It Happens ... Even in Type 2! When to Start Thinking Seriously About Hypoglycemia

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Disclosures
• Dr. Jacqueline LaManna has no disclosures or COI's to report.

• Dr. Holly Divine has no disclosures to COI's to report.

Objectives
• Discuss physical, pharmacologic, and social causations of hypoglycemia and interventions diabetes team members can use to anticipate and mitigate risk in patients.

• Formulate comprehensive plans of care using case-based examples that focus on hypoglycemia risk mitigation in a variety of patient populations.

• Discuss revisions to hypoglycemia standards of care and other national initiatives to address hypoglycemia risk mitigation.
Type 2 Diabetes By the Numbers

- Almost half of new cases of T2DM are diagnosed in people between ages 45-64.
- 17.0% of people age 45-64 diagnosed with diabetes
- 25.2% of people age ≥65 have diabetes
- Impact – diabetes is often diagnosed in middle age – people may enter older adulthood with long duration of diabetes and chronic complications (CDC, 2017)
- The population of people with T2DM is heterogeneous.

Diabetes in Older Adults

- 12 million (25.2%) older adults are affected by diabetes.
- Increasingly diverse population of older adults among groups with greater prevalence of diabetes.
- More often affected by multiple chronic conditions.
- Are at increased risk for development of geriatric syndromes.

Hypoglycemia in Type 2 Diabetes

- Diabetes medications are one of most common drug classes leading to emergent hospitalization (National Action Plan for Adverse Drug Event Prevention, 2014)
- Annual emergency department visits in adults over age 18 (CDC, 2017)
  - Total ED visits of people with DM (all diagnoses) = 14,392,000
  - Hypoglycemia = 245,000 (rates increasing in older adults)
  - Insulin cause of 13.9% of emergent hospitalizations
  - Oral agents cause of 10.7% of emergent hospitalizations
  - Hyperglycemic crisis = 207,000 (rates decreasing in older adults)
- Although the hypoglycemia occurs more frequently in people with type 1 diabetes, most episodes of hypoglycemia are seen in people with type 2 DM due to its greater prevalence (Singal & Walker, 2016)
- How an individual responds to hypoglycemia is product of the frequency of events.
Hypoglycemia Defined
• Clinical definition — “all episodes of an abnormally low plasma glucose concentration that expose the individual to potential harm” (ADA, 2017)

• Research trial definition – need to define level to avoid because of immediate or long-term adverse consequences (International Hypoglycaemia Group, 2017)
  • Level 1 – glucose less than 70 mg/dL;
  • Level 2 – glucose less than 54 mg/dL; indicates serious, clinically important hypoglycemia.
  • Level 3 – severe hypoglycemia with significant cognitive impairment requiring external assistance for recovery.

Hypoglycemia in Type 2 Diabetes
• Trials showing adverse cardiovascular events and mortality associated with severe hypoglycemia in people with Type 2 diabetes:
  • ACCORD
  • ADVANCE
  • VA Diabetes Trial

Hypoglycemia in Older Adults
• Hypoglycemia risk is the primary limiting factor in treatment of diabetes to glycemic targets in many older adults with diabetes.
• Older patients in ACCORD trial had 50% more events of hypoglycemia.
• Fatal hypoglycemia is most likely to occur during night time hours.
### Causes of Treatment-Related Hypoglycemia in Older Adults

<table>
<thead>
<tr>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varying physiologies</td>
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<tr>
<td>Antecedent hypoglycemia</td>
</tr>
<tr>
<td>5 or more medications</td>
</tr>
<tr>
<td>Inconsistent food intake/food insecurity</td>
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<tr>
<td>Chronic kidney disease/hepatic changes</td>
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<tr>
<td>Hospitalization within 30 days</td>
</tr>
<tr>
<td>Gastroparesis</td>
</tr>
<tr>
<td>Alcohol intake</td>
</tr>
<tr>
<td>Hypoglycemia unawareness</td>
</tr>
<tr>
<td>Cognitive impairment</td>
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<tr>
<td>African American/Black race</td>
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</tbody>
</table>

### Adverse Outcomes of Hypoglycemia in Older Adults

<table>
<thead>
<tr>
<th>Outcome</th>
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<tbody>
<tr>
<td>Anxiety</td>
</tr>
<tr>
<td>Social withdrawal and isolation</td>
</tr>
<tr>
<td>Reduced quality of life</td>
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<tr>
<td>Accelerated atherosclerosis</td>
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<tr>
<td>Cardiac arrhythmias</td>
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<tr>
<td>Unsafe driving/motor vehicle crashes</td>
</tr>
<tr>
<td>Cognitive decline/dementia</td>
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<tr>
<td>Falls</td>
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<tr>
<td>Acute cardiovascular events/sudden death</td>
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### Individualized Treatment Goals in Older Adults

Glycemic goals in older adults require individualization based upon presence of comorbid conditions, mental status, functional abilities, and anticipated longevity.

