Mild Cognitive Impairment in Heart Failure Affects Care Transition

Kitsum Li
Department of Occupational Therapy, Dominican University of California, kitsum.li@dominican.edu

Kristin Myers
Mill-Peninsula Health Services

Survey: Let us know how this paper benefits you.
Follow this and additional works at: https://scholar.dominican.edu/all-faculty
Part of the Occupational Therapy Commons
Mild Cognitive Impairment in Heart Failure affects Care Transition

Kitsum Li, OTD, OTR/L, CSRS
Mills-Peninsula Heath Services,
Assistant Professor, Dominican University of California

Kristin Myers, OT/L
Mills-Peninsula Health Services
Objectives

After attending the presentation, the audiences will be able to:

- Understand the importance of cognition in everyday activity and the cognitive hierarchy to guide practice.
- Recognize the incidence of mild cognitive impairment in individuals with heart failure.
- Understand how mild cognitive impairment may affect heart failure self-care practice and hospitalization readmission.
- Identify the evidence that support use of cognitive screen to identify mild cognitive impairment in individuals with heart failure.
- Compare the evidence among three cognitive screens (Mini-mental Status Exam, Montreal Cognitive Assessment and St. Louis University Mental State Exam).
- (Using Montreal Cognitive Assessment as an example) Identify cognitive components assessed in a cognitive screening tool.
- Individualize care transition program that target individual’s cognitive impairments and address individual’s learning needs.
Cognition in Everyday Activity

Cognition.... is the outcome of an ongoing dynamic interaction between the person, an activity and the environment (Toglia)

Pedretti 6th edition, p. 591
Definitions of Cognition

- A person’s capacity to acquire and use information to adapt to environmental demands.
- All of the mental activities involved in receiving information, comprehending it, storing it, retrieving it, and using it.

Pedretti 7th edition, p. 591
Primary Cognitive Functions

- Metacognition
- Executive Function
- Organization
- Memory
- Orientation, Attention, Sensory Processing, Perception
- Arousal

Basic Cognition

Higher Level Cognition
What is Mild Cognitive Impairment (MCI)?

Four criteria:

- An individual’s report of his/her own memory problems
- Measurable, greater-than-normal memory impairment detected with standard memory assessment tests
- Normal general think and reasoning skills
- Ability to perform normal daily activities

American Academy of Neurology, 2001
Normal Aging vs Mild Cognitive Impairment (MCI)

- Subjective memory complaints
- Difficulties recalling detailed events
- Problems with name retrieval
- Delayed processing

- Mild but persistent memory loss
- Word finding difficulties
- Subtle cognitive deficits such as visual spatial, attention

Currie, Rideout, Lindsay & Harkness, 2014; Davis et al., 2015; Harkness et al., 2014
Assessing for MCI?

- Mini Mental State Exam (MMSE)
- St. Louis University Mental Status Exam (SLUMS)
- Montreal Cognitive Assessment (MoCA)
- Cognitive Status Examination (Cognistat) Five©
MMSE (Folstein test)

- Drs. Folstein and McHugh in 1975
- 11 questions to assess six cognitive domains: Orientation, Registration, Attention and Calculation, Recall, Language, and visual construction
- About <10 minutes to complete
- Validated and extensively used in clinical practice and research (many neurological diagnosis)
- Maximum 30 points, 18-23 indicative of mild cognitive impairment
- Ceiling effect?
- Copyright sold to PAR since 2001
The Mini-Mental State Exam

Patient ____________________ Examiner ____________________ Date __________

Maximum Score

5 ( ) Orientation
   What is the (year) (season) (date) (day) (month)?
   Where are we (state) (country) (town) (hospital) (floor)?

5 ( ) Registration
   Name 3 objects; 1 second to say each. Then ask the patient
   all 3 after you have said them. Give 1 point for each correct answer.
   Then repeat them until he/she learns all 3. Count trials and record.
   Trials __________

3 ( ) Attention and Calculation
   Serial 7’s. 1 point for each correct answer. Stop after 5 answers.
   Alternatively spell “world” backward.

3 ( ) Recall
   Ask for the 3 objects repeated above. Give 1 point for each correct answer.

Language

2 ( ) Name a pencil and watch.
1 ( ) Repeat the following “No ifs, ands, or buts”
3 ( ) Follow a 3-stage command:
   “Take a paper in your hand, fold it in half, and put it on the floor.”
1 ( ) Read and obey the following: CLOSE YOUR EYES
1 ( ) Write a sentence.
1 ( ) Copy the design shown.

