Welcome to Diabetes MiniSeries – Class 1
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President, Diabetes Education Services

Program Info
» Handouts and resources – We emailed a link to all the handouts and resources for this program.

» Sign in link for each broadcast – keep an eye on your incoming email for important email from Beverly with a subject line: Confirmation - Diabetes Mini-Series. Please store it for safe keeping!

» Plan on checking in 5-10 minutes before the program starts. However, you can join in at any time.

» DiabetesEducationUniversity.com Can’t make it live? No worries, the recorded versions will be available to you through your Student Center through December 31, 2014.

» To receive CE credit, just complete the post-test and survey. Then, print out your CE certification! Than you.

Mini-Series – Class 1
A Clinical and Educational Update

1. Describe impact of diabetes
2. Pathophysiology made easy
3. Latest updates on the different types of diabetes.
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
- 25.8 million or > 8.3%
- 12.6 million are women
- 79 million have pre diabetes

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

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

World Diabetes Day
November 14

Why Should Zip Code Determine Life Expectancy?

California Endowment – look up your zip code at www.measureofamerica.org
Age-adjusted Diabetes Prevalence
20 yrs or older, by race/ethnicity—U.S. 2008

- Native Americans 16.5%
- Alaska Natives 16.5%
- Blacks 11.8%
- Hispanics 10.4%
- Asian Americans 7.5%
- Whites 6.6%

In 2002, Native Hawaiians and Japanese and Filipino residents of Hawaii aged twenty years or older were approximately 2 times as likely to have diagnosed diabetes as white residents of Hawaii.

Engaging and supporting Kids to help slow the epidemic

- Phases of Life
  - During Childhood
    - Environment
      - Access to safe places to exercise
      - Access to healthy foods
      - Access to learning rich environments
      - Access to health care
    - LifeStyle
      - Limit screen time to 2 hours a day
      - 1 hour a day of activity
      - Healthy snacks
      - Limit junk food, sugary beverages
      - Fruits and Veggies

Diabetes Education Services © www.DiabetesEd.net
Role of the Pancreas
Endocrine Functions

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

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

Role of the Pancreas
Endocrine Functions

Alpha cells - Glucagon
Opposes action of insulin at the liver
› stimulated in response to low glucose levels
› stimulates liver to convert glycogen to glucose
› inhibits liver from glucose uptake
› causes hyperglycemia
Hormones Effect on Glucose

<table>
<thead>
<tr>
<th>Hormone</th>
<th>Effect</th>
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<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>
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<tr>
<td>Insulin (pancreas)</td>
<td>⬤</td>
</tr>
<tr>
<td>Amylin (pancreas)</td>
<td>⬤</td>
</tr>
<tr>
<td>Gut hormones - incretins (GLP-1)</td>
<td>⬤</td>
</tr>
<tr>
<td>released by L cells of intestinal mucosa, beta cell has receptors</td>
<td>⬤</td>
</tr>
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</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 cells: Enhances glucose-dependent insulin secretion
- Alpha cells: ↓ Postprandial glucagon secretion
- Liver: ↓ Glucagon reduces hepatic glucose output
- Stomach: Helps regulate gastric emptying
- GLP-1 degraded by DPP-4 within minutes

Bariatric Surgery

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

**Normal**
- FBG <100
- Random <140
- A1c <5.7%

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

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

Development of type 2 diabetes happens over years or decades

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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
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?

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?

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: JDF
Type 1 – 10% of all Diabeties
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.

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)

Autoantibodies Assoc w/ Type 1

Panel of autoantibodies –
- GAD65 - Glutamic acid decarboxylase –
- ZnT8 - Zinc Co-Transporter 8
- ICA - Islet Cell Cytoplasmic Autoantibodies
- IA-2A - Insulinoma-Associated-2 Autoantibodies
- IAA - Insulin Autoantibodies
Type 1 Diabetes Associated with other immune conditions

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

Medalist Study – Harvard Joslin Diabetes Center

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

Type 1 Summary

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

Visceral Fat – “Endocrine Organ”
Natural Progression of Type 2 Diabetes

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 ≥ 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 satiation neurotransmission
- Decreased amylin, β-cell secretion
- Increased renin activity
- Increased lipolysis
- Decreased glucose uptake
- Decreased gut hormones

Comparison of Type 1 and Type 2

<table>
<thead>
<tr>
<th></th>
<th>Type 1</th>
<th>Type 2</th>
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</thead>
<tbody>
<tr>
<td>Obesity</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>30%</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>

Diabetes is also associated with:

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

Screen Pregnant Women Before 13 weeks

- Screen for undiagnosed Type 2 at the first prenatal visit using standard risk factors.
- Women found to have diabetes at their initial prenatal visit treated as “Diabetes in Pregnancy”
- If normal, recheck at 24-28 weeks
Increasing Prevalence –
A public health perspective

- Body weight before and during pregnancy influences risk of GDM and future diabetes
- Children born to women with GDM at greater risk of diabetes
- Focus on prevention

Postnatal Health:
Maternal Behavior

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

Start Metformin therapy

- For women with PreDiabetes and History of GDM
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

Life Study – Mrs. Jones

Mrs. Jones is 62 years old, overweight and complaining of feeling tired and urinating several times a night. She is admitted with a urinary tract infection. Her WBC is 12.3, glucose 237. She is hypertensive with a history of gestational diabetes. No ketones in urine.

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

What Do You Say?
Mrs. Jones asks you

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

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

Bill Polonsky, PhD, CDE

- Ask pt, “Tell me 1 thing that is driving you crazy about your diabetes”
- Discuss medication beliefs
- To improve outcomes, see pts more often
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

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

New Meters – a little goes a long way
- 0.3 microliters of blood
- Minimal pain

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

Thank You

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