1. **Prediabetes:**
   What is it. What can we do about it?

2. **Diabetes in the Elderly.**

   FOCUS Conference 2016 on the Art of Chronic Disease Management.
   November 16, 2016

   Steven B. Magill, MD, PhD
   Endocrinology and Metabolism
   Medical College of Wisconsin

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**Overview**

- **Epidemiology of diabetes and prediabetes.**
- What is prediabetes?
- The Diabetes Prevention Program.
- How do we treat prediabetes?
- Diabetes in the elderly.
  - Focus on antidiabetic medications, the dos and don’ts.
  - What are appropriate glucose goals in the elderly patient with diabetes.
- Care of patients with diabetes in long term care facilities.

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**Presenter Disclosure Information**

In compliance with the accrediting board policies:

Steven B. Magill, MD, PhD
has no conflicts of interest
National Diabetes Statistics-2014

- Estimates are that 29.1 million Americans have diabetes.
  - 21 million have been diagnosed.
  - One quarter or about 8 million are undiagnosed.
- 9.3% of the adult population.
- Ages
  - Age 20-44 4.1%
  - Age 45-64 16.2%
  - Age ≥65 25.9%

Number of Americans with Diagnosed Diabetes, 1980-2009

Prevalence* of Self-Reported Obesity Among U.S. Adults, by State, BRFSS, 2013

*Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.
Overweight and Obesity

- Body mass index
  - Ht (m²) / Wt (kg) = BMI
- Classifications:
  - BMI 18.5-24.9 = normal
  - BMI 25-29.9 = overweight
  - BMI 30-34.9 = class I obesity
  - BMI 35-39.9 = class II obesity
  - BMI ≥40 = class III obesity or morbid obesity

These criteria apply to US populations.

**Relationship Between BMI and Risk of Type 2 Diabetes**


<table>
<thead>
<tr>
<th>Body Mass index (kg/m²)</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;22</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>22-23</td>
<td>2.5</td>
<td>2.2</td>
</tr>
<tr>
<td>24-25</td>
<td>4.3</td>
<td>4.4</td>
</tr>
<tr>
<td>26-27</td>
<td>5.2</td>
<td>5.3</td>
</tr>
<tr>
<td>28-29</td>
<td>8.1</td>
<td>8.7</td>
</tr>
<tr>
<td>30-31</td>
<td>15.8</td>
<td>21.3</td>
</tr>
<tr>
<td>32-33</td>
<td>40.3</td>
<td>54.0</td>
</tr>
<tr>
<td>34-35</td>
<td>54.0</td>
<td>83.2</td>
</tr>
<tr>
<td>≥36</td>
<td>93.2</td>
<td>93.2</td>
</tr>
</tbody>
</table>

Age-Adjusted Relative Risk

- Controlled for age, family history of diabetes, exercise, smoking, saturated fat intake, calcium, potassium, magnesium, and glycemic index.

**Nurses' Health Study: Type 2 Diabetes and Waist Circumference**

<table>
<thead>
<tr>
<th>Waist circumference (inches)</th>
<th>Relative Risk T2DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;28</td>
<td>1.0</td>
</tr>
<tr>
<td>28-29</td>
<td>2.9</td>
</tr>
<tr>
<td>30-31</td>
<td>4.3</td>
</tr>
<tr>
<td>32-33</td>
<td>5.2</td>
</tr>
<tr>
<td>34-35</td>
<td>8.1</td>
</tr>
<tr>
<td>36-37</td>
<td>27.6</td>
</tr>
<tr>
<td>≥38</td>
<td>54.0</td>
</tr>
</tbody>
</table>

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Risk Factors for Diabetes

- Age 45 and older
- Overweight (BMI ≥ 25) or obesity (BMI >30).
- Hypertension
- Abnormal lipid levels
- Family history of diabetes
- Race/ethnicity
- Inactive lifestyle
- History of gestational diabetes
- History of vascular disease
- Signs of insulin resistance
  - PCOS
  - Acanthosis nigricans
- IGT or IFG on previous test

What is Pre-diabetes?

- Pre-diabetes occurs when the blood glucose is higher than normal but not high enough to be called diabetes.
- Pre-diabetes increases the risk for type 2 diabetes and cardiovascular disease.
- Pre-diabetes includes
  - Impaired fasting glucose (IFG)
  - Impaired glucose tolerance (IGT).


---

Diagnostic Criteria for Pre-diabetes and Diabetes

<table>
<thead>
<tr>
<th>Category of glucose tolerance</th>
<th>Fasting Plasma Glucose Test (FPG)</th>
<th>2-Hour Glucose Challenge Test</th>
<th>HbA1c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;100 mg/dl</td>
<td>&lt;140 mg/dl</td>
<td>&lt;5.6%</td>
</tr>
<tr>
<td>Pre-diabetes</td>
<td>100-125 mg/dl</td>
<td>140-199 mg/dl</td>
<td>5.7 to 6.4%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>≥126 mg/dl</td>
<td>≥200 mg/dl</td>
<td>≥6.5%</td>
</tr>
</tbody>
</table>


---

Progression of IGT to Diabetes

<table>
<thead>
<tr>
<th>Category of glucose tolerance</th>
<th>Risk of diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normoglycemia</td>
<td>0.7% per year</td>
</tr>
<tr>
<td>Person with IGT or IFG</td>
<td>~5-10% per year</td>
</tr>
<tr>
<td>Diabetes Prevention Program (placebo arm)</td>
<td>11% progression per year</td>
</tr>
<tr>
<td>Indian Diabetes Prevention Program (IDPP-1)</td>
<td>18% per year</td>
</tr>
</tbody>
</table>

---
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Diabetes Prevention Program

3234 high-risk individuals with IGT and IFG randomized to:

- Metformin titrated to 850 mg bid.
- Placebo.
- Intensive lifestyle intervention.
- Primary end point: prevention of diabetes diagnosed by annual OGTT or semiannual FPG.

Diabetes Prevention Program: Baseline Patient Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Placebo</th>
<th>Metformin</th>
<th>Intensive Lifestyle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>50.3</td>
<td>50.9</td>
<td>50.6</td>
</tr>
<tr>
<td>Family history of diabetes</td>
<td>70%</td>
<td>68%</td>
<td>70%</td>
</tr>
<tr>
<td>History of GDM (women)</td>
<td>16%</td>
<td>16%</td>
<td>16%</td>
</tr>
<tr>
<td>Waist (cm)</td>
<td>105 (~41 inches)</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>34.2</td>
<td>33.9</td>
<td>33.9</td>
</tr>
</tbody>
</table>


Diabetes Prevention Program: Randomization Scheme

3234 Randomized

Standard lifestyle recommendations to all

Intensive lifestyle (n=1079)  Placebo bid (n=1082)  Metformin 850 mg bid (n=1073)


Lifestyle Interventions
Diabetes Prevention Program

Goals of intensive lifestyle intervention
- 7% loss of body weight
  - Dietary fat goal: 25% of calories from fat
  - Calorie intake goal: 1200-1800 kcal/day based on initial body weight
- >150 minutes of physical activities weekly
  - Similar in intensity to brisk walking; at least 700 kcal energy expenditure per week


Frequent sessions with a case manager:
- At least 16 sessions during first 24 weeks
  - Instruction in diet, exercise, and behavior modification
  - Reduction of fat and total calories to achieve and maintain weight-loss goals
  - At least monthly contact
  - Two optional, supervised exercise sessions per week

4–6 week group courses offered quarterly

Diabetes Prevention Program:
Achievement of Study Goals

<table>
<thead>
<tr>
<th>Lifestyle modifications</th>
<th>Goal</th>
<th>% Achieving Goal</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight loss</td>
<td>≥7%</td>
<td>50%</td>
<td>38%</td>
</tr>
<tr>
<td>Physical activity (min/wk)</td>
<td>≥150</td>
<td>74%</td>
<td>58%</td>
</tr>
</tbody>
</table>

Pharmacologic intervention

<table>
<thead>
<tr>
<th>Metformin</th>
<th>Placebo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliance</td>
<td>≥80%</td>
</tr>
</tbody>
</table>


The Diabetes Prevention Program (DPP)

Diabetes Prevention Program:
Conclusions

- Intensive lifestyle and metformin each reduced the risk of developing diabetes in a high-risk population with IGT.
- Lifestyle modification was more effective in older and leaner individuals.
- Metformin reduced the risk of developing type 2 diabetes most effectively in younger, obese participants.
Lifestyle Modification in the Major Diabetes Prevention Trials