Total Score

---

ASSESS level of consciousness along a continuum _________
Alert  Drowsy  Stupor  Coma

"MINI-MENTAL STATE," A PRACTICAL METHOD FOR GRADING THE COGNITIVE STATE OF PATIENTS FOR THE CLINICIAN.
St. Louis University Mental Status Exam (SLUMS)

- 11 questions to assess orientation, memory, attention and executive function
- Takes about 7-10 minutes to complete
- Maximum 30 points
- Based on education level, 21-26 = MCI (High School or above) OR 20-24 = MCI (less than High School Education)
- Validated for elderly veterans and community-dwelling elders
1. What day of the week is it?
2. What is the year?
3. What state are we in?
4. Please remember these five objects. I will ask you what they are later.
   Apple Pen Tie House Car
5. You have $100 and you go to the store and buy a dozen apples for $3 and a tricycle for $20.
   How much did you spend?
   How much do you have left?
6. Please name as many animals as you can in one minute.
   0 0-4 animals 1 5-9 animals 2 10-14 animals 3 15+ animals
7. What were the five objects I asked you to remember? 1 point for each one correct.
8. I am going to give you a series of numbers and I would like you to give them to me backwards. For example, if I say 42, you would say 24.
   0 87 1 648 1 8537
9. This is a clock face. Please put in the hour markers and the time at ten minutes to eleven o’clock.
   Hour markers okay
   Time correct
10. Please place an X in the triangle.
   Which of the above figures is largest?
11. I am going to tell you a story. Please listen carefully because afterwards, I’m going to ask you some questions about it.
   Jill was a very successful stockbroker. She made a lot of money on the stock market. She then met Jack, a devastatingly handsome man. She married him and had three children. They lived in Chicago. She then stopped work and stayed at home to bring up her children. When they were teenagers, she went back to work. She and Jack lived happily ever after.
   What was the female’s name?
   When did she go back to work?
   What work did she do?
   What state did she live in?
Cognistat Five®

- Less than 5 minutes
- Screen for Delirium, MCI and Dementia
- 4 areas: Memory registration, orientation, memory recall and construction
- Spatial, Amnestic, Mixed or Unspecified MCI
Cognitstat Five
Severn MCI index

Index zero = no indication of cognitive impairment
Index 1 = Risk of MCI
Index 2 = Suspected MCI
Index 3 = MCI
Index 4 = Risk of Dementia
Index 5 = Suspected Dementia
Index 6 = Dementia
Montreal Cognitive Assessment (MoCA)

- 16 items to assess seven cognitive domains: visuo-spatial, executive functions, naming, memory, attention, language, abstraction, and orientation
- 10 minutes to complete
- Maximum score of 30
- 18-25 = MCI (after adjustment for Education)
- No ceiling or floor effect
- Widely validated to a variety of conditions (including medical conditions)
Montreal Cognitive Assessment
MONTREAL COGNITIVE ASSESSMENT (MOCA®)
Version 7.2 Alternative Version

VISUOSPATIAL / EXECUTIVE

[ ] Copy rectangle

[ ] Draw CLOCK (Five past four) (3 points)

[ ] Contour [ ] Numbers [ ] Hands

NAMING

[ ] [ ] [ ] [ ] [ ]

MEMORY

Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.

TRUCK [ ] BANANA [ ] VIOLIN [ ] DESK [ ] GREEN [ ]

1st trial [ ] 3 2 9 6 5 2
2nd trial [ ] 8 5 2

ATTENTION

Read list of digits (1 digit/sec.). Subject has to repeat them in the forward order. Subject has to repeat them in the backward order.

Serial 7 subtraction starting at 90

[ ] [ ] [ ] [ ] [ ]

[ ] 83 [ ] 76 [ ] 69 [ ] 62 [ ] 55
4 or 5 correct subtractions: 3 pts, 2 or 3 correct: 2 pts, 1 correct: 1 pt, incorrect: 0 pt

LANGUAGE

Fluency / Name maximum number of words in one minute that begin with the letter S

ABSTRACTION

Similarity between e.g. carrot - potato - vegetable: [ ] diamond - ruby [ ] cannon - rifle

DELAYED RECALL

Has to recall words WITH NO CUE

TRUCK [ ] BANANA [ ] VIOLIN [ ] DESK [ ] GREEN [ ]

Optional

ORIENTATION

[ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City

TOTAL

---/30

Adapted by: Z. Nasreddine MD, N. Phillips PhD, H. Chertkow MD
© Z.Nasreddine MD www.mocatest.org

