Diabetes Survival Skills Across the LifeSpan

1. Unique features of type 1 and type 2 diabetes across the lifespan
2. Strategies to prepare for successful hospital discharge
3. Medication and insulin considerations and teaching points
4. Critical points to share about food and activity
5. Teaching approaches to prevent hypo and improve lower extremity care

CDC Announces

35% of Americans will have Diabetes by 2050

Boyle, Thompson, Burkit; Williamson 2010, Oct 22-81(2)209
www.pophealthmetrics.com/df
Diabetes in America 2019

- 30.3 million or > 9.4%
- 27% don’t know they have it
- 37% of US adults have pre diabetes (846mil)

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 to celebrate the discovery of insulin

Best and Banting – U of Toronto 1921
Natural History of Diabetes

No Diabetes
FBG <100
Random <110
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

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

ABCs of Diabetes –

- A1c less than 7% (avg 3 month BG)
  - Pre-meal BG 80-130
  - Post meal BG <180
- Blood Pressure < 140/90
  - Goal 130/90 (if 10 year CVD risk > 15%, or has history of CV event) google ASCVD Risk Estimator
- Cholesterol
  - DM and 40 yrs, start statin
  - HDL >40
  - Triglyceride < 150
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>
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<td>9</td>
<td>212</td>
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<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>

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

Translating the A1c Assay Into Estimated Average Glucose Values – ADAG Study
Diabetes Care: 31, #8, August 2008

Factors that Affect Blood Glucose

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
Exercise Standards

- 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
- Flexibility and balance training 2-3 xs a week (Yoga and Tai Chi)
- T1 and T2 – resistance training 2-3 xs a week

A hard truth

- Exercise alone doesn’t cause weight loss
- But....
  - It helps keep weight off
  - Decreases visceral adiposity
  - Decreases CV Risk

To combat the rise in body weight, we need to change the food environment
- “You cannot outrun an unhealthy diet”.

Where are we on this continuum?
### 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

- **Beta-cell response**
  - Enhances glucose-dependent insulin secretion

GLP-1 degraded by DPP-4 in minutes

- **Alpha cells**
  - Postprandial glucagon secretion

- **Liver**
  - GLP-1 reduces hepatic glucose output

- **Stomach**
  - Helps regulate gastric emptying

- **Promotes satiety and reduces appetite**

### Incretin Mimetics – GLP-1 RAs

**GLP-1 Receptor Agonists & Injectables**

- **Liraglutide (Victozis)** 0.6, 1.2, and 1.8 mg daily
- **Exenatide (Symlin)** 0.5 and 1.0 mg
- **Glyburide (Diamicron)** 2.5 mg daily

**GLP-1 Receptor Agonists & Injectables (GLP-1 RA)**

- **Incretin Mimetics**
  - Decrease in food intake
  - Reports signs of exocrine pancreatitis
  - Renal insufficiency
- **Promotes satiety**
- **Suppression of glucagon**

**Side effects for all**
- Neuropathy, vomiting, weight loss, injection site reactions

**GLP-1 RAs**

Liraglutide and semaglutide ADA recommended as helpful agents to slow progression of CKD (chronic kidney disease).
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

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?
"Diabetes is my biggest competitor"
Gary Hall Jr

Incidence of Type 1 in Youth
- Rate of 13.8 to 16.9 per 100,000 for Caucasian - American
- Rate of 3.3 – 11.8 per 100,000 for African-American
- 208,000 children under age 20 in U.S. have type 1 diabetes
- Rate doubling every 20 yrs
  - Greatest increase in children <5
- Many trials underway to detect and prevent (Trial Net)

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?
Poll Question 1

What percent beta cell function remains when someone is diagnosed with type 1 diabetes?
A. 20%
B. 20-30%
C. None
D. 15 – 40%

Type 1 – New Diagnosis

- Diagnosis in infancy rare
- 75% new cases diagnosed before age 18
- 30% of new diagnosis present in DKA
- Complaints include:
  - Nocturia, enuresis, weeks of polyuria, polydipsia, wt loss, tired, infections. Polyphagia is rare.
  - Labs indicate hyperglycemia, glycosuria, ketonemia and ketonuria

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 Associated with Type 1 Diabetes

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

Pediatric Glycemic Control Goals

<table>
<thead>
<tr>
<th>Blood glucose goal range</th>
<th>A1C Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before meals 90–130 mg/dL (5.0–7.2 mmol/L)</td>
<td>&lt;7.5% A lower goal (&lt;7.0%) is reasonable if it can be achieved without excessive hypoglycemia</td>
</tr>
<tr>
<td>Bedtime/overnight 90–150 mg/dL (5.0–8.3 mmol/L)</td>
<td></td>
</tr>
</tbody>
</table>

- Goals should be individualized and lower goals may be reasonable based on benefit-risk assessment.
- Blood glucose goals should be modified in children with frequent hypoglycemia or hypoglycemia unawareness.
- Postprandial blood glucose values should be measured when there is a discrepancy between preprandial blood glucose values and A1C levels and to help assess glycemia in those on basal-bolus regimens.
What Does Type 1 Look Like?

