Type 2 Diabetes & The Older Adult

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Objectives

- Identify risk factors that can lead to hypoglycemia
- Develop and understanding of the diagnostic criteria and glycemic targets for older adults
- Gain knowledge regarding medication management, including deintensification, simplification and deprescribing in older adults
- Gain knowledge regarding management of diabetes at end of life.
Background

- Diabetes is defined as:
  - FPG ≥ 126 mg/dl or A1c ≥ 6.5
- Diabetes classified as either Type 1 (T1D) or Type 2 (T2D)
- T1D – more likely to occur in younger adults
- T2D occurs in 9% of adults
- T2D occurs in 20% of adults 65 y/o or older; accounts for 90–95% of all diabetes cases in older adults.
- Aging and T2D increases risk for:
  - Functional decline and disability
  - Development of frailty & muscle loss
  - Falls
  - Lower quality of life
- Untreated T2D leads to the development of micro and macro vascular complications
Risk factors

Genetic
- Family history
  - parent or sibling
- Race
  - Black, Hispanic/Latino, American Indian, Alaska Native and Asian-American, Native Hawaiian or Pacific Islander

Lifestyle
- Inactivity
- Diet

Comorbidities
- Overweight or Obese
- Fat distribution
- High Blood Pressure
- Low HDL or high Triglycerides
- History of heart Disease or stroke
- Depression
- Polycystic Ovary Syndrome

Aging
- Decrease in exercise – loss of muscle mass - weight gain with age
Pathophysiology

Figure: Pathophysiology of Type 2 Diabetes Development
Presentation in older adults

- Different than younger adults
- Older adults more likely to present with
  - Dehydration
  - Confusion
  - Incontinence
  - Diabetes complications
    - Neuropathy
    - Nephropathy
### ADA Diagnostic Criteria for Prediabetes and Diabetes

<table>
<thead>
<tr>
<th>Diagnostic Test</th>
<th>Prediabetes</th>
<th>Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGTT 2-hour post</td>
<td>140 – 199 mg/dl</td>
<td>≥ 200 mg/dl</td>
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<tr>
<td>Fasting Plasma Glucose</td>
<td>100 - 125 mg/dl</td>
<td>≥ 126 mg/dl</td>
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<tr>
<td>A1c</td>
<td>5.7 – 6.4 %</td>
<td>≥ 6.5%</td>
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</table>
## Treatment Goals

### Patient Characteristics/Health Status

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Rationale</th>
<th>A1c Goal</th>
<th>Blood pressure</th>
<th>Lipids</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Healthy</strong> (few coexisting chronic conditions, intact cognitive and functional status)</td>
<td>Longer remaining life expectancy</td>
<td>&lt; 7.5%</td>
<td>&lt; 140/90 mmHg</td>
<td>Statin unless contraindicated or not tolerated</td>
</tr>
<tr>
<td><strong>Complex/Intermediate</strong> (multiple coexisting comorbidities or 2+ instrumental ADL Impairments, or mild to moderate cognitive impairment)</td>
<td>Intermediate remaining life expectancy, high treatment burden, hypoglycemia vulnerability, fall risk</td>
<td>&lt; 8.0%</td>
<td>&lt; 140/90 mmHg</td>
<td>Statin unless contraindicated or not tolerated</td>
</tr>
<tr>
<td><strong>Very complex/poor health</strong> (LTC or end-stage chronic illnesses, or moderate to severe cognitive impairment or 2+ ADL dependencies)</td>
<td>Limited remaining life expectancy makes benefit uncertain</td>
<td>&lt; 8.5%</td>
<td>&lt; 150/90 mmHg</td>
<td>Consider likelihood of benefit with statin</td>
</tr>
</tbody>
</table>

- ADA Framework for considering treatment goals for glycemia, blood pressure and dyslipidemia in older adults with diabetes (2019)
Management Considerations

Individualization is essential

Goals based on:
- functional status,
- risk for hypoglycemia
- prevention of hospital admissions
- Maintenance and/or improvement of functional status

