Welcome to Diabetes in 21st Century

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Diabetes in the 21st Century:
A Clinical and Educational Update

1. Describe impact of diabetes
2. Discuss prevention, management strategies
3. Discuss different types of diabetes
4. Describe insulin therapy
5. 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, Benker, Williamson
2010, Oct 22-8(1)29
www.pophealthmetrics.co/f
Diabetes in America 2014

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

Type 2 in Kids

- 7 fold increase since 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 urgently needed

Global Epidemic

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

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

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic whites</td>
<td>7.6</td>
</tr>
<tr>
<td>Asian Americans</td>
<td>9.0</td>
</tr>
<tr>
<td>Hispanics</td>
<td>12.8</td>
</tr>
<tr>
<td>Non-Hispanic blacks</td>
<td>13.2</td>
</tr>
<tr>
<td>American Indians/Alaska Natives</td>
<td>15.9</td>
</tr>
</tbody>
</table>


- Among Hispanic adults, the age-adjusted rate of diagnosed diabetes was 7.9% for Central and South Americans, 6.9% for Cuban, 15.9% for Mexican Americans, and 14.8% for Puerto Ricans.
- Among Asian American adults, the age-adjusted rate of diagnosed diabetes was 7.3% for Chinese, 3.2% for Filipinos, 15.0% for Asian Indians, and 4.8% for other Asians.
- Among American Indians and Alaska Natives adults, the age-adjusted rate of diagnosed diabetes varied by region from 6.0% among Alaska Natives to 31.8% among American Indians in northern Arizona.

**Why Should Zip Code Determine Life Expectancy?**

<table>
<thead>
<tr>
<th>City</th>
<th>Zip Code</th>
<th>Life Expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stockton</td>
<td>95202</td>
<td>73</td>
</tr>
<tr>
<td>Irvine</td>
<td>92606</td>
<td>88</td>
</tr>
</tbody>
</table>

*Mathofamerica.org*
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

**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

<table>
<thead>
<tr>
<th>Hormone</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucagon (pancreas)</td>
<td></td>
</tr>
<tr>
<td>Stress hormones (kidney)</td>
<td></td>
</tr>
<tr>
<td>Epinephrine (kidney)</td>
<td></td>
</tr>
<tr>
<td>Insulin (pancreas)</td>
<td></td>
</tr>
<tr>
<td>Amylin (pancreas)</td>
<td></td>
</tr>
<tr>
<td>Gut hormones - incretins (GLP-1) released by L cells of intestinal mucosa, beta cell has receptors</td>
<td></td>
</tr>
</tbody>
</table>

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

GLP-1 secreted upon the ingestion of food

Promotes satiety and reduces appetite

↑ Beta-cell response

Alpha cells: L Postprandial glucagon secretion

Liver: ↓ L-Glucagon reduces hepatic glucose output

Stomach: Helps regulate gastric emptying

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

Incretin Mimetics
Byetta, Bydureon, Trulicity, Tanzeum

Action (synthetic gut hormone)

- Insulin release in response to meal
- Slows gastric emptying
- Causes Satiety – promotes wt loss
- Preserves Beta Cells

Details:
- Daily and long acting version - 1x week injection
- Efficacy: Decreases A1c by 0.5 – 1.6%, wt by 3lbs +

Benefits/Issues – wt loss, no hyp. Expensive, N/V
- Pancreatitis Warning – report signs immediately
**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**

<table>
<thead>
<tr>
<th>Normal</th>
<th>Prediabetes</th>
<th>Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FBG &lt;100</td>
<td>FBG 100-125</td>
<td>FBG 126 +</td>
</tr>
<tr>
<td>Random &lt;140</td>
<td>Random 140 - 199</td>
<td>Random 200 +</td>
</tr>
<tr>
<td>A1c &lt;5.7%</td>
<td>A1c ~ 5.7-6.4%</td>
<td>A1c 6.5% or +</td>
</tr>
<tr>
<td></td>
<td>50% working pancreas</td>
<td>20% working pancreas</td>
</tr>
</tbody>
</table>

Development of type 2 diabetes happens over years or decades

**Signs of Diabetes**

- Polyuria
- Polydipsia
- Polyphasia
- Weight loss
- Fatigue
- Skin and other infections
- Blurry vision
- Glycosuria, H₂O losses
- Dehydration
- Fuel Depletion
- Loss of body tissue, H₂O
- 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)

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

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

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

Autoantibodies Assoc w/ Type 1

Panel of autoantibodies –
- GAD65 - Glutamic acid decarboxylase –
- ICA - Islet Cell Cytoplasmic Autoantibodies
- IAA - Insulin Autoantibodies
Medalist Study – Harvard Joslin Diabetes Center

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

Type 1 Diabetes Associated with other immune conditions

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

Type 1 Summary

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

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

What do you say?

