Diabetes and the Older Adult
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Disclosures

• Presenter disclosures, if any, listed here.
Learning Objectives

• Define the present and future epidemiology of diabetes and its complications in older adults
• Discover screening, diagnostic, and prevention strategies for diabetes in older adults
• Discuss individualization of care and prevention of diabetes in older adults
• Identify best practices to involve patients in decisions related to diabetes care in older adults
Epidemiology of Diabetes in Older Adults

- More than 25% of the US population over 65 has diabetes
- Half over 65 have prediabetes
- Postprandial hyperglycemia is common in older adults


Kirkman MS. Diabetes in Older Adults ADA Consensus Report. *Diabetes Care* 2012.
Onset ≥65 Years vs. Middle Age

**Older Onset**
- Shorter diabetes duration
- Lower mean A1C
- Lower insulin use
- Lower incidence of retinopathy

**Middle Age Onset**
- Longer diabetes duration
- Higher mean A1C
- Higher insulin use
- Higher incidence of retinopathy

No difference in prevalence of cardiovascular disease (CVD) or peripheral neuropathy

Exponential Growth of Adults ≥65 in the US

Population 65+ by Age: 1900–2050

One out of every five

www.cdc.gov/diabetes/statistics/incidence/fig5.htm
Know Your Patient Population: Recognize Disparities

2011

Percent prevalence of T2DM by age, race, and gender in 2011.


American Diabetes Association.
Diagnosis of Diabetes in All Adults

- Criteria do not change with age
- Diagnosis based exclusively on hyperglycemia
- Three methods used to determine dysglycemia

<table>
<thead>
<tr>
<th>Stage</th>
<th>HbA1c</th>
<th>Fasting Glucose</th>
<th>OGGT (2 hr. glucose)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIABETES</td>
<td>≥6.5%</td>
<td>≥126 mg/dL (7 mmol/L)</td>
<td>≥200 mg/dL (11.1 mmol/L)</td>
</tr>
<tr>
<td>PREDIABETES</td>
<td>5.7–6.4%</td>
<td>100–125 mg/dL (5.6–6.9 mmol/L)</td>
<td>140–199 mg/dL (7.8–11.0 mmol/L)</td>
</tr>
<tr>
<td>NORMAL</td>
<td>&lt;5.6%</td>
<td>&lt;100 mg/dL (5.5 mmol/L)</td>
<td>&lt;140 mg/dL (7.7 mmol/L)</td>
</tr>
</tbody>
</table>

Screening in Older Adults

- ADA recommends screening adults ≥45 years every one to three years
  - Use FPG test, A1C, or oral glucose tolerance test
- Annual screening for early detection of mild cognitive impairment or dementia in adults ≥65 years of age
- Adults ≥65 years of age with diabetes should be considered a high priority population for depression screening and treatment
Highest Rates of Complications

Age 65-74
- More cardiovascular disease
- More lower extremity amputations
- More nonretinopathy visual impairment
- More end-stage renal disease
- Hyperglycemic crisis $\Rightarrow$ death

Age 75+ also experience
- More complications
- 2x rate of ER visits due to hypoglycemia

**Heterogeneity of Older Adults with Diabetes**

<table>
<thead>
<tr>
<th>RELATIVELY HEALTHY</th>
<th>DIFFICULT TO IMPLEMENT</th>
<th>LIMITED BENEFIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• &lt;3 chronic diseases</td>
<td>• ≥3 chronic diseases</td>
<td>• Moderate to severe cognitive impairment</td>
</tr>
<tr>
<td>• No cognitive or significant visual impairment</td>
<td>• Mild cognitive impairment</td>
<td>• ≥2 IADL dependencies</td>
</tr>
<tr>
<td>• 0 or 1 of instrumental activities of daily living (IADL) dependencies</td>
<td>• Severe vision impairment</td>
<td>• Residence in a long-term nursing facility</td>
</tr>
<tr>
<td></td>
<td>• ≥2 IADL dependencies</td>
<td></td>
</tr>
</tbody>
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**HEALTH AND RETIREMENT STUDY**
A Longitudinal Study of Health, Retirement, and Aging
Sponsored by the National Institute on Aging

