illness. Resume when kidney function adequate

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Considerations
Biguanide - Metformin (Glucophage®)

▸ Contraindications due to lactic acidosis:
  ▸ creatinine >1.4 females, >1.5 males
  ▸ liver disease
  ▸ alcohol abuse
  ▸ over 80 years old
  ▸ risk of acidosis
  ▸ during IV dye study
  ▸ CHF requiring meds

Sulfonylureas –

▸ Action: tells pancreas to squirt insulin all day
▸ Who?
  ▸ Lean type 2

Sulfonylureas - Squirts

▸ Action: Increase endogenous insulin secretion
▸ Efficacy:
  ▸ Decrease FPG 60-70 mg/dl
  ▸ Reduce A1C by 1.0-2.0%
▸ Primary failures: about 20% no response
  ▸ R/O glucose toxicity or low beta cell function
▸ Secondary failures: 5-10% shortly after initial response, many more later
  ▸ Usually after 5 or more years of therapy due to natural history of DM 2

Sulfonylureas: 2nd Generation

Generic	Trade	Duration
▸ Glyburide	Diabeta, Micronase, Glynase Prestabs	12-24 hrs
▸ Glipizide*	Glucotrol, Glucotrol Xl	12-24 hrs
▸ Glimepiride	Amaryl	16-24 hrs

*take short acting product on empty stomach

What questions?

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

Sulfonylureas

▸ Other Effects
  ▸ Hypoglycemia
  ▸ Weight gain
  ▸ Cleared by kidney, use caution for pts with kidney problems
  ▸ Generally the least expensive class of medication

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 (chlorpropamide) Diabenese® and (glyburide) Micronase®, Diabeta®
- Blood glucose levels don't describe severity, response is individual

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Hypoglycemia 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:
- 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)

Next Step?

- 69 year old male, BMI 25, on Metformin 1000mg BID and Glucotrol 20mg before breakfast and dinner.
- Pt overweight - A1c 8.1%. Creat 1.2

Indications for Insulin Sensitizers
Rosiglitazone (Avandia®), Pioglitazone (Actos®)

▸ Action: **Sensitizers**

▸ Who?
  ▸ Insulin resistant patient
  ▸ Dysmetabolic syndrome

Thiazolidinediones – TZD's

▸ **Action**: decrease insulin resistance by making muscle and adipose cells more sensitive to insulin. Decrease free fatty acids

▸ **Names**:
  ▸ pioglitazone (Actos) – bladder cancer warning
    ▸ Dosing: 15-45 mg daily
  ▸ rosiglitazone (Avandia) – restriction removed
    ▸ Dosing: 4-8 mg daily

▸ **Efficacy:**
  ▸ Decrease fasting plasma glucose ~35-40 mg/dl
  ▸ Reduce A1C ~0.5-1.0%
  ▸ 6 weeks for maximum effect
  ▸ $30 a month
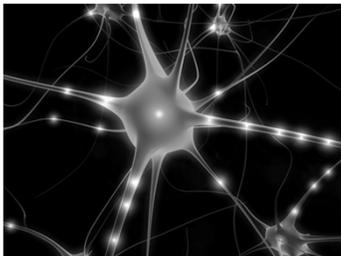

Incretin Mimetics – GLP-1 Agonists
"Gut Hormone Imitators"   DPP-IV Inhibitors

▸ How do they work?

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

For all the Following GLP-1 Agonists

- **Pancreatitis Warning**
  - Please tell all patients to report signs right away and discontinue meds
  - Signs include:
  - Sudden abdominal pain, nausea and vomiting

    Also investigating if use associated w/ increased risk of pancreatic cancer

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Incretin Mimetics
Exenatide (Byetta) XR (Bydureon)

- **Action:**
  - Insulin release in response to meal
  - Slows gastric emptying
  - Causes Satiety
- **Exenatide Dosing**: - 5-10 mcg ac break, dinner
  - Extended Release 2013 – Bydureon – 1x week
- **Efficacy:** Decreases A1c by 0.7%, wt by 3lbs
- **Indication**: For type 2s only - mono or in combo
- **Other**: In prefilled pens in 5 or 10 mcg doses

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Incretin Mimetics – GLP-1 Analog
Liraglutide (Victoza)

Liraglutide Dosing: 1x daily, time not critical
- 0.6 x 1 week – if tolerated (nausea), go to >
- 1.2 x 1 week – if tolerated go to >
- 1.8 mg daily
▸ **Efficacy:** lowers; A1c by 1%, body wt by ~ 2.5kg
▸ **Indication**: Monotherapy or in combo . Type 2 only
▸ **Other**: In pen, with preset dosing
▸ **Black box**–thyroid tumor warning (avoid if family hx, notify MD of hoarseness, lump).

Incretin Mimetics Considerations
Exenatide, Liraglutide, DPP - IVs

▸ Store pens in refrig, toss after 30 days
▸ Sub-Q Injection in abd, thigh, upper arm
▸ To prevent hypoglycemia , reduce sulfonylurea/insulin dose when starting
▸ Side effects include nausea, diarrhea
▸ Pancreatitis warning (instruct pt to report abd pain, vomiting)
▸ Don't use w/ gastroparesis, severe renal disease
▸ Exenatide Cost : $150-175 for month supply of pen devices

DPP-4 Inhibitors – "Incretin Enhancers"
Januvia (sitagliptin) Tradjenta (linagliptin)
Onglyza (saxagliptin) Nesina (Alogliptin)

▸ **Action:**
  ▸ Increase insulin release w/ meals
  ▸ Suppress glucagon
  ▸ Promote satiety (slows gastric emptying)
▸ **Dosing**: See pocketcard
▸ **Efficacy:** Decreases A1c by 0.6 -0.8%
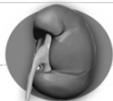▸ **Indication**: For type 2s

DPP-4 Inhibitors- "Incretin Enhancers"

‣ Januvia, Onglyza eliminated via kidney, lower dose needed

‣ Do not cause wt gain or hypoglycemia

‣ Side effects –headache, runny nose, sore throat- watch for pancreatitis

‣ Cost $100 - $150 mo

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SGLT2 Inhibitors

Increased Glucose Reabsorption

‣ Cangliflozin (Invokana)

‣ Dapagliflozin (Farxiga)

‣ "Glucoretic" - Inhibit the reabsorption of glucose in the proximal kidney tubules

‣ Monitor B/P, K+ & renal function.

‣ If GFR < 60, see instructions

‣ Side effects: hypotension, UTI, increased urination, genital yeast infections.

‣ Lowers A1c 0.7%–1.0%, wt loss of 1-3 lbs.

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DiaBingo - N

N Injected hormone called an incretin mimetic

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 1% A1c = _____ of Blood Glucose

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High Numbers Got You Down?

▶ **By getting glucose less than 150 you will**:

✴ have more energy
✴ spend fewer days in bed
✴ feel less depressed
✴ urinate less often
✴ improve your vision
✴ think more clearly
✴ miss work less often

Testa, Simonson JAMA 280: 1998

Thank You

▶ Questions?
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