Administered by: ____________________________

NAME: ____________________________

Education: ____________________________

Sex: ____________________________

Date of birth: ____________________________

DATE: ____________________________

POINTS

---/5

---/3

---/2

---/2

---/1

---/1

---/5

---/6

Add 1 point if 12 yr educ
## Montreal Cognitive Assessment / MoCA-Blind

**Version 7.1 Original Version**

<table>
<thead>
<tr>
<th>Memory</th>
<th>1st trial</th>
<th>2nd trial</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read list of words, subject must repeat them. Do 2 trials even if 1st trial is successful. Do a recall after 5 minutes.</td>
<td></td>
<td></td>
<td>No points</td>
</tr>
</tbody>
</table>

### Attention

- Read list of digits (1 digit/sec.) Subject has to repeat them in the forward order: 2 1 8 5 4
- Subject has to repeat them in the backward order: 7 4 2

### Language

- Serial 7 subtraction starting at 100:
  - 93, 86, 79, 72, 65
  - 4 or 5 correct subtractions: 3 pts, 2 or 3 correct: 2 pts, 1 correct: 1 pt, 0 correct: 0 pt

### Fluency / Name maximum number of words in one minute that begin with the letter F.

- Repeat: I only know that John is the one to help today.
- The cat always hid under the couch when dogs were in the room.

### Abstraction

- Similarity between e.g. banana - orange = fruit
- Category cue
- Multiple choice cue

### Delayed Recall

- With no cue
  - FACE [ ]
  - VELVET [ ]
  - CHURCH [ ]
  - DAISY [ ]
  - RED [ ]

### Orientation

- Date [ ]
- Month [ ]
- Year [ ]
- Day [ ]
- Place [ ]
- City [ ]

### Total

© Z. Nasreddine MD 2012 - mocatest.org

Normal ≥ 18 / 22

Add 1 point if ≤ 12 yr edu

---

Name: ________________________________

Education: ____________________________

Sex: _________________________________

Date of birth: ________________________

Date: ________________________________

---

**Points for UNCLUED recall only**: __/ 6
What does the score mean?

- Diagnostic
  - Not within OT scope of practice
- A snap shot
  - Static
  - Multi-factorial: intrinsic vs extrinsic
- Guide intervention
  - How?
- “Dissecting” the assessment
  - Short term memory, working memory, semantic memory, executive function, visuo-spatial, attention, language fluency & processing, abstraction
Incidence of MCI in Heart Failure (HF)

• **28%-60%** in individual with HF (Bauer, Johnson & Pozehl, 2011; Cameron, Warroll-Carter, Page, Stewart & Ski, 2012; Kaur, Sidhu, Sibia & Kaur, 2014; Lee et al., 2013)

• Increase with age
  • **19% <75, 22% 75-84, 29% >85** (Lopez et al., 2003)

• **2x** more likely to have MCI (1.62-1.96) than general population 65 years and older (Cameron et al., 2010; Clark & McDougall, 2006; Vogels, Scheltens, Schroeder-Tanka & Weinstein, 2007)
Why?

- Microembolism
- Chronic or intermittent cerebral hypoperfusion
- Impaired cerebral vessel reactivity
- Cerebral hypoxia or ischemic brain damage

Dardiotis et al., 2012
Irreversible!

- Attention
- Memory (delay recall or working memory deficit)
- Executive functions
- Psychomotor speed

Bauer et al., 2011; Dickson, Tkacs, & Riegel, 2007; Dardiotis et al., 2012; Harkness et al., 2013; Levin et al., 2014
Consequence of unrecognized MCI in patients with Heart Failure

- High readmission rates
- Poor compliance with cardiac therapy
- Poor compliance with heart failure self-care management
  - Poor compliance with medication management
  - Poor compliance with diet restrictions
  - Failure to recognize early symptoms of heart failure deterioration.

Currie et al., 2014; Desai & Stevenson, 2012; Dickson et al., 2007; Hajduk et al., 2013; Harkness et al., 2013; Kerzman, Baron-Epel, & Toren, 2005; Wu et al., 2008
Why is MCI not being recognized?

- Variations in reporting if cognitive impairment detected or not detected
  - Patient is alert and oriented x 4
  - Patient is able to walk the walk and talk the talk
- MCI is subtle and not easily detected.
- MCI is often overlooked in heart failure patients because MCI can be subtle.

Bauer et al., 2011; Lee et al., 2013
How does MCI impact care transitions

- Affects what services are recommended for patient when MCI not being recognized
- Does this person benefit from home OT evaluation for home safety?
- Would this patient benefit from Circle of Care or AIM referral?
- Does this person require further follow up appointments with outpatient services such as a neuropsychologist?
How does MCI impact Care Transitions (Continued)

- Affects education provided to patient at the time of discharge:
  - Does this patient require the presence of a caregiver/family to receive discharge instruction?
  - Does this patient require literature and written handouts for heart failure self-care program?
  - What mode or alternate teaching methods would benefit the heart failure patient with MCI?