*AGS Standards in Older Adults Consensus Statement, 2012; ADA Standards of Medical Care in Diabetes, 2018*
Clinical Guidelines – Comprehensive Assessment and Individualized Goals

• Assessment of medical, mental, cognitive, functional, and social geriatric domains should determine individualized treatment targets and self-management goals.

Reasonable Glycemic Targets for Older Adults

<table>
<thead>
<tr>
<th>Health Status/Characteristics</th>
<th>Rationale</th>
<th>HbA1c (%)</th>
<th>Fasting/Prandial (mg/dL)</th>
<th>Baseline (mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generally well</td>
<td>• few comorbidities, cognitively intact, adequate function</td>
<td>&lt; 7.5</td>
<td>90-130</td>
<td>90-150</td>
</tr>
<tr>
<td>Complex</td>
<td>• multiple chronic conditions, 2+ IADL deficits, mild to moderate CI</td>
<td>&lt; 8</td>
<td>90-150</td>
<td>100-180</td>
</tr>
<tr>
<td>Very complex/poor health</td>
<td>• LTC or EOL, moderate to severe CI, 2+ ADL deficits</td>
<td>&lt; 8.5</td>
<td>100-180</td>
<td>110-200</td>
</tr>
</tbody>
</table>

Source: ADA Standards of Medical Care in Diabetes: 2018; AGS Diabetes in Older Adults Consensus Statement

Clinical Guidelines – Individualized Treatment Goals

(ADA Standards of Medical Care in Diabetes, 2018)
Case 1 - Samuel

- 78-year-old Black male with 15 year history of type 2 diabetes
- Past medical history: hypertension, asthma, prostate cancer, hyperlipidemia
- Social history: married – caregiver for spouse; retired factory worker; 3 children; reformed smoker; no use alcohol
- Activity: rides bike to senior meal daily; active in church
- Insurance: Medicare – no supplement; income – social security only

Case 1 - Samuel

- Current medications:
  - 70/30 Novolin insulin 18 units in am; 12 units pm
  - metformin 1000 mg twice daily
  - amlodipine 10 mg daily
  - hydrochlorothiazide 12.5 mg orally daily
  - albuterol inhaler prn
  - atorvastatin 20 mg daily

- Labs:
  - A1c = 8.9%
  - Total cholesterol = 195 mg/dL
  - LDL = 110 mg/dL
  - HDL = 38 mg/dL
  - Triglycerides = 225 mg/dL
  - BUN = 15 mg/dL
  - Creatinine = 1.1 mg/dL
  - Albumin-to-creatinine ratio = 58 mg/g
  - "Forgot blood gluoses"
Case 1 - Samuel

- Physical exam
  - Height 71 inches; Weight 186 lb; BMI – 28.9
  - B/P 138/88; pulse 82 regular; respirations 18
  - Physical exam unremarkable other than reduced sensation to both feet

- Reason for visit – “passed out” during church service and required transport to emergency department. Blood glucose reported by medics was 40 mg/dL.

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Case 1 - Samuel

- What additional history/data is required before establishing a plan of care?
- What is a reasonable A1c for this patient?
- What recommendations do you have at this time?
Case 1 - Samuel

Follow-up blood glucose readings

<table>
<thead>
<tr>
<th>Date</th>
<th>Breakfast</th>
<th>Lunch</th>
<th>Dinner</th>
<th>Bedtime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>145</td>
<td>82</td>
<td>124</td>
<td>-</td>
</tr>
<tr>
<td>Day 2</td>
<td>138</td>
<td>78</td>
<td>130</td>
<td>182</td>
</tr>
<tr>
<td>Day 3</td>
<td>149</td>
<td>81</td>
<td>141</td>
<td>225</td>
</tr>
<tr>
<td>Day 4</td>
<td>132</td>
<td>90</td>
<td>160</td>
<td>190</td>
</tr>
<tr>
<td>Day 5</td>
<td>146</td>
<td>76</td>
<td>135</td>
<td>201</td>
</tr>
</tbody>
</table>

What actions are indicated at this time?

