



**Welcome to
Diabetes in the 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

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
- ▶ 1 in 3 of US adults have pre diabetes (79 mil)

Diabetes



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



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Type 2 in Kids



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



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Global Epidemic

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



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World Diabetes Day
November 14

The right education
for all

Diabetes:
protect our future

www.worlddiabetesday.org

The right environment
for all

Diabetes:
protect our future

www.worlddiabetesday.org

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Age-adjusted Diabetes Prevalence
20 yrs or older, by race/ethnicity— U.S. 20014

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

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

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

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

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Why Should Zip Code Determine Life Expectancy?

STOCKTON
95202
Life Expectancy
73

IRVINE
92606
Life Expectancy
88

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

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Free Live Webinars and Live Seminars at DiabetesEd.net

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



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Role of the Pancreas Endocrine Functions

Beta Cells - Insulin

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

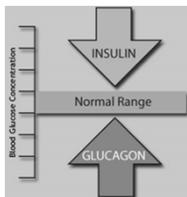
Beta Cells - Amylin

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



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Role of the Pancreas Endocrine Functions



Alpha cells - Glucagon

Opposes action of insulin at the liver

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



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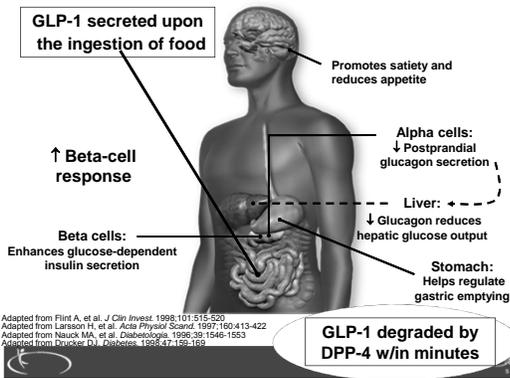
Hormones Effect on Glucose

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



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



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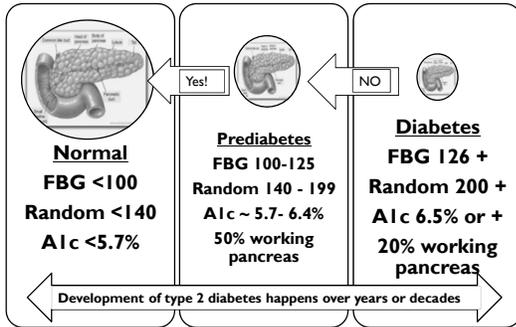
Bariatric Surgery

- ▶ 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



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Natural History of Diabetes



Signs of Diabetes



- ▶ Polyuria
- ▶ Polydipsia
- ▶ Polyphasia
- ▶ Weight loss
- ▶ Fatigue
- ▶ Skin and other infections
- ▶ Blurry vision
- ▶ Glycosuria, H₂O losses
- ▶ Dehydration
- ▶ Fuel Depletion
- ▶ Loss of body tissue, H₂O
- ▶ Poor energy utilization
- ▶ Hyperglycemia increases incidence of infection
- ▶ Osmotic changes



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Diabetes Classifications

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



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Case Study

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

Diabetes 12 years, on insulin 3 yrs

What type of DM and how do you know?



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

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

What type of DM and how do you know?



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Type 1 Rates Increasing Globally

▶ 23% rise in type 1 diabetes incidence from 2001-2009

▶ Why?

- ▶ Autoimmune disease rates increasing over all
- ▶ Changes in environmental exposure and gut bacteria?
- ▶ Hygiene hypothesis
- ▶ Obesity?



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Type 1 Diabetes Facts

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

Source: JDRF



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

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

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



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Incidence of Type 1 in Youth



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



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Autoantibodies Assoc w/ Type 1

Panel of autoantibodies –

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



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Type 1 Diabetes Associated with other immune conditions

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



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What Does Type 1 Look Like?



Mary Tyler Moore



Adam Morrison



Nick Jonas



Justice Sonia Sotomayor

Bret Michaels



From Debbie Nagata's slide collection



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Medalist Study – Harvard Joslin Diabetes Center

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



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Type 1 Summary

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



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Type 1 in Hospital

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



What do you say?



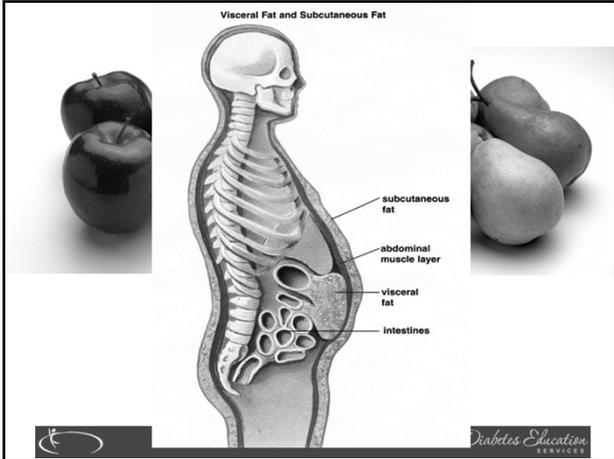
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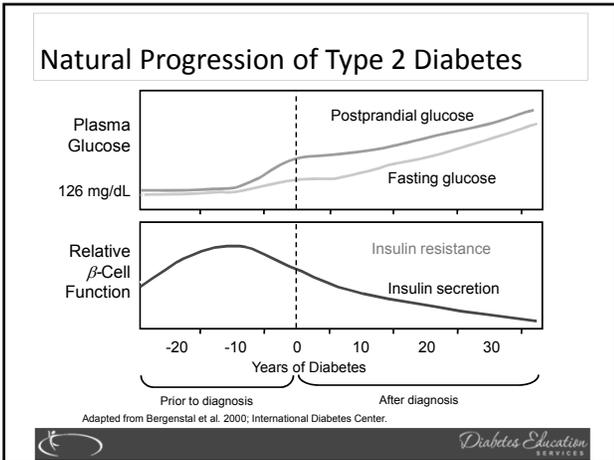


Patti LaBelle
"divabetic" --
that's a mix of
diabetic and
diva



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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

Diabetes 2 - Who is at Risk?