Barnason, Zimmeran, Hertzog & Schulz, 2010; Davis et al., 2012; Scott, 2010; White et al, 2013; Wu et al, 2008; Zavertnik 2014
EVIDENCE REVIEW
Evidence in Cognitive Screening Tools

- Multiple Cognitive Screening Tools available to detect/recognize Mild Cognitive Impairment
  - MMSE: Mini Mental State Exam
  - MoCA: Montreal Cognitive Assessment
  - Cognistat: Cognistat Assessment Section
  - SLUMS: Saint Louis University Mental Status Exam
Evidence in Cognitive Screening Tools (continued)

- Predictive Validity of NYHA and ACC/AHA Classifications of Physical and Cognitive Functioning in Heart Failure
- 90 participants, mean age of 62 and predominantly men
  - Found the predictive validity of NYHA and ACC/AHA stages of HF was supported by relations with cognitive screening scores of the MoCA.

Athillingam, D’aoust, Zambroski, Mcmillan, & Sahebzemani, 2013
MMSE or MoCA?

**MMSE**
- Most widely used screening measures in assessing cognitive impairments
- High level of sensitivity in moderate to severe cognitive impairment.

**MoCA**
- Developed to specifically screen MCI
- Has a higher sensitivity at detecting MCI
- Uses more words in assessing memory
- Longer delay before testing memory recall

Aggarwal & Kean, 2010; Athilingam et al., 2010
What does the evidence tell us?

**MoCA**
- Cameron et al article- in sample of CHF patients, cognitive impairments that would otherwise have been unrecognized were found in 73% of the sample - MoCA identified 38 patients that were not identified on MMSE

**MMSE**
- Widely used as a frontline screening but accuracy in detecting MCI is limited
- More than 80% of participants with scores suggestive of MCI on MoCA was not observed on MMSE.

Cameron et al., 2012
Differences in the frequency of observed task errors between Mini Mental State Exam (MMSE) and Montreal Cognitive Assessment (MoCA) in patients with low cognitive scores suggestive of mild Cognitive impairment ($n=68$)

Cameron, et al., 2012
MoCA and cut-off point

- Suggested cut off score greater than or equal to 26 shows no cognitive deficits
  - Mild Cognitive Impairment 18-25
  - Moderate Cognitive Impairment 10-17
  - Severe Cognitive Impairment below 9

Nasreddine et al., 2005
### MOCA SCORES

<table>
<thead>
<tr>
<th></th>
<th>Normal Controls (NC)</th>
<th>Mild Cognitive Impairment (MCI)</th>
<th>Alzheimer’s Disease (AD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of subjects</strong></td>
<td>90</td>
<td>94</td>
<td>93</td>
</tr>
<tr>
<td><strong>MoCA average score</strong></td>
<td>27.4</td>
<td>22.1</td>
<td>16.2</td>
</tr>
<tr>
<td><strong>MoCA standard deviation</strong></td>
<td>2.2</td>
<td>3.1</td>
<td>4.8</td>
</tr>
<tr>
<td><strong>MoCA score range</strong></td>
<td>25.2 - 29.6</td>
<td>19.0 - 25.2</td>
<td>21.0 - 11.4</td>
</tr>
<tr>
<td><strong>Suggested cut-off score</strong></td>
<td>≥26</td>
<td>&lt;26</td>
<td>&lt;26ψ</td>
</tr>
</tbody>
</table>

Although the average MoCA score for the AD group is much lower than the MCI group, there is overlap between them. The suggested MoCA cut-off score is thus the same for both. The distinction between AD and MCI is mostly dependent on the presence of associated functional impairment and not on a specific score on the MoCA test.