Diabetes and Geriatric Syndromes

- Gait problems and falls
- Polypharmacy
- Cognitive impairment
- Depression
- Vision/hearing impairment

Worsening Functional Impairments and Disability

Diabetes and Functional Impairment

ASSOCIATED CONDITIONS

Diabetic eye disease
Diabetic foot disorders
Obesity
Depression
High blood pressure
Low education level
Low income level

Greater disability
Delayed recovery
Hospitalization
Nursing home stays
# Assessments for Physical Function

<table>
<thead>
<tr>
<th>NAME</th>
<th>CONTEXT</th>
<th>STRENGTHS</th>
<th>LIMITATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Meter Walk Test (10MWT)</td>
<td>Tests short duration walking speed; tests gait and functional mobility</td>
<td>Easy/quick to administer (&lt;5 mins.) Assistive devices can be used</td>
<td>Not for patients who cannot walk without caretaker assistance</td>
</tr>
<tr>
<td>Timed Up &amp; Go Test (TUG)</td>
<td>Assesses mobility, balance, walking ability, and fall risk</td>
<td>Easy/quick to administer (&lt;5 mins.) Excellent test-retest reliability and correlation with other assessments</td>
<td>May demonstrate less reliability among patients suffering from cognitive impairment</td>
</tr>
<tr>
<td>Barthel Index (BI)</td>
<td>Assesses the ability to perform 10 activities of daily living (ADL)</td>
<td>Easy/quick to administer (&lt;5 mins.) for self-report; 20 mins. for observation Widespread familiarity contributes to its interpretability</td>
<td>Not for use with people who have Communication deficits and changes in their mental status</td>
</tr>
<tr>
<td>Four Step Square Test (FSST)</td>
<td>Test of dynamic balance; clinically assesses ability to change directions while stepping</td>
<td>Easy/quick to administer (&lt;5 mins.) Preferred by older adults – they feel it is relevant to daily life</td>
<td>Can be difficult for impaired patients to perform</td>
</tr>
</tbody>
</table>
Vision and Hearing Impairment

- Ophthalmologic examination at the time of diagnosis and at least yearly thereafter to screen for diabetic retinopathy, cataracts, glaucoma
- Symptomatic patients with prediabetes and diabetes can benefit from screening for hearing loss
- Ask, “Do you have a hearing problem now?”
- Refer to audiologist for thorough audiological evaluation and appropriate recommendations for aural rehabilitation
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<th>STRENGTHS</th>
<th>LIMITATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clock Drawing Test/Mini Cog Assessment</td>
<td>Tests executive functioning</td>
<td>Easy/quick to administer (&lt;5 mins.)</td>
<td>Not for patients with visual impairment or who can’t hold a writing tool</td>
</tr>
<tr>
<td>Confusion Assessment Method (CAM)</td>
<td>Diagnoses delirium with altered mental status</td>
<td>Clearly defined clinical features</td>
<td>Does not identify the cause of delirium</td>
</tr>
<tr>
<td>Digit Span Test</td>
<td>Tests attention and immediate recall</td>
<td>Easy/quick to administer (&lt;5 mins.)</td>
<td>Only tests attention and immediate recall</td>
</tr>
<tr>
<td>Folstein Mini-Mental State Exam (MMSE)</td>
<td>Tests multiple cognitive domains</td>
<td>Widely used; assesses several cognitive domains</td>
<td>Age, education, cultural background affect the score; insensitive to change over time</td>
</tr>
<tr>
<td>Modified Mini Mental Status Examination (3MS)</td>
<td>Tests multiple cognitive domains</td>
<td>Higher sensitivity, similar specificity, better predictor of functional outcome than MMSE</td>
<td>Requires ≥15 mins. to administer</td>
</tr>
</tbody>
</table>
Cognitive Status

- Screen for cognitive dysfunction at initial work-up
- Periodic screening at subsequent appointments
- Simplify self-care regimen
- Interview and involve caregivers

Diabetes and Cognitive Impairment

- Approximately 20% of older adults with diabetes have undiagnosed CI

- Alzheimer’s-type and multi-infarct dementia are two to three times as likely in an older adult population with diabetes