Lifestyle intervention continues to have an effect, even after 20 years

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Intervention</th>
<th>Treatment</th>
<th>Risk Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Da Qing1,2</td>
<td>IST</td>
<td>Lifestyle</td>
<td>6 years 20 years</td>
<td>34% - 69%</td>
</tr>
<tr>
<td>Finnish DPS3,4</td>
<td>IST</td>
<td>Lifestyle</td>
<td>3+ years 7 years</td>
<td>58%</td>
</tr>
<tr>
<td>Diabetes Prevention Program (DPP)5,6</td>
<td>IST</td>
<td>Lifestyle</td>
<td>3 years 10 years</td>
<td>58% 34%</td>
</tr>
</tbody>
</table>


Prevention of Type 2 Diabetes. The Evidence

<table>
<thead>
<tr>
<th>Study</th>
<th>Intervention</th>
<th>Risk Reduction</th>
</tr>
</thead>
</table>

Pharmacologic Intervention in the Major Diabetes Prevention Trials

Pharmacologic intervention provides benefit but with increased adverse effects with some drugs

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<th>Intervention</th>
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<th>Risk Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes Prevention Program (DPP)1,2</td>
<td>IST</td>
<td>Metformin</td>
<td>3 years 10 years</td>
<td>31% 18%</td>
</tr>
<tr>
<td>DREAM3</td>
<td>IST</td>
<td>Rosiglitazone</td>
<td>3 years</td>
<td>60%</td>
</tr>
<tr>
<td>STOP-NIDDM4,5</td>
<td>IST</td>
<td>Acarbose</td>
<td>3 years</td>
<td>21%</td>
</tr>
<tr>
<td>ACT NOW6</td>
<td>OG</td>
<td>Pioglitazone</td>
<td>3 years</td>
<td>81%</td>
</tr>
</tbody>
</table>

Diabetes Prevention Program
Cost Effectiveness after 10-Year Intervention

- Lifestyle cost-effective, metformin marginally cost-saving vs placebo
- Investment in lifestyle, metformin interventions for diabetes prevention in high-risk adults provides good value

<table>
<thead>
<tr>
<th>Societal Perspective</th>
<th>Lifestyle vs Placebo</th>
<th>Metformin vs Placebo</th>
<th>Lifestyle vs Metformin</th>
<th>DPP Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undiscounted</td>
<td>11,274</td>
<td>Cost-saving</td>
<td>44,562</td>
<td>Cost-saving</td>
</tr>
<tr>
<td>Discounted</td>
<td>14,365</td>
<td>Cost-saving</td>
<td>42,753</td>
<td>1,681</td>
</tr>
</tbody>
</table>


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Diabetes Prevention. Lifestyle Modification
Facilitating Weight Loss

- Long-range goal: 7% loss of body weight.
- Increase physical activity to ≥150 min/week.
- Individualized medical nutrition therapy.
  - Provided by a registered dietitian

**Lifestyle Modification**  
*Facilitating Weight Loss*

- Reduce caloric intake by 500-1000 kcal/day.
- Reduce dietary fat.
- Limit intake of sugar-sweetened beverages.
- Dietary fiber intake of 14 grams/1000 kcal.
- Whole grains are 50% of grain intake.
- 5-7 servings of fruits and vegetables a day.

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**Physical Exercise**  
*The Association Between Insulin Sensitivity and Exercise: The IRAS Study*

![Bar chart showing the association between insulin sensitivity and exercise frequency in the IRAS study.]


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**Energy Expenditure of Physical Activity**

![Graph showing energy expenditure of various physical activities.]

Benefits of Physical Activity

- Improved lipid levels
- Lower blood pressure.
- Weight control.
- Improved glucose control.
- Reduced risk of CHD.
- Prevent or delay onset of diabetes.


Criteria for Screening for Prediabetes

Testing should be considered in all adults who are overweight (BMI ≥25) and who have at least one other risk factor:

- Sedentary lifestyle
- First degree relative with diabetes.
- High risk ethnic group
  - All non-Caucasian groups at higher risk.
- Women with a hx of gestational diabetes.
- Women who had a baby >9 pounds at birth.
- Hx of hypertension.
- Abnormal lipids.
  - HDL <35 mg/dl
  - TG >150 mg/dl
- Women with a hx of PCOS.
- Hx of coronary heart disease.
- Patients with insulin resistance
  - Acanthosis nigricans

CDC Prediabetes Screening Test

COULD YOU HAVE PREDIABETES?
Prediabetes means your blood glucose (sugar) is higher than normal, but not yet diabetes. Diabetes is a serious disease that can cause heart attack, stroke, blindness, kidney failure, or loss of feet or legs. Type 2 diabetes can be delayed or prevented in people with prediabetes through lifestyle changes. Take the first step. Find out your risk for prediabetes.

