Older adults with diabetes are a growing population with unique needs. Many older adults with diabetes have coexisting chronic medical conditions, such as cognitive dysfunction, depression, functional limitations, vision impairment, and hearing impairment. These conditions further put them at risk of falls, fractures, and functional dependency. Screening and early detection of these conditions is indicated to understand patient’s inability to perform self-care. Overall treatment strategies and selection of medications in older adults with diabetes should be guided by their self-care abilities. In general, older adults are at increased risk of hypoglycemia and its poor consequences. Medications with low risk of hypoglycemia should be preferred in this population. Glycemic goals should be individualized carefully based on disease characteristics, patient preference, and self-care abilities. Recent data has shown that, over treatment of diabetes in older adults is common and should be avoided. De-intensification of complex regimens can be successfully achieved in older adults, without compromising their glycemic goals. Simplification can improve benefits of diabetes management along with overall quality of life.

References

1. Kirkman MS, Briscoe VJ, Clark N, Florez H, Haas LB, Halter JB, Huang ES, Korytkowski MT, Munshi MN, Odegard PS, Pratley RE, Swift CS: Diabetes in Older Adults; 2012 Dec; 35(12); 2650-64; PMID 23100048
2. Older Adults: Standards of Medical Care in Diabetes-2018. Diabetes Care January; 41; (supplement 1); S119-125.
3. Pharmacological approaches to Glycemic Treatment: Standards of Medical Care in Diabetes-2018. Diabetes Care January 2018; 41;(supplement 1); S73-85.
**Diabetes in Older Adults: Evidence-based Strategies for Glycemic Treatment**

Medha Munshi, M.D.
Associate Professor, Harvard Medical School
Director, Joslin Geriatric Diabetes Program
Geriatrician, Beth Israel Deaconess Medical Center
Boston, Massachusetts

**Objectives**
**Glycemic Treatment in older adults**

- **Unique characteristics** of population
- Complexity associated with **glycemic goal-setting**
- **Effective strategies** for treatment

**Who is an older adult?**

**Homeostenosis**
Progressive constriction of homeostatic reserve

- Allows us to maintain homeostasis in presence of Environmental, physiological, or emotional stress
- Physiologic limit beyond which Homeostasis can not be restore

**Where do you treat an 80 years old patient?**

**Presenter Disclosure Information**

Presenter: Medha Munshi

Consultant /Advisory Panel: Sanofi
**Diabetes Management Challenges**

- Complex regimen can be dangerous if patient unable to follow them.
- Acute illness cause ↓ cognitive or physical status.
- Need frequent education and reeducation.
- May/may not have control over meal content.
- Assistance with medications but not BS monitoring or insulin.
- High risk of failure after acute illness.
- Little control over time/content of diet.
- Higher risk of side effects with oral medications.
- Higher risk of acute illness, anorexia, dementia/delirium.
- Self-care performed by NH staff.

**Memory loss: Mr. JB**

**Cognitive Dysfunction**

- Frontal lobe–mediated: higher function
  - Insight in to the problem
  - Planning and judgment
  - Problem-solving
  - Starting, changing, or stopping behavior

**Case History – Mr. D**

- 82 yo male
- Engineer—computer savvy
- DM duration 17 yrs
- Glargine BID and lispro before meals
- A1C 6.5%

**Error in Problem Solving**
Modified Clock-in-a-Box (CIB)

Please read and do the following carefully:
➢ In the blue box on the next page:
➢ Draw a picture of a clock
➢ Put in all the numbers
➢ Set the time to ten after eleven
Hand this sheet back and go to the next page

Response Form:

Difficultly With Problem-Solving

Mrs. MB

Mr. JW

Caregiver Support
Cognitive Dysfunction in Older Adults
With and Without DM

Health and retirement study (CDC).

Depression in Older Adults
With and Without DM

Health and retirement study (CDC).

Depressive Symptoms
Associated With ↑ Risk of Functional Disability

Health and retirement study (CDC).

Polypharmacy
Mrs. M: Age: 92 years, legally blind, 14 meds/day


Women Living Alone
Glycemic control worsens as medications taken increase

**Management of Diabetes in Older Adults**

- Screening for barriers
  - Clinical / functional / psychosocial
- Management of hyperglycemia
  - Medications
  - Diet
  - Exercise / physical activity
- Management of risk factors
  - BP control
  - LDL cholesterol
  - Cessation of cigarette smoking
  - Low-dose aspirin therapy
  - Yearly screening for microalbuminuria (ACE inhibitors), retinopathy, foot examination