(ADA Clinical Practice Guidelines)

1. Testing should be considered in all adults who are overweight (BMI \geq 25) and have additional **risk factors**:

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



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Diabetes 2 - Who is at Risk?

(ADA Clinical Practice Guidelines)

Risk factors cont'd



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



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Acanthosis Nigricans (AN)

- ▶ Signals high insulin levels in bloodstream
- ▶ Patches of darkened skin over parts of body that bend or rub against each other
 - ▶ Neck, underarm, waistline, groin, knuckles, elbows, toes
 - ▶ Skin tags on neck and darkened areas around eyes, nose and cheeks.
- ▶ No cure, lesions regress with treatment of insulin resistance



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Diabetes Detectives Needed

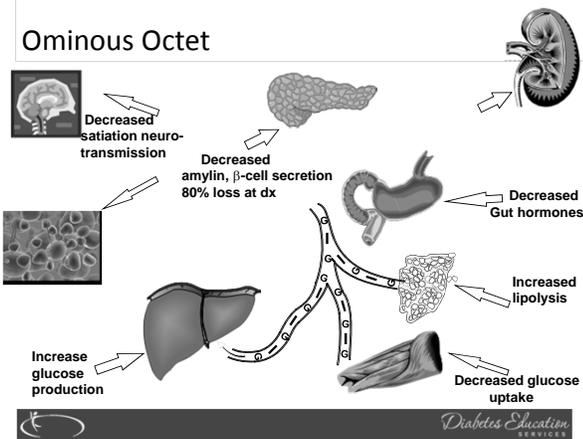


- ▶ On average – takes 6.5 years to diagnose diabetes
- ▶ 1/4 of all people with diabetes don't know they have it



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Ominous Octet



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Comparison of Type 1 and Type 2

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



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Diabetes is also associated with:

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



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Gestational DM ~ 7% of all Pregnancies

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



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Diabetes in pregnant mothers associated with ...

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



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Postnatal Health: Maternal Behavior

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



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Start Metformin therapy

- ▶ For women with PreDiabetes and History of GDM



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Other Causes of Hyperglycemia

- ▶ Steroids
- ▶ Agent Orange
- ▶ Tube feedings / TPN
- ▶ Transplant medications
- ▶ Cystic Fibrosis

Regardless of
cause, requires
treatment

- ▶ Insulin always works
- ▶ Sign of pancreatic malfunction



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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



Diabetes Education SERVICES

DiaBingo

- ▣ Frequent skin and yeast infections.....
- ▣ A BMI of ____ or greater is considered overweight
- ▣ To reduce complications, control A1c, Blood pressure, Cholesterol
- ▣ PreDiabetes – fasting glucose level of ____ to ____
- ▣ Erectile dysfunction indicates greater risk for ____
- ▣ Diabetes – fasting glucose level ____ or greater
- ▣ Type 1 diabetes is best described as an _____ disease
- ▣ People with diabetes are _____ times more likely to die of heart dx
- ▣ Elevated triglycerides, < HDL, smaller dense LDL
- ▣ Each percentage point of A1c = _____ mg/dl glucose
- ▣ At dx of type 2, about ____% of the beta cell function is lost
- ▣ Diabetes – random glucose ____ or greater



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Glucose Management and Hospitalized Patients



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



Diabetes Education SERVICES

Hospitals and Hyperglycemia – What’s the Big Deal?

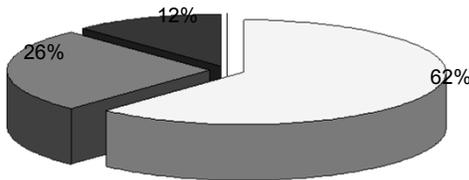
- ▶ Hyperglycemia is associated with increased morbidity and mortality in hospital settings.
- ▶ Acute Myocardial Infarction
- ▶ Stroke
- ▶ Cardiac Surgery
- ▶ Infection
- ▶ Longer lengths of stay



Diabetes Education SERVICES

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

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



Normoglycemia
 Known Diabetes
 New Hyperglycemia

n = 2,020

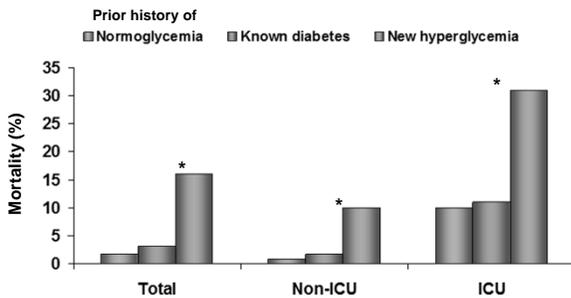
Umipierrez et al

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



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Effect of Hyperglycemia on Hospital Mortality



*P<.01 compared with normoglycemia and known diabetes.
Umipierrez GE et al. J Clin Endocrinol Metab. 2002;87:978-982.



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BG Above Normal = Trouble

▶ Pre Diabetes

- ▶ Fasting Glucose = 100-125mg/dl
- ▶ A1c 5.7 – 6.4%

▶ Diabetes

- ▶ Fasting Glucose = 126 mg/dl +
- ▶ Random Glucose = 200 mg/dl +
- ▶ A1c 6.5% +



- ▶ Any blood glucose above 140 requires treatment

Umpierrez et al



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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)



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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

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 cellulitis of her foot. Her WBC is 12.3, glucose 237. She is hypertensive with a history of gestational diabetes. No ketones in urine.

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



What Do You Say? Mrs. Jones asks you

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



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In Patient Strategies – Start Early, Focus on Survival Skills



Look for
“teaching moment”
opportunities



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Running into Roadblocks?

▶ HUG Patients

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

Anne Peters, MD, CDE
ADA Post Grad

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



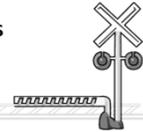
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No one is Unmotivated

... to lead and long and healthy life

▶ These are the 3 usual Critical Barriers

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



Bill Polonsky, PhD, CDE



Diabetes Education SERVICES

Overcoming barriers

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

Bill Polonsky, PhD, CDE



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How Often Should I Check?

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



Diabetes Education SERVICES

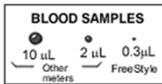
How will it help me?

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



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New Meters – a little goes a long way



- 0.3 microliters of blood
- minimal pain



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



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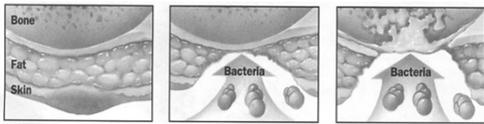
Foot Care

Lift the sheets
and look at the
Feets!



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Foot Wounds



Blisters
Calluses

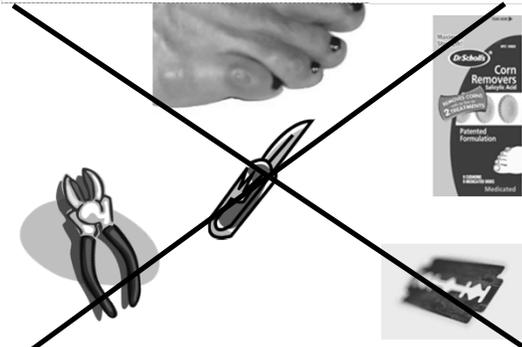
Ulcers

Bone infection



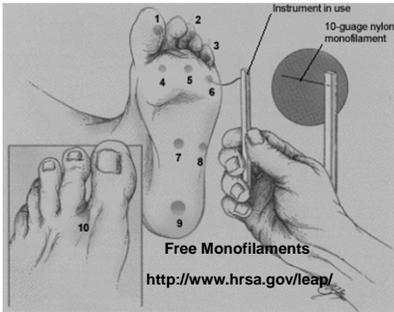
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No Bathroom Surgery



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5.07 monofilament = 10gms linear pressure
If pt can't feel pressure = neuropathy



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3 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.



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Life Study – Mrs. Jones

- ▶ How would we manage her BG in hospital?



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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 Aspart and patient needs to go to OR NOW!

Medication for Discharge?

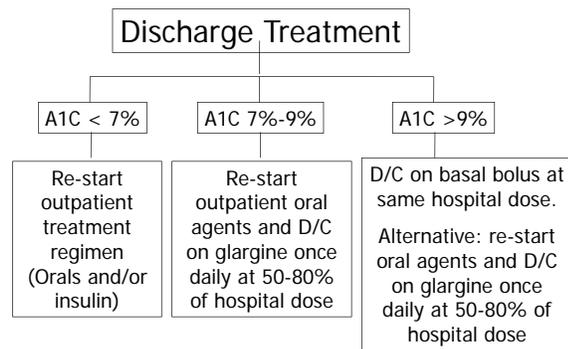


- ▶ Mrs. Jones is improved and ready to go home.
- ▶ What glucose management strategies for home?
- ▶ Her A1c is 9.3%



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Discharge insulin Algorithm



Clinical Guidelines for the Management of Hyperglycemia in Hospitalized Patients in a Non-Critical Care Setting

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Discharge Teaching



- ▶ What supplies will she need?
- ▶ What top 5 things do we need to teach her?
- ▶ What resources can we provide?
- ▶ What referrals?



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5 Survival Skills

1. Basics of Diabetes
 2. Can patient perform self blood glucose monitoring? Do they need meter?
 3. Can pt safely take meds / insulin? Teach side effects.
 4. Meal Planning?
 5. Self Care including hypo prevent/treat
- ▶ Follow-Up plan - Does pt know who to contact when need help?
 - ▶ Diabetes Education and more!



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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



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Insulin Pens

▶ Instructions

- ▶ Prime needle to assure accurate insulin dose given
- ▶ Hold needle in for 5 seconds after injection
- ▶ Roll 70/30 pens
- ▶ Replace large needle cap (white),
 - Unscrew and remove needle after injection. Do not leave needle on pen



Remember that inpatient safety pen needles are different than home pen needles.



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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/HW/HealthCare/Collection/>



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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.



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When to Call Provider?*

- ▶ Blood glucose <70
- ▶ Blood glucose > 250 twice in a day (adults)
- ▶ Blood glucose >240 x 3
- ▶ *When sick with fever



**Individualize based on pt/provider*



Diabetes Education SERVICES

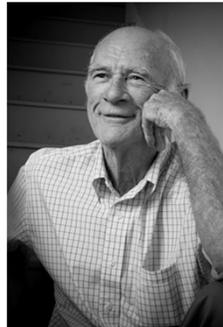
Mrs Jones – Teaching Priorities

- ▶ Foot Care
- ▶ How to use meter
- ▶ Insulin Injections
- ▶ Signs of Hypo/Hyper
- ▶ When and who to call for help
- ▶ Follow-up Care



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Based on Mr R's clinical picture – In hospital
How Much Insulin Needed?



- ▶ Creatinine 1.6
- ▶ 76 years old
- ▶ Not very hungry
- ▶ BMI 21
- ▶ Weighs 80kg
- ▶ Glucotrol 5mg at home
- ▶ A1c 7.2%



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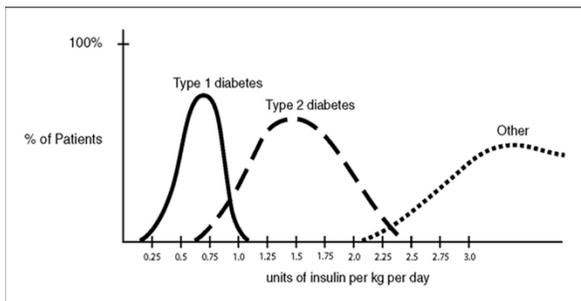
How Much Insulin Does a Patient Need?

- ▶ It depends, based on:
 - ▶ Body weight
 - ▶ Overwt, normal wt, or thin
 - ▶ Frail, elderly
 - ▶ Eating status
 - ▶ Normal, poor intake or NPO
 - ▶ Renal or hepatic insufficiency
 - ▶ Type of Diabetes
 - ▶ Current meds; steroids, insulin, oral dm agents
 - ▶ Infected or Septic



Diabetes Education SERVICES

Insulin Dosing Type 1 & 2



U-500 Insulin: When More With Less Yields Success: Diabetes Spectrum March 2010 vol. 22 no. 2 116-122



Diabetes Education SERVICES

Calculate Daily Insulin Needs

- ▶ Based on unique characteristics of pt, where would you start?
 - ▶ Body wt in Kg x _____ = total daily dose
 - ▶ May need more or less based on clinical presentation
 - ▶ Divided into 50% basal and 50% bolus



←—————→
 Less 0.3 u/kg 0.5u/kg More 1.0 u/kg

Thin, elderly, creat Heavy, infection, steroids



Diabetes Education SERVICES

Calculate Insulin Needs Basal/ insulin carb/ correct

- ▶ Body wt in Kg x 0.3
- ▶ 80kg x 0.3 = 24 units daily

- ▶ Basal = 12 units (50%)
- ▶ Bolus = 12 units / 3 meals = 4 units each meal
- ▶ What if he is nauseated?



Mr. Rs Pattern

4 unit meal bolus + 12 unit Lantus hs

	Break	Lunch	Dinner	HS
Day 1	admit	219	143	179
Day 2	58	97	84	95 -NPO
Day 3	67	nausea	119 clear liquids	104
Day 4	74	81	Start tube feeds	

BG Running Low?

- ▶ Possible Causes
 - ▶ Too much insulin
 - ▶ Premeal bolus
 - ▶ HS basal
 - ▶ Glucose toxicity improving
 - ▶ Infection improving
 - ▶ Stopped/lowered steroids
 - ▶ Poor kidney function
 - ▶ Skipped meal, poor PO intake
 - ▶ Not eating enough carbs



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



Diabetes Education SERVICES

Hypoglycemia Symptoms



- ▶ Autonomic
 - ▶ Anxiety
 - ▶ Palpitations
 - ▶ Sweating
 - ▶ Tingling
 - ▶ Trembling
 - ▶ Hypoglycemic Unawareness
- Neuroglycopenia
 - ▶ Irritability
 - ▶ Drowsiness
 - ▶ Dizziness
 - ▶ Blurred Vision
 - ▶ Difficulty with speech
 - ▶ Confusion
 - ▶ Feeling faint



Diabetes Education SERVICES

Treatment of Hypoglycemia

- ▶ If blood glucose **70mg/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



Diabetes Education SERVICES

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)



Diabetes Education SERVICES

BG Too Low? Insulin Adjustment Guidelines



- ▶ Before meal Blood glucose <70?
 - ▶ Implement hypoglycemia protocol
 - ▶ Evaluate cause and make needed adjustments
 - ▶ Missed meal?
 - ▶ Too much insulin?
- ▶ Morning blood glucose < 90?
 - ▶ Decrease evening Lantus by 10%
- ▶ Evaluate trends, provide feedback



Diabetes Education SERVICES

3 days poor intake, pt started on Tube Feeding



- ▶ If on continuous tube feeding, how would this change his insulin regimen?
- ▶ If on intermittent tube feeding, how would this change his insulin regimen?
- ▶ If patients tube feeding is interrupted, what precautions would you take?



Diabetes Education SERVICES

Glycemic Management During Enteral Nutrition

Continuous enteral nutrition (EN)

- Basal insulin: once or twice daily
- Prandial bolus insulin: to match the feeding or 70/30 mix BID

Cycled enteral nutrition: Based on situation:

- Basal insulin
- Bolus insulin administered q4 to 6 hours
- Correctional insulin given for BG above goal

Bolus enteral nutrition

- Rapid acting analog or short acting insulin given prior to each bolus
- May also need basal on board

If tube pulled out, consider hanging IV D10%



Diabetes Education SERVICES

BG Running High?



▶ Possible Causes

- ▶ Glucose Toxic
- ▶ Infection
- ▶ Started on steroids
- ▶ Physical stress
- ▶ Insulin dose too low



Diabetes Education SERVICES

Calculate Daily Insulin Needs

▶ Based on unique characteristics of pt, where would you start?

- ▶ Body wt in Kg x _____ = total daily dose
- ▶ May need more or less based on clinical presentation



←—————→
Less 0.3 u/kg 0.5u/kg More 1.0 u/kg

Thin, elderly, creat

Heavy, infection, steroids



Diabetes Education SERVICES

Intensify Insulin therapy or start insulin Drip



- 100 units insulin in 100 cc NS Bag
- ▶ 1 cc = 1unit of insulin

Society of Hospital Medicine
listing of sample Insulin Drip
Protocols

Preparation for Surgery

- ▶ Try to schedule surgery in am, resume meds/insulin when eating and stable.
- ▶ **Oral medications:** In am, hold all diabetes oral medications
- ▶ **Basal Insulin:** Night before
 - ▶ type 2s, may need to adjust basal dose
 - ▶ type 1s give up to 100% of basal dose.
- ▶ **Bolus insulin:** may need mild insulin bolus coverage for type 1 and type 2's
- ▶ Have D5 or D10 IV bags available in case of hypo



Diabetes Education
SERVICES

Special Considerations During Hospital Stay

- ▶ Hypoglycemia –
 - ▶ treat with 15 gms carb and recheck every 15-30 minutes until BG stable
 - ▶ Notify MD to change insulin orders
- ▶ Contact Diabetes Ed Team if patient admitted with insulin pump.
- ▶ IV Insulin – look carefully at insulin sensitivity and adjust insulin drip rate based on BG Trends
- ▶ Give basal insulin, even if pt isn't eating. Dose may need adjustment.



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

Diabetes Self-Management

- ▶ Prevention
- ▶ Goals
- ▶ Insulin
- ▶ Meal Plan
- ▶ Exercise / Activity
- ▶ Medications



Diabetes Education SERVICES

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?



Diabetes Education SERVICES

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 Education SERVICES

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)



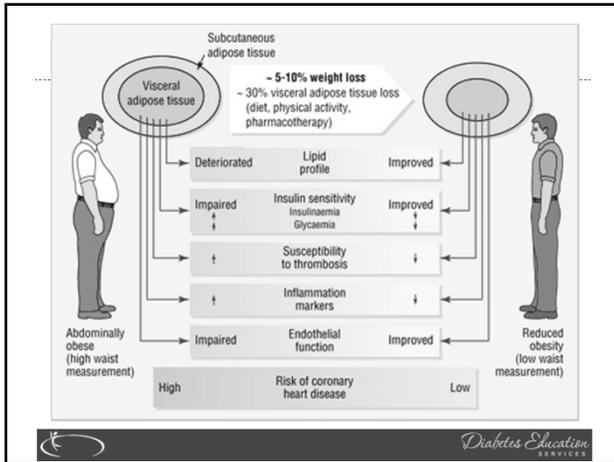
Diabetes Education SERVICES

Weight loss and Prevention

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



Diabetes Education SERVICES



Control Matters

- ▶ Trials
- ▶ Practice Recommendations

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



Diabetes Education SERVICES

Goals of Care



Diabetes Education SERVICES

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



Diabetes Education SERVICES

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



Diabetes Education
SERVICES

“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



Diabetes Education
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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. 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
- ▶ 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

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

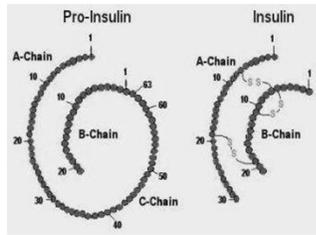


Diabetes Education SERVICES

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

The Miracle of Insulin



Patient J.L., December 15, 1922



February 15, 1923



Diabetes Education SERVICES

The Nobel Prize in Physiology or Medicine 1923



Frederick G. Banting

Born: 14 November 1891, Alliston, Canada
Died: 21 February 1941, Newfoundland, Canada
Affiliation at the time of the award: University of Toronto, Toronto, Canada
Prize motivation: "for the discovery of insulin"
Field: endocrinology, metabolism



Diabetes Education SERVICES

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

Case Study

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



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Diabetes Education SERVICES

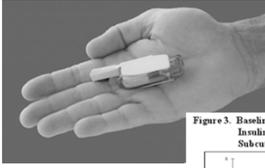
Cost Per Vial in Northern CA

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



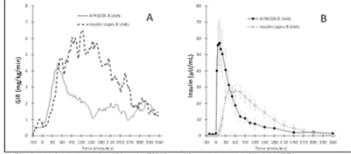
Diabetes Education SERVICES

Afrezza – Inhaled Insulin – Approved 2014



For adults over 18
Not indicated for
pregnancy, while
breastfeeding

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



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



Diabetes Education
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Bolus Insulins

($\frac{1}{2}$ of total daily dose \div 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 Dosing and Considerations

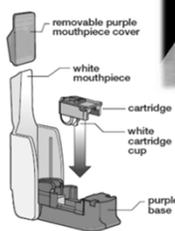
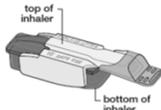
- ▶ Bolus regular insulin – inhaled before meals
- ▶ Dosing: 4 and 8 unit cartridges
 - ▶ Convert with 1:1 ratio to existing insulin dose
- ▶ Lung function test before start (incentive spiro)
 - ▶ Not for pts w/ chronic lung issues
 - ▶ Asthma, COPD, history of lung cancer, smokers
 - ▶ Can cause acute bronchospasm
- ▶ Side effects:
 - ▶ Hypoglycemia, sore throat, cough



Diabetes Education
SERVICES

Afrezza Inhaler

Know your AFREZZA® inhaler:



Replace inhaler every 15 days



Diabetes Education SERVICES

Bolus Insulin Summary

- ▶ Regular, Novolog, Humalog, Apidra, Afrezza
- ▶ 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

Bolus – Insulin Sliding Scale

Starts at 150, 2 units Novolog for every 50 mg/dl >150

	Break	Lunch	Dinner	HS
Day 1	94 no insulin	212 4 uN	148 no insulin	254 6 uN
Day 2	243 4uN	254 6 uN	201 4uN	199 no insulin
Day 3	189 2uN	243 4uN	162 2uN	244 4uN
Day 4	66 No insulin	287 6uN	144 none	272 6uN



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

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



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 – 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

Type 2 – Amaryl 4mg AM, 10u Lantus pm

	Break	Lunch	Dinner	HS
Day 1	164	94	66	162
Day 2	169		59	195
Day 3		84	81	242
Day 4	159		43	211



Diabetes Education SERVICES

Basal Bolus – What Adjustments?
Pt weighs 80kg – Novolog Bolus

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



Diabetes Education SERVICES

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



Diabetes Education SERVICES

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



Diabetes Education SERVICES

Intensive Diabetes Therapy
Insulin Dosing Strategy

50/50 Rule

- ▶ 0.5-1.0 units/kg day
- ▶ Basal = 50% of total
 - Glargine QD
 - NPH or Detemir BID
- ★ Bolus = 50% of total
 - usually divided into 3 meals

Example – You Try

- ▶ Wt 60kg x 0.5 = 30 units of insulin/day
- ▶ Basal dose: 15 units
 - Glargine 15 QD or
 - NPH/Detemir 7u BID
- ▶ Bolus dose: 15 units
 - ▶ 5 NovoLog, Apidra, Humalog, Reg each meal



Diabetes Education SERVICES

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

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



Diabetes Education SERVICES

DiaBingo - I

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



Diabetes Education SERVICES

Medical Nutrition Therapy

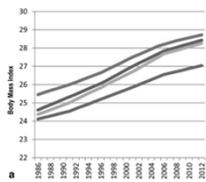


“Let food be thy medicine and medicine be thy food.”
“Walking is man's best medicine.”
— Hippocrates

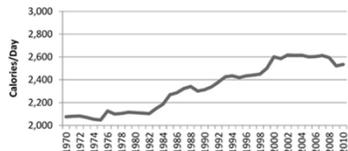


Diabetes Education SERVICES

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



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



Diabetes Education SERVICES

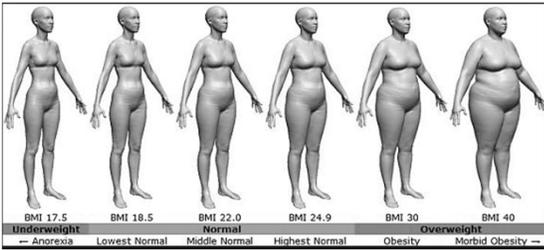
Average American Consumes 25 teaspoons of sugar a day (400 cal)

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



Diabetes Education SERVICES

BMI – Visual Image



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 2014

- ▶ 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%



Diabetes Education SERVICES

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



Diabetes Education SERVICES

Approach Depends on Patient

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



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 cal
 - ▶ Decrease intake 250-500 cal 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 Education SERVICES

Diabetes Prevention Program Focus on fat = wt loss success

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

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

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



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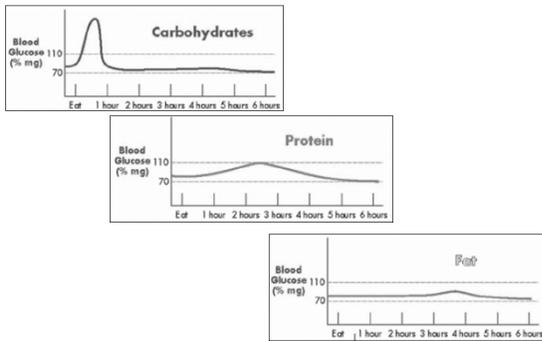
Public Health Issue?

- ▶ 66% of our people are obese/overweight
- ▶ Rates of gestational diabetes on rise
- ▶ 30% of kids are obese/overweight



Diabetes Education SERVICES

How nutrients affect blood sugar



Diabetes Education SERVICES

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.*



Diabetes Education SERVICES

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?



Diabetes Education SERVICES

10 Superfoods

- | | |
|----------------------------|------------------------------------|
| ▶ Beans | ▶ Tomatoes |
| ▶ Dark Green Leafy Veggies | ▶ Fish High in Omega-3 Fatty Acids |
| ▶ Citrus Fruit | ▶ Whole Grains |
| ▶ Sweet Potatoes | ▶ Nuts |
| ▶ Berries | ▶ Fat-Free Milk and Yogurt |



Diabetes Education SERVICES

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.



Diabetes Education SERVICES

Another plate example

Mi planificador de plato Una comida saludable sabe buenísima



El Método del Plato es una manera simple de planificar las comidas para usted y su familia. No necesita contar nada ni hacer largas listas de alimentos. Todo lo que necesita es un plato de 9 pulgadas.