- T2DM is associated with medial temporal lobe atrophy and poor performance on tests of executive function, speed, memory and attention, language and praxis

Diabetes and Cognitive Impairment

Hypoglycemia
Hyperglycemia
Insulin resistance
Insulin insufficiency

Cognitive Function

Depression in Older Adults with Diabetes

• Depression and diabetes are "synergistic" ⇒ earlier onset of negative outcomes than either factor alone:
  - Poor glycemic control
  - Poor self-care
  - Accelerated rates of coronary heart disease
  - Higher occurrence of dementia
  - Higher mortality
  - Greater disability and complications

Treating Diabetes in Older Adults
Management Rules of Diabetes in Older Adults

- Rule # 1: Individualize targets
- Rule # 2: Avoid hypoglycemia
- Rule # 3: Individualize medications
### Individualization of Glycemic Targets

#### Approach to the Management of Hyperglycemia

<table>
<thead>
<tr>
<th>Patient / Disease Features</th>
<th>More stringent</th>
<th>Less stringent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks potentially associated with hypoglycemia and other drug adverse effects</td>
<td>low</td>
<td>high</td>
</tr>
<tr>
<td>Disease duration</td>
<td>newly diagnosed</td>
<td>long-standing</td>
</tr>
<tr>
<td>Life expectancy</td>
<td>long</td>
<td>short</td>
</tr>
<tr>
<td>Relevant comorbidities</td>
<td>absent</td>
<td>severe</td>
</tr>
<tr>
<td>Established vascular complications</td>
<td>absent</td>
<td>few / mild</td>
</tr>
<tr>
<td>Patient attitude and expected treatment efforts</td>
<td>highly motivated, adherent, excellent self-care capabilities</td>
<td>less motivated, nonadherent, poor self-care capabilities</td>
</tr>
<tr>
<td>Resources and support system</td>
<td>readily available</td>
<td>limited</td>
</tr>
</tbody>
</table>

Framework for Individualizing A1C Targets in Older Adults

• 7.5% Reasonable A1C goal for healthy older adults
• <7% May be appropriate if it can be safely achieved in healthy older adults with few comorbidities and good functional status
• <8.5% Appropriate for older adults with multiple comorbidities, poor health, and limited life expectancy

Potential harm in lowering A1C to <6.5% in older adults with type 2 and comorbidities

Pharmacotherapy

- Carefully choose antihyperglycemic therapies with consideration of polypharmacy as well as patient/caregiver preferences
- In type 2 patients, hypoglycemia risk is linked more to treatment strategies than to achieved lower A1C
- Metformin is the preferred initial therapy in many older adults with type 2 diabetes, but at reduced dose in those with stage 3 CKD (avoid in those with ≥ stage 4 CKD)
- Assess patients regularly for hypoglycemia
- Modify therapy and/or glycemic targets for recurrent or severe hypoglycemia

Metformin

• Can be used in patients with estimated glomerular filtration rate (eGFR) ≥30 mL/min/1.73 m²
  – If eGFR <45 mL/min/1.73 m², do not initiate therapy, or if existing treatment, reassess use
• Low cost, low hypoglycemic risk
• Contraindicated in advanced renal insufficiency or significant heart failure
• Can be temporarily discontinued before procedures, during hospitalizations, and when acute illness may compromise renal or liver function
• Associated with vitamin B12 deficiency, so periodic testing should be considered

Sulfonylureas

• HIGH RISK FOR HYPOGLYCEMIA
  – Avoid glyburide
  – Risk of hypoglycemia increases with: age >60, disability, poor nutrition, polypharmacy, renal impairment
  – May have increased risk of hip fractures
• Shorter-duration sulfonylureas, such as glipizide are preferred
• Low cost and good efficacy

Incretin-based Therapy (GLP-1 and DPP-4)

- **GLP-1 Receptor Agonists**
  - Minimal hypoglycemia
  - Lower CVD event rate and mortality in CVD (liraglutide)
  - May be associated with nausea, vomiting, and diarrhea
  - High cost, injectable

- **DPP-4 Inhibitors**
  - Minimal hypoglycemia
  - Possible angioedema/urticaria and other immune-mediated dermatological effects
  - Increased heart failure hospitalizations (saxagliptin, alogliptin)
  - High cost

TZDs

• Use very cautiously in those with, or at risk for congestive heart failure (water retention) and falls or fractures (increased risk of osteoporosis)

• Low cost, low risk hypoglycemia

• Can be used in renal insufficiency

SGLT2 Inhibitors

- Rare hypoglycemia
- Oral route convenient for older adults
- Weight loss, lower CVD event rate and mortality in patients with CVD (empagliflozin)
- Mycotic infections, potential hypovolemic, UTI

Insulin Therapy

• Once-daily basal insulin injection therapy has minimal side effects in many older patients

• Injectable – except for inhaled insulin – which may be associated with pulmonary toxicity

• Effective in reducing HbA1c and fasting hyperglycemia

• Hypoglycemia is a common and serious complication of diabetes in older adults
  - Major contributor of emergency hospitalization
  - Associated with increased risk of death and fractures
Antihyperglycemic Medications

- Basal insulin therapy
  - Usually prescribed with metformin and sometimes one additional noninsulin agent and without rapid-acting insulin
  - Minimal side effects in older adults
  - Risk of hypoglycemia must be carefully considered
  - Multiple daily injections may be too complex for older adults with advanced complications, life-limiting comorbidities or limited functional status
  - T2DM patients may require mealtime bolus insulin as well; if so, consider decreasing basal insulin dose
Management in Settings Outside the Home

• The glycemic goals for hospitalized older adults with diabetes are usually similar to those for the general population.

• The use of sliding scale insulin alone for chronic glycemic management is discouraged in inpatient settings as well as in LTC facilities.

• Transitions of older adults with diabetes (e.g., from home or LTC facility to hospital to postdischarge setting) are periods of high risk.

• Hypoglycemia: Assessments should be done at least every 30 days for the first 90 days after admission and then at least once every 60 days.
Shared Decision-Making

Key components of the shared decision-making approach, include:

1. Establishing ongoing partnership between patient and provider
2. Exchanging information
3. Deliberation on choices
4. Deciding and acting on decisions

- Congruence of your patient’s goals with your goals for management is important

Diabetes Care 2012; 35:2650-64.
Shared Decision-Making (cont’d)

• Patients need to understand the plan to see value
• Refer to diabetes self-management education and support
• Know your patient’s preferences regarding treatment plan, medications, management
• Accommodate patient preferences when feasible and in line with goals
• Caregivers/family will often relay patient’s preferences – check with patient directly

Diabetes Care 2012; 35:2650-64.
Hypoglycemia in Older Adults with Diabetes
Hypoglycemia in Older Adults

- >50% higher rates of severe hypoglycemia (requiring assistance)
- Earlier and more severe deterioration of psychomotor coordination
- Impaired awareness of autonomic warning symptoms even when educated
  - There is loss of the usual 10–20 mg/dL difference in PG between subjective awareness of hypoglycemia and onset of cognitive dysfunction
- Risk higher in cognitively impaired

Hypoglycemia and Mortality

- Hypoglycemia is associated with increased risk of mortality
- History of severe hypoglycemia nearly doubled risk of mortality in both ACCORD and ADVANCE
- Risk was greatest in ACCORD participants who could not get to target A1C (including those in the intensive arm who did not achieve the target A1C <6.0%)
- Five year f/u study at Mayo Clinic of >1000 patients (mean age 60) showed those with a history of severe hypoglycemia at baseline had OR for mortality of 3.38 at five years (95% CI: 1.55–7.38, p <0.005)

McCoy DC. Diabetes Care 2012 Sep; 35(9):1897-901.
Hypoglycemia in Older Adults

- Risk factors for hypoglycemia in older adults include:
  - Use of insulin or insulin secretagogues
  - Longer duration of diabetes
  - History of antecedent hypoglycemia
  - Erratic meals
  - Renal insufficiency
  - Hospital discharge within the last 30 days
  - Advanced age
  - African American ethnicity
  - Use of ≥5 concomitant medications
Hyperglycemia and Hypoglycemia in Older Adults

Longitudinal Trends in Hospital Admission for Hyperglycemia and Hypoglycemia in Older Adults

- Currently, hypoglycemia accounts for more hospital admissions than hyperglycemia
- Hypoglycemia risk is greatest in patients aged ≥75 years

Hypoglycemia: Action Plan

- Severe or frequent hypoglycemia is an absolute indication for the modification of treatment regimens, including setting higher glycemic goals.