**Glycemic Goal**
Optimize benefits – Minimize harm

**Is A1C dependable marker of glycemic control in older adults?**

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Possible mechanisms</th>
<th>Change in A1C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Unknown</td>
<td></td>
</tr>
<tr>
<td>Race – AA / Hispanic</td>
<td>unknown</td>
<td></td>
</tr>
<tr>
<td>Iron deficiency anemia</td>
<td>↓ RBC turnover</td>
<td></td>
</tr>
<tr>
<td>Recent infection</td>
<td>Insulin resistance</td>
<td></td>
</tr>
<tr>
<td>Transfusion</td>
<td>↑ RBC turnover</td>
<td></td>
</tr>
<tr>
<td>Hemodialysis</td>
<td>↓ RBC life span</td>
<td></td>
</tr>
<tr>
<td>Erythropoietin therapy</td>
<td>↑ young RBC</td>
<td></td>
</tr>
<tr>
<td>Metabolic acidosis / uremia</td>
<td>Carbamylation of hemoglobin</td>
<td></td>
</tr>
<tr>
<td>Anemia of chronic diseases</td>
<td>Unknown</td>
<td></td>
</tr>
</tbody>
</table>

**Hypoglycemia in older adults**

- Insulin therapy in older adults
- Cognitive dysfunction interfering with identification/treatment of hypoglycemia
- Co-morbidities mimicking hypoglycemic symptoms
- Hypoglycemia & Fear of hypoglycemia
- Noncompliance
- Falls, hospital visits
- Exacerbation of chronic conditions

Even mild hypoglycemia may result in poor outcome

**Frequent Hypoglycemic Episodes Detected by CGM**

- age>70 yrs; A1C>8%; n=40

<table>
<thead>
<tr>
<th>Hypoglycemia</th>
<th>Patients with hypoglycemia</th>
<th>n = 26 (65 %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypoglycemia</td>
<td>Patients with A1C 8-9 %</td>
<td>14 (54 %)</td>
</tr>
<tr>
<td></td>
<td>Patients with A1C &gt; 9 %</td>
<td>12 (46 %)</td>
</tr>
</tbody>
</table>

**Severity of hypoglycemic episodes**

- 60-69 mg/dl 100 %
- 50-59 mg/dl 73 %
- < 50 mg/dl 46 %

Munshi et al; Arch Intern Med. 2011;171(4):362-364
National Trends in US Hospital Admissions for Hyper/Hypoglycemia
Medicare Beneficiaries 1999-2011
Lipska et al; JAMA intern Med 2014; 174(7): 1116-24

A Framework for Goals
Consensus report (ADA)

<table>
<thead>
<tr>
<th>Patient characteristics</th>
<th>Rational</th>
<th>A1C</th>
<th>BP</th>
<th>Lipids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Few co-existing illnesses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Intact cognitive status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Intact functional status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complex/Intermediate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Multiple co-existing illnesses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Mild-moderate cognitive impairment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 2+ IADL dependency</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Complex/Poor Health</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- LTC care residents</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- End-stage chronic illnesses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Moderate-severe cognitive impairment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 2+ ADL dependencies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DM control across health status
A1C<7% across health status

Is it intuitive to liberate goals in older adults?
Potential Overtreatment in Older adults
NHANES: 2001-2010
Kirkman MS et al; Diabetes Care. 2012 Dec;35(12):2650-64
Lipska K et al; JAMA intern Med 2015;175;3;356-62

Use of serum c-peptide to simplify insulin regimen in older adults

- Normal/high serum C-peptide: 65/100
- Age: 79±14 yrs, DM duration: 21±13 yrs
- Number of medications: 11 (range 4-18)
- Simplification completed in 35 patients
  - In 19 patients, patients completely off insulin
  - In 16 patients number of insulin injections were decreased significantly
  - Number of hypoglycemic episodes decreased
  - A1c improved from 8% to 7.4% (p<0.002)
Munshi et al; American Journal of Medicine 2009;122:395-97
Higher contribution of post-prandial glucose in older adults


SIMPLE study de-intensification

- Age >70 yrs
- ≥ 1 insulin injection/day
- High stimulated C-peptide
- ≥ 1 episode of glucose <70

Primary outcome: Duration of hypoglycemia by CGM
Secondary outcome: A1C

Munshi et al, JAMA Intern Med 2016 July 5;166(7):1023-8

Algorithm for Insulin Regimen Simplification

Change or add long-acting insulin

Change meal-time insulin

Simplification of insulin regimen

Improved hypoglycemia without worsening glycemic control

Munshi et al, JAMA Intern Med 2016 July 5;166(7):1023-8
Table 3 A: Change in Hypoglycemia duration and A1C in groups with different A1C at baseline

<table>
<thead>
<tr>
<th>Baseline A1C</th>
<th>≤ 7%</th>
<th>7.1-8</th>
<th>8.1-9</th>
<th>&gt;9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time &lt; 70 mg/dL</td>
<td>203 ± 38</td>
<td>202 ± 40</td>
<td>200 ± 50</td>
<td>204 ± 30</td>
</tr>
<tr>
<td>Time &lt; 60 mg/dL</td>
<td>140 ± 25</td>
<td>159 ± 18</td>
<td>174 ± 10</td>
<td>180 ± 50</td>
</tr>
<tr>
<td>Change in HbA1C</td>
<td>0.37 ± 0.05</td>
<td>-0.03 ± 0.04</td>
<td>-0.06 ± 0.04</td>
<td>-0.10 ± 0.06</td>
</tr>
</tbody>
</table>

