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The Association Between Mild Cognitive Impairment and Self-care in Adults With Chronic Heart Failure

A Systematic Review and Narrative Synthesis

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Background: Emerging evidence suggests that heart failure (HF) patients who have mild cognitive impairment (MCI) may experience greater difficulty with self-care. **Objective:** This article reports a systematic review that addressed the objective ''What is the evidence for an association between MCI and self-care, measured in 1 or more of the self-care domains related to HF, in adults who have a diagnosis of chronic HF?'' **Method:** We adopted Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines for the review and synthesis of quantitative research studies that formally measured both cognitive function and self-care in HF patients and sought to describe the relationship between these factors. **Results:** Ninety-one potentially relevant studies were located; 10 studies (2006–2014) were included. Because of heterogeneity in the retrieved studies, meta-analysis was not possible. Narrative synthesis found growing evidence regarding the association between MCI and adverse effects on self-care in HF. Nine studies reported significant positive associations between MCI and self-care in HF, either specifically in relation to medication adherence or more generic measures of self-care activity. One study reported a significant, negative correlation between cognitive function and self-care, suggesting that worse cognitive function was associated with better self-care; however, this is partially explained by a small sample size and mixed methodology. **Conclusions:** These findings have implications for clinical practice. It is known that HF patients have difficulty with self-care, and the influence of cognitive function needs to be considered when providing professional support. Further research to determine the feasibility and acceptability of cognitive assessment in routine clinical care is recommended.

KEY WORDS: heart failure, mild cognