

Cognitive Impairment in Heart Failure

Lee Ann Hawkins, MSN, NP
Anthony Firek, MD
Shirley Kilian, PhD
Christopher Firek, BA
Elena Perez
T. Michael Kashner, PhD
and Helme Silvet, MD

VA Loma Linda Healthcare System, Loma Linda, CA

The Problem



Adherence & Heart Failure

- Heart failure (HF) is growing & costly problem
- Proven strategies improve outcome
- Patient adherence to these strategies poor
- Poor adherence = poor outcome
 - Especially with medication
- Adherence is complex
 - WHO model (socio-economic, health care system, therapy, condition, and patient-related domains)¹

¹Sabate, E. 2003

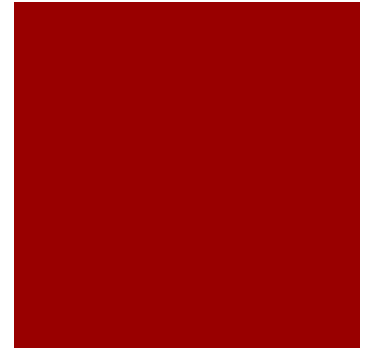
CI in HF



- CI impacts memory, attention, learning, motor speed, reaction times and executive functioning
- CI may impact all domains in WHO model
 - Particularly with complex regimens
- CI in HF
 - Limited studies
 - Paucity of data in outpatients
 - No data in veterans
 - No studies to evaluate association with medication adherence (MA)

Hypothesis

- We suspected CI may be both under-recognized and prevalent in veteran outpatients with HF
- We suspected CI may directly impact MA
- May provide a target for intervention to improve outcome



Study Aims

- Describe the prevalence, type, and severity of CI in the outpatient veteran population
- Examine clinical and demographic variables that may predict CI in HF
- Determine the relationship between CI and MA



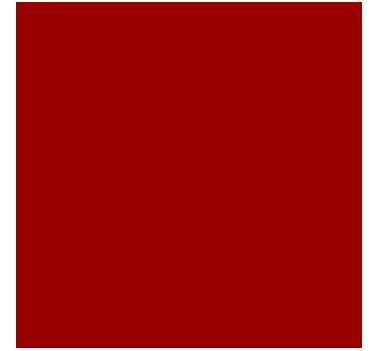
Study Setting and Population

- Prospective cohort at Loma Linda VA Healthcare System (ethnically mixed, urban population of 246,000 veterans in Southern California).
- Approved by the IRB
- Subjects recruited from the outpatient HF and general medical clinics
 - Inclusion: established clinical diagnosis of HF (not limited by LVEF), able to participate in cognitive function testing
 - Exclusion: life expectancy of >6 months, documented dementia requiring a caregiver.

Study Design

- All subjects screened for CI using SLUMS ¹
- Clinical and demographic data collected, including depression screen
- All subjects asked to bring all regularly taken prescription medications for a direct 30-day pill count
- All subjects identified as having CI invited back for a modified battery of neuropsychological testing

¹Morley, JE 2002



Study Flowsheet



Screen for cognitive impairment (SLUMS test)
Clinical/demographic data collection

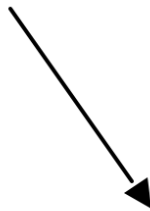


CI screen negative

CI screen positive



Advanced neuropsychological tests



Adherence measured with one-month pill-count

251 subjects recruited from December 2009 – March 2011

Other predictor variables collected:

Employment
 Perceived financial distress
 Educational level
 Systolic BP
 History of atrial fibrillation
 History of stroke
 Substance abuse:
 tobacco, marijuana, alcohol,
 illicits
 Serum: thiamine, vitamin B-12,
 creatinine, hemoglobin, TSH,
 Hgb A1c, BNP
 Number of prescribing providers
 Number of hospitalizations past
 Questionnaires:
 medication taking behavior
 beliefs related to adherence