Take the Test...Know Your Score!
Answer these seven simple questions. For each “yes” answer, add the number of points listed. “No” answers are 0 points.

- Are you a woman who has had a baby weighing more than 9 pounds at birth?
- Do you have a sister or brother with diabetes?
- Do you have high blood pressure?
- Do you have a hx of hypertension?
- Have you eaten more than 150 grams of sugar in a day?
- Are you 65 years of age or older?
- Are you 55 years of age or older?

Add your score and check the box on this page to see what it means.

www.cdc.gov/diabetes
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Diabetes in the Elderly and in Long Term Care Facilities

Diabetes Therapy in the Elderly

- Epidemiology
  - ~25% of patients over 65 have DM2.
  - 10% of diabetes cases are diagnosed after the age of 65.

- Research and Evidence
  - There are few if any long term randomized trials in geriatric populations.

- Treatment Guidelines
  - A general principle to use is to “Start Low, and Go Slow”.
  - Frail patients at risk for hypoglycemia-
  - Those with functional or cognitive impairment-
  - Those patients with a life expectancy of < 5 years – should have less intensive goals.


- The prevalence of diabetes in nursing home residents increased from 1995 to 2004:
  - From 16.9% to 26.4% in men.
  - From 16.1% to 22.2% in women (for all P<0.05)

- Multivariate analysis also showed the prevalence of cardiovascular disease increased:
  - From 60% to 75.4% in men.
  - From 68% to 78.7% in women (for both genders P<0.05)

Based on the National Nursing Home Surveys
Diabetes in the Elderly

- The overall goals of glycemic control of diabetes in elderly patients is dependent on the functional status and projected survival.
- However, the elderly population is heterogeneous and includes:
  - Persons living independently.
  - Persons in assisted living centers.
  - Persons in nursing homes.
- Management has to be individualized for the patient and the situation.

Modified from UpToDate. September, 2016

Co-Morbidities in Older Adults with Diabetes Mellitus

- Hypertension 83.8%
- Dyslipidemia 59.5%
- Obesity 51.4%
- Chronic kidney disease (CKD) 31.5%
- Coronary heart disease (CHD) 20.7%
- Prior MI 20.2%
- Congestive heart failure 17.9%
- Angina 16.1%
- Stroke 14.3%
- Peripheral vascular disease 10.6%


Other Comorbidities in Long Term Care Facilities

- Depression
  - No interest in activities
  - Refusal to eat, weight loss in some
  - Excess sugary food intake
- Delirium
  - Refusal of blood glucose monitoring
  - Irregular and or skipped meals.
- Skin problems
  - Pressure ulcers, delay in wound healing, increased glucose levels as a result.
- Hearing and vision problems
  - Reduced quality of life; makes it more difficult to control the diabetes.

Cognitive Dysfunction

- Clinicians should use a standardized screening tool at baseline and monitor for decline in cognition over time.
- Increased difficulty with self-care is a red flag.
- Dementia.
  - Several studies have demonstrated that dementia is more common in patients with diabetes.
  - Elderly patients with diabetes have a faster decline in mentation if they have dementia.


Diabetes and Neuropathy

- Many patients with diabetes have peripheral neuropathy.
  - Lack of sensation; the “insensate foot”
  - Burning or shooting pain (Neuropathic pain).
  - Altered anatomy.
    - Charcot foot
    - Hammer toes
    - Increase callous formation and higher risk of foot ulcer.
  - Poor balance.
    - Increased risk of falls.
Charcot Foot


www.medicinenet.com/diabetes/foot

Hammer Toe Deformities

Increased risk for callouses and ulceration

www.medicinenet.com/diabetes/foot

Polypharmacy

- Older adults should maintain an updated medication list.
  - Prescription drugs
    - What are the current insulin doses?
  - OTC medications
  - Herbal supplements and vitamins.
    - Some herbal remedies obtained from other countries are adulterated with glyburide and/or other active medications.
- This allows for review of drug-drug interaction.
- Many medications have side effects including sedation or change in cognition and increases the risk for falls.
Expected Quality of Life Benefits of Intensive Glucose Control With Increasing Levels of Comorbidities

Can Tight Glycemic Control Prevent Cardiovascular Events?