Mary Tyler Moore
Justice Sonia Sotomayor
Nick Jonas
Bret Michaels

From Debbie Nagata’s slide collection

Ms. Idaho and Ms America – Pumpin’ It

JR has Type 1, in hospital for procedure

- Before lunch blood glucose 98.
- Plans to eat 60 gms of carb for lunch.
- On insulin sliding scale that starts at 150.
- What is the best action?
- Survival skill education?
Physiologic Insulin Secretion: 24-Hour Profile

Insulin Action Teams

- **Bolus**: lowers after meal glucose levels
  - Very Rapid Acting – Aspart (Fiasp)
  - Rapid Acting
    - Aspart, Lispro, Admelog, Glulisine, Afrezza
  - Short Acting - Regular
  - **Basal**: controls glucose between meals, hs
  - Intermediate
    - NPH
  - Long Acting
    - Detemir (Levemir)
    - Glargine (Lantus, Basaglar)
    - Degludec (Tresiba)

Bolus Insulins

<table>
<thead>
<tr>
<th>Name</th>
<th>Onset</th>
<th>Peak Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspart (Fiasp)</td>
<td>2.5 min</td>
<td>1 hour</td>
</tr>
<tr>
<td>Aspart (NovoLog)</td>
<td>15-30 min</td>
<td>1-1.5 hrs</td>
</tr>
<tr>
<td>Lispro (Humalog, Admelog)</td>
<td>30 mins</td>
<td>2-4 hrs</td>
</tr>
</tbody>
</table>
**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

**Basal Insulins**

(½ of total daily dose)

<table>
<thead>
<tr>
<th>Intermediate Acting</th>
<th>Peak Action</th>
<th>Duration</th>
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<tbody>
<tr>
<td>NPH</td>
<td>4-12 hrs</td>
<td>12-24</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>No Peak</td>
<td>20 hrs</td>
</tr>
<tr>
<td>Glargine (Lantus)</td>
<td>24 hrs</td>
<td></td>
</tr>
<tr>
<td>Glargine (Basaglar)</td>
<td>24 hrs</td>
<td></td>
</tr>
<tr>
<td>Degludec (Tresiba)</td>
<td>42 hrs</td>
<td></td>
</tr>
</tbody>
</table>

*Fasting BG reflects efficacy of basal*

**Basal Insulin Summary**

- NPH, Levemir, Lantus, Degludec
- Covers in between meals, through night
- Starts working slow (4 hours)
- Stays in long (12-24 hours)
  - NPH 12 hrs
  - Levemir, Lantus 20-24 hrs
  - Degludec – 42 hours
- Fasting blood glucose reflects effectiveness
Bolus – Insulin Sliding Scale
Starts at 150, 2 units for every 50 mg/dl >150

<table>
<thead>
<tr>
<th>Break</th>
<th>Lunch</th>
<th>Dinner</th>
<th>HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>94</td>
<td>212</td>
<td>148</td>
</tr>
<tr>
<td>no insulin</td>
<td>4 uR</td>
<td>no insulin</td>
<td>6 uR</td>
</tr>
<tr>
<td>Day 2</td>
<td>243</td>
<td>254</td>
<td>201</td>
</tr>
<tr>
<td>4uR</td>
<td>6 uR</td>
<td>4uR</td>
<td>no insulin</td>
</tr>
<tr>
<td>Day 3</td>
<td>189</td>
<td>243</td>
<td>162</td>
</tr>
<tr>
<td>2uR</td>
<td>4uR</td>
<td>2uR</td>
<td>4uR</td>
</tr>
<tr>
<td>Day 4</td>
<td>66</td>
<td>287</td>
<td>144</td>
</tr>
<tr>
<td>No insulin</td>
<td>6uR</td>
<td>none</td>
<td>6uR</td>
</tr>
</tbody>
</table>

Insulin Guidelines in hospital

- **Bolus insulin**
  - 1 unit for 15 gms of carb
  - Most hospitals serve 45-60gms of carb per meal
  - 3-4 units of bolus insulin at meals