- Hypoglycemia unawareness or one or more episodes of severe hypoglycemia should trigger reevaluation of the treatment regimen.
Diabetes may be Overtreated in Older Adults


About 25% of patients in the VA system have diabetes

n = 652,378 patients receiving insulin or sulfonylurea. The denominator population: patients 75 years or older; serum creatinine level, 2.0mg/dL; or diagnosis of cognitive impairment or dementia. A,B,C, outliers.
Polypharmacy in Older Adults with Diabetes
## Polypharmacy

<table>
<thead>
<tr>
<th>Common Comorbidities Requiring Daily Multiple Drug Regimens</th>
<th>Common Comorbidities Requiring Occasional Multiple Drug Regimens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>Glaucoma</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>Peripheral vascular disease</td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td>Lower-extremity ulcers</td>
</tr>
<tr>
<td>Renal disease</td>
<td>Obesity</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>Diabetes Medications</td>
</tr>
<tr>
<td>Neuropathy</td>
<td>• Oral agents</td>
</tr>
<tr>
<td>Cognitive dysfunction</td>
<td>• Non-insulin injectables</td>
</tr>
<tr>
<td>Depression</td>
<td>• Rapid-acting insulin analogs</td>
</tr>
<tr>
<td></td>
<td>• Long-acting analogs</td>
</tr>
<tr>
<td></td>
<td>• Traditional insulins</td>
</tr>
</tbody>
</table>
Polypharmacy

• ≥ four prescriptions associated with an increased risk of falls and increased fear of falling
• ≥ four prescriptions associated nine-fold risk of cognitive impairment among adult diabetes patients
• May be multiple prescribers – risk of duplicate therapies can be high
• Increases risk of adverse effects, drug interactions, geriatric syndromes
• Increases risk of prescribing and dispensing errors

Adverse Drug Reactions in Older Adults

• Approx. 100,000 hospitalizations for adverse drug events per year among older adults (>65) in US

• Antidiabetic agents accounted for one quarter of adverse drug hospitalizations in older adults
  – Insulins, 14%
  – Oral hypoglycemic agents, 11%

• Adverse reactions generally resulted from unintentional overdoses

Think-Pair-Share

• What are common comorbidities in the older adult with diabetes?
• Which ones are associated with multiple drug regimens?
Case Study

Introduction

• Mr. C is a 76-year-old retired lawyer; he has a history of hypertension and type 2 diabetes

• **Physical exam:** height, 5’9” (175 cm); weight, 161 lbs (73 kg); BP, 138/72 mmHg
Case Study (cont’d)

Discussion question
What should Mr. C be screened for to provide a framework to determine targets and therapeutic approaches?
A. Cognitive impairment
B. Depression
C. Medical, mental, functional, and social geriatric domains
D. A and B
E. A, B, and C
Diabetes Prevention Program

Lifestyle change

• 7% weight loss and maintenance
• ≥150 min/wk physical activity

• ≥60 years reduced risk 71%
• 10-year follow-up with continued lifestyle change:
  - 49% risk reduction vs. 34% for the total cohort
  - Reduction in urinary incontinence
  - Improvement in quality of life domains and cardiovascular risk factors

Summary

- One out of every three to four individuals age >65 has diabetes
- Screening every 3 years in adults 45 and older, or annually for people with prediabetes
- Diabetes Prevention Program is effective in reducing or delaying risk for type 2 diabetes
- Goal directed therapy of glucose, BP, and lipids modified according to life expectancy and or illness burden reduces risk for micro- and macrovascular complications
- Choice of diabetes medications in older adults requires careful assessment of hypoglycemia risk

Guidelines

- Full version
- Abridged version for PCPs
- Free app
- Pocket cards with key figures
- Free webcast for continuing education credit

Professional.Diabetes.org/SOC
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• Online self-assessment programs
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