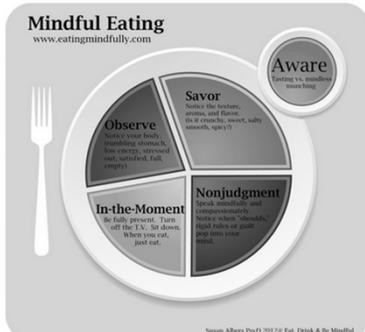
1/4 de proteína, 1/4 de almidón, 1/2 de vegetales, Plato de 9 pulgadas



Diabetes Education SERVICES

Mindful Eating

Mindful Eating www.eatingmindfully.com



Source: Albers PhD 2012/9 Eat, Drink & Be Mindful



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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 diet of 2,000 calories. Your daily values may be higher or lower depending on your calorie needs.

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

1 tsp sugar ⇒
= 4 gms

Fooducate App – gives grade and nutrition info.

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Carbs affect Post meal Blood Glucose

- o Starch
- o Fruit
- o Milk
- o Desserts

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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

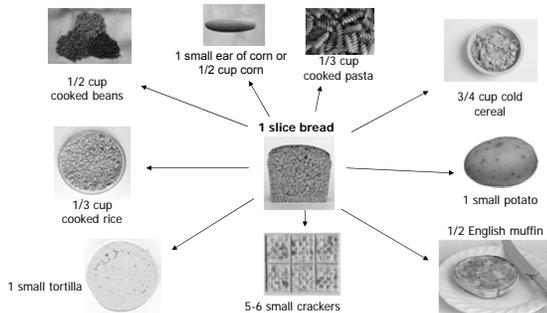
- ▶ Per Meal Serving
 - ▶ Each finger = 15 gms carb (can have 3-4 servings/meal)
 - ▶ Palm of hand = 3 oz's protein
 - ▶ Thumbnail = 1 tsp fat serving



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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

1 slice bread

- 1 small fresh fruit
- 1/2 cup fruit juice
- 1/2 banana
- 1/2 cup unsweetened apple sauce
- 17 small grapes
- 1 cup melon
- 1/4 cup dried fruit
- 2 tsp raisins
- 1 1/4 cup strawberries

Diabetes Education SERVICES

Carb Counting - Milk

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

1 slice bread

- 8 oz buttermilk
- 1 packet diet hot cocoa
- 6 oz plain yogurt
- 8 oz milk
- 8 oz soy milk
- 6 oz light fruit yogurt

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Carb Counting - Sweets

Each Food has:
Calories vary
15 grams carb

1 slice bread

- 2 inch square cake or brownie, unfrosted
- 1/2 cup diet pudding
- 1/2 cup regular jello
- 2 tsp light syrup
- 2 small cookies
- 1 tsp syrup, jam, jelly, table sugar, honey
- 1/4 cup sorbet
- 1/2 cup ice cream or frozen yogurt
- 1/2 cup sherbet

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 (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

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/



Diabetes Education SERVICES

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.



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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



Diabetes Education SERVICES

Diabetes Meds for Type 2: Objectives



1. Describe the main action of the 5 different categories of type 2 diabetes medications.
2. Discuss strategies to determine the right medication for the right patient.
3. List the side effects and clinical considerations of each category of medication.



Diabetes Education SERVICES

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 Care 2012;35:1364-1379
Diabetologia 2012;55:1577-1596



Diabetes Education SERVICES

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 |



Diabetes Education SERVICES

Biguanides – Suppressor Metformin (Glucophage®)

- ▶ Action: suppresses release of glycogen from the liver
- ▶ Who?
 - ▶ Fasting hyperglycemia
 - ▶ Dysmetabolic Syndrome
 - ▶ For pediatrics starting age 10
 - ▶ (XR age 17)



Glycogen
Stopper



Diabetes Education
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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%



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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



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Metformin – How does it rate?

<u>Question</u>	<u>Answer</u>
▶ Cause hypoglycemia?	No
▶ Cause weight gain?	No
▶ Affordable?	Yes
▶ Lowers CV risk?	Yes
▶ Can most tolerate /use?	Yes/No



Diabetes Education SERVICES

What is next step?

69 year old male, BMI 25, on Metformin 1000mg BID.
AM glucose 120s, A1c 8.1%.
Creat 1.3



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Sulfonylureas –

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



Diabetes Education SERVICES

Sulfonylureas - Squirts

- ▶ Action: Increase endogenous insulin secretion
- ▶ Efficacy:
 - ▶ Decrease FPG 60-70 mg/dl
 - ▶ Reduce A1C by 1.0-2.0%
- ▶ 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



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Sulfonylureas: 2nd Generation

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



Diabetes Education SERVICES

Sulfonylureas



- ▶ Other Effects
 - ▶ Hypoglycemia
 - ▶ Weight gain
 - ▶ Cleared by kidney, use caution for pts with kidney problems
 - ▶ Generally the least expensive class of medication
 - ▶ Amaryl safest for those with CV Disease



Diabetes Education SERVICES

Squirters – How does they rate?

<u>Question</u>	<u>Answer</u>
▶ Cause hypoglycemia?	Yes
▶ Cause weight gain?	Yes
▶ Affordable?	Yes
▶ Lowers CV risk?	No
▶ Can most tolerate /use?	Yes/No



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What Medications Cause Hypoglycemia?

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



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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.



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%

- ### ▶ Indication:
- For type 2s



Diabetes Education SERVICES

DPP-4 Inhibitors – “Incretin Enhancers”

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

- ▶ 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



Diabetes Education SERVICES

DPP-IV Inhibitors – How do they rate?