- **Basal insulin**
  - Type 2, restart what they use at home (reduce by 25%)
  - For Type 1, continue usual regimen or keep on pump
  - New start – 10 units or
  - Body weight Kg x 0.2.
    - 50 kg x 0.2 = 10 units
    - 75 kg x 0.2 = 15 units
  - If going home on insulin, let person self-inject

ADA/AACE Goals and Treatments For Hospitalized Patients

**ADA Goals:** If BG 180 +
- Start subq insulin
- Blood glucose goals 140-180
  - Individualize based on pt status
- Basal /bolus Insulin preferred
- Insulin drip preferred treatment

**AACE Goals:**
- Before meal < 140
- After meal <180
Consensus: Inpt Hyperglycemia, Endocr Pract. 2009;15 (No.4)
JR has Type 1, in hospital for procedure

- Before lunch blood glucose 98.
- Plans to eat 60 gms of carb for lunch.
- On insulin sliding scale that starts at 150.
- What is the best action?
- Survival skill education?

Insulin Teaching Keys

- Abdomen preferred injection site
- Stay 1” away from previous site
- Don’t re-use syringes
- Keep unopened insulin in refrigerator
- Look for:
  - Lipodystrophy
  - Lipohypertrophy
- Make sure insulin isn’t expired
- Proper disposal
- Review patients ability to withdraw and inject.

Emergence of “Copy Cat” or “Biosimilar Insulins”

- Insulin considered a “biological drug product”
- Patent on “biologica...
Biosimilar Insulins: Lispro (Admelog)  
Glargine (Basaglar)

- 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
- Currently - Pharmacist to contact Provider before switching to biosimilar
- Future – may be same as generics

Cost Per Vial in Northern CA

<table>
<thead>
<tr>
<th>Per vial cost</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>$137</td>
<td>$137</td>
<td>$137</td>
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<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>$220</td>
<td>$223</td>
<td>$206</td>
</tr>
</tbody>
</table>

Poll Question 2

- JR has type 1. Nurse is ready to inject 10 units of regular insulin for breakfast. Pt weighs 70 kg and is almost 6 feet tall. Pre meal BG is 88. What is JR at risk of?
  A. infection due to chronic hyperglycemia
  B. hyperglycemia since there is no basal insulin
  C. severe stress response
  D. hypoglycemia due to over insulinization
Hypoglycemia – Focus on Prevention

- Defined as BG < 70
- Clinically Significant Hypo < 54
- If BG < 100, consider adjusting insulin / meds
- If BG < 70, Insulin change required
- Need hypoglycemia treatment policies / action
- Need hypo Prevention Policies.

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 **70mg/dl** or below:
  - 10-15 gms of carb to raise BG 30 - 45mg/dl
  - Retest in 15 minutes, if still low, treat again, even without symptoms
  - Follow with usual meal or snack
  - If non responsive, give D50 IV or glucagon Emergency Kit
  - Figure out how to prevent in future
15 - 20 Gms Carb Sources
- 4 ounces apple juice
- 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)

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 need to get this shot every year
- 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
Continuous Glucose Monitors

- Tiny sensor under skin measures interstitial glucose every few minutes
- A transmitter wirelessly sends glucose data to a receiver: smart phone, reader, insulin pump

Poll Question 3

- Which of the following is a benefit of continuous glucose monitoring?
  - B. Provides glucose readings as accurate as a lab value.
  - C. Interstitial glucose is more accurate than capillary glucose.
  - D. Contributes to decreased hypoglycemia

Continuous Glucose Monitoring (CGM)

- CGM appropriate tool for children to adults
- Useful for those with frequent hypoglycemia or hypoglycemia unawareness (alarm features)
- Measures percent of time in, above and below range
- Assess individual’s readiness
CGM Time in Range Recommendations

- For most with type 1 or type 2 diabetes
  - > 70% of readings within BG range of 70-180mg/dL
  - < 4% of readings < 70 mg/dL
  - < 1% of readings < 54 mg/dL
  - < 25% of readings > 180 mg/dL
  - < 5% of readings > 250 mg/dL

- For under 25 years, with A1c goal is < 7.5%, time-in-range target is set to about 60%.