- Medication management
- Self-management education/support

Insulin Use – Community Dwelling Older Adults

- Consider individualization of treatment targets
- May do well with single-dose long-acting insulin
- Consider complexity of regimen
  - Complexity
  - Dexterity
  - Sensory
  - Cognition – may require assistance
- Evaluate support system and provide education on hypoglycemia risk and management
- Utilize teach back strategies when teaching insulin use
- Consider driving safety
- Primary care and community pharmacists are critical in delivery of education on hypoglycemia risk reduction and management
Case 2 - Judy

- 84-year-old woman with 10-year history of type 2 diabetes
- Past medical history – hypertension, TIA, heart failure, Stage 3 chronic kidney disease, arthritis
- Social history – lives alone in senior housing complex, retired school teacher, widowed, daughter lives in Colorado
- Activity - walks with a cane, history of a fall 6 months ago
- Insurance – Medicare Choice HMO and supplement; teacher’s pension and Social Security
- Admitted to hospital 7 days ago; planned home discharge today

Case 2 - Judy

- Current medications:
  - Discontinued glyburide in hospital; on in-patient insulin protocol
  - Furosemide 40 mg orally daily
  - Carvedilol 6.25 mg orally twice daily
  - Spironolactone 50 mg orally daily
  - Lisinopril 20 mg orally daily
  - Atorvastatin 20 mg daily
  - Acetaminophen prn pain
- Labs:
  - A1c – 7.2%
  - Total cholesterol – 149 mg/dL
  - LDL – 80 mg/dL
  - HDL – 47 mg/dL
  - Triglycerides – 100 mg/dL
  - BUN – 24 mg/dL
  - Creatinine – 1.6 mg/dL
  - Estimated GFR – 52 ml/min
Case 2 - Judy

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Case 2 - Judy

- What additional history/data is required before establishing a plan of care?

- What is a reasonable A1c for this patient?

- What recommendations do you have at this time?

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Case 2 - Judy

- Care transitions are times of heightened vulnerability for people with diabetes and older adults.

- Poor communication of discharge instructions prior to the hospital-to-home transition is associated with medication errors and adverse drug events, especially in the early stages of the home recovery.

- Clear instructions, particularly related to insulin management and hypoglycemia risk are essential.
Case 2 - Judy

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• Clear instructions, particularly related to insulin management, hypoglycemia, and home glucose monitoring are essential.

Case 2 - Judy

• Critical admission data include:
  • Diabetes history
  • Self-management behaviors and difficulties
  • Degree of glycemic control including prior history of hypoglycemia
  • Early assessment of cognition (ie: Mini-Cog)
  • Literacy/numeracy skills
  • Sensory deficits (vision loss and hearing impairment)
  • Dexterity
  • Ability to perform basic and instrumental ADLs
  • Living environment and supports
  • Financial resources
  • Cultural considerations
  • Usual diet (food acquisition, preparation, appetite, weight changes, swallowing/chewing issues, food security)
  • How and where medications are obtained and affordability of medication

Case 2 - Judy

• Critical elements of discharge preparation
  • Identification of health care provider after discharge; follow-up appointments and who will receive hospital reports
  • Planned discharge location; access to a caregiver
  • Level of understanding of diagnosis
  • Practice of self-monitoring/goals
  • Definition, recognition, and management of hyperglycemia and hypoglycemia
  • Meal planning
  • Safe use of each medication including relationship to meal plan; insulin administration and dosing – how to integrate medications for multiple diagnoses
  • Sick day management
  • Post-discharge support resources
Medication Management – Oral Agents

• Sulfonylureas
  • If used, must be done with caution due to high potential for iatrogenic hypoglycemia
  • Risk of hypoglycemia may be potentiated in combination therapy
  • Patients may request use due to prior history with the drug and cost-effectiveness
  • Many older adults have multiple sources where they obtain medications – full medication profile may be lacking
  • Primary care/diabetes care providers must provide in-office education on these medication with support provided by pharmacists
  • Glipizide (Glucotrol) preferred over glyburide
    • Glyburide is listed agent on Beers list

Available Standards:
• American Geriatrics Society Guidelines for Improving the Care of Older Adults with Diabetes – 2013
• ADA –Diabetes Standards of Medical Care in Diabetes – Older Adults (2018)
• ADA – Management of Diabetes in Long Term Care and Skilled Nursing Facilities (2016)
• American Medical Directors Association - Management of Diabetes in the Post-Acute and Long-Term Care Setting (2015)