BMI Categories

BMI Categories

BMI Categories

Types of Fat

Types of Fat
Natural Progression of Type 2 Diabetes

Cardio Metabolic Risk - 5 Hypers -
- Hyperinsulinemia (resistance)
- Hyperglycemia
- Hyperlipidemia
- Hypertension
- Hyper"waist"emia (35" women, 40" men)

Manifestations of Insulin Resistance

Diabetes 2 - Who is at Risk?

1. Testing should be considered in all adults who are overweight (BMI ≥ 25) and have additional risk factors:
   - First-degree relative w/ diabetes
   - Member of a high-risk ethnic population
   - Habitual physical inactivity
   - PreDiabetes
   - History of heart disease
Diabetes 2 - Who is at Risk?
(ADA Clinical Practice Guidelines)

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

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

Diabetes Detectives Needed
- On average – takes 6.5 years to diagnose diabetes
- 1/4 of all people with diabetes don’t know they have it
Ominous Octet

- Decreased salivation, decreased neuro-transmission
- Decreased amylin, β-cell secretion (80% loss at dx)
- Decreased gut hormones
- Increased lipolysis
- Decreased glucose uptake
- Increased glucose production

SGLT2 Inhibitors - “Glucoretics”

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

<table>
<thead>
<tr>
<th>SGLT2 Inhibitors</th>
<th>Canagliflozin (Insulcan)</th>
<th>100–300 mg once daily</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dapagliflozin (Farxiga)</td>
<td>5–10 mg once daily</td>
</tr>
<tr>
<td></td>
<td>Empagliflozin (Jardiance)</td>
<td>10–25 mg once daily</td>
</tr>
</tbody>
</table>

- **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

Comparison of Type 1, Type 2, LADA

<table>
<thead>
<tr>
<th></th>
<th>Type 1</th>
<th>Type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Obesity</strong></td>
<td>x</td>
<td>xxx</td>
</tr>
<tr>
<td>Insulin dependence</td>
<td>xxx</td>
<td>30%</td>
</tr>
<tr>
<td>Respond to oral agents</td>
<td>0</td>
<td>xxx</td>
</tr>
<tr>
<td>Ketosis</td>
<td>xxx</td>
<td>x</td>
</tr>
<tr>
<td>Antibodies present</td>
<td>xxx</td>
<td>0</td>
</tr>
<tr>
<td>Typical Age of onset</td>
<td>teens</td>
<td>adult</td>
</tr>
<tr>
<td>Insulin Resistance</td>
<td>0</td>
<td>xxx</td>
</tr>
</tbody>
</table>
Gestational DM ~ 7% of all Pregnancies

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

Diabetes 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

Postnatal Health: Maternal Behavior

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

- For women with PreDiabetes and History of GDM

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

A Frequent skin and yeast infections
B A BMI of ____ or greater is considered overweight
B To reduce complications, control A1c, Blood pressure, Cholesterol
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

Overcoming barriers

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

Bill Polonsky, PhD, CDE

How will blood glucose testing help me?

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

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

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
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

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 A1c reduces microvascular complications by 35%
- 1% decrease in A1c reduces diabetes related deaths by 25%
- B/P control (144/82) reduced risk of:
  - Heart failure (56%)
  - Stroke (44%)
  - Death from diabetes (32%)


6. Glycemic Targets

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

A1c and Estimated Avg Glucose (eAG) 2008

<table>
<thead>
<tr>
<th>A1c (%)</th>
<th>eAG</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>97</td>
</tr>
<tr>
<td>6</td>
<td>126</td>
</tr>
<tr>
<td>7</td>
<td>154</td>
</tr>
<tr>
<td>8</td>
<td>183</td>
</tr>
<tr>
<td>9</td>
<td>212</td>
</tr>
<tr>
<td>10</td>
<td>240</td>
</tr>
<tr>
<td>11</td>
<td>269</td>
</tr>
<tr>
<td>12</td>
<td>298</td>
</tr>
</tbody>
</table>

\[ eAG = 28.7 \times A1c - 46.7 \sim 29 \text{ pts per 1%} \]

Translating the A1c Assay into Estimated Average Glucose Values – ADA Study
Diabetes Care 31, 40, August 2008