Clinical Targets for Continuous Glucose Monitoring Data Interpretation:
Recommendations From the International Consensus on Time in Range
Tadej Battelino et al. Diabetes Care Aug 2019, 42 (8) 1593-1603; DOI: 10.2337/dc19-0028

Continuous Glucose Monitors

- Medtronic 670 G
  - With Guardian Sensor
  - Contour Next Link

- Tandem Tslim X2
  - with Dexcom G6

- Insulet OmniPod System and
  - OmniPod Dash

- Medtronic 630 G
  - Guardian Sensor
  - Contour Next Link

- 530G with
  - Enlite CGM (discontinued sales 2018)

Insulin Pumps
Pediatric Diabetes Self-Management Education and Support – Type 1

- All should receive diabetes self-management education and support at diagnosis and routinely thereafter that is:
  - Culturally sensitive
  - Developmentally appropriate
  - Individualized
  - Help prepare for transition to adult care

Poll Question 4

- 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. Encouraging complete autonomy
  - B. Moving to his own apartment
  - C. Requiring partial payment for his diabetes supplies
  - D. Introducing him to adult team a few months before transitioning.

Risk Taking Youth and Emerging Adults

- Monitor social adjustment, school performance
- Time alone w/ provider starting at age 12
- **Address risk taking** –
  - Alcohol – 15 gms of carb per drink, don’t cover with extra insulin especially if going to sleep
  - Starting at puberty, preconception counseling
  - Drug use increases risk for hyperglycemic crisis
  - Make sure friends know what to do in case of Hypo or Hyperglycemia
Poll question 5

- JR is 15 and has had type 1 diabetes for the past 2 years. JR started insulin pump therapy a few months ago and noticed that their weight increased by over 5 pounds. JR is very worried about weight gain. JR’s mom called the diabetes educator to share her concerns and added that JRs daily insulin usage significantly decreased over the past few weeks. What is the most likely reason for this insulin usage decrease?
  - Insulin needs decrease with pump therapy
  - The insulin pump is not delivering insulin effectively
  - JR is under dosing insulin
  - Insulin needs decrease during puberty

Disordered Eating

- Eval treatment regimen if individual presents with unexplained:
  - Hyperglycemia
  - Weight loss
- Review med regimen to eval treatment related
  - Weight loss
  - Weight gain
- Look for discorded eating behavior and disrupted patterns of eating

Disordered Eating

- “DiaBulimia”
  - People with diabetes give themselves less insulin than needed to lose weight
  - Tends to start in adolescence, more likely to occur in women than men.
  - Signs: unexplainable spikes, A1c, weight loss, lack of marks from fingerpricks, lack of prescription refills for diabetes meds, records that don’t match A1c.
  - Treatment – Mental health specialist and team
## 2. Classification and DM Diagnosis

- **Pre Diabetes & Type 2 - Screening Guidelines**
- Start screening at age 45 or for anyone with excess weight (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
- history of Gestational Diabetes
- Polycystic ovary syndrome (PCOS)
- Other conditions assoc w/ insulin resistance:
  - Severe obesity, acanthosis nigricans (AN)
- Recheck every 3 years

---

### 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
Acanthosis Nigricans

Ominous Octet

- Decreased satiation neurotransmission
- Decreased amylin, β-cell secretion 80% loss at dx
- Increased glucagon secretion
- Increased renal glucose reabsorption
- Decreased gut hormones
- Increased lipolysis
- Decreased glucose uptake

SGLT2 Inhibitors- “Glucoretics”

- Action: "Glucoretic" decreases renal reabsorption in the proximal tubule of the kidneys (reset renal threshold and increase glucosuria)
- Side effects: hypotension, UTIs, increased urination, genital infections, ketoacidosis, Fournier's gangrene
- Canagliflozin and Empagliflozin ADA indicated in CKD

Common Oral Diabetes Meds

<table>
<thead>
<tr>
<th>Drug/Drug Class</th>
<th>Name(s)</th>
<th>Daily Dose Range</th>
<th>Common Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>SGLT2 Inhibitors</td>
<td>&quot;Glucoretics&quot;</td>
<td>100-300 mg/day</td>
<td>Hypotension, UTIs, increased urination, genital infections, ketoacidosis, muscle cramps, osteodystrophy, increased risk of bone fractures, increased risk of hospitalization for volume depletion, increased risk of renal disease progression</td>
</tr>
</tbody>
</table>

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Comparison of Type 1 and Type 2

<table>
<thead>
<tr>
<th>Feature</th>
<th>Type 1</th>
<th>Type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excess weight</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>x</td>
<td>xxx</td>
</tr>
<tr>
<td>Antibodies present</td>
<td>xxx</td>
<td>0</td>
</tr>
<tr>
<td>Typical age of onset</td>
<td>puberty</td>
<td>40-65</td>
</tr>
<tr>
<td>Insulin Resistance</td>
<td>x</td>
<td>xxx</td>
</tr>
</tbody>
</table>

Older Adults

- Screen annually for early detection of cognitive impairment starting at age 65
- Assess for neuropsychological function and dementia using standardized assessment tools
- Use collaborative care models that involve care managers to treat comorbidities and depression

Older Adults – Individualized Assessment

- Social support
  - Who do they live with?
  - Anyone helping with self-care?
- Finances
  - Housing, food, transportation
- Activity, Nutrition
- Medications
  - Types
  - Can they afford?
What are next steps?

