DSME/S for Older Adults with Cognitive Decline

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Linda Gottfredson, PhD
AADE 16
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The U.S. population is getting older.....

Older adults are more likely to have diabetes

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Wilmington, DE

• AADE Public Health Community of Interest Co-Leader
• Co-Author of AADE Practice Advisory “Special Considerations in the Management and Education of Older Persons with Diabetes”
• NDEP Practice Transformation Task Group

Linda Gottfredson, PhD
Professor Emeritus
University of Delaware, School of Education

Co-Author of AADE Practice Advisory “Special Considerations in the Management and Education of Older Persons with Diabetes”

...and older
Newly diagnosed cases of DM in persons =>65 years of age

<table>
<thead>
<tr>
<th>Number of new diabetes cases</th>
<th>Rate of new diabetes cases per 1,000 persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1,920,000</td>
</tr>
<tr>
<td>65-69 years</td>
<td>0.6</td>
</tr>
<tr>
<td>70-74 years</td>
<td>1.6</td>
</tr>
<tr>
<td>75-79 years</td>
<td>3.0</td>
</tr>
<tr>
<td>80 years and over</td>
<td>5.1</td>
</tr>
</tbody>
</table>

Forecast for 2025:
50% increase in diabetes prevalence and costs among seniors

Types of Age-related Cognitive Impairment

Cognitive impairment is a continuum of changes:
- normal
- mild
- major

Older adults with diabetes:
- Are 2 times more likely to develop dementia than older adults without diabetes
- 1 in 5 has vision problems

Persons aged 65-85+ with functional impairments (self-reported)
Spectrum of Cognitive Changes

- Asymptomatic
- Normal Cognitive Aging
- Subjective Cognitive Aging
- Mild Neurocognitive Disorder
- Major Neurocognitive Disorder

Cognitive Functions that are Vulnerable to the Effects of Aging

- Processing Speed
- Long Term Memory
- General control processes (executive functions)
- Inhibitory Control
- Sensory Perception
- Working Memory

Mild Neurocognitive Disorder

- Significant, but less severe cognitive deficit
- Need to develop compensatory behaviors that limit the impact of cognitive decline
- May need more accommodation to maintain day-to-day function
- Interference with daily activities may not be noticeable, but higher-level cognition is likely affected

Major Neurocognitive Disorder (aka Dementia)

- A significant cognitive decline from a previous level of performance in one or more cognitive domains
- The cognitive deficits interfere with independence of everyday activities (i.e., IADLs)
- This is not delirium or another mental disorder

MCI: Definition and Subtypes

Example of Mild Cognitive Complaints

- A 64 yo overworked accountant is behind in his work and overwhelmed. He worries that his memory is failing and that he can’t keep up with his responsibilities.
- He’s using lists and GPS more and more. He came close to missing an important appointment, but was reminded of it, at the last minute.
- Assessment: normal MRI, but low scores in executive functioning and memory.
Example of Mild Cognitive Complaints

• A 68 yo attorney is forgetting appointments and relying more on her GPS.
• Her car, in neutral, rolled out of the driveway and hit a car.
• She paid a large bill twice and never recorded it in her checkbook.
• Assessment: apparent mild decline in memory storage and executive function.

Normal age-related cognitive decline
A finer-grained look

Executive function—the brain’s “command & control” system

It refers to mental processes that enable us to:
• plan
• focus attention
• remember instructions
• juggle multiple tasks successfully

These mental processes include:
• Working Memory (how much information the mind can hold & work on at the same time)
• Attention (keep focusing on what is relevant)
• Inhibition (suppress irrelevant & impulsive thoughts)

The brain uses these processes to:
• filter distractions
• prioritize tasks
• set and achieve goals
• control impulses

It is like:
• an air traffic control system at a busy airport, which safely manages the arrivals and departures of many aircraft on multiple runways.
Example: Your patient is an elderly professor starting a new meter and/or insulin device. He may be highly literate and well-read (crystallized intelligence), but that does not guarantee he grasped your instructions for how and when to use the new device (fluid intelligence).