Order teaching tool kit free at diabetes.org
“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

<table>
<thead>
<tr>
<th>Statin Recommendations – ADA Stds of Care 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Table B.1—Recommendations for statin treatment in people with diabetes</strong></td>
</tr>
<tr>
<td><strong>Age</strong></td>
</tr>
<tr>
<td>&lt;40 yrs</td>
</tr>
<tr>
<td>40-75 yrs</td>
</tr>
<tr>
<td>None</td>
</tr>
<tr>
<td>40-75 yrs</td>
</tr>
<tr>
<td>None</td>
</tr>
<tr>
<td>&gt;75 yrs</td>
</tr>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

*In addition to lifestyle therapy.
**CVD risk factors include I26 cholesterol >100 mg/dl (2.6 mmol/l), high blood pressure, smoking, and overweight and obesity.
***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
- Exercise, Education
- Healthy 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.

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
## 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.

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## DiaBingo- G

- **ADA goal for A1c is less than ____%**
- **People with DM need to see their provider at least every month**
- **Blood pressure goal is less than**
- **People with DM should see eye doctor (ophthalmologist) at least**
- **The goal for triglyceride level is less than**
- **Goal for my HDL cholesterol is more than**
- **The goal for blood sugars 1-2 hours after a meal is less than**
- **People with DM should get this shot every year**
- **People with DM need to get urine tested yearly for ______________**
- **Periodontal disease indicates increased risk for heart disease**
- **The goal for blood sugar levels before meals is:**
- **The activity goal is to do ____ minutes on most days**

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## Diabetes Care Guidelines- ADA

<table>
<thead>
<tr>
<th>Test / Exam</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A1c</em></td>
<td>At least twice a year</td>
</tr>
<tr>
<td><em>B/P</em></td>
<td>Each diabetes visit</td>
</tr>
<tr>
<td><em>Cholesterol (LDL, HDL, Tri)</em></td>
<td>Yearly (less if normal)</td>
</tr>
<tr>
<td><em>Weight</em></td>
<td>each diabetes visit</td>
</tr>
<tr>
<td><em>Microalbumin/GFR/Creat</em></td>
<td>Yearly</td>
</tr>
<tr>
<td><em>Eye exam</em></td>
<td>Yearly</td>
</tr>
<tr>
<td><em>Dental Care</em></td>
<td>At least twice a year</td>
</tr>
<tr>
<td><em>Comprehensive Foot Exam</em></td>
<td>Yearly (more if high risk)</td>
</tr>
<tr>
<td><em>Physical Activity Plan</em></td>
<td>As needed to meet goals</td>
</tr>
<tr>
<td><em>Preconception counseling</em></td>
<td>As needed</td>
</tr>
</tbody>
</table>
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"

---

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
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**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*

---

Glucose Management and Hospitalized Patients

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

- Normoglycemia: 26%
- Known Diabetes: 12%
- New Hyperglycemia: 62%

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

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

Effect of Hyperglycemia on Hospital Mortality

- Mortality (%) for Prior history of:
  - Normoglycemia
  - Known diabetes
  - New hyperglycemia

- Mortality for Total, Non-ICU, ICU

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

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)

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

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
Three Most Important Foot Care Tips

- Inspect and apply lotion to your feet every night before you go to bed.
- Do NOT go barefoot, even in your house. Always wear shoes!
- Every time you see your doctor, take off your shoes and show your feet.

Bottom Line

- 30-40% of hospitalized patients have diabetes
- 10% aren't officially diagnosed
- Cardiovascular disease is the leading cause of hospitalization for people with diabetes
- Look for patients with hyperglycemia and cardiometabolic risk factors: smokers, HTN, central obesity, abnormal lipids, Acanthosis.
- Provide education and promote self-advocacy
68% overweight or obese
34% BMI 30+; 14% BMI 25-29
1/3 of all overweight people don’t get diabetes
the least 5% of calories a day at work
Overall, food costs ~10-15% of income
Calorie Intake is on the rise

1/3 of all overweight people don’t get diabetes

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)

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 individuated assessment of eating patterns, preferences and metabolic goals.
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?