Table 3b: Duration of hypoglycemia by A1C levels at 5 months and 8 months

<table>
<thead>
<tr>
<th>5-month A1C</th>
<th>≤ 7%</th>
<th>7.1-8</th>
<th>8.1-9</th>
<th>&gt;9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time &lt; 70 mg/dL</td>
<td>103 ± 12</td>
<td>97 ± 20</td>
<td>103 ± 19</td>
<td>103 ± 20</td>
</tr>
<tr>
<td>Time &lt; 60 mg/dL</td>
<td>50 ± 5</td>
<td>57 ± 18</td>
<td>58 ± 20</td>
<td>59 ± 20</td>
</tr>
<tr>
<td>Change in HbA1C</td>
<td>0.34 ± 0.05</td>
<td>-0.03 ± 0.02</td>
<td>-0.09 ± 0.04</td>
<td>-0.10 ± 0.06</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8-month A1C</th>
<th>≤ 7%</th>
<th>7.1-8</th>
<th>8.1-9</th>
<th>&gt;9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time &lt; 70 mg/dL</td>
<td>34 ± 13</td>
<td>67 ± 16</td>
<td>65 ± 50</td>
<td>66 ± 75</td>
</tr>
<tr>
<td>Time &lt; 60 mg/dL</td>
<td>21 ± 21</td>
<td>27 ± 33</td>
<td>30 ± 26</td>
<td>31 ± 72</td>
</tr>
<tr>
<td>Change in HbA1C</td>
<td>0.37 ± 0.05</td>
<td>-0.04 ± 0.03</td>
<td>-0.10 ± 0.06</td>
<td>-0.10 ± 0.06</td>
</tr>
</tbody>
</table>

Table 3c: Change in Hypoglycemia duration and A1C in groups with different A1C at baseline

<table>
<thead>
<tr>
<th>Baseline A1C</th>
<th>≤ 7%</th>
<th>7.1-8</th>
<th>8.1-9</th>
<th>&gt;9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time &lt; 70 mg/dL</td>
<td>203 ± 38</td>
<td>202 ± 40</td>
<td>200 ± 50</td>
<td>204 ± 30</td>
</tr>
<tr>
<td>Time &lt; 60 mg/dL</td>
<td>140 ± 25</td>
<td>159 ± 18</td>
<td>174 ± 10</td>
<td>180 ± 50</td>
</tr>
<tr>
<td>Change in HbA1C</td>
<td>0.37 ± 0.05</td>
<td>-0.03 ± 0.04</td>
<td>-0.06 ± 0.04</td>
<td>-0.10 ± 0.06</td>
</tr>
</tbody>
</table>

Table 3d: Duration of hypoglycemia by A1C levels at 5 months and 8 months

<table>
<thead>
<tr>
<th>5-month A1C</th>
<th>≤ 7%</th>
<th>7.1-8</th>
<th>8.1-9</th>
<th>&gt;9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time &lt; 70 mg/dL</td>
<td>103 ± 12</td>
<td>97 ± 20</td>
<td>103 ± 19</td>
<td>103 ± 20</td>
</tr>
<tr>
<td>Time &lt; 60 mg/dL</td>
<td>50 ± 5</td>
<td>57 ± 18</td>
<td>58 ± 20</td>
<td>59 ± 20</td>
</tr>
<tr>
<td>Change in HbA1C</td>
<td>0.34 ± 0.05</td>
<td>-0.03 ± 0.02</td>
<td>-0.09 ± 0.04</td>
<td>-0.10 ± 0.06</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8-month A1C</th>
<th>≤ 7%</th>
<th>7.1-8</th>
<th>8.1-9</th>
<th>&gt;9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time &lt; 70 mg/dL</td>
<td>34 ± 13</td>
<td>67 ± 16</td>
<td>65 ± 50</td>
<td>66 ± 75</td>
</tr>
<tr>
<td>Time &lt; 60 mg/dL</td>
<td>21 ± 21</td>
<td>27 ± 33</td>
<td>30 ± 26</td>
<td>31 ± 72</td>
</tr>
<tr>
<td>Change in HbA1C</td>
<td>0.37 ± 0.05</td>
<td>-0.04 ± 0.03</td>
<td>-0.10 ± 0.06</td>
<td>-0.10 ± 0.06</td>
</tr>
</tbody>
</table>

Munshi MN et al, JDiab and its Compl, July, 2017, Vol 31; 7; 1197-99cc

Summary

Older vs Younger

- Unique characteristics of the population
  - Older adults are a heterogeneous population
  - Aging is associated with Homeostenosis and presence of comorbidities

- Complexity of the goal-setting
  - Avoid dependence on A1C as the sole parameter
  - Risk to hypoglycemia should be carefully assessed

- Effective strategies for treatment
  - Avoid overtreatment
  - De-intensify and match patient’s coping abilities with treatment complexity

Aging Successfully

Wisdom to know when not to mess with it!