Diabetes in 21st Century
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Disclosure

Diabetes Education Services and Beverly Thomassian have no conflict of interest to disclose.
References on slide as noted or in reference page
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Objectives

This symposium will enable participants to:
1. Discuss the pathophysiology of the different types of diabetes including Latent Autoimmune Diabetes of Adults (LADA), Double Diabetes and Steroid-Induced Hyperglycemia.
2. List the 2017 updates to the diabetes management guidelines as outlined by the American Diabetes Association.
3. Describe how to use the different classes of diabetes meds individually or in combination to achieve optimal glucose control including new medications, warnings and breakthroughs.
4. Review glucose patterns and determine how to adjust therapy to improve glucose in the outpatient and inpatient setting.
5. List strategies related to the gut microbiome to help people with or at risk for diabetes nourish their body to maintain optimal health.
Topics

- Current State of Diabetes
- What’s new ADA Standards
- Individualizing Goals
- Diabetes Prevention Program
- Medication Update
- Using ADA and AACE Algorithm
- Insulin Pattern Management
- Getting the Gut

Global Epidemic

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

Diabetes in America 2017

- 30.3 million or > 9.4%
  - 27% don’t know they have it
- 37% of US adults have pre diabetes (86 mil)
  - 90% don’t know they have it
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

Adapted from Nauck MA, et al. Diabetologia. 1996;39:1546-1553
Adapted from Drucker DJ. Diabetes. 1998;47:159-169

GLP-1 secreted upon the ingestion of food

Promotes satiety and reduces appetite

↑ Beta-cell response

Enhances glucose-dependent insulin secretion

Alpha cells:

↓ Postprandial glucagon secretion

Liver:

↓ Hepatic glucose output

Stomach:

Helps regulate gastric emptying

GLP-1 degraded by DPP-4 within minutes

Incretin Mimetics

Exenatide (Byetta), Exenatide XR (Bydureon)

Action:

- Insulin release in response to meal
- Slows gastric emptying
- Causes Satiety
- Protects Beta Cells

Exenatide Dosing:

- 5-10 mcg before breakfast, 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

Exenatide XR - Bydureon

Once a Week Dosing: 2mg

Efficacy:

- Decreases A1c by 1.6%, wt by ~6lbs

Indication:

- For type 2s only

Other:

- Available in pen

Caution:

- not indicated for pt’s w/ history of medullary thyroid tumor
- pancreatitis warning

Incretin Mimetics –

Exenatide XR - Bydureon

© Copyright 1999-2017, Diabetes Education Services  www.DiabetesEd.net
**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

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**Incretin Mimetics — dulaglutide – Trulicity**

- **Once a Week Dosing**: 0.75 – 1.5 mg
- **Efficacy**: Decreases A1c by ~ 1%, wt by ~2lbs
- **Indication**: For type 2s only
- **Other**: Premixed Pen injector with retracting needle
- **Caution**: not indicated for those with history of medullary thyroid tumor - pancreatitis warning

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**Incretin Mimetics - GLP-1 Analog Liraglutide (Victoza)**

**Liraglutide Dosing**: 1x daily, time not critical
- 0.6 x 1 week – if tolerated (nausea), go to >
- 1.2 x 1 week – if tolerated go to >
- 1.8 mg daily
- **Efficacy**: lowers; A1c by 1%, body wt by ~ 2.5kg
- **Indication**: Monotherapy or in combo . Type 2 only
- **Other**: In pen

**Black box**: thyroid tumor warning (avoid if family hx, notify MD of hoarseness, lump).
Victoza significantly reduced the risk of cardiovascular death, non-fatal heart attack or non-fatal stroke by 13%
Liraglutide Approved for Weight Loss
- Saxenda and Victoza contain the same active ingredient (liraglutide) at different doses
- Saxenda 3 mg and Victoza 1.8 mg
- Saxenda – as a treatment option for chronic weight management in addition to a reduced calorie diet and physical activity.
- Saxenda is approved for use in adults with a
  - BMI of ≥ 30 or
  - BMI of ≥ 27 or greater who have hypertension, type 2 diabetes, or dyslipidemia.

Quick Question 1
- According to ADA 2017 Standards, who should be screened for prediabetes/diabetes?
  a. JR, has family history of diabetes, BMI 22, age 39
  b. MS, age 47
  c. LK, smokes, has HTN age 43
  d. RA, Hispanic, low HDL, avg wt

2. Classification and DM Diagnosis
- Pre Diabetes & Type 2- Screening Guidelines
- Start screening at age 45 or for anyone who is overweight (BMI ≥ 25, Asians BMI ≥ 23) with one or > additional risk factor:
  - 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
- History Gestational Diabetes
- Polycystic ovary syndrome (PCOS)
- Other conditions assoc w/ insulin resistance:
  - Severe obesity, acanthosis nigricans (AN)

Screening for Type 2
- 25% of all people with diabetes are undiagnosed
- 50% of all Asian and Hispanic Americans are undiagnosed
- Most people with prediabetes are undiagnosed.
  The duration of glycemic burden is a strong predictor of adverse outcomes.
- Use Validated Diabetes Risk Test (ADA)
- Dentists find undetected diabetes.
  - 30% of dental pts over 30 have dysglycemia.
Test Criteria T2 Kids & Adolescents

- Overweight plus any two:
  - Family history type 2 in 1st or 2nd degree relative
  - Race/ethnicity
  - Signs of insulin resistance or conditions associated with insulin resistance
  - Maternal history of diabetes or GDM
- Start testing at 10 yrs or onset of puberty
  - Recheck every 3 years or if symptoms
  - A1c preferred screening method

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>
</tbody>
</table>

50% working pancreas

Development of type 2 diabetes happens over years or decades

3. Initial Eval and Diabetes Management Planning

- Medical Evaluation
  1. Classify diabetes
  2. Detect diabetes complications
  3. Review previous treatment and risk factor control
  4. Assist in formulating a management plan
  5. Provide a basis for continuing care
3. Initial Eval – Conditions to look for

- Type 1 - Autoimmune diseases
- Other conditions that may appear Type 1/2
  - Depression and anxiety
  - Obstructive sleep apnea
  - Fatty liver disease
  - Cancer
  - Fractures
  - Cognitive impairment
  - Low Testosterone in Men
  - Periodontal disease
  - Hearing impairment

Type 1 Rates Increasing Globally

- 23% rise in type 1 diabetes incidence from 2001-2009
- Why?
  - Autoimmune disease rates increasing overall
  - Changes in environmental exposure and gut bacteria?
  - Hygiene hypothesis
  - Obesity?

Autoantibodies Assoc w/ Type 1

Panel of autoantibodies –
  - GAD65 - Glutamic acid decarboxylase –
  - ICA - Islet Cell Cytoplasmic Autoantibodies
  - IAA - Insulin Autoantibodies
Quick Question 2
What factors would make you suspect type 1 diabetes?
   a. Pt has a history of celiac disease
   b. Pt presents with low HDL cholesterol
   c. Friend tells you she has been eating “tons of sweets”
   d. Pt is slightly overweight

Type 1 Diabetes Associated with other immune conditions
   • Celiac disease (gluten intolerance)
   • Thyroid disease
   • Addison’s Disease
   • Rheumatoid arthritis
   • Other
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?

What Does Type 1 Look Like?

Mary Tyler Moore

Justice Sonia Sotomayor

Nick Jonas

Bret Michaels

Medalist Study – Harvard Joslin Diabetes Center

- After 50 years with diabetes
  - Many still produced some insulin
  - Many had no eye disease
Type 1 – Please encourage family members to get involved www.TrialNet.org

What kind of Diabetes?
- Pt is 58, states she has had type 1 diabetes for 18 years. Quit smoking a year ago and gained about 20 lbs. BMI 25.
- Meds
  - Humalog 18-23 units before each meal
  - Lantus 28 units at bedtime
  - Metformin 500mg TID
- What tests would you recommend?