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

Losing 2-8kg Early in diagnosis Type 2 Helpful

- ADA 2014

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

To lose one pound – avoid 3,500 cals
- Decrease intake 250-500 cals daily + exercise
Successful weight loss strategies include

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

Diabetes Prevention Program Focus on fat = wt loss success

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

<table>
<thead>
<tr>
<th>Weight (lb)</th>
<th>Fat Goal (grams)</th>
<th>Calorie Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>120-174</td>
<td>33</td>
<td>1,200</td>
</tr>
<tr>
<td>175-219</td>
<td>42</td>
<td>1,500</td>
</tr>
<tr>
<td>220-249</td>
<td>50</td>
<td>1,800</td>
</tr>
<tr>
<td>&gt;250</td>
<td>55</td>
<td>2,000</td>
</tr>
</tbody>
</table>


How nutrients affect blood sugar

[Graph showing blood sugar levels for carbohydrates, protein, and fat]
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 Veggies
- Citrus Fruit
- Sweet Potatoes
- Berries
- Tomatoes
- Fish High in Omega-3 Fatty Acids
- Whole Grains
- Nuts
- Fat-Free Milk and Yogurt

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.

Another plate example
Mindful Eating

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

*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

Fooducate App – gives grade and nutrition info.

1 tsp sugar = 4 gms

Carb affect Post meal Blood Glucose

- Starch
- Fruit
- Milk
- Desserts

Starchy foods

© Diabetes Education Services 1998-2015
Carbohydrate Needs for Most Adults

<table>
<thead>
<tr>
<th>Grams</th>
<th>Servings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each Meal</td>
<td>45-60 gm</td>
</tr>
<tr>
<td>Snacks</td>
<td>15-30 gm</td>
</tr>
</tbody>
</table>

Carbs affect Post Meal Blood Glucose

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

Handy Meal Plan

- Per Meal Serving
  - Each finger = 15 gms carb (can have 3-4 servings/meal)
  - Palm of hand = 3 oz’s protein
  - Thumbnail = 1 tsp fat serving
Carb Counting - Starch
Each Food has:
80 Calories
15 grams carb

1/2 cup cooked beans
1 small ear of corn or 1/2 cup corn
1/2 cup cooked pasta
3/4 cup cold cereal
1 small potato
1/2 English muffin
1 small tortilla
5-6 small crackers
1/3 cup cooked rice
3/4 cup cold cereal

Carb counting - fruit
Each Food has:
60 Calories
15 grams carb

1 small fresh fruit
1/2 cup juice
1 banana
1/4 cup unsweetened apple sauce
1 cup melon
1 1/4 cup strawberries
1 slice bread
1 1/4 cup strawberries

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

8 oz buttermilk
6 oz plain yogurt
6 oz light fruit yogurt
1 slice bread
8 oz milk
1 packet diet hot cocoa
8 oz soy milk
Carb Counting - Sweets
Each Food has: Calories vary 15 grams carb

- 2 inch square cake or brownie, unfrosted
- ¼ cup ice cream or frozen yogurt
- ½ cup sorbet
- 1 slice bread
- 1 tbsp light syrup
- ½ cup jell-o
- 2 tbsp light syrup
- ½ cup diet pudding
- 1 slice bread
- 1 tsp syrup, jam, jelly, table sugar, honey
- 1 slice bread
- 2 tbsp light syrup
- ½ cup ice cream or frozen yogurt
- ½ cup sorbet

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

Fats - Aim for heart health
- Saturated fats (LIMIT)
  - Solid
  - Animal
  - Tropical (palm, coconut)
  - Trans fats (deep fried)
- Monounsaturated
  - Olive & canola oils
  - Nuts
  - Avocado
- Polyunsaturated
  - Veg oils: canola, corn, walnut, safflower, soybean

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

- Women: 1 or fewer alcoholic drinks a day
- Men: 2 or fewer alcoholic drinks a day
  - 1 alcoholic drink equals 12 oz beer, 5 oz glass of wine, or 1.5 oz distilled spirits (vodka, gin etc)
- If drink, limit amount and drink with food.
- Ask HCP if safe for you to drink. Tell them your usual quantity and frequency.
- Can cause hypo and worsen neuropathy

Ms. Gonzales’ Daily Meal plan

<table>
<thead>
<tr>
<th>Break</th>
<th>Lunch</th>
<th>Dinner</th>
<th>Night</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 corn</td>
<td>Sandwich, low fat</td>
<td>Lg bowl low salt soup,</td>
<td>1 bowl of</td>
</tr>
<tr>
<td>tortillas,</td>
<td>potato chips, 1c.</td>
<td>1c. rice, BBQ meat,</td>
<td>cereal</td>
</tr>
<tr>
<td>1/2 c. beans,</td>
<td>juice, 2-4 lowfat</td>
<td>salad &amp; cooked veggies,</td>
<td></td>
</tr>
<tr>
<td>salsa, peppers</td>
<td>cookies</td>
<td>1 glass wine</td>
<td></td>
</tr>
<tr>
<td>egg beaters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avg BG 120’s</td>
<td>Avg BG 200’s</td>
<td>Avg BG 200’s</td>
<td>Avg BG 180’s</td>
</tr>
</tbody>
</table>