- 72 yr old, thin, lives alone, A1c 7.3%.
- Concerns
- Meds?

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

Question 6

- MR is 79 year old with type 2 diabetes who prided themselves on always keeping their A1c less than 7%. Lately, MR is having trouble reaching target, so they are cutting carbs and have lost over 10lbs and have a BMI of 23. What would be an appropriate intervention?
  - A. Start basal insulin
  - B. Discuss option of starting an oral medication
  - C. Remind MR that carbs are healthy
  - D. Encourage exercise to increase muscle mass
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

DiaBingo - N

- DPP demonstrated that exercise and diet reduced risk of DM by ___%  
- Average A1c of 7% = Avg BG of ___  
- An ___ 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
- One % drop in A1c reduces risk of complications by ___%  
- 1 gm of fat equal ____kilo/calories
- Metabolic syndrome = hyperinsulinemia, hyperlipidemia, hypertension
- Average American consumes 15 teaspoons of sugar a day.
- Medication that was derived from the saliva of the Gila Monster

Mr. Jones admitted to hospital

Mr. Jones is 72 years old, with a BMI of 26 and complains of feeling tired and 10 lb wt loss. He was unusually confused and was found to have a lower extremity infection. His A1c is 9.3%, random glucose 297. He is hypertensive with a history of diabetes on glyburide, but no meter. No ketones in urine.

- What are his risk factors and signs of diabetes?
- You find a few moments to teach and he asks you some questions.
Mrs. Jones asks you
What Do You Say?

- What is diabetes?
- Will I be on insulin for life?
- They say I am a diabetic because I am overweight?
- How am I going to control this?
- What is a normal blood sugar?
- Do I have to test my blood sugars?
- I heard people with diabetes can’t eat fruit, is that true?

Language of Diabetes Education

**Old Way**
- Control diabetes
- Test BG
- Patient
- Normal BG
- Non-adherent, compliant
- Refuse

**New Way**
- Manage
- Check
- Participant
- BG in target range
- Focus on what they are accomplishing
- Decided, chose

American Diabetes Association, Diabetes Care
The Use of Language in Diabetes Care and Education, 2017

Language of Diabetes Education

**Old Way**
- Can’t, shouldn’t, don’t, have to
- Regimen
- Refused
- Victim, suffer, stricken

**New Way**
- Have you tried...”
- What about...”
- May I make a suggestion...”
- Plan, choices
- Declined, Chose not to
- ...lives with diabetes
- ...has diabetes

American Diabetes Association, Diabetes Care
The Use of Language in Diabetes Care and Education, 2017
Mr. Jones asks you
What Do You Say?

- You are wondering if your weight caused your diabetes?
- You can manage your diabetes and improve your health at the same time.
- For people without diabetes, fasting blood sugar is less than 100 and A1c is less than 5.7%
- Checking blood sugars can help you figure out if the plan is working.

Mr. Jones asks about his foot ulcer

Foot Wounds

Blisters
Calluses
Ulcers
Bone infection
No Bathroom Surgery

5.07 monofilament = 10gms linear pressure

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

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.
Mr. Jones is ready to leave hospital

- Discharge meds:
  - Metformin 500mg BID
  - Antibiotics
  - Simvastatin
  - Baby aspirin
  - Lisinopril
- What survival skill education does he need?

Ms. Jones Survival Skills

- Check BG once daily
  - Before breakfast or two hours after dinner
  - Keep a log book
- Take metformin with meal to reduce upset stomach
- Contact provider if blood glucose above 200.
- Daily feet care
- Healthy eating, activity
- When to get help

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
What feedback for this log book?

Metformin & 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 - 2500 mg</td>
<td>Side effects: nausea, bloating, diarrhea. GFR deficiency. May increase HbA1c</td>
</tr>
<tr>
<td></td>
<td>(Glipizide)</td>
<td>(usually 800 mg</td>
<td>with metformin. Consider stopping metformin.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>usual)</td>
<td>If GFR &lt; 30, do not use.</td>
</tr>
</tbody>
</table>

Biguainide derived from:
- Goat’s Rue
- Galega officinalis
- French Lilac

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%

Medical Nutrition Therapy – ADA

Diabetes Education Services®
www.DiabetesEd.net
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
- Drink Water
- Sleep
Diabetes Vacations

“The greatest glory in living lies not in never falling, but in rising every time we fall.”

— Nelson Mandela

Thank You

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