What type of Diabetes?
- 72 Years old
- A1c 3 months prior 6.2%
- A1c now 13.9%
- BMI 24.5
- Lost about 10 pounds over last month
Latent AutoImmunity Diabetes in Adults (LADA)

- Antibody positive to 1-2 of below
  - GAD-65 autoantibodies
  - Insulin Autoantibodies
  - Islet Cell antigen-2
- Adult Age at onset
- Usually need insulin w/in first 6 months of diagnosis
- Early insulin therapy may preserve beta cell function

Diabetes Care 26:536-538, 2003
Jerry P. Palmer, MD and Irl B. Hirsch, MD

LADA Clinical Features Compared to Type 2

<table>
<thead>
<tr>
<th>Feature</th>
<th>LADA</th>
<th>Type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &lt;50</td>
<td>63%</td>
<td>19%</td>
</tr>
<tr>
<td>Acute hyperglycemia</td>
<td>66</td>
<td>24</td>
</tr>
<tr>
<td>BMI &lt; 25</td>
<td>33</td>
<td>13</td>
</tr>
<tr>
<td>Hx of autoimmune dx</td>
<td>27</td>
<td>12</td>
</tr>
<tr>
<td>Family hx autoimmune</td>
<td>46</td>
<td>35</td>
</tr>
</tbody>
</table>

Practical Diabetology March 08, Unger MD

Patti Labelle
“divabetic”
“I have diabetes, it doesn’t have me”
What is Type 2 Diabetes?

- Complex metabolic disorder .... (insulin resistance and deficiency)
- with social, behavioral and environmental risk factors unmasking the effects of genetic susceptibility.

New Diagnosis?
Call 800 – DIABETES to request “Getting Started Kit”
www.Diabetes.org
Ominous Octet

- Increased glucagon secretion
- Decreased amylin, β-cell secretion (80% loss at dx)
- Decreased gut hormones
- Increased lipolysis
- Decreased glucose uptake
- Decrease glucose production

SGLT2 Inhibitors- “Glucoretics”

- **Action:** “Glucoretic” decreases renal glucose reabsorption (resets renal threshold and increases glucosuria)
- **Side effects:** hypotension, UTIs, increased urination, genital infections, ketoacidosis
- **Expensive**

<table>
<thead>
<tr>
<th>Class/Max Action</th>
<th>Name(s)</th>
<th>Daily Dose Range</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>SGLT2 inhibitors</td>
<td>Canagliflozin</td>
<td>300–3000 mg/d</td>
<td><strong>Action:</strong> decreases renal glucose reabsorption in kidneys</td>
</tr>
<tr>
<td></td>
<td>Dapagliflozin</td>
<td>10–40 mg/d daily</td>
<td><strong>Side effects:</strong> hypotension, UTIs, increased urination, genital infections, ketoacidosis</td>
</tr>
<tr>
<td></td>
<td>Empagliflozin</td>
<td>10–35 mg/d daily</td>
<td>Monitor GFR and other considerations: Possible – stop meds if GFR &lt; 45.</td>
</tr>
<tr>
<td></td>
<td>(l oxide)</td>
<td></td>
<td><strong>Other considerations:</strong> do not start if GFR &lt; 45. Lowers all-cause mortality by 32%</td>
</tr>
<tr>
<td></td>
<td>(sulfate)</td>
<td></td>
<td><strong>Benefits:</strong> no hypo or weight gain.</td>
</tr>
</tbody>
</table>

EMPA-REG OUTCOME®: Summary

- Empagliflozin used in trial for 3 years in 1,000 patients with type 2 diabetes at high CV risk:
- Empagliflozin reduced hospitalisation for CHF 35%
- Empagliflozin reduced CV death by 38%
- Empagliflozin improved survival by reducing all-cause mortality by 32%

Need more research to determine this is a class effect
Jardiance gets special FDA CV approval

Quick Question 3

For patients on SGLT-2 Inhibitors, a potential side effect is:

a. Balanitis
b. Hypertension
c. Kidney tenderness
d. Increased uric acid

Comparison of Type 1, Type 2, LADA

<table>
<thead>
<tr>
<th></th>
<th>Type 1</th>
<th>Type 2</th>
<th>LADA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obesity</td>
<td>x</td>
<td>xxx</td>
<td>x</td>
</tr>
<tr>
<td>Insulin dependence</td>
<td>xxx</td>
<td>30%</td>
<td>6mos</td>
</tr>
<tr>
<td>Respond to oral agents</td>
<td>0</td>
<td>xxx</td>
<td>x</td>
</tr>
<tr>
<td>Ketosis</td>
<td>xxx</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Antibodies present</td>
<td>xxx</td>
<td>0</td>
<td>xx</td>
</tr>
<tr>
<td>Typical Age of onset</td>
<td>teens</td>
<td>adult</td>
<td>adult</td>
</tr>
<tr>
<td>Insulin Resistance</td>
<td>0</td>
<td>xxx</td>
<td>x</td>
</tr>
</tbody>
</table>
Diabetes is also associated with

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

Other Specific Types of DM

- Medications such as: steroids, protease inhibitors and Prograf
- Secondary to Agent Orange
- Liver failure
- TPN or tube feedings
- Pancreatic cancers or removal
- Cystic fibrosis, pancreatitis
- Other

Steroids Impact on BG

- What we know
  - Steroids cause insulin resistance
    - Most notable after lunch and dinner
    - Need bolus insulin at lunch/dinner
    - Can also try 70/30 in am
    - Oral agents alone, usually won’t work
    - Decadron causes highest blood glucose levels
  - BG trends down through night
    - Give basal insulin in am
    - Avoid basal at night
    - Assess kidney function/eating habits
Regardless of the cause, hyperglycemia needs to be treated.

“Getting diabetes saved my life.”
~ Sherri Shepard

Sherri Shepard decided to embrace diabetes and use it as a motivator to improve her health.

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 ___% beta cell function is lost
- Diabetes – random glucose ____ or greater
Start Metformin therapy
- For women with PreDiabetes and History of GDM

Quick Question 4
- Karen had GDM, now has prediabetes. She is started on Metformin 500mg BID. Which of the following is true?
  a. Metformin can cause kidney damage
  b. If you forget to take metformin before the meal, hold the dose.
  c. Take metformin with meals
  d. Always hold metformin if you are sick

Metformin – New GFR Guidelines

<table>
<thead>
<tr>
<th>Class/Main Action</th>
<th>Name(s)</th>
<th>Daily Dose Range</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biguanides</td>
<td>metformin</td>
<td>500 - 2,000mg</td>
<td>Side effects: nausea, bloating, diarrhea, GI upset. Transient GFR side effects, use GFR and take 50% of dose. Obtain GFR before starting.</td>
</tr>
<tr>
<td></td>
<td>(Gliclazide)</td>
<td>100 - 250mg</td>
<td>FSGR &lt;20, don’t start Metformin.</td>
</tr>
<tr>
<td></td>
<td>(Raniletic)</td>
<td>100 - 500mg/Day</td>
<td>For those with GFR 30-60, review dose and risk vs. benefit; consider decreasing dose.</td>
</tr>
</tbody>
</table>

Biguanide derived from: Goat’s Rue, Galgo officinalis, French Lilac.
Biguanides - Metformin

- Benefits
  - Decrease LDL cholesterol and triglycerides
  - No weight gain, possible modest weight loss
  - Cancer protective? Improves gut bacteria health.

- Concerns
  - Diarrhea and abdominal discomfort – Use XR (may see pill shell in stool – okay)
  - Lactic acidosis if improperly prescribed
  - Watch for B12 deficiency
  - Special instructions after IV contrast dye studies. Resume when kidney function adequate.