Prevention of management of comorbidities
- Hypertension
- Hyperlipidemia
- Obesity

Prevention of Hypoglycemia
Hypoglycemia

- Increases risk for
  - Heart Failure
  - Dementia
  - Myocardial infarction
  - Stroke
  - Falls
  - Fractures
  - Death
<table>
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<tr>
<th>Risk Factors for Hypoglycemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medications used in the treatment of T2D</td>
</tr>
<tr>
<td>Psychosocial factors</td>
</tr>
<tr>
<td>Cognitive issues</td>
</tr>
<tr>
<td>Sensory changes</td>
</tr>
<tr>
<td>Motor changes</td>
</tr>
<tr>
<td>Comorbidities</td>
</tr>
<tr>
<td>Decreased Renal and hepatic function</td>
</tr>
<tr>
<td>Overall decreased awareness of symptoms associated with hypoglycemia</td>
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</table>

- Medications used in the treatment of T2D
- Psychosocial factors: Living alone, Reduced food intake, Depression
- Cognitive issues: memory loss and dementia
- Sensory changes: Hearing loss, Visual impairment, Diminished taste
- Motor changes: Decreased dexterity, Reduced physical activity, Impaired mobility
- Comorbidities: Decreased Renal and hepatic function
- Overall decreased awareness of symptoms associated with hypoglycemia
Medication selection

- Metformin 1st line for those without contraindication

- Selection of 2nd agent and insulin is dependent upon patient’s health status and risk for hypoglycemia

- Not uncommon for older adults to be on 2 – 3 agents.

- If on sulfonylurea when insulin is introduced – sulfonylurea needs to be tapered and discontinued.
<table>
<thead>
<tr>
<th><strong>Metformin</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Usual dose is 850 – 1000mg Bid po</strong></td>
</tr>
<tr>
<td><strong>1 – 2 % A1c reduction</strong></td>
</tr>
<tr>
<td><strong>GI effects are common – can be dose related</strong></td>
</tr>
</tbody>
</table>

**Considerations in older adults:**

- Recommended initial therapy
- Low risk for hypoglycemia
- Reduce cardiovascular events and mortality
- Do not use if eGFR< 30.
- Avoid in patients with decompensated HF
Sulfonylureas

Glyburide, Glipizide, Glimepiride

PO daily med, dose dependent on specific agent

1 – 2% A1c reduction

Adverse events
- Risk for hypoglycemia,
- weight gain
- increased risk of CV mortality

Use with caution
- Glyburide is not recommended in older adults
- Glipizide and Glimepiride needs to be used very cautiously
Thiazolidinediones

**Pioglitazone & Rosiglitazone**

- **Daily, oral**
- **Dose dependent on agent**
- **1 – 2% reduction in A1C**

**Adverse effects:**
- Fluid retention
- Weight gain
- Fracture risk
- Bladder cancer (pioglitazone)
- Increased LDL (rosiglitazone)
- Increased risk for MI (rosiglitazone)

**Considerations in older adults**
- Do not use in patients with renal impairment
- Use cautiously in hepatic insufficiency, HF and CAD
- Avoid in patients who are a fall risk or at high risk for fractures
A-Glucosidase inhibitors

Arcarbose
50 – 100mg TID po
A1c reduction 0.4% - 0.9%

Side effects:
• Flatulence
• Diarrhea
• Abdominal pain

Considerations for older adults:
• CV events decreased in patients with impaired glucose tolerance
• Do not use in patients with comorbid liver or bowel disease or if serum creatine > 2 mg/dl
Melitnides

**Repaglinide, Nateglinide**

- Dose dependent on regimen, administered TID orally
- 0.4% - 0.9% A1c reduction

**Adverse events:**
- Weight gain
- Peripheral edema
- Hepatotoxicity
- GI disturbances
- Risk of hypoglycemia

**Considerations for Older Adults**
- CV events decreased in patients with impaired glucose tolerance
- Do not use in patients with comorbid liver or bowel disease or if serum creatinine > 2 mg/dl
Amylin mimetics