Reported Causes of Death in People With Diabetes
HbA1c Predicts CHD in Type 2 Diabetes

CHD mortality
Incidence (%) in 3.5 years

- Low <6%
- Middle 6%-7.9%
- High >7.9%

All CHD events
Incidence (%) in 3.5 years

- Low <6%
- Middle 6%-7.9%
- High >7.9%

*P<0.01 vs lowest tertile.
**P<0.05 vs lowest tertile.


ACCORD: Three Medical Strategy Questions

- Glycemia:
  Intensive control (HbA1c<6.0%) vs Standard control (HbA1c 7.0%-7.9%)
- BP:
  Intensive control (SBP <120 mmHg) vs Standard control (SBP <140 mmHg)
- Lipids:
  Fibrates to increase HDL-C and lower TG + statins to lower LDL-C vs Statins to lower LDL-C alone

ACCORD Primary Outcome Measure

- First occurrence after randomization of a major CVD event:
  - Nonfatal MI
  - Nonfatal Stroke
  - Cardiovascular Death
- Adjudicated by committee
  masked to group assignment

**ACCORD Trial**

**Median HbA1c Levels at Each Study Visit**

![Graph showing median HbA1c levels at each study visit.](image)

- **Standard Therapy**
  - No. at M0: 3389
  - Median HbA1c: 7.4%
  - Median HbA1c at each study visit
- **Intensive Therapy**
  - No. at M0: 3392
  - Median HbA1c: 6.2%
  - Median HbA1c at each study visit

**ACCORD Trial**

**Kaplan-Meier Curves for the Primary Outcome and Death from Any Cause**

![Graph showing Kaplan-Meier curves.](image)

- **All-Cause Mortality With Intensive Glucose-Lowering vs. Standard Treatment in T2DM.**

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>Weight of study size</th>
<th>Odds ratio (95% CI)</th>
<th>Odds ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensive</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Standard</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Intensive</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
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</tr>
<tr>
<td>Standard</td>
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<td>0.6</td>
<td>0.6</td>
</tr>
</tbody>
</table>

**Figure 4:** Probability of events of all-cause mortality with intensive glucose-lowering versus standard treatment.

**Lancet 2009; 373: 1765-72**
**Glycemic Control**

- In general a HbA1c goal of 7.5% to 8.0% can be considered in many elderly patients with diabetes.
- For patients ≥85 yrs., the HbA1c goal may be 8.0 to 9.0%.
- There is potential harm in lowering the A1c to <6.5 or even <7.0% in many elderly patients.

> American Geriatrics Society Guidelines for Improving the Care of Older Adults with Diabetes Mellitus: 2013 Update. 

---

**HbA1c Goals by Societies for Older Patients with Diabetes**

<table>
<thead>
<tr>
<th>Society</th>
<th>HbA1c Goal</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Geriatrics Society</td>
<td>7.0-7.5%</td>
<td>HbA1c goal</td>
<td>Elderly ▶ Lower risk of acute events</td>
</tr>
<tr>
<td>American Diabetes Association</td>
<td>7.0-7.5%</td>
<td>HbA1c goal</td>
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</tr>
</tbody>
</table>

---

**Diabetes Management Goals**

- Multiple considerations
- Nutrition
- Exercise
- A1c
- Hyperglycemia
- Hypoglycemia
- Microvascular complications
- Macrovascular complications

# Antiglycemic Medications

- **Metformin** is first line therapy for patients with diabetes (1000 to 2000 mg/day).
  - Use the estimated GFR (eGFR) rather than the creatinine to guide use.
  - For most patients it is safe to use metformin to an eGFR <60 mL/min.
    - Recommend using smaller doses of metformin in patients with an eGFR between 30 and 45 mL/min.
  - The risk for lactic acidosis is very low outside the hospital.
  - GI side effects can be minimized with use of metformin ER.

- **Sulfonylureas**
  - Are potent and inexpensive and there is a long term safety data with these medications.
  - Greater risk of hypoglycemia.

# Other Antihyperglycemic Medications

- **DPP-IV inhibitors**
  - Boost insulin production and reduce hepatic glucose output.
  - Low risk for hypoglycemia.
  - Oral agents taken once per day.
  - Expensive
    - Sitagliptin (Januvia), Saxagliptin (Onglyza), Linagliptin (Tradjenta)

- **Glitazones**
  - Treat insulin resistance and secondarily improve glucose secretion.
  - Moderately potent.
  - Leads to weight gain, increased pedal edema. Avoid using in patients with low bone mass.
  - Pioglitazone (Actos) and rosiglitazone (Avandia).

