Diabetes Education SERVICES

15 years

Welcome to Diabetes in 21st Century

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www.DiabetesEd.net

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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. 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

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CDC Announces

35% of Americans will have Diabetes by 2050

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

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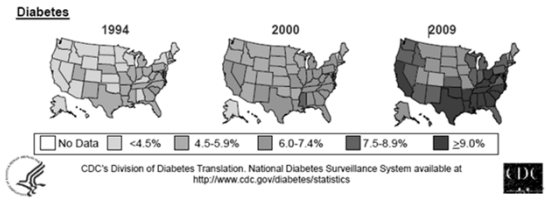
Diabetes in America 2014

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



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Type 2 in Kids

- 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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Global Epidemic

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

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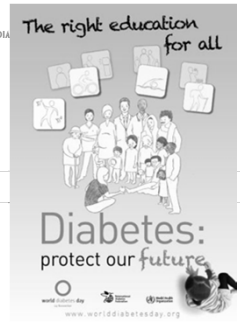
World diabetes day – November 14



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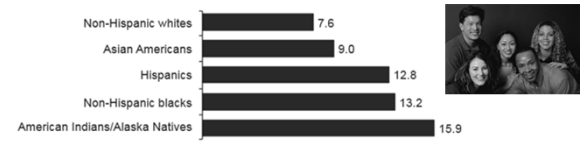
Age-adjusted Diabetes Prevalence

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



*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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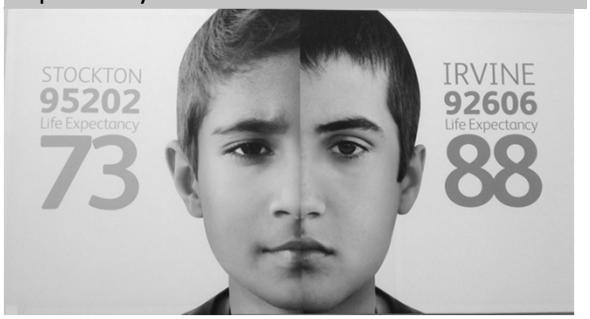
Why Should Zip Code Determine Life Expectancy?



Measureofamerica.org

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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

Role of the Pancreas Endocrine Functions

Beta Cells - Insulin

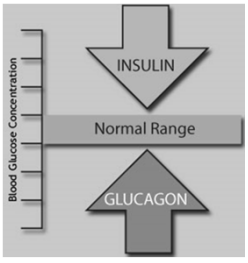
Anabolic hormone - helps store glucose as glycogen in muscle, liver

- 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

Role of the Pancreas Endocrine Functions



Alpha cells - Glucagon

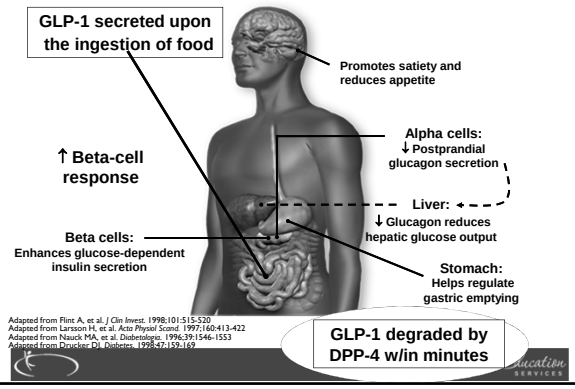
Opposes action of insulin at the liver

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

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



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

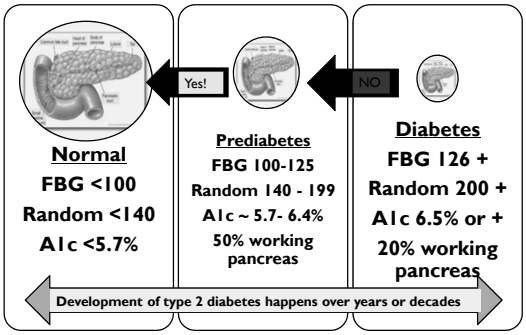
Incretin Mimetics
Byetta, Bydureon, Trulicity, Tanzeum

- **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

Bariatric Surgery

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

Natural History of Diabetes



Signs of Diabetes

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

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

Diabetes Classifications

- Type 1
- Type 2
- Gestational
- Secondary

Case Study

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.

Incidence of Type 1 in Youth

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

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

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

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

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Autoantibodies Assoc w/ Type 1

Panel of autoantibodies –

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

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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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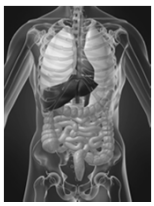
Type 1 Diabetes Associated with other immune conditions

- 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?

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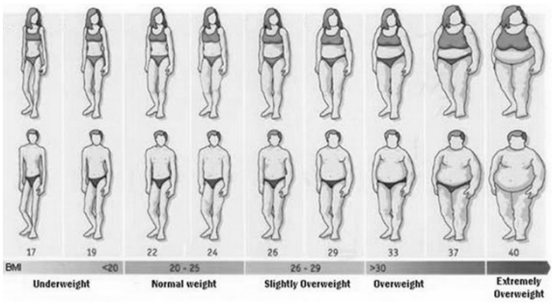
BMI Categories



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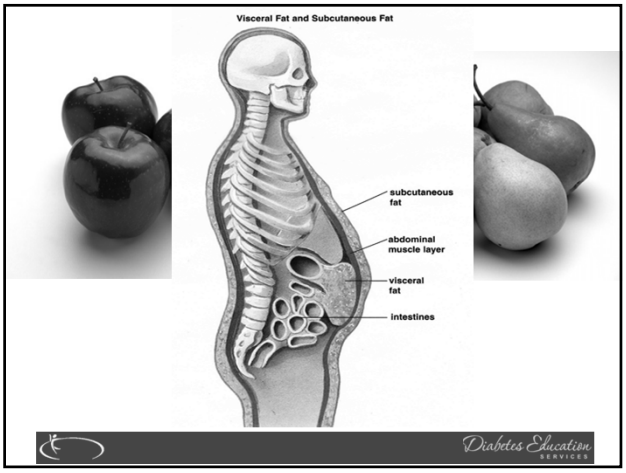

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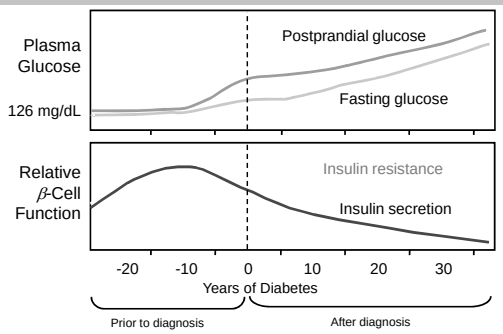
Natural Progression of Type 2 Diabetes



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

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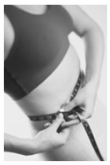
Cardio Metabolic Risk - 5 Hypers -

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



Manifestations of Insulin Resistance

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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

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Diabetes 2 - Who is at Risk?

(ADA Clinical Practice Guidelines)

Risk factors cont'd

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

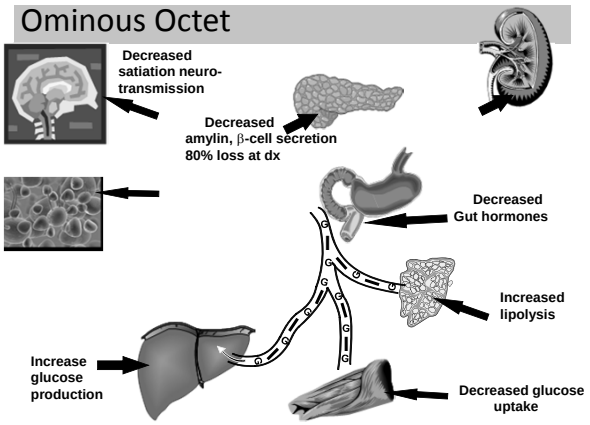
Acanthosis Nigricans (AN)

- 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



SGLT2 Inhibitors- "Glucoretics"

- **Action**: "Glucoretic" decreases renal reabsorption in the proximal tubule of the kidneys (reset renal threshold and increase glycosuria)

SGLT2 Inhibitors • Decrease glucose reabsorption in kidneys • "glucoretic."		
	Canagliflozin (Invokana)	100–300 mg once daily
	Dapagliflozin (Farxiga)	5–10 mg once daily
	Empagliflozin (Jardiance)	10–25 mg once daily

- Benefits: Lowers A1c 0.7 – 1.5%, lowers wt 1-3 lbs, no hypo
- Issues: Can initially lower GFR, monitor kidney function and lytes. Watch for hypotension/ GU infections. Expensive

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Comparison of Type 1,Type 2, LADA

	Type I	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

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Gestational DM ~ 7% of all Pregnancies

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

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Diabetes in pregnant mothers associated with …

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

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Postnatal Health: Maternal Behavior

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

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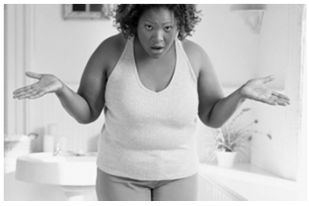
Start Metformin therapy

- For women with PreDiabetes and History of GDM



Metformin – 1st agent of choice

- **Action:** decrease hepatic glucose (glycogen)
- Metformin (Glucophage)
  - Starting dose: 500 BID, max 2500mg daily
  - Metformin XR - extended release – less GI upset
- **Efficacy:**
  - Decrease fasting plasma glucose 60-70 mg/dl
  - Reduce A1C 1.0-2.0%
- Benefits / Issues
  - Cheap, no weight gain; some lose weight, lowers LDL, no hypo
  - Not indicated if creat > 1.4-1.5 or GFR < 60 (cleared by kidney)

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

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

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, Focus on Survival Skills

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?

I don't want to!

No one is Unmotivated

…. to lead and long and healthy life

- **These are the 3 usual Critical Barriers**
  - Perceived worthlessness
  - Too many personal obstacles
  - Absence of support and resources

Bill Polonsky, PhD, CDE

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Overcoming barriers

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

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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

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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

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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

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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

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)

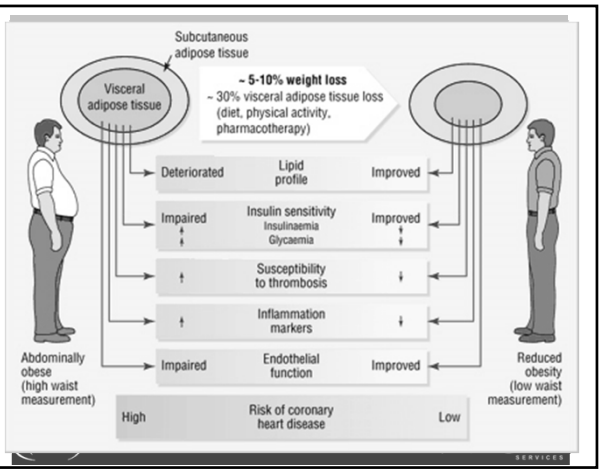
Weight loss and Prevention

- 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

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

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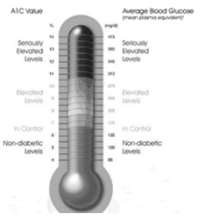
6. Glycemic Targets

- **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.



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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

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"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

Over 40 with Diabetes – Start Stain

Statin Recommendations – ADA Stds of Care 2015

Table 8.1—Recommendations for statin treatment in people with diabetes

Age	Risk factors	Recommended statin dose*	Monitoring with lipid panel
<40 years	None	None	Annually or as needed to monitor for adherence
	CVD risk factor(s)**	Moderate or high	
	Overt CVD***	High	
40–75 years	None	Moderate	As needed to monitor adherence
	CVD risk factors	High	
	Overt CVD	High	
>75 years	None	Moderate	As needed to monitor adherence
	CVD risk factors	Moderate or high	
	Overt CVD	High	

*In addition to lifestyle therapy.
**CVD risk factors include LDL cholesterol ≥100 mg/dL (2.6 mmol/L), high blood pressure, smoking, and overweight and obesity.
***Overt CVD includes those with previous cardiovascular events or acute coronary syndromes.

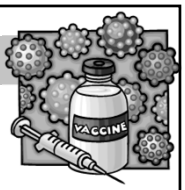
ABCs of Diabetes –

- 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

BP Goal for KP NCAL

BP 139/ 89 or less

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

Education

- People with diabetes and pre diabetes should receive DSME
  - Monitor for effective self-management and quality of life
  - Address psychosocial issues and emotional well being
  - Results in cost savings and improved outcomes, should be reimbursed by third party payers.

Exercise Recommendations

- **Activity update –Don't sit more than 90 minutes**
- Evidence supports that everyone, including with diabetes should be encouraged to reduce sedentary time, by not sitting for more than 90 minutes at a time.
- It is recommended that people with pre diabetes and diabetes engage in 150 minutes of activity a week and at **least 2 weekly sessions of resistance exercise.**

Diabetes Education SERVICES

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

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
  - For diabetes pts age 19 – 59 (not previously vaccinated)
  - Double risk of Hep B due to lancing devices/ glucose meter exposure

Diabetes Education SERVICES

Pneumonia Vaccination Update

- Pneumonia polysaccharide PPSV23 vaccine to all patients starting at age 2
- **Adults ≥ 65 years of age**, if not previously vaccinated, should receive pneumococcal conjugate vaccine 13 (PCV13), followed by PPSV23 6-12 months after initial vaccination.
- **Adults ≥ 65 years of age**, if previously vaccinated with PPSV23 should receive a follow-up ≥ 12 months with PCV13.

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

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. 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"

Diabetes Education SERVICES

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
- LDL 114 mg/dl
- Triglyceride 260mg/dl
- Proteinuria - neg
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- Bowls every Friday
- 3 beers daily
- Widowed, so usually eats out
- 15 lbs overweight
- *My foot hurts*

Diabetes Education SERVICES

Glucose Management and Hospitalized Patients

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

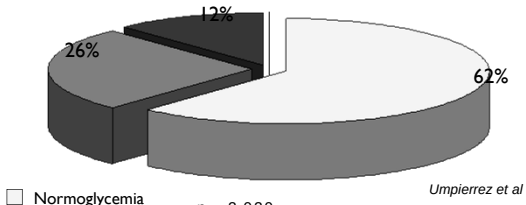
Diabetes Education SERVICES

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

Hyperglycemia*: A Common Comorbidity in Medical-Surgical Patients in a Community Hospital

Umpierrez G et al, J Clin Endocrinol Metabol 87:978, 2002



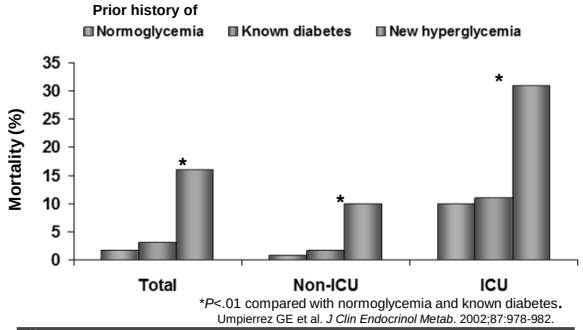
Umpierrez et al

- Normoglycemia
- Known Diabetes
- New Hyperglycemia

n = 2,020

* Hyperglycemia: Fasting BG ≥ 126 mg/dl or Random BG ≥ 200 mg/dl X 2

Effect of Hyperglycemia on Hospital Mortality



**P*<.01 compared with normoglycemia and known diabetes.

Umpierrez GE et al. *J Clin Endocrinol Metab*. 2002;87:978-982.

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!

In Patient Strategies – Start Early, Focus on Survival Skills

Mr. Jones - What are Your Recommendations?

Patient Profile

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

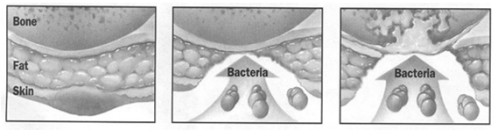
Current Status:

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

Foot Care

Lift the sheets and look at the Feets!

Foot Wounds

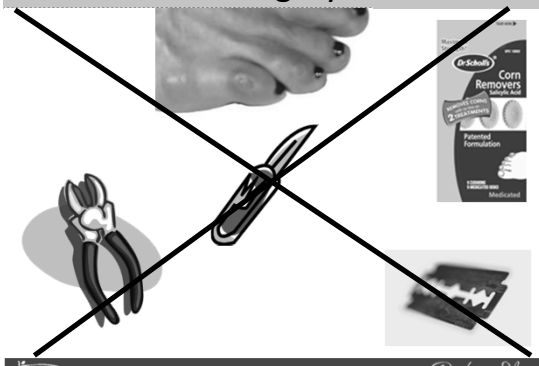


Blisters
Calluses

Ulcers

Bone infection

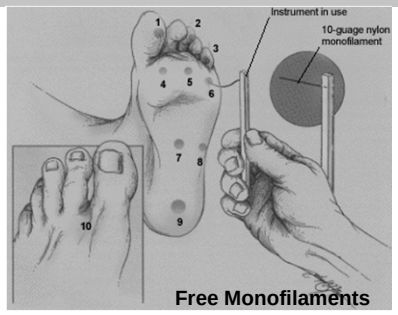
No Bathroom Surgery



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



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

Diabetes Education SERVICES

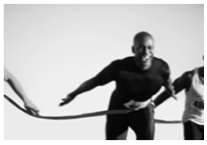
Three Most Important Foot Care Tips

- 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

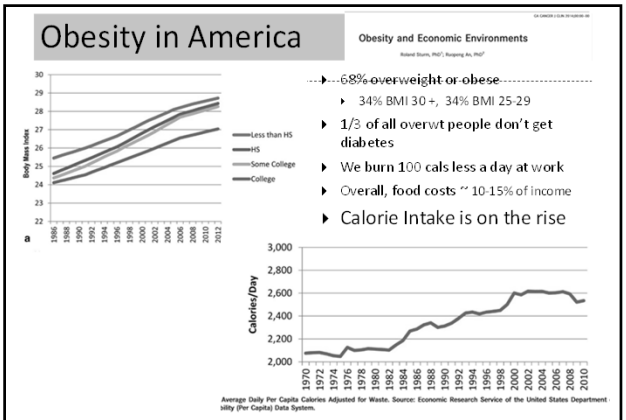
Bottom Line

- 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



Diabetes Education SERVICES

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

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

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 – 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%

Sodium, Fat and Fiber

- Sodium – Try and keep less than 2,300 mg a day
- Vitamin and mineral supplements not recommended -lack of evidence.
- Fat - same as recommended for general population
  - Less than 10% saturated fat,
  - Limit trans fats
  - Less than 300 mg cholesterol daily
  - Mediterranean Diet looks like good option
- Fiber 25 -38 gms a day

Approach Depends on Patient

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

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.

Diabetes Education SERVICES

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

Diabetes Education SERVICES

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

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

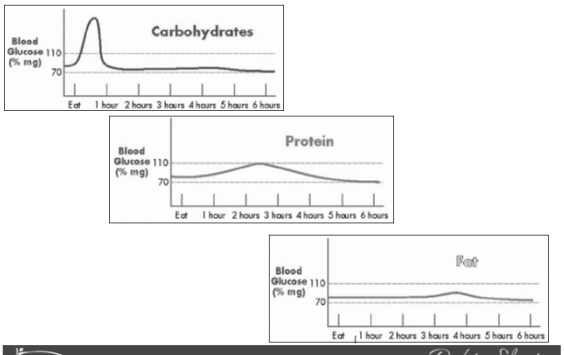
Diabetes Prevention Program Focus on fat = wt loss success

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

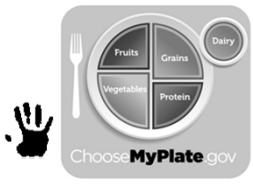
How nutrients affect blood sugar



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.



Move toward the Tomato

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?
- 12 teaspoons sugar in one soda

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

Diabetes Education SERVICES

USDA Plate Method 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.

Diabetes Education SERVICES

Another plate example

Diabetes Education SERVICES

Mindful Eating

Diabetes Education SERVICES

Nutrition Facts

Serving Size 1/2 cup (114 g)
Servings Per Container 4

Amount Per Serving	
Calories 90	Calories from Fat 30
	% Daily Value*
Total Fat 3g	5%
Saturated Fat 0g	0%
Cholesterol 0g	0%
Sodium 300mg	13%
Total Carbohydrate 13g	4%
Dietary Fiber 3g	12%
Sugars 3g	
Protein 3g	
Vitamin A 80% * **Vitamin C** 60%	
Calcium 4% * **Iron** 4%	

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

	Calories	2000	2500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2400mg	2400mg
Total Carbohydrate		300g	375g
Fiber		25g	30g

Calories per gram: Fat 9 Carbohydrates 4 Protein 4

1 tsp sugar ⇨ =4 gms

Fooducate App – gives grade and nutrition info.

Fooducate
eat a bit better™

Diabetes Education SERVICES

Carbs affect Post meal Blood Glucose

- Starch
- Fruit
- Milk
- Desserts

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

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

Diabetes Education SERVICES

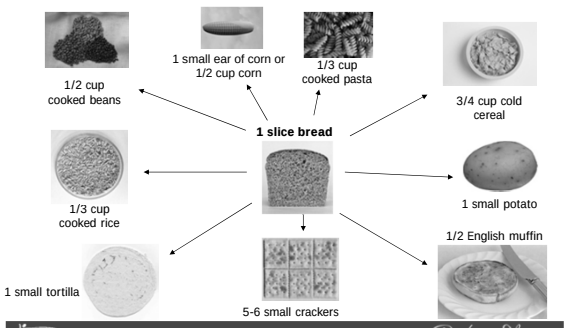
Handy Meal Plan

- 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

Diabetes Education SERVICES

Carb Counting - Starch

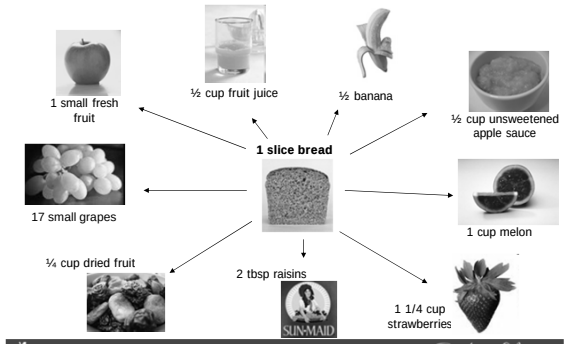
Each Food has:
80 Calories
15 grams carb



Diabetes Education Services

Carb counting- fruit

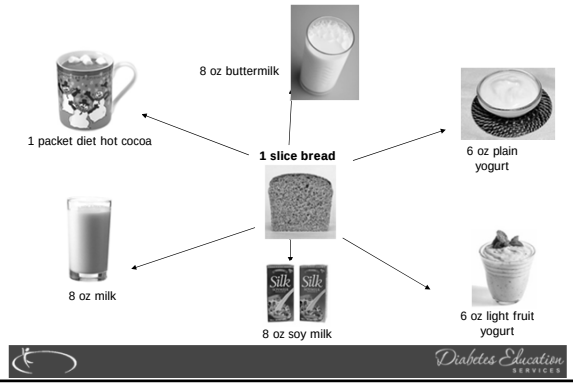
Each Food has:
60 Calories
15 grams carb



Diabetes Education Services

Carb Counting - Milk

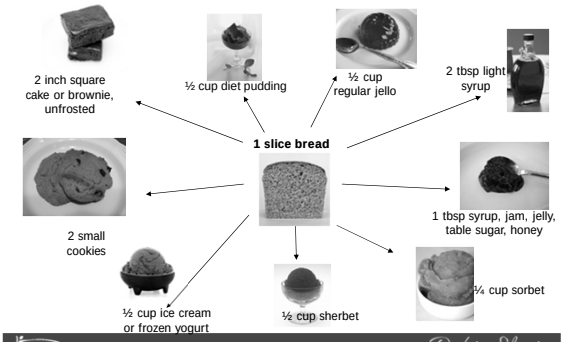
Each Food has:
90-150 calories
12-15 grams carb



Diabetes Education Services

Carb Counting - Sweets

Each Food has:
Calories vary
15 grams carb



Diabetes Education Services

Go Lean with Protein

- Choose lean protein
  - Poultry, fish, egg, lean beef
  - Plant sources- beans, lentils, nuts
  - Low fat cheese- cottage cheese, mozzarella cheese
- Limit high fat protein
  - Bacon & sausage
  - High fat cuts of beef
  - Whole milk cheese
- Serving size
  - 1 oz = ¼ cup
  - 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

Diabetes Education Services

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

Diabetes Education SERVICES

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**

Diabetes Education SERVICES

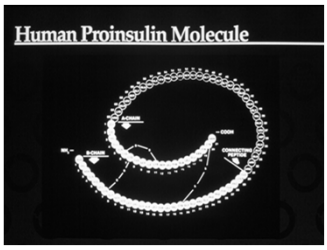
DiaBingo - N

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

Diabetes Education SERVICES

Insulin – the Ultimate Hormone Replacement Therapy

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



Diabetes Education SERVICES

Insulin Therapy From Ants to Analogs:

Diabetes Education SERVICES

Insulin – the Ultimate Hormone Replacement Therapy

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- Discuss the actions of different insulins
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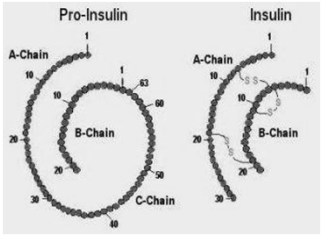


Diabetes Education SERVICES

Psychological Insulin Resistance (PIR)

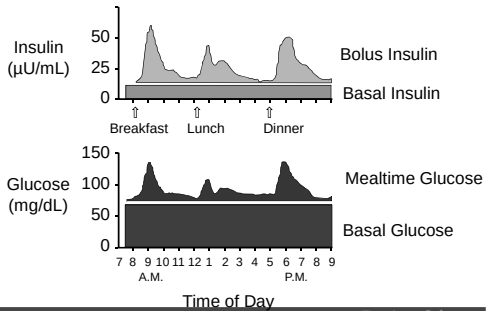
- 50% of providers in study threatened pts "with the needle".
- Less than 50% of providers realized insulins' positive effect on type 2 dm
- Most pts don't believe that insulin would "better help them manage their diabetes".
- Solutions: Find the root of PIR and address

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

Physiologic Insulin Secretion:
24-Hour Profile



Insulin Action Teams

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

Diabetes Education SERVICES

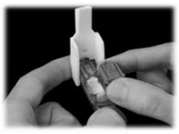
Bolus Insulins
(½ of total daily dose ÷ meals)

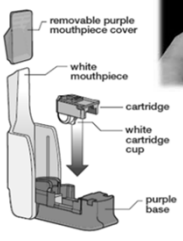
Name	Onset	Peak Action
Lispro (Humalog)	15-30 min	1-1.5 hrs
Aspart (NovoLog)		
Glulisine (Apidra)		
Afrezza (Inhaled)		
Regular	30 mins	2-4 hrs

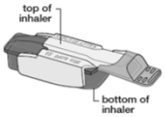
Diabetes Education SERVICES

Afrezza Inhaler

Know your AFREZZA® inhaler:







Replace inhaler every 15 days

Diabetes Education SERVICES

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

Diabetes Education SERVICES

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

Diabetes Education SERVICES

Pattern Management –AKA

How to think like a pancreas

Diabetes Education SERVICES

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)

Diabetes Education SERVICES

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

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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

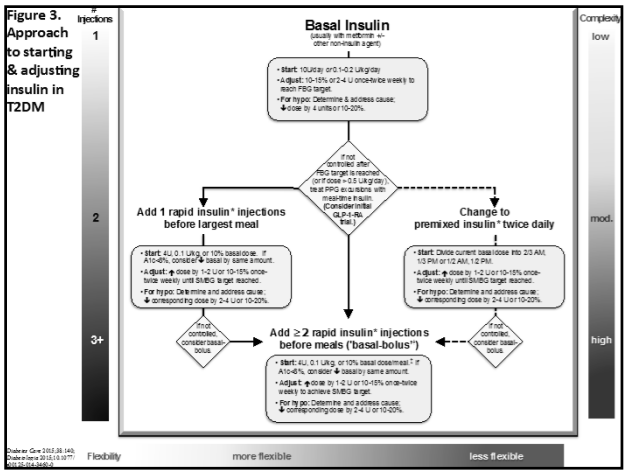
Basal Insulin Summary

- 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

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

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



Next Steps

- Start bolus insulin at largest meal
- Don't add sulfonylurea to insulin (increases mortality)
- Or switch to 70/30 Insulin
  - 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

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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

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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

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Type 2 – Glburide 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

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What Medications Cause Hypoglycemia?

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

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

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

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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

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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

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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

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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/
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DiaBingo - I

- Injected hormone that is an analog of amylin
- Glargine, Detemir, NPH are types of
- Breakdown of glycogen into glucose
- Anabolic hormone
- Insulin is released when glucose levels are low
- Once opened, insulin vials are good for one _____
- Elevated post-prandial glucose indicate need for pre-meal
- Epinephrine increases insulin resistance
- Creation of glucose from amino acids and lactate
- Decreasing renal function for people on insulin can cause
- Bolus insulins
- A hormone that increases blood glucose levels

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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*

Thank You

- Questions?
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