Pramlintide
120 μg before meals, sub-q

Adverse Events:
• N/V
• Risk hypoglycemia when used with insulin

Considerations for older adults
• Should not be used in patients with an A1c > 9%
• Avoid use in patients with decreased hypoglycemia awareness
• Avoid in patients with history of poor adherence
GLP-1 receptor agonist

<table>
<thead>
<tr>
<th>Medications</th>
<th>Dose</th>
<th>Adverse events</th>
<th>Considerations in older adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exenatide, Liraglutide, Lixisenatide</td>
<td>sub-q</td>
<td>Weight loss, N/V/D, Risk for acute pancreatitis, Injection site reactions, Increased risk of hypoglycemia when taking sulfonylureas</td>
<td>Increased risk of side effects in patients with renal insufficiency, Exenatide not indicated with eGFR &lt; 30, Caution when using lixisenatide, Liraglutide may provide some CV benefits, Good motor skills and visual acuity needed due to being an injectable</td>
</tr>
</tbody>
</table>
DPP-4 inhibitors

- Sitagliptin, Saxagliptin, Linagliptin, Alogliptin,
- Dose dependent on regimen, Oral daily
- A1c reduction: 0.5 - 0.8%
- Adverse effects:
  - Joint pain
  - Skin lesions
  - Potential risk of acute pancreatitis
- Considerations for use in older adults:
  - Can be used in renal impairment
  - Renal dose adjustment required for linagliptin
SGLT2 inhibitors

- Dapagliflozin, Canagliflozin, Empagliflozin
- Dose dependent on modality, daily, po
- A1c reduction .5% - .7%

Adverse effects:
- Weight loss
- Blood pressure lowering
- Vulvovaginal candidiasis
- Urinary tract infection
- Risk of euglycemic diabetic ketoacidosis
- Risk of amputation and fractures with canagliflozin
- Increased LDL cholesterol

Considerations for older adults:
- May lead to abnormalities in renal function
- Avoid in older patients with preexisting renal impairment
- Avoid when eGFR <60

Avoid in older patients with preexisting renal impairment
Avoid when eGFR <60
### Insulin

<table>
<thead>
<tr>
<th>Novolog, Humalog</th>
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<tbody>
<tr>
<td>Individualized, sub-q</td>
</tr>
<tr>
<td>A1c reduction – no limit</td>
</tr>
</tbody>
</table>

**Adverse events**

- Hypoglycemia
- Weight gain

**Considerations for use in older adults**

- Dosing errors can occur with functional and cognitive changes in older adults
- Can challenge self-management capacity
- Lower dose may be required in patients with lower eGFR
Management of Comorbidities

<table>
<thead>
<tr>
<th>Condition</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective diabetes management also includes management of lipids and blood pressure</td>
<td>• Minimizes both macrovascular and microvascular complications</td>
</tr>
<tr>
<td>Nutritional status assessment</td>
<td>• Important in order to decrease risk of frailty and functional status</td>
</tr>
<tr>
<td>Obesity –</td>
<td>• 90% of T2D patients are obese</td>
</tr>
<tr>
<td></td>
<td>• Weight loss in fit older patients can be beneficial</td>
</tr>
<tr>
<td>HTN</td>
<td>• Target systolic of 140 or less should be goal</td>
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<tr>
<td></td>
<td>• Systolic less than 130 has shown few benefits, increases risk of falls, cognitive decline and frailty.</td>
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<tr>
<td></td>
<td>• Frail individuals BP target should be 145 – 160/90</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>• Managed until the age of 80, some studies show benefit until age 85</td>
</tr>
<tr>
<td></td>
<td>• Statins are recommended class of medications</td>
</tr>
<tr>
<td></td>
<td>• Statins should be stopped in older adults with severe morbidity and/or limited life expectancy</td>
</tr>
<tr>
<td></td>
<td>• Fibrates can be used in healthy adults, no recommended in frail older adults</td>
</tr>
</tbody>
</table>
Inappropriate Polypharmacy