DiaBingo - N

- Injected hormone called an incretin mimetic
- DPP demonstrated that exercise and diet reduced risk of DM by ___%
- A _______ day can help prevent heart attack and stroke
- Rebound hyperglycemia
- Scare tactics are effective at motivating patients to change behavior
- Losing ___ % of body weight, can improve blood glucose, BP, lipids
- Drugs that can cause hyperglycemia
- 2/3 cups of rice equals ______ serving carbohydrate
- A1c of 7% equals glucose of
- One % drop in A1c reduces risk of complications by ___ %
- 1 gm of fat equal ________ kilo/calories
- Metabolic syndrome = hyperglycemia, hyperlipidemia, hypertension
- 1% A1c = _______ of Blood Glucose
Insulin – the Ultimate Hormone Replacement Therapy

Objectives:
- Discuss the actions of different insulins
- Describe using pattern management as an insulin adjustment tool.
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 (µU/mL)
- Glucose (mg/dL)
- Bolus Insulin
- Basal Insulin
- Mealtime Glucose
- Basal Glucose

Time of Day

A.M. P.M.
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)

Bolus Insulins
(½ of total daily dose ÷ meals)

<table>
<thead>
<tr>
<th>Name</th>
<th>Onset</th>
<th>Peak Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lispro (Humalog)</td>
<td>15-30 min</td>
<td>1-1.5 hrs</td>
</tr>
<tr>
<td>Aspart (NovoLog)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glulisine (Apidra)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Afrezza (Inhaled)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular</td>
<td>30 mins</td>
<td>2-4 hrs</td>
</tr>
</tbody>
</table>

Afrezza Inhaler

Know your AFREZZA Inhaler:

Replace inhaler every 15 days
Bolus Insulin Summary

- Regular, Novolog, Humalog, Apidra,
- Starts working fast (15-30 mins)
- Gets out fast (3-6 hours)
- Post meal BG reflects effectiveness
- Should comprise about ½ total daily dose
- Covers food or hyperglycemia.
- 1 unit
  - Covers ≈ 10 - 15 gms of carb
  - Lowers BG = 30 – 50 points

Bolus Insulin Timing

- How is the effectiveness of bolus insulin determined?
  - 2 hour post meal (if you can get it)
  - Before next meal blood glucose
- Glucose goals (ADA) – may be modified by provider/pt
  - 1-2 hours post meal <180
  - Before next meal – 70 - 130

Pattern Management – AKA

How to think like a pancreas
Pattern Management

- Safety 1st!! - Evaluate 3 day patterns
- **Hypo:** eval 1st and fix:
  - If possible, decrease medication dose
  - Timing of meals, exercise, medications
- **Hyperglycemia:** evaluate 2nd
  - Identify patterns
  - Before increase insulin, make sure not missing something (carbs, exercise, omission)


<table>
<thead>
<tr>
<th></th>
<th>Break</th>
<th>Lunch</th>
<th>Dinner</th>
<th>HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>164</td>
<td></td>
<td></td>
<td>181</td>
</tr>
<tr>
<td>Day 2</td>
<td></td>
<td>124</td>
<td>106</td>
<td>195</td>
</tr>
<tr>
<td>Day 3</td>
<td>149</td>
<td></td>
<td>102</td>
<td>242</td>
</tr>
<tr>
<td>Day 4</td>
<td>151</td>
<td>81</td>
<td></td>
<td>211</td>
</tr>
</tbody>
</table>

Bolus – Insulin Sliding Scale

<table>
<thead>
<tr>
<th></th>
<th>Break</th>
<th>Lunch</th>
<th>Dinner</th>
<th>HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>94 no insulin</td>
<td>212 4 uR</td>
<td>148 no insulin</td>
<td>254 6 uR</td>
</tr>
<tr>
<td>Day 2</td>
<td>243 4 uR</td>
<td>254 6 uR</td>
<td>201 4 uR</td>
<td>199 no insulin</td>
</tr>
<tr>
<td>Day 3</td>
<td>189 2 uR</td>
<td>243 4 uR</td>
<td>182 2 uR</td>
<td>244 4 uR</td>
</tr>
<tr>
<td>Day 4</td>
<td>66 no insulin</td>
<td>287 6 uR</td>
<td>144 none</td>
<td>272 6 uR</td>
</tr>
</tbody>
</table>
**Basal Insulins**
(½ of total daily dose)

<table>
<thead>
<tr>
<th>Intermediate Acting</th>
<th>Peak Action</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPH</td>
<td>4-12 hrs</td>
<td>12-24 hrs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Long Acting</th>
<th>Peak Action</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detemir (Levemir)</td>
<td>peakless</td>
<td>20 hrs</td>
</tr>
<tr>
<td>Glargine (Lantus)</td>
<td>No peak</td>
<td>24 hrs</td>
</tr>
</tbody>
</table>

*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%*

<table>
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<th>Break</th>
<th>Lunch</th>
<th>Dinner</th>
<th>HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mo 1</td>
<td>170s</td>
<td></td>
<td></td>
<td>298</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10uNPH</td>
</tr>
<tr>
<td>Mo 2</td>
<td>160s</td>
<td></td>
<td></td>
<td>233</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20uNPH</td>
</tr>
<tr>
<td>Mo 4</td>
<td>140s</td>
<td>283</td>
<td>265</td>
<td>206</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>40uNPH</td>
</tr>
</tbody>
</table>
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

Combo Sub-Q Insulin

<table>
<thead>
<tr>
<th>Insulin Type</th>
<th>Onset</th>
<th>Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humalog Mix</td>
<td>0.25 - 0.5 hr</td>
<td>0.5-6.5 hrs</td>
</tr>
<tr>
<td>75/25: 75% NPL, 25% lispro</td>
<td>0.25 - 0.5 hr</td>
<td>0.5-6.5 hrs</td>
</tr>
<tr>
<td>50/50: 50% NPL, 50% lispro</td>
<td>0.25 - 0.5 hr</td>
<td>0.5-6.5 hrs</td>
</tr>
<tr>
<td>NovoLog Mix</td>
<td>0.25 - 0.5 hr</td>
<td>1 – 4 hrs</td>
</tr>
<tr>
<td>70/30: 70% NPA, 30% aspart</td>
<td>0.25 - 0.5 hr</td>
<td>1 – 4 hrs</td>
</tr>
<tr>
<td>NPH + Reg Combo</td>
<td>0.5 – 1.0 hr</td>
<td>2 - 16 hrs</td>
</tr>
<tr>
<td>70/30: 70%N /30%R</td>
<td>0.5 – 1.0 hr</td>
<td>2 - 16 hrs</td>
</tr>
<tr>
<td>50/50: 50%N /50%R</td>
<td>0.5 – 1.0 hr</td>
<td>2 - 16 hrs</td>
</tr>
</tbody>
</table>

Considerations:
- Pre-mixed, difficult to fine tune therapy
24u 70/30 am, 16 u 70/30 pm
Patterns? Changes needed?

<table>
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<td>102</td>
<td>63</td>
<td>92</td>
<td>181</td>
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<tr>
<td>Day 2</td>
<td>112</td>
<td>67</td>
<td>106</td>
<td>195</td>
</tr>
<tr>
<td>Day 3</td>
<td>98</td>
<td>56</td>
<td>112</td>
<td>201</td>
</tr>
<tr>
<td>Day 4</td>
<td>99</td>
<td>71</td>
<td>132</td>
<td>211</td>
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Type 2 – Glburide 20mg AM, 10u NPH pm

<table>
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<tr>
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What Medications Cause Hypoglycemia?

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

- Action: Increase endogenous insulin secretion throughout day
- Efficacy:
  - Decrease FPG 60-70 mg/dl
  - Reduce A1C by 1.0-2.0%
- Side Effects:
  - Weight gain, hypoglycemia
- Benefits:
  - Cheap, effective

Hypoglycemia = “Limiting Factor”

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

Hypoglycemic Symptoms

- Autonomic
  - Anxiety
  - Palpitations
  - Sweating
  - Tingling
  - Trembling
  - Hypoglycemic Unawareness

- Neuroglycopenia
  - Irritability
  - Drowsiness
  - Dizziness
  - Blurred Vision
  - Difficulty with speech
  - Confusion
  - Feeling faint
### Treatment of Hypoglycemia

- If blood glucose **70** mg/dl or below:
  - 10-15 gms of carb to raise BG 30 - 45 mg/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

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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**
- 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

**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

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

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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

## 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)

## 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
Unconditional Positive regard

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

- Term coined by humanist, Carl Rogers

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

Thank You

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