4. Lifestyle Management

- Education –
  - Setting Up Successful Diabetes Ed Program Online Course

- Nutrition

- Physical Activity

- Smoking Cessation

- Psychosocial Care

- Immunization

Quick Question 5

- What are the ADA current exercise recommendations?
  - a. Walk daily for 30 minutes
  - b. 30 minutes activity 5xs a week plus daily strengthening exercises
  - c. 10 minutes of activity three times daily.
  - d. 30 minutes activity 5xs a week plus strengthening exercises 2-3 times /wk
Physical Activity

- Children with diabetes – 60 mins / day
- Adults – 150 min/wk moderate intensity
  - over 3 days a week.
  - Don’t miss > 2 consecutive days w/out exercise
  - Get up every 30 mins - Reduce sedentary time
- T1 and T2 – resistance training 2-3 xs a week
- Flexibility and balance training 2-3 xs a week (Yoga and Tai Chi)

Good Exercise Info / Quotes

- “Passagiata” – take an after meal stroll
- Exercise decreases A1c 0.7%
- No change in body wt, but 48% loss in visceral fat
  - ADA PostGrad 2010
- “Every minute of activity lowers blood sugar one point.”
- “I don’t have time to exercise, I MAKE time.” Mike Huckabee

PreDiabetes is FREAKING ME OUT

- 86 million people in US
- 90% don’t know they have it
- In 3-5 years, about 30% of predm will get diabetes
- Associated with higher rates of heart attack, stroke, neuropathy and vessel disease
- Why isn’t is called stage 1 diabetes?
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

CDC 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%.
We want your Feedback

Diabetes Prevention Program?
Should we create for our community?

5. Prevention of Diabetes

- Medicare will start funding approved Diabetes Prevention Programs 2018
- $250 reimbursement per student completing program

**Proposed Medicare Diabetes Prevention Program Benefit Description**

- CDC-approved DPP curriculum
- 12 month Core Benefit
- Maintenance Sessions
- Minimum of 26 core sessions
- Session 6 months
- Monthly maintenance sessions
- Second 6 months
- After 1st Year: monthly contact and education
- Patient monitors & maintains inverse weight loss

**Diabetes Prevention Program Recognition**

*Standards for CDC recognition include:*

- Use of a CDC-approved curriculum.
- Offer lifestyle program within 6 mo's of receiving approval from CDC.
- Capacity and commitment to deliver program over 1 year, including at least 16 sessions during the first 6 mo’s and at least 6 sessions during the last 6 mo’s.
- Ability to submit data on participants’ progress—including attendance, weight loss, and physical activity—every 12 months.
- Trained lifestyle coaches who can help build participants’ skills and confidence to make lasting lifestyle changes.
  - People who have been trained to deliver the required curriculum content and possess the skills, knowledge, and qualities listed. Lifestyle coaches may have credentials (e.g., RD, RN), but credentials are not required.
- Designated individual(s) to serve as the diabetes prevention program coordinator.
Criteria for referral to Prevention Program

- Pts must meet the following requirements:
  - At least 18 years old and
  - Overweight (body mass index ≥24; ≥22 if Asian)
  - Have no previous diagnosis of type 1 or type 2 and
  - 50% must have a blood test result in the prediabetes range within the past year:
    - Hemoglobin A1C: 5.7%–6.4% or
    - Fasting plasma glucose: 100–125 mg/dL or
    - Two-hour plasma glucose (after a 75 gm glucose load): 140–199 mg/dL or
    - Be previously diagnosed with gestational diabetes

Getting to Goal

- A1c less than 7% (avg 3 month BG)
  - Pre-meal BG 80-130
  - Post meal BG <180
- Blood Pressure < 140/90
- Cardiovascular risk reduction
  - Eval if statin therapy indicated
6. A1c and Estimated Avg Glucose (eAG)

<table>
<thead>
<tr>
<th>A1c (%)</th>
<th>eAG</th>
</tr>
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<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>

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

Order teaching tool kit free at diabetes.org

6. Pediatric Glycemic Targets

- **A1c goal <7.5 % for all ages;**
  - however individualization is still encouraged.
  - A lower goal, <7% if can be achieved w/out excessive hypoglycemia
- **Blood glucose goals**
  - Before meals: 90-130
  - Bedtime/overnight: 90-150

12. Children and Adolescents

- **Start preconception counseling at puberty for all girls of childbearing potential** – decreases risk of malformations associated with unplanned pregnancies and poor metabolic control
- **Type 1 or Type 2 Diabetes?**
  - Many children overweight (type 1 and 2)
  - 6% of kids with new type 2 present in DKA.
  - Type 2 in kids is different than type 2 in adults,
    - more rapid decline in beta cell function
    - accelerated development of complications.
- Evaluate autoantibodies and do a careful history to determine the correct diagnosis and provide early and appropriate treatment.
Recommendations for Pediatric Psychosocial Issues

- At diagnosis and during routine follow-up care, assess psychosocial issues and family stresses that could impact adherence with diabetes management
- Provide appropriate referrals to trained mental health professions, preferably experienced in childhood diabetes

Youth and Emerging Adults

- Continue to assess family issues, stresses that can impact diabetes management
- Monitor social adjustment, school performance
- Assess for diabetes distress (age 7-8)
- Time alone w/ provider starting at age 12
- Starting at puberty, preconception counseling
- Provide appropriate referrals to trained mental health professionals

Prepare for Transition from Pediatric to the Emerging Adult

- Encourage family involvement in diabetes management tasks
- Avoid Premature transfer of diabetes care to the child
- As teens transition to adulthood, health care providers / families must recognize vulnerabilities and prepare teen at least 1 year prior to transition
- Both pediatricians and adult providers should assist in providing support and resources for teen and emerging adult
Poll Question 6
Jason has type 1 diabetes for 7 years and is turning 18 this year. What will help him make a successful transition to diabetes self-care as an adult?
A. Encourage complete autonomy
B. Moving to his own apartment
C. Requiring he pay for his own diabetes supplies
D. Providing support and resources

When does old age start?

Quick Question 7
What percent of the population over the age of 65 has type 2 diabetes?
A. 9.3%
B. 18%
C. 26%
D. 34%
Older People and Diabetes Stats

- Diabetes prevalence to double in next 20 years, in part due to aging population
- 26% of Americans age 65 or older have diabetes (11.8 million seniors)
- 20% of new cases occur in ages 65–79
- Adults 75+ highest rates of complications: myocardial infarction, amputations, visual impairment, kidney disease.

Older Adults (≥65 years) with diabetes

- Assess nutritional status
- Depression screening and treatment
- Cognitive screening for dementia
- Avoid hypoglycemia in this high risk group
  - Prevent hypo by adjusting glycemic targets and adjusting pharmacologic interventions
- Provide Resources

Older Adults at Risk for Malnutrition

- Due to:
  - Altered taste and smell
  - Swallowing difficulties
  - Oral/dental issues
  - Functional difficulties shopping for/preparing food
  - Anorexia
  - Overly restrictive eating patterns - carb deprivation
    - Self-imposed or provider/partner directed
Type 3 Diabetes - Alzheimer’s (AD)

- Diabetes doubles the risk of AD
- Brain nervous tissue becomes insulin resistant
- Can affect neurotransmission in brain and lead to amyloid deposits
- High blood sugars can intensify process

Link Between Gut and Brain

Healthy & Good Functional Status

- Set more intensive goals if:
  - Good cognitive and physical function
  - Expected to live long enough to reap benefits of intensive management,
  - Ongoing follow-up to eval safety

- Goals:
  - Reasonable A1c goal <7.5%
  - Fasting BG 90 – 130
  - Blood Pressure < 140/90
  - Statin unless contraindicated or not tolerated
Patients with Complications and Reduced Functionality - Less Intense Goals

- Adjusted based on shared-decision making and safety.
- Keep it realistic
- Consider DE-Intensification
- Goals:
  - Reasonable A1c goal <8.0%
  - Fasting BG 90 – 150
  - Blood Pressure < 140/90
  - Statin unless contraindicated or not tolerated

Very Complex Pts with Poor Health

- For patients with:
  - limited life expectancy and end stage chronic illnesses
  - moderate-to-severe chronic functional or cognitive issues
- Focus on quality of life and avoidance of hypo & hyperglycemic crisis.
- Goals:
  - Reasonable A1c goal <8.5%
  - Fasting BG 100 – 180
  - Blood Pressure < 150/90
  - Consider likely benefit of statin unless contraindicated or not tolerated

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 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
What questions?