### Sensitivity and Specificity (%) MoCA and MMSE

<table>
<thead>
<tr>
<th>Cut-off</th>
<th>Normal controls (90)</th>
<th>Mild Cognitive Impairment (94)</th>
<th>Alzheimer Disease (93)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MoCA</strong></td>
<td>87</td>
<td>90</td>
<td>100</td>
</tr>
<tr>
<td><strong>MMSE</strong></td>
<td>100</td>
<td>18</td>
<td>78</td>
</tr>
</tbody>
</table>

Nasreddine et al., 2005
MoCA cut-off point for Heart Failure patients

- MoCA <26 Sensitivity 83% Specificity 30% for heart failure self care deficit
- MoCA <24 Sensitivity 83% Specificity 52% for heart failure self care deficit

MoCA <22 Sensitivity 89% Specificity 84% for MCI

McLennan, Mathias, Brennan & Stewart, 2011

Lee et. al., 2008
Deficits in cognitive domains

- Delayed recall (Amnestic MCI)
- Visuo-spatial/executive function (Constructive MCI)
- Abstraction

Gallagher et al., 2013
Evidence-based Project

Sutter Health
Mills-Peninsula Health Services
We Plus You
Current practice in acute setting

- **Problem:** Patient care transition can be affected when mild cognitive impairment is not being recognized during hospital stay

- **Current Practice:** No standardized cognitive assessment to detect mild cognitive impairment
PICO Question

Will occupational therapy completing a brief cognitive screen, increase recognition of Mild Cognitive Impairment in Heart Failure patient population in order to improve care transitions?
Patients with HF may have subtle, mild cognitive impairment (MCI). MCI is not being assessed in a standardized manner. Occupational Therapy (OT) assesses for MCI as a standard practice. Teaching during discharge and referral for post-discharge care is an important aspect of care transition.
Suggested Care Transitions

- Use of color flip chart with very concrete suggestion when to call for Medical advice
  - HF self-care behavior and daily weights improved significantly ($p=.01$ and .03)
- Individualized + follow-up telephone calls
  - Over 2-3 sessions
  - Printed materials at 6th grade level
  - Individualized educational and counseling sessions
  - Involvement of family/caregiver

Caldwell, Peters & Dracup, 2005
Dunbar, 2015; Krumholz et.al., 2002
Next Steps in Documentation

- Patient Education Section
  - Types of education
    - Teach back
    - Visual
      - Highlight
      - Demonstration
    - Literature
      - Bauer et al., 2011; Lambrinou, Protopapas, & Kalogirou, 2014
      - White, Garbez, Carroll, Brinker, & Howie-Esquivel, 2013
      - Vreeland, Rea, & Montgomery, 2011; Wu et al, 2008
Next Steps in Documentation (continued)

- 3 KEY POINTS to education
  - Literature has found that patient education provided with 3 key points is most efficient
- Slow down in teaching
- Short teachings over consecutive days
- Involve Family and Caregivers

Davis et al., 2012; Davis et al., 2015; Lambrinou et al., 2014; Shen et al., 2006; McBride & Andrews, 2013; Zavertnik, 2014
Example of documentation using MoCA

Patient scored **30/30** in Montreal Cognitive Assessment, and this shows that patient has {mild, moderate, severe} cognitive impairment in {abstraction, attention, executive function, language, memory, visual spatial}. When teaching the patient, use {emphasize 3 key points, give literature, involve family/caregiver in teaching, short teaching sessions over consecutive days, slow down in teaching, teach back, use highlighter to highlight important information, visual demonstration}. Recommend follow up service at home: {AIM, Circle of Care, Heart Failure Specialty program in Home Health, Home Health PT/OT for home safety}. 
Outcome Measurements

1. # of qualified heart failure patients that are eligible (i.e. could get) for MoCA assessment (from Apr 27 – Jun 5) (denominator)
2. # of above that are assessed during the same time period (numerator)
3. # and type of impairments identified in the MoCA assessments
4. Percentage documentation made based on MoCA findings
5. #/% of increased referrals to additional services such as home health and circle of care program after MCI is recognized in the heart failure patient
MoCA Evaluation & Feasibility

Before
January-February, 2015 N=54
- 79% HF patients without receiving OT
- 19% HF patients who received OT but no MCI screen
- 2% One patient was screened for MCI

After
April 27-June 5, 2015 N=44
- 69% HF patients without receiving OT
- 22% HF patients who received OT but no MCI screen
- 9% Eight patients were screened for MCI
MoCA Evaluation & Feasibility

Cognitive impairments in heart failure patients

- Memory: 100%
- Abstraction: 60%
- Executive dysfunction: 50%
- Attention: 30%
Successes and Challenges

Successes:
• Heart Failure patients receive standardized cognitive screen
• Mild cognitive impairment is being identified!
• Engage interprofessional collaboration

Challenges:
• Nurses and case managers need more education
• Short time frame
• Making sure MD referring to OT
• New practice for OT
Take Home Messages

- MCI is subtle
  - Subjective and objective detection of memory impairment
  - It can also affect single or multiple cognitive domains
- High incidence of MCI in patients with HF
- MCI affects results of HF self-care management
- Use of cognitive screen can help quickly identify impairments in different cognitive domains