# Insulin Treatment in the Elderly Patient with Diabetes

- **Benefits**
  - Best possible glucose control.
  - Avoids potential side effects of many of the oral antiglycemic medications.
  - Can be used safely in CKD.
  - The expense may be less than that of many oral agents.

- **Risks**
  - Hypoglycemia.
  - Weight gain.
  - Daily glucose monitoring.
  - Complexity of insulin regimens.
Newer Antihyperglycemic Medications.

- **GLP-1 analogs.**
  - Potent but expensive.
  - Non-insulin injectable medication.
  - Boosts insulin secretion, reduces hepatic glucose output, decreased appetite in many, leads to weight loss in the majority of patients.
    - Daily sc injection: Liraglutide (Victoza)
    - Weekly Injection: Extended release exenatide (Bydureon), dulaglutide (Trulicity).

- **SGLT-2 inhibitors**
  - Increases glucose excretion in the kidneys.
  - Lowers insulin requirements.
  - Oral agents taken once a day. Expensive.
  - Moderate potency.
    - Canagliflozin (Invokana), dapagliflozin (Farxiga) and empagliflozin (Jardiance).

Sliding Scale Insulin

- **BG: 100-150, Ø insulin**
  - BG 151-200, 2 units
  - BG 201-250, 4 units
  - BG 251-300, 6 units
  - BG 300-350, 8 units
  - BG >350, call provider.
- Use of this scale leads to a roller-coaster of glucose levels and increases the risk for nocturnal hypoglycemia.

Basal Insulins
- Glargine (Lantus)
- Detemir (Levemir)
- Glargine 300 (Toujeo)
- Insulin degludec (Tresiba)

Premixed Insulins
- 70/30 insulin
- Mixed analogs
  - Humalog Mix 75/25
  - Novolog Mix 70/30
Basal-Bolus Insulin

Bolus insulin (blue) using insulin lispro (Humalog), aspart (Novolog) or insulin glulisine (Apidra) combined with a basal insulin (red).

2015 Revised BEERS Recommendations
Potentially inappropriate medications in the elderly

- For diabetes:
  - Avoid use of glyburide
    - Increased risk of severe and prolonged hypoglycemia.
  - Avoid use of sliding scale insulin.
    - Especially use of regular insulin sliding scale.
    - Higher risk of hypoglycemia without improvement in glucose control.

Hypoglycemia

- Elderly patients have more neuroglycopenic manifestations from hypoglycemia than younger patients.
  - Lightheadedness, confusion and delirium are common.
  - This can lead to delay in recognition of the low glucose.
  - These signs may lead to misidentification as a TIA or stroke.
- Severe hypoglycemia requiring hospitalization leads to:
  - Increased risk of development of dementia.
  - Higher risk of dementia with recurrent severe hypoglycemia.

Kaplan-Meier Survival Curves Amongst Older Adults with Diabetes

A. Time to dementia associated with a preceding hypoglycemic event.
B. Time to a hypoglycemic event associated with a preceding diagnosis of dementia.

Specific Situations Needing Attention in Patients with Diabetes in the LTC Setting

- **Hypoglycemia (BG <70 mg/dl)**
  - Rule of 15s, 15 g of carbs, recheck the BG in 15 minutes, repeat if necessary
  - Call provider, increase glucose monitoring for 24 hrs
  - Consider alteration in the diabetes regimen

- **Hyperglycemia (BG >300 mg/dl)**
  - Evaluate nutrition
  - Alter antidiabetic regimen
  - Consider contributing factors to high glucose.

- **Patient is not eating**
  - Call provider
  - Adjust medications accordingly.

Exercise is Beneficial

- True for most patients.
- Walking, light weights, recumbent bicycles or swimming.
- Exercise classes.
- Yoga for balance and flexibility.

Transitions for Elderly

- Transitions from the home or long term care facility to the hospital and vice versa are periods of high risk.
- Medication reconciliation is important.
- Clear and concise instructions for medications are needed.
  - This is especially true for insulin.
- The electronic medical record can be helpful.
  - The discharge summary and updated medication list needs to get to the provider and nursing staff in a timely manner.

Overview

- Epidemiology of diabetes and prediabetes.
- What is prediabetes and how is it defined?
- The Diabetes Prevention Program.
- How do we treat prediabetes?
- Diabetes in the elderly.
  - Focus on antidiabetic medications, the dos’ and don’ts.
  - What are appropriate glucose goals in the elderly patient with diabetes.
- Care of patients with diabetes in long term care facilities.
Thank you!