- 72 yr old, thin, lives alone, A1c 7.3%.
- Good insurance

DPP-4 Inhibitors – “Incretin Enhancers”
Januvia (saxagliptin) – Tradjenta (linagliptin)
Onglyza (saxagliptin) Nesina (algliptin)

- **Action:**
  - Increase insulin release w/ meals
  - Supress 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
  *Can increase risk of heart failure.

DPP-IV Inhibitor Updates

- Can cause severe, disabling joint pain.
  - Contact Provider, Stop Medication
- Saxagliptin (Onglyza) and Alogliptin (Nesina) can increase risk of heart failure.
  - Notify provider for shortness of breath, edema, weakness, etc.
- Side effects: headache and flu-like symptoms
- Report signs of pancreatitis
- No wt gain or hypoglycemia
- Lowers A1c 0.6% - 0.8%
Quick Question 8

MT is ready to take medications to get blood sugar to target. Yet, is very concerned about avoiding hypoglycemia, since mom almost died from a hypoglycemic incident. Which medication class would you recommend?

a. Meglitinides
b. SGLT-2 Inhibitors
c. Sulfonylureas
d. Analog insulins

Mr. Jones - What are Your Recommendations?

64 yr old with type 2 for 11 yrs. Hx of CVD. On glyburide 10mg BID.

Labs:
- A1c 9.3%
- HDL 37 mg/dl
- Triglyceride 260mg/dl
- Proteinuria - neg
- B/P 152/94

Self-Care Skills
- Walks dog around block 3 x’s a week
- Bowls every Friday
- 3 beers daily
- Meds needed?
- Get shaky between breakfast and lunch.
- Med adjustments?

Sulfonylureas – “Squirters”

- 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
  - Cleared by kidneys, watch GFR
- Benefits:
  - Cheap, effective
Quick Question 9

MT tells you that she get symptoms of hypoglycemia when her blood sugar is in the 120 range. What of the following is an accurate statement regarding MT?
A. She is experiencing hyperglycemia unawareness
B. She is having frequent hypoglycemic episodes
C. Instruct her to treat with 15 - 30 gms of carb
D. She has chronic hyperglycemia

7. Obesity Treatment

This section incorporates bariatric surgery, assessment of weight and the treatment of overweight and obesity through behavior and pharmacotherapy.

At each pt encounter, calculate BMI and document in medical record

Quick Question 10

Pt is on Metformin and Sulfonylurea. Her A1c is 8.4. Patient has been trying to lose weight with limited success. Which of the following medications would be indicated to improve BG without increasing weight?

a. Basal insulin
b. GLP-1 Receptor Agonists
c. Meglitinides
d. Bolus insulin
"The highest form of wisdom is kindness."

_The Talmud_

Metabolic Surgery Benefits

- Increases gut hormone availability
- More likely to cause remission* with recent diabetes (more beta cell mass)
  - 30 - 63% remission over 1-5 years
  - 35 – 50% redeveloped diabetes
    - Avg remission time 8.3 years
    - Most pts maintain substantial BG control
      from baseline for ~5 yrs
- Less micro and macro disease, cancer
- May reduce long term mortality
  *remission = BG levels normal without meds

Metabolic (Bariatric) Surgery -2017

- Consider for adults with;
  - BMI 30-34.9 (27.5 -32.4 for AA) if hyperglycemia is inadequately controlled despite optimal medical control by either oral or injectable medications.
  - BMI 35 – 39.9 (32.5 -37.4 for AA) when hyperglycemia is inadequately controlled despite lifestyle an optimal therapy
  - BMI 40 + (37.5 for Asian Americans, AA) regardless of BG control
- Need life long support and monitoring
- Provide comprehensive mental health assessment prior to surgery and mental health support on an ongoing basis.
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

Ideal Diabetes Med -

- No hypoglycemia
- No weight gain
- Affordable
- Lowers CV risk
- Most people can tolerate /use?
ADA Step Wise Approach to Hyperglycemia 2017

- Start lifestyle coaching and metformin therapy
- If A1c target not achieved after 3 mos, start 2nd med/ins
- If A1c target not achieved after 3 mos, add 3rd agent
- If A1c target not achieved after 3 mos, add basal insulin
- If A1c target not achieved after 3 mos, keep metformin, consider adding bolus insulin, or switching to GLP-1 RA + Basal, or premixed insulin
- A1c ≥ 9% consider initiating dual therapy or insulin if
- A1c ≥ 10% consider initiating combo insulin therapy

Quick Question 11

- George type 2, is losing weight and thirsty with an A1c of 10.3%. Using AACE guidelines, what is appropriate action?
  a. Evaluate lifestyle changes for 3 months
  b. Start insulin therapy
  c. Start metformin immediately
  d. Start metformin plus another agent
DiaBingo - O

- SGLT-2 Inhibitors main action
- Januvia (sitagliptin) belongs to which class?
- These classes of diabetes pills increase insulin release
- Patients with high am fasting glucose may benefit from pm
- Pts on Acarbose (Precose) should treat hypo with ___
- Pt’s on Metformin (Glucophage) should stop med if GFR ___
- Pt on which med should be know about hypoglycemia SE’s
- Possible side effects of TZD’s include
- Metformin can damage kidney function
- What warning for DPP-IV and GLP-1 RA
- GLP-1 Receptor agonists cause increased satiety
- Side effects of Canagliflozin (Invokana) include
- Pts with GI side effects on Metformin should try

Objectives – Insulin and Pattern Management

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

Dr. Banting and Best with Marjorie at University of Toronto
Insulin Action Teams

- **Bolus**: lowers after meal glucose levels
  - Rapid Acting
    - Aspart, Lispro, Glulisine, Afrezza
  - Short Acting
  - Regular

- **Basal**: controls glucose between meals, hs
  - Intermediate
    - NPH
  - Long Acting
    - Detemir (Levemir)
    - Glargine (Lantus, Basaglar)
    - Degludec (Tresiba)

**Insulin PocketCard**

- **Bolus**
  - Rapid Acting Analogos: Aspart (Novolog)
  - Glulisine (Apidra)
  - Insulin Glargine: Lantus, Basaglar

- **Short Acting**
  - Regular (Protamine Zinc Insulin NPH): 30-60 mins

- **Intermediate**
  - Detemir (Levemir)
  - Glargine (Lantus)
  - Degludec (Tresiba)

- **Long Acting**

- **Basal + Bolus**
  - Intermediate + Short: NovoMix® 50/50, Humulin® R 75/25, Humalog® Mix 75/25, and 50/50
  - Intermediate Rapid: Apidra, Aspart, Glulisine

- **Dual Peak**
  - Lispro/Aspart (Humalog Mix 75/25)

- **Rapid Insulin**
  - NovoRapid® 70/30

- **Effective Duration**: varies depending on type and manufacturer
  - Short Acting: 2-3 hrs
  - Intermediate: 6-24 hrs
  - Long Acting: 20-34 hrs
  - Basal + Bolus: Dual peak 10-16 hrs

**Considerations**

- Effective duration reflects efficacy
- Basal insulin controls BG between meals and nighttime fasting
- Side effects: hypoglycemia, weight gain
- Use caution with children

*Uncontrolled insulin levels can be fatal.*
### 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>Aspart (Fiasp)</td>
<td>2.5 mins</td>
<td>60 mins</td>
</tr>
<tr>
<td>Aspart (NovoLog)</td>
<td>15-30 min</td>
<td>1-1.5 hrs</td>
</tr>
<tr>
<td>Lispro (Humalog)</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 – Inhaled Insulin –
Approved 2015 – Type 1 or 2