Question	Answer
▶ Cause hypoglycemia?	No
▶ Cause weight gain?	No
▶ Affordable?	No
▶ Lowers CV risk?	No
▶ Can most tolerate /use?	Yes



Diabetes Education SERVICES

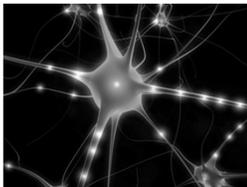
If on Metformin and Sulfonylurea – BG still high, other options?
Pt overweight.



Diabetes Education SERVICES

Incretin Mimetics –
“Gut Hormone Imitators”
GLP-1 Agonists

▶ How do they work?



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

GLP-1 secreted upon the ingestion of food

Promotes satiety and reduces appetite

Alpha cells: ↓ Postprandial glucagon secretion

Liver: ↓ Glucagon reduces hepatic glucose output

Stomach: Helps regulate gastric emptying

↑ Beta-cell response

Beta cells: Enhances glucose-dependent insulin secretion

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

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;47:189-199

Diabetes Education SERVICES

Incretin Mimetics Exenatide (Byetta), Exenatide XR (Bydureon)

- ▶ **Action:**
 - ▶ Insulin release in response to meal
 - ▶ Slows gastric emptying
 - ▶ Causes Satiety
 - ▶ Preserves Beta Cells
- ▶ **Exenatide Dosing:**
 - ▶ 5-10 mcg before break, dinner
 - ▶ Long acting version - 1x week (available in pens in 2015)
- ▶ **Efficacy:** Decreases A1c by 0.7%, wt by 3lbs
- ▶ **Indication:** For type 2s only - mono or in combo

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Incretin Mimetics – Albiglutide - Tanzeum

- ▶ **Once a Week Dosing:** 30 – 50mg
- ▶ **Efficacy:** Decreases A1c by ~ 1%, wt by ~2lbs
- ▶ **Indication:** For type 2s only
- ▶ **Other:** Pen injector
- ▶ **Caution:** not indicated for those with history of medullary thyroid tumor - pancreatitis warning

Viewing Window

Clear Cartridge

Pen Body

Injection Button*

*Injection Button is inside the pen until the pen is ready for injection.

Diabetes Education SERVICES

**Trulicity - Easy to Use Once-a-Week
Injector - GLP 1 Agonist**



Patient Friendly Injector - Eli Lilly received FDA Approval for their Ready-to-Use once weekly GLP-1 agonist, dulaglutide (Trulicity). The unique quality about this injector is that unlike the other once weekly GLP-Agonists, which require mixing of powder and fluid, it comes in a single-dose pen and does not require mixing, measuring or needle attachment. And the needle is hidden from the user and retracts after use. This definitely makes it a stand out amongst it's competitors and is a leap forward in terms of convenience.

It comes in both .75 and 1.5 mg doses. Given its ease of use, efficacy and weight loss benefits, maybe we will start seeing Trulicity used earlier in the course of diabetes care.



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For all the Previous DPP-IV and 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
-



Diabetes Education SERVICES

Incretin Mimetics – How do they rate?

Question	Answer
▶ Cause hypoglycemia?	No
▶ Cause weight gain?	No
▶ Affordable?	No
▶ Lowers CV risk?	No
▶ Can most tolerate /use?	Yes/No (GI)



Diabetes Education SERVICES

Next Step?

- ▶ 69 year old male, BMI 25, on Metformin 1000mg BID and Exenatide 10mcg before breakfast and dinner.
- ▶ Pt overweight - A1c 8.1%. Creat 1.2



Diabetes Education SERVICES

SGLT2 Inhibitors- "Glucoretics"



Decreases Glucose Reabsorption

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

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

For all, monitor B/P, K+ and renal function. If GFR<60, stop Farxiga. If GFR<45, stop Invokana. Do not start pts w/ GFR<60 on Jardiance. Side effects: hypotension, UTIs, increased urination, genital infections. Avoid Farxiga in pts. w/ bladder cancer. Lowers A1c 0.7% -1.5%, lowers wt 1-3 lbs.



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Considerations



- Monitor B/P, K+ & renal function.
- Side effects: hypotension, UTI, increased urination, genital yeast infections.
- Improves beta cell function?
 - Reverses glucoses toxicity by increasing GLUT4 transport in muscle
 - Increase liver sensitivity to insulin and decreases gluconeogenesis.



Diabetes Education SERVICES

SGLT2 Inhibitors- How do they rate?

Question	Answer
▶ Cause hypoglycemia?	No
▶ Cause weight gain?	No
▶ Affordable?	No
▶ Lowers CV risk?	No
▶ Can most tolerate /use?	Yes?



Indications for Insulin Sensitizers

Rosiglitazone (Avandia), Pioglitazone (Actos)

- ▶ **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 relaxed
 - ▶ Dosing: 4-8 mg daily
- ▶ **Efficacy/ Considerations**
 - ▶ Reduce A1C ~0.5-1.0%
 - ▶ 6 weeks for maximum effect
 - ▶ \$100 a month
 - ▶ Can cause fluid retention, not indicated w/ CHF



TZDs – How do they rate?

Question	Answer
▶ Cause hypoglycemia?	No
▶ Cause weight gain?	Yes
▶ Affordable?	Yes/No
▶ Lowers CV risk?	??
▶ Can most tolerate /use?	Yes/No



Thank You



- ▶ Questions?
- ▶ Email
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- ▶ Web
www.DiabetesEd.net



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