Cognitive dysfunction in patients with diabetes mellitus was first noted in 1922.

Patients with diabetes, who were “free from acidosis but usually not sugar free,” were found to have impaired memory and attention when compared with controls.

Recent evidence for cognitive changes in PWDs

ACCORD-MIND

“...neither intensive glycemic control nor blood pressure control...was shown to prevent a decline in brain function”

Swedish National Diabetes Registry

In DM2 patients, an A1c in excess of 10% substantially increased the rate of dementia. No dementia risk at A1c < 6.7% but it increased substantially thereafter.

Cognitive Impairment and Diabetes
Cognitive Dysfunction

Alzheimer’s and multi-infarct dementia are approximately twice as likely to occur in those with diabetes compared with age-matched nondiabetic control subjects. The presentation of cognitive dysfunction can vary from subtle executive dysfunction to overt dementia and memory loss.

Such dysfunction makes it difficult for patients to perform complex self-care tasks such as glucose monitoring, changing insulin doses, or appropriately maintaining timing and content of diet. In elderly patients with cognitive dysfunction, regimens should be simplified, caregivers involved, and the occurrence of hypoglycemia carefully assessed.

“Hypoglycemia is linked to cognitive dysfunction in a bidirectional fashion”

- Cognitive impairment increases the subsequent risk of hypoglycemia
- A history of severe hypoglycemia is linked to the incidence of dementia
Cognitive Functions that are Vulnerable to the Effects of Aging

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Many studies have shown that, in patients with T1DM, the following are affected:
- Information processing
- Attention
- Visuoconstruction
- Mental flexibility
- Psychomotor efficiency

Neuropsychological studies consistently report modest cognitive decrements in patients with T2DM, even in people without dementia.

....This is reflected in worse performance on measures of:
- Information processing speed
- Attention
- Executive functioning
- Verbal memory

Questions about patients with diabetes and glucose intolerance:
- What causes the decline in cognitive function?
- What can be done to prevent future dementia in patients?
- What is the impact of glycemic control on cognitive function?
- Can good glucose control suppress cognitive impairment and prevent progression to dementia?

The pathophysiology underlying the development of cognitive dysfunction in patients with diabetes has not been completely elucidated.

Evidence supports possible causative roles for
- hyperglycemia
- vascular disease
- hypoglycemia
- insulin resistance
- amyloid deposition

...the cause of cognitive dysfunction in patients with diabetes may turn out to be a combination of these factors....
Cognitive impairment in diabetic patients: Can diabetic control prevent cognitive decline?

Takahiko Kawamura 1,2,*
Toshitaka Umemura 3
Nigishi Hotta 1

Journal of Diabetes Investigation
Volume 3, Issue 5, pages 413–423, October 2012

DSM is a cognitively demanding “job”

DSM from patient’s perspective
Risk of cognitive overload!
Especially when cognitive resources are weak or declining

Get little training or supervision

Will need to apply DSME on their own

DSM from patient's perspective
DSME

DSM is complex job

Risk of cognitive overload!
Especially when cognitive resources are weak or declining

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Will need to apply DSME on their own
Patient Responsibilities for Effective DSM

Objective: Keep blood glucose within safe limits

- Learn about diabetes in general (ongoing)
  - Physiological process
  - Interdependence of diet, exercise, meds
  - Symptoms & corrective action
- Apply knowledge to own case (Daily, Hourly)
  - Implement appropriate regimen
  - Continuously monitor physical signs
  - Prognosis revisited in timely manner
  - Adjust food, exercise, meds in timely and appropriate manner
- Coordinate with relevant parties (Frequently)
  - Nutritional changes in activities with family, friends, job
  - Adaptation to social support
  - Communicate status and needs to practitioners
- Update knowledge & adjust regimen (Occasionally)
  - When other chronic conditions or disabilities develop
  - When new treatments are ordered
  - When life circumstances change
- Conditions of work—24/7, no days off, no retirement

Successful DSM requires good cognitive abilities

- Preventing/minimizing excursions is cognitive process
- 24/7 job for patient

What do the large national surveys of adult functional literacy reveal about:

- the cognitive demands of different DSM tasks
- older adults’ ability to master them

Typical literacy items, by difficulty level

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<th>Daily self-maintenance in modern literate societies</th>
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<tr>
<td>1 1 1 1 1 1 1 1 1</td>
<td>Use calculator to determine cost of a room</td>
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</tr>
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<td>1 1 1 1 1 1 1 1 1</td>
<td>Locate intersection on street map</td>
</tr>
<tr>
<td>1 1 1 1 1 1 1 1 1</td>
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</tr>
<tr>
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<td>Locate expiration date on driver’s license</td>
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P WDs must prevent glycemic excursions and maintain optimal blood glucose control.

Successful DSM requires good cognitive abilities

- IT IS NOT mechanically following a recipe
- IT IS keeping a complex metabolic system under control in often unpredictable circumstances (like an accident prevention process)
  - Coordinate a regimen having multiple interacting elements
  - Adjust parts as needed to maintain good control of system buffered by many other factors
  - Anticipate lag time between (action) and system response
  - Monitor advanced “hidden” indicators (blood glucose) to prevent system veering badly out of control
  - Decide appropriate type and timing of corrective action if system veering off-track
  - Monitor/control other shocks to system (infection, emotional stress)
  - Coordinate regimen with other daily activities
  - Plan ahead (meds, meds, etc.)
  - Prioritize conflicting demands on time and behavior

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To summarize:

Most older adults have very weak learning skills. Their brain’s “command & control” centers not working well. So they need lots of cognitive help.

Case Studies

- Complexity of DSM from the patient’s perspective
- Cognitive errors

Challenges of DSM

- Diabetes self-management is inherently complex
- Relentless, evolving cognitive demands
- Frequent cognitive overload
- High risk errors = noncompliance

Effective DSME/S

Recognize the Cognitive Burdens of DSM

Provide DSME/S to reduce those burdens

Physical health

Cognitive ability

- Neuropathy
- Vision & hearing problems
- Balance problems
- Polypharmacy

- Memory loss
- Dementia
- Decreased processing speed
- Slower learning

Complexity of DSM Tasks

Cognitive errors increase with age
Substituting is more complex than adding or subtracting something.
These tasks were low complexity.
Cognitive complexity was minimal.
But
The tasks were difficult for these patients,
because their cognitive abilities were declining.

All older adults’ have more difficulty learning because:
The aging brain doesn’t work as fast or efficiently as before,
for example:

- Slower processing speed
- Weaker working memory

Neuropsychological studies consistently report
modest cognitive decrements in patients with T2DM,
even in people without dementia.

...This is reflected in worse performance on measures of:

- Information processing speed
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To summarize:
Most older adults have very weak learning skills. Their brain’s "command & control" centers not working well. So they need lots of cognitive help.

% with low or very low functional literacy*

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<td>70%</td>
</tr>
<tr>
<td>70-79</td>
<td>80%</td>
</tr>
<tr>
<td>80 and Older</td>
<td>90%</td>
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How can DSME/S address these cognitive changes?

- Target the most critical tasks
- Identify their cognitive demands

DSME/S must assure the cognitive accessibility of information & materials.

Even if the DSM "job" did not get more complex, cognitive decline makes it more difficult.

Educational strategy

1. Identify cognitive hurdles
   - Identify what makes the task(s) cognitively complex
   - Anticipate common errors
   - Identify which errors are most critical

2. Wherever possible, lower task complexity
   - Focus on essentials
   - Then simplify

3. Tailor DSME to patient’s literacy level to avoid cognitive overload
   - Narrow the task domain (triage) when necessary
   - Provide more "scaffolding" for learning
   - Increase supervision (monitoring, feedback)

To summarize:

- Many of your patients/clients will:
  - Have complex medical problems,
  - Experience heavy burdens in self-care,
  - But have fewer physical and cognitive reserves for effective self-care.

- Patients’ physical and cognitive health trajectories will differ widely.
Complexity & aging

“Okay your father managed to get a mouse. Now how do we use it?”

Questions

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gottfred@udel.edu