Only studied in adults over 18
Not indicated for pregnancy, while breastfeeding

### 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 – 80 - 130
Quick Question 12

- Mary takes 4 units lispro (Humalog) before breakfast. Which BG result reflects that the dose was the right dose?
  1. Before breakfast BG of 97
  2. 1 hour post breakfast BG of 153
  3. Before lunch BG of 69
  4. 2 hour post breakfast BG of 183

Bolus – Insulin Sliding Scale

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

<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 4uR</td>
<td>254 6 uR</td>
<td>201 4uR</td>
<td>199 no insulin</td>
</tr>
<tr>
<td>Day 3</td>
<td>189 2uR</td>
<td>243 4uR</td>
<td>162 2uR</td>
<td>244 4uR</td>
</tr>
<tr>
<td>Day 4</td>
<td>66 No insulin</td>
<td>287 6uR</td>
<td>144 none</td>
<td>272 6uR</td>
</tr>
</tbody>
</table>

Basal Insulins

(½ of total daily dose)

- Intermediate Acting
  - NPH
    - Peak Action: 4-12 hrs
    - Duration: 12-24 hrs

- Long Acting
  - Detemir (Levemir) Novo
    - Peak Action: No Peak
    - Duration: 20 hrs
  - Glargine (Lantus) Sanofi
    - Peak Action: 24 hrs
  - Glargine (Basaglar) Lilly
    - Peak Action: 24 hrs
  - Degludec (Tresiba) Novo
    - Peak Action: 42 hrs

Fasting BG reflects efficacy of basal
Degludec and Ryzodeg

- Degludec (Tresiba)
  - An ultra long acting insulin - lasts up to 42 hours
  - Takes 3-4 days to reach steady state
  - Available in u-100 and u200 pens*
    - *200 units per mL vs 100 units per mL
  - Seems to cause less hypo
  - Adjust dose every 3-4 days
  - Wait at least 8 hours between doses
  - Good at room temp for 8 wks
- Ryzodeg 70/30
  - mixture of insulin degludec and aspart

Glargine (Basaglar)
“Copy Cat” or “Biosimilar Insulin”

- Insulin considered a “biological drug product”
- Patent on “biologics” last 12 yrs
  - Insulin patent sold in 1923 for $1
  - Patent can be extended by making small improvements
  - Insulin manufacturer’s have maintained exclusivity for 93 years. Until now
- Patent on glargine expired in 2015

Glargine (Basaglar) – Eli Lilly

- Can’t use the term generics for large molecule biologicals because they are manufactured in living organisms (bacteria and yeast)
- Each batch may be slightly different
- Correct term is “biosimilar”
- Currently - Pharmacist to contact Provider before switching to biosimilar
  - Future – may be same as generics
- FDA working on standardized insulin naming system
Basal Insulin Summary

- NPH, Levemir, Glargine, Degludec
- Covers in between meals, through night
- Starts working slow (4 hours)
- Stays long (12-42 hours)
  - NPH 12 hrs
  - Levemir, Glargine 20-24 hrs
  - Degludec – up to 42 hrs
- Fasting blood glucose reflects effectiveness

Pattern Management – AKA

How to think like a pancreas

Quick Question 13

- When looking at glucose patterns, which problem do you fix first?
  a. Hyperglycemia
  b. Hypoglycemia
  c. non-compliance
  d. legible writing
### Type 2 – glyburide 10mg AM, Detemir 12 units at hs

<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>94</td>
<td>66</td>
<td>162</td>
</tr>
<tr>
<td>Day 2</td>
<td>169</td>
<td>59</td>
<td>195</td>
<td></td>
</tr>
<tr>
<td>Day 3</td>
<td>84</td>
<td>81</td>
<td>242</td>
<td></td>
</tr>
<tr>
<td>Day 4</td>
<td>159</td>
<td>43</td>
<td>211</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<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>10uLan</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>20uLan</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>40uLan</td>
</tr>
</tbody>
</table>

American Diabetes Association Diab Care 2017;44:564-574
Basal insulin key points – Type 2

- When is it too much basal insulin?
  - If basal insulin is >0.5 units/kg day, advance to combination injectable therapy
    - Add bolus, switch premixed 70/30 or to Basal + GLP-RA
  - Maintain metformin therapy and stop other oral meds to decrease complexity.

Next Steps

- At max basal dose
  - 80 x 0.5 = 40 units
  - Start bolus insulin at largest meal
  - Or switch to 70/30 Insulin
  - Or Basal + GLP-1 RA

Combo Sub-Q Insulin

<table>
<thead>
<tr>
<th>Insulin Type</th>
<th>Onset</th>
<th>Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humalog Mix 75/25: 75% NPL, 25% lispro</td>
<td>0.25 - 0.5 hr</td>
<td>0.5-6.5 hrs</td>
</tr>
<tr>
<td>Humalog Mix 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 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 70/30: 70% N /30%R</td>
<td>0.5 – 1.0 hr</td>
<td>2 - 16 hrs</td>
</tr>
<tr>
<td>NPH + Reg Combo 50/50: 50%N /50%R</td>
<td>0.5 – 1.0 hr</td>
<td>2 - 16 hrs</td>
</tr>
<tr>
<td>Ryzodeg Mix 70% Degludec / 30% aspart</td>
<td>0.25 – 1.0 hr</td>
<td>24 hours</td>
</tr>
</tbody>
</table>
Next Steps – Switch from 40 units basal to 70/30 Insulin

- Switch to 70/30 Insulin
- Take current dose and give 2/3 in am and 1/3 in pm.
  - 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

24u 70/30 am, 16 u 70/30 pm
Patterns? Changes needed?

<table>
<thead>
<tr>
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<th>Break</th>
<th>Lunch</th>
<th>Dinner</th>
<th>HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>102</td>
<td>63</td>
<td>92</td>
<td>181</td>
</tr>
<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>
</tr>
</tbody>
</table>

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
- Pt can’t afford Lantus insulin pen or Invokana – what other option?
Quick question 14

- Which insulins are cheapest?
  a. Lantus, Levemir
  b. Novolog, Humalog
  c. Reg, NPH
  d. Insulin pens

Cost Per Vial in CA

<table>
<thead>
<tr>
<th></th>
<th>Walmart</th>
<th>Walgreens</th>
<th>Costco</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular Insulin</td>
<td>$25*</td>
<td>$92</td>
<td>$99</td>
</tr>
<tr>
<td>NPH</td>
<td>$25*</td>
<td>$92</td>
<td>$99</td>
</tr>
<tr>
<td>70/30</td>
<td>$25*</td>
<td>$92</td>
<td>$101</td>
</tr>
<tr>
<td>Humalog</td>
<td>$200</td>
<td>$220</td>
<td>$178</td>
</tr>
<tr>
<td>Novolog</td>
<td>$197</td>
<td>$217</td>
<td>$178</td>
</tr>
<tr>
<td>Apidra</td>
<td>$180</td>
<td>$246</td>
<td>$178</td>
</tr>
<tr>
<td>Levemir</td>
<td>$300</td>
<td>$300</td>
<td>$300</td>
</tr>
<tr>
<td>Lantus</td>
<td>$226</td>
<td>$221</td>
<td>$206</td>
</tr>
</tbody>
</table>

Case Study

- 70 yr old, weighs 100kg
- History of CABG
- A1c – 11.3%, BG 400-500 for past weeks
- Insulin – 100+ units Lantus at hs (solostar).
- Metformin 1000mg BID
- What is max basal insulin should he be on?
Case Study

- 70 yr old, weighs 100kg
- History of CABG
- A1c – 11.3%, BG 400-500 for past weeks
- Insulin – 100+ units Lantus at hs (solostar)
- Metformin 1000mg BID
- What is max basal insulin he should be on?
  - 100kg x 0.5 = 50 units a day
- What can we do next to improve BG?
  - Add GLP-1 (Exenatide, Victoza, Trulicity, Tanzeum)
  - Add 4 units bolus insulin to largest meal (or 10% of basal)
  - Switch him to 70/30 insulin ac breakfast and dinner
    - Total previous basal dose – 100 units
    - 2/3 in am – 65 units am (43 NPH and 22 regular)
    - 1/3 pre dinner – 35 units pm (23 NPH and 12 regular)

Case Study

What is max basal insulin?
100kg x 0.5 = 50 units a day
- What can we do next to improve BG?
  - Add GLP-1 (Exenatide, Victoza, Trulicity, Tanzeum)
  - Add 4 units bolus insulin to largest meal (or 10% of basal)
  - Switch him to 70/30 insulin ac breakfast and dinner
    - Total previous basal dose – 100 units
    - 2/3 in am – 65 units am (43 NPH and 22 regular)
    - 1/3 pre dinner – 35 units pm (23 NPH and 12 regular)

Case Study

- 70 yr old, weighs 100kg
- History of CABG, tobacco
- A1c – 11.3%, BG 400-500 for past weeks
- What will inform you of how to proceed?
  - Insurance coverage
  - His willingness to stick to a complex regimen
  - His ability to self-monitor
  - His social support and connection to his medical team
More than 200 units a day?