Age, years	66.4
Male gender	98.0%
Race	
Caucasian	72.0%
African-American	13.6%
Hispanic	9.6%
Living arrangement: living alone	27.0%
Diabetes	53.0%
Coronary artery disease	64.0%
Hypertension	77.0%
Systolic Blood Pressure (mean)	125.8
HF duration >5 years	49.0%
HF etiology: ischemic	55.0%
LVEF \leq 40%	66.0%
LVEF (mean)	37.5
History of depression	30.0%
Geriatric Depression Scale score ¹	13.3
PTSD	19.0%
Managed in specialized HF clinic	57.0%

¹score 0-9=normal, 10-19=mild depression, 20-30=severe depression



Strikingly High Prevalence of Undiagnosed CI - 57.6%

Presence of CI in study population based on SLUMS exam
n=250

Cognitive Impairment	No. / total no. (%)	
None	106/250	42.4
Mild	104/250	41.6
Severe (dementia)	40/250	16.0

SLUMS score (mean \pm SD, range) 24.39 \pm 4.0 (12-30)

SLUMS administration time - 7.1 minutes \pm 1.4, (4-15) (mean \pm SD, range)

Neuropsychological Testing



- Subjects with CI were invited back for further neuropsychological testing
 - Only 61% actually returned, perhaps reflecting another effect of CI
 - Verbal learning, immediate memory and delayed verbal memory were the most impaired

Variables Predicting CI

Generalized Linear Regression using an Ordinal Multinomial link



Variables significantly associated with CI were:

- Age
- African-American race
- Depression (GDS score)
- Use of alcohol
- Not returning for the pill-count

*adjusted for age, AA race, Hispanic ethnicity, living alone, tobacco use, and number of prior admissions to the hospital

Medication Adherence (MA)



- MA was calculated from the 30-day pill count
 - To capture both overtaking and undertaking the medication, a “delta” was determined by computing the absolute difference between the number of pills that were taken from the number that should have been taken
- Only 67% of subjects returned

CI Worsens MA



Cognitive Impairment	Adherence (%)	95% CI	Change score	X ² (df)	p-value
None	81.1	77.1 – 85.0	REF	REF	REF
Mild	74.1	69.6 – 78.5	7.0	5.22 (1)	0.022
Severe (dementia)	74.0	65.9 – 82.1	7.0	2.33 (1)	0.127

Change score computed from patients with no cognitive impairment.

CI Worsens MA (adjusted)



Cognitive Impairment	Adjusted Adherence (%)	95% CI	Adjusted change score	X ² (df)	p-value
None	78.1	70.5 – 85.6	REF	REF	REF
Mild	70.7	63.0 – 78.4	7.4	5.68 (1)	0.017
Severe (dementia)	73.3	63.3 – 83.4	4.7	1.03 (1)	0.310

Change score computed from patients with no cognitive impairment. Adjusted for patient age, race, ethnicity, living arrangement, use of tobacco, and number of prior hospitalizations

Limitations

- Male veteran population
- Pill count may not accurately reflect MA
- MA in the cohort may have been overestimated due to the high non-returning rate of cognitively impaired patients
- The use of the SLUMS screening may not be adequate to make quantitative conclusions about CI (though has been validated in a Veteran population as a sensitive qualitative screening tool).



Discussion



- We found a higher than previously reported incidence of CI
- Verbal learning, immediate memory, and delayed verbal memory were the most impaired
- Many predictors of CI found in previous studies did not reach significance in our study
- The entire study population had poor adherence
- The effect on adherence starts in mild CI range, which easily goes undiagnosed

Conclusions

- Our study demonstrated a high prevalence of undiagnosed CI in the outpatient veterans with HF
- CI had a significant effect on worsening MA
- Consider adding screen for CI for all HF patients
- Interventions that improve MA targeting underlying CI need to be implemented and tested