- T2D puts older adults at risk for inappropriate polypharmacy
- The use of multi antidiabetic meds and medications for other comorbidities increases risk
- Need to consider if intensifying treatment is necessary
- Questions to be asked:
  - Can other medications be reduced or eliminated as new medications are added?
  - What adverse effects need to be considered? (hypoglycemia, weight gain etc)
  - Will some of these effects be increased by the addition of new medication?
  - What are the patient preferences?
  - What is the patients and care givers capacity? Are they capable to follow the plan and monitor for side effects?
- May need to consider either simplification and/or deintensification of regimen.
<table>
<thead>
<tr>
<th>Patient health status</th>
<th>Simplification</th>
<th>Deintensification/deprescribing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy (few comorbidities, functional &amp; cognitive status intact)</td>
<td>• Severe or recurrent hypoglycemia (if on insulin) • Wide glucose excursions • Decline in cognitive or functional status</td>
<td>• Severe or recurrent hypoglycemia (on non-insulin therapy) • Wide glucose excursions • Inappropriate polypharmacy is present</td>
</tr>
<tr>
<td>Complex/Intermediate (multiple comorbidities, 2+ instrumental ADL impairment or mild to moderate cognitive impairment)</td>
<td>• Severe or recurrent hypoglycemia (if on insulin) • Unable to manage complexity of insulin regimen • Significant change in social circumstances (loss of caregiver, financial difficulties, change in living situation)</td>
<td>• Severe or recurrent hypoglycemia (on non-insulin therapy) • Wide glucose excursions • Inappropriate polypharmacy is present</td>
</tr>
<tr>
<td>Community-dwelling (receiving care in a skilled nursing facility for short-term (ST) rehab)</td>
<td>• If treatment regimen was escalated during recent hospitalization, the reinstating of prehospital regimen is appropriate during rehab</td>
<td>• If hospitalization resulted in weight loss, anorexia, ST cognitive decline and/or loss of physical functioning</td>
</tr>
<tr>
<td>Very complex/poor health (long-term (LT) care, end stage chronic disease, moderate to severe cognitive impairment or 2+ ADL dependencies)</td>
<td>• On Insulin and patient desires to decrease number of injections and finger sticks • inconsistent eating pattern</td>
<td>• On hypoglycemic agents with high risk of hypoglycemic events • Taking medications without clear benefit</td>
</tr>
<tr>
<td>EOL</td>
<td>• Pain or discomfort caused by treatment • Excessive caregiver stress due to treatment complexity</td>
<td>• Taking medications that do not have any clear benefit of improving symptoms &amp;/or comfort</td>
</tr>
</tbody>
</table>

ADA 2019 recommendations for deintensification and simplification of treatment regimens in older adults with T2D
Management at End of Life

**Goal**
- Decreasing symptoms
- Improve comfort
- Prevention of hypoglycemic and hyperosmolar hyperglycemic events (polydipsia and polyuria)

**Discussions regarding diabetes**
- Focus on frequency of glucose testing
- Continuation or stoppage of medications
- Monitoring of glycemic control
EOL Management Changes

**Weeks to months**
- Maintain glucose levels between 180 and 360 mg/dl
- Target levels based on patient's preferences and risk for development of hyperosmolar hyperglycemic events
- Requirements for self blood glucose monitoring reduced from daily to every 3 days
- A1c's no longer required
- Medications may need to be adjusted based on patients' symptoms and risk for hyperosmolar events

**Days to live**
- Main goal prevention of hypoglycemia
- Oral medications can be stopped
- Glucose monitoring only when patients are exhibiting symptoms of hypo or hyperglycemia
- Short acting insulin is appropriate in patients who are conscious and experiencing hyperglycemic events.
Conclusions: Implications for Practice

Management plans take into consideration:
- Patients functional and cognitive status
- Mutual preferences and values
- Are collaboratively developed and include shared decision making and mutual goal setting

Goals need to consider:
- Current functional status
- Prevention of hypoglycemia
- Prevention of unnecessary hospital admissions
- Focus on improving functional health
- Reduction of disability
- Adjusted as patient moves across the aging trajectory
Questions