Your patients injecting more than 200 units of insulin per day may be ready for a change.

LEARN MORE

5 x the concentration of u100

- 500 units per mL vs 100 units per mL
- 20 mL a vial. 500 units per mL = 10,000 unit
- Costs ~ $400-$1,200 per vial
- Less volume

Consider U-500 High Potency Insulin

Concentrated & Inhaled Insulins

<table>
<thead>
<tr>
<th>Name/Concentration</th>
<th>Insulin/Action</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humulin Regular U-500</td>
<td>Regular (Biosulin) and Rapid or Slow</td>
<td>5 x concentration of u100 insulin. Indicated for prn taking 300 units per mL daily. 5 mL Pen. Once opened, good for 28 days. 30 mL vial - does require a designated U-500 insulin syringe.</td>
</tr>
<tr>
<td>Humalog Regular U-500</td>
<td>Lispro (Humalog)</td>
<td>5 x concentration of u100 insulin. 5 mL Pen. Once opened, good for 28 days</td>
</tr>
<tr>
<td>Toujeo Solotar U-500 Pen 200 units insulins</td>
<td>Glargine (Lantus)</td>
<td>5 x concentration of u100 insulin. 5 mL Pen. Once opened, good for 28 days</td>
</tr>
<tr>
<td>Inhaled Insulin</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- All concentrated insulin pens and the U-500 syringe automatically deliver correct dose (no need volume). No conversion calculation or adjustments required. For example, 2 insulin units 30 units, add the concentrated pen to 30 units or draw up 30 units on the U-500 syringe. Important - never withdraw concentrated insulin from the pen using a syringe.

The information listed here are not guidelines. Please consult prescribing information for details.
Dedicated U-500 Insulin Syringe

- Manufactured by BD – Nov 2016
- 5 unit increments
- No conversion required
- If 85 units of U-500 R Insulin is ordered...

Dosing Strategies u-500

- Dosing – take total daily needs and split into 2-3 doses
  - 2 doses: 60% am / 40% pm or
  - 3 doses: 40/30/30 or 40/40/20
- No basal insulin needed, because U-500 has bolus and basal action
- Needs careful monitoring/education

Example - Pt on 240 units of insulin a day
- 140 units am / 100 units pm (2 doses)
- 100 / 70 / 70 or 100 / 100/ 40

Basal Bolus – What Adjustments?
Pt weighs 80kg

<table>
<thead>
<tr>
<th></th>
<th>Break</th>
<th>Lunch</th>
<th>Dinner</th>
<th>HS</th>
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</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>69</td>
<td>79</td>
<td>245</td>
<td>190</td>
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<td></td>
<td>7H</td>
<td>5H</td>
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<tr>
<td>Day 2</td>
<td>81</td>
<td>87</td>
<td>170</td>
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<tr>
<td>Day 3</td>
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<td>94</td>
<td>194</td>
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<tr>
<td>Day 4</td>
<td>62</td>
<td>83</td>
<td>211</td>
<td>127</td>
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</tbody>
</table>
**Intensive Diabetes Therapy**

**Insulin Dosing Strategy**

**50/50 Rule**
- 0.5-1.0 units/kg day
  [0.5 units/kg most common]
- Basal = 50% of total
  - Glargine Q day
  - NPH or Detemir BID
- Bolus = 50% of total
  - Usually divided into 3 meals

**Example**
- Wt 50 kg x 0.5 = 25 units of insulin/day
- Basal dose: 13 units
  - Glargine 13 units Q day
  - NPH/Detemir 6u BID
- Bolus dose: 12 units
  - 4 units NovoLog, Apidra, Reg, Humalog each meal

---

**Example – You Try**

- Wt 80 kg x 0.5 = ___ units of insulin/day
- Basal dose: ___ units
  - Glargine ___ units QD
  - NPH/Detemir ___ BID
- Bolus dose: ___ units
  - ____ units NovoLog, Apidra, Humalog each meal

---

**Basal Bolus – Using 50/50 Rule – Pt weighs 80kg**

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<th>HS</th>
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<td>69</td>
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<td>208</td>
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Type 1 and a Teen

- Cindy is trying to carb count and adjust her insulin, but is still having trouble. She weighs 60kg.
- What is her daily dose of insulin?
- What is her basal dose?

1. Pre meal target BG is 120
2. Post meal goal < 180.
3. Carb ratio: 1 unit for every 15 gms
4. Hyperglycemic correction factor is one unit for every 55 above goal (she uses Humalog and 1700 rule)

1700 Rule:

1700 / TDD = insulin sensitivity
1700 / 30 = 56
1 unit drops BG 56 points

Correction Bolus for Cindy

Analog Insulin (1 unit:55 mg/dl>120)

<table>
<thead>
<tr>
<th>Less than 70 mg/dl</th>
<th>Subtract 1 unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>70-119 mg/dl</td>
<td>0 units</td>
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<tr>
<td>120-175 mg/dl</td>
<td>1 unit</td>
</tr>
<tr>
<td>176-230 mg/dl</td>
<td>2 units</td>
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<tr>
<td>231-285 mg/dl</td>
<td>3 units</td>
</tr>
<tr>
<td>286-340 mg/dl</td>
<td>4 units</td>
</tr>
<tr>
<td>341-395 mg/dl</td>
<td>5 units</td>
</tr>
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</table>

Carb to Insulin Ratio > 450-500 / Total Daily Dose

500 Rule - Humalog and Novolog
- Divide 500 by total daily insulin dose
- Equal grams of carb covered by one unit of Humalog/Novolog insulin
- Example: Pt takes 33 total units/day. 500 divided by 33 (total dose) = 15
  - 1 unit insulin covers 15 grams of carb

450 Rule for Regular Insulin
- Divide 450 by total daily insulin dose
- Equal grams of carb covered by one unit of regular insulin.
- Example: Pt takes 45 units daily. 450 divided by 45 (total dose) = 10
  - 1 unit covers 10 grams of carb
Adjusting Cindy’s Bolus Insulin With Ratios

BG before lunch 285, she plans to eat 45 gms of carbohydrate.
285-120 = 165 over target, 165/55 = 3
45gms / 15 = 3

- 3 units bolus insulin to correct to target
- 3 units bolus insulin to cover carbs in meal

Total adjusted dose: 6 units humalog insulin

Adjusting Cindy’s Bolus Insulin With Ratios - You Try

BG before lunch 230, plans to eat 60 gms of carbohydrate.
____-120 = ____ over target, ____/55 = ____ units
____gms / ____ = ____ units ins for carbs

- ____ units insulin to correct for hyperglycemia
- ____ units insulin to cover carbs in meal

Total adjusted dose: ____ units humalog insulin

How much Insulin Needed?

- Morning - BG 173
  - Breakfast – slice cold pizza, ½ c. applesauce
- Lunch BG 69
  - Menu—ham sandwich, pear, diet 7-up, mini snickers bar.
- 2 hours after lunch, BG 148 - ran track
- Before dinner - BG 98
  - Cheeseburger, small fries, chocolate chip cookie
- At bedtime, BG 173
How much Insulin Needed?
- Morning - BG 173
  - Breakfast – slice cold pizza, ½ c. applesauce
    - 45 gms = 3 units  1 unit for hyper  total = 4 units
- Lunch BG 69
  - Menu- ham sandwich, pear, diet 7-up, mini snickers
    - 60 gms = 4 units  -1 unit since < 70  total = 3 units
  - 2 hours after lunch, BG 148 – ran track
- Before dinner - BG 98
  - Cheeseburger, small fries, chocolate chip cookie
    - 75 gms = 5 units  0 units for hyper
  - At bedtime, BG 173 – 15 unit Lantus

Quick Question 15
- Pt on insulin pump takes 1 unit  novolog for 15 gms of carb. Meal 1 cup rice, bbq steak, 1 c. skim milk, sm banana, SF ice tea. BG 118. How much insulin?
  a. 4.8 units
  b. 6.0 units
  c. 5.2 units
  d. 5.0 units  
  \[ \frac{45 + 12 + 15}{15} = 4.8 \text{ units} \]

Quick Question 16
- JZ is excited about his A1c of 5.4%. He takes bolus insulin 4-6 times a day using a pen needle to keep his BG to target. Plus, adjusts Lantus as needed if his pm BG is elevated. What is your biggest concern?
  A. Does he change his needle each time?
  B. Why is he adjusting Lantus?
  C. Is he adjusting insulin for exercise?
  D. How many hypoglycemic events per week?
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

ADA Goals and Treatments For Hospitalized Patients

Non Critically Ill pts if BG 180 +
- Start subq insulin
- Blood glucose goals:
  - 140 – 180 (ADA)
  - <140 premeal, <180 post meal (AACE)
- Basal/bolus Insulin preferred treatment

Critically Ill pts
- Start insulin therapy at BG 180
- Once insulin started, BG goal 140-180
- Insulin drip preferred treatment

Is Inpatient Diabetes Education Realistic?

- Unique opportunity to address urgent learning needs
- Brief and targeted education effective
- Strategies
  - Empathic listening and open ended questions
  - "What are you most worried about when it comes to taking care of your diabetes.
- Assist w/ needed supplies and referrals

Look for "teaching moment" opportunities
Mr. Jones has new diabetes and an infected foot ulcer. He 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?

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 misinformation. 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
Steps to Prevent Hypo in Hosp

- If fasting BG < 100, consider adjusting basal insulin
- If patient has renal failure, conservative insulin dosing required
- Patient has N/V or not consistent eater?
  - Give bolus insulin after meals
- Anticipate events that put pt at risk of hypo:
  - NPO for surgery, decreasing steroid dose, improving infection, recovering after cardiac event
  - Strive to admin the least amount of insulin necessary to reach glycemic targets

Mrs. Jones on 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 Novolog and patient needs to go to OR NOW!

Mrs. Jones needs to go to surgery

- In spite of antibiotics, her foot ulceration isn’t improving.
Preparation for Surgery

- Try to schedule surgery in am, resume meds/insulin when eating and stable.
- Oral medications: Hold morning dose. If on sulfonylurea, may need to hold night before.
- Basal Insulin:
  - Type 2, give 50%-100% of usual am/pm basal dose
  - for type 1s give 100% of basal dose (individualize)
- Bolus insulin: Use mild insulin bolus coverage for type 1 and type 2's

General Recommendations

- Diabetes discharge planning starts on admit
- Type of DM clearly identified / documented
- Check A1c in hospital:
  - If no A1c available for past 3 months
  - Present with hyperglycemia and no DM history
- Pts with new hyperglycemia need appropriate follow-up testing care and testing at d/c

Topics to Cover in Hospital

- Survival Skills
  - Diabetes, self-monitoring, BG Goals
  - Hypo & Hyper – recognition, treatment and prevention
  - Healthy eating
  - Meds- how to take, potential side effects and action
  - Proper use and disposal of needles and syringes
- ID of health care provider for post d/c care
  - Schedule for f/u visit within 1 month
  - Parameters of when to call for help
    - Sick days, N/V, if BG < 70 or > 300
Medication Reconciliation

- Pts meds must be crossed-checked to make sure no chronic meds were stopped
- Ensure the safety of new prescriptions
- New or changed prescriptions reviewed with pt/ family before discharge
- Avoid complex insulin regimens for those with limited cognition
  - As pt heals, remind them that they may need less insulin / diabetes meds to control BG
- Supplies for insulin administration

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:
  - Provide education and promote self-advocacy

Meet Your Gut Bacteria

- Discuss the role of gut bacteria in relation to health.
- State strategies to improve intestinal health.
- Describe the integration of diabetes prevention and optimizing gut microbiome.
- Enjoy the state of wonder
In the Beginning

- Earth
- Human
- Spirit

Obesity - other factors?

- Not only humans are gaining weight globally
- Animals are getting heavier too (and not just the domestic kind).
- Factors – sleep deprivation, AC, light exposure?
  - Marmosets to macaques

Quick Question 17

- What do you think is contributing to increasing prevalence of type 2 diabetes?
  - A. Processed foods
  - B. Increased sugar intake
  - C. Lack of exercise
  - D. Changes in gut bacteria
  - E. Environment
  - F. All of the above
U.S. Weight - 68% overweight or obese

- 34% BMI 25-29
- 34% BMI 30+
- 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

Standard American Diet is SAD

- 70% of food consumed is processed
- Low fiber, high sugar
- Intake of fruit and veggies decreasing
- We are starving our good bacteria

Dietary Sugar Affects Gut Colonies?

- Daily sugary beverage increases type 2 risk by 18%.
- After accounting for weight, type 2 diabetes risk 13%
- Diet Soda alters gut bacteria?
- Dietary sugar affecting "healthy" gut microbial colonies

Dr. Steven Smith, Mayo Clinic in Rochester, MN.
Online issue of BMJ, July 2015

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Quick Question 18

Which of the following is considered an added sugar?

a. Lactose
b. Aspartame
c. Non-nutritive sweeteners
d. Sucrose

Quick Question 19

How many teaspoons of added sugar are Americans eating a day

a. 3 Tablespoons
b. 30 Teaspoons
c. 3 servings
d. 75 gms (5 serving)

Sugar hides in many places
Quick Question 20

- How many grams of sugar in one teaspoon of sugar?
  a. 2 gms
  b. 4 gms
  c. 5 gms
  d. 15 gms (one serving)

How Many Teaspoons of Sugar?

- Artificial sweeteners:
  - stimulate and distort appetite
  - alter gut bacteria
  - increase glucose intolerance
- Sugar sodas:
  - increase risk of LADA
  - increase insulin resistance
- Associated with less healthy lifestyle

European Journal Endo, 10-2016
Sucrose and High Fructose Corn Syrup undermine health

HFCS is 42%-55% Fructose; Sucrose is 50% Fructose

- Make first pass through liver
- Does not stimulate insulin or satiety hormone
- Is stored as fat, increasing risk of fatty liver disease
- 70% of obese patients with diabetes have fatty liver disease
- Excess fructose intake associated with inflammation, oxidative stress, metabolic syndrome, hyperglycemia

Fructose

Where to Start - Soda Tax?

- Mexico – down 12% (esp in lower SES groups)
- Berkeley had 21% drop in a year
  - Both resulted in increase in water and milk consumption
- Sugary drinks a primary driver of obesity
- Let your vote and voice be heard
Type 2

look BEYOND the obvious

Bacterial Cells Outnumber Human Cells 10 to 1

• 10 trillion human cells
• Hosts 100 trillion bacterial and fungal cells
Bacterial Taxis?

For better or worse, we’re “host-microbe ecosystems.” Microbes shape us from without and also from within.

Bacteria and Romance

The microbiome often acts as an invisible puppet master. We are attracted to partners by the scent of their microbiome. Partners are often attracted to others because they have different pathogen recognition genes.

Sonia Shah

HUMANS SHARE MICROBIOMES WITH THEIR DOGS, STUDY FINDS

- Bring bacteria into house from soil and who knows what else?
- Increases human microbiome diversity
- Less allergic and autoimmune diseases
Quick Question 21

- How much does your gut bacteria weigh?
  A. 24 ounces
  B. 3 pounds
  C. Less than 1 pound
  D. 1.5 pounds
  E. Not sure

3 lbs of Microbes in our Gut

- Community of bacteria extra 'organ' "microbiome".
- Evolved together with our microbiome over millions of years.
- Ratios of these communities has changed over the past 30 years
- Mirrors global spikes in obesity, diabetes, allergic and inflammatory diseases
- What are we doing to change these bacteria?

How do our bacteria help us?

- Maintain physiological homeostasis and metabolism.
- Other benefits
  - pathogen displacement
  - immune system development
  - barrier fortification
  - vitamin production
  - nutrient absorption

Forgotten organ

Good bacteria split nutrients
Some vitamins need good bacteria to thrive
Good bacteria keep things clean
Gut Microbiome
- Part of endocrine axis
- Stabilized by 3 years of age
- Influenced by:
  - Birth method
  - Breast fed
  - Early Antibiotic use
  - Environment
  - Travel
- Help us
  - utilize energy
  - fight off invaders

More Breast Milk
PreBiotic
- Sets the stage for healthy bacterial microdiversity to take hold
- Oligosaccharides feed the Bifidobacterium

ProBiotic
- Contains healthy super hero bacteria

C-Section – Consider Gauze in Vagina
- early research by Dr. Maria Gloria Dominguez-Bello, an associate professor in the Human Microbiome Program at the NYU School of Medicine. She is testing a fast and easy work-around called the "gauze-in-the-vagina technique."
Weight and Gut Bacteria
New and Early Research

- Leaner people appear to have more bacterial diversity and a higher proportion of bacteroidetes
- Obese people appear to have higher levels of firmicutes
- Bacteria tend to run in families

Intestinal bacteria protect against diabetes

- 2 groups with prediabetes (Finnish Diabetes Prevention Study)
- Group who did NOT get diabetes:
  - A high concentration of gut acid that protects against type 2
  - Gut acid produced by intestinal bacteria
  - Fed by a diet rich in whole grain and dietary fiber
  - This acid is neuroprotective and decreases inflammation
  - Potent scavenger of hydroxyl radicals

Gut Mucous lining thickness correlates with risk of Diabetes

Benoit Chassaing, Shreya M. Raja, James D. Lewis, Shanthi Srinivasan, Andrew T. Gewirtz
Cellular and Molecular Gastroenterology and Hepatology (September 2017)
Encroachment of bacteria into mucus layer of intestine causes inflammation

- **Translation**
  - Patients with diabetes had a thinner mucus layer of the intestine
  - Why? Less short chain fatty acids
  - Why? Less healthy bacteria (Akkermansia and Bifidobacteria) to protect mucus membrane and produce fatty acids (byturate)

Metformin alters gut metabolism

- Metformin boosts good gut bacteria! Great news!
- Researchers have shown the type 2 diabetes drug metformin boosts good gut bacteria, according to a new study. The treatment is commonly used to control people’s blood sugar levels and weight...
- ** Especially increases Akkermansia and Bifidobacterium. **

Gastric Bypass effects on Blood Glucose

- Increases gut hormones but...
- Physical manipulation of the gut alters bacterial communities
- Levels of the Firmicute *Roseburia Intestinalis* increase
  - *Roseburia Intestinalis* are lacking in people with type 2 (butyrate producing)
  - Maybe this increase lowers BG levels?

*Endocrine Today – April 2015*
Protect against Type 1 Diabetes

A happy gut may help protect against Type 1 Diabetes - a diet rich in high-fiber foods encourages production of beneficial short-chain fatty acids that may help protect against the onset of Type 1 diabetes.

The diet is rich in a specific type of fiber that comes from a plant product called high-amylose corn starch. The fiber is resistant to digestion in the upper intestine, and instead is fermented into acetate and butyrate by bacteria in the large intestine, or colon.

Sydney, Nature Immunology March 2017

Including fruits, legumes in your diet may help check the onset of diabetes - The Economic Times

Early TEDDY Finding

- Infants at Risk of Type 1 Diabetes Benefit from Early Probiotics
- Exposure to probiotics during the first month of life is associated with a 60% decrease in the risk of pancreatic beta-cell islet autoimmunity among children with type 1 diabetes- associated HLA genotype DR3/4, but not among those with other genotypes.

JAMA Pediatrics

Take Home Messages

- What can we pass on to our patients and communities to promote healthy microbiomes?
Reunite with “Old Friends”

But while your inherited genes are more or less fixed, it may be possible to reshape, even cultivate, your “second genome”

Getting to Better Gut Bacterial Health

**Eat more PREbiotics**
- Foods with indigestible fibers that nourish the good bacteria:
  - High fiber foods like, whole grains, fruits, veggies, nuts
  - High in prebiotic fibers include: Jerusalem artichokes, onions, kale, Brussels sprouts, bananas, dandelion greens & more

**PRObiotics**
- These foods contain healthy bacteria like *Bifidobacterium* and *lactobacillus*.
  - Yogurt, Kefir – look for “live or active cultures”
  - Fermented foods like: Sauerkraut, Kimchi, Miso soup, kombucha

12 Super Foods to Enjoy

- Beans
- Dark Green Leafy Vegs
- Citrus Fruit
- Sweet Potatoes
- Berries
- Garlic
- Tomatoes
- Onions
- Fish High in Omega-3 Fatty Acids
- Whole Grains
- Nuts
- Fat-Free Milk and Yogurt
Kefir – Fermented Milk

From the Turkish word **keyif**, which means “feeling good” after eating.

---

GET Lots of Diverse Fiber Foods

**Goal is 25 – 30 gms day**

**American Food Project Full Plate Diet**

- Helps increase fiber in usual meals

---

Get your gut bacteria analyzed for $99

**American Gut**

**AmericanGut.org**
Follow Your Gut – Dr. Rob Knight

Check out Dr. Knight’s:

- TED Talk
- Website – AmericanFoodProject.org
- Articles in Nature and all over

100 Trillion Friends to Call Your Own

From the way back when, to current time man and bacteria have been intertwined.

Start with your head, it’s a happening place, there’s staphylococcus all over your face.

Next up is gums, teeth and mouth, you’ll find streptococcus inside and out!

Now to your stomach, to keep the pH, H. pylori is on the case!

Inside the intestines, 30 feet of tube, 3 pounds of bacteria digesting your food.

From Bacteroidetes to keep you lean, to Firmicutes, a junk food digesting machine!

Prevotella another bug on the scene, breaks down fiber, veggies and beans!

Lactobacillus is a newborn’s friend, lining birth canal from tip to end.

Down to your feet, in-between the toes, that’s where lots of pseudomonas grow!

Short chain fatty acids, you wanna keep them around

Protects gut mucous lining from breakin’ down

So here’s my message, always nourish your gut

With fresh fruit, veggies, grains, beans and nuts

More kefir, miso, sauerkraut, kimchi

Less sugar and fast foods to keep away disease

Breast feed, get dirty, limit antibiotic use

Let newborns come out through the natural shoot

Be reassured that you’re never alone

You’ve got 100 trillion friends to call your own!

Lactic acid bacteria (Lactobacillus) is a newborn’s friend, lining birth canal from tip to end. Down to your feet, in-between the toes, that’s where lots of pseudomonas grow!

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100 Trillion Friends to Call Your Own by Beverly Thomassian, RN, MPH, CDE, BC-ADM to the tune “Yeah” in the style of Usher.

Thank You

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  bev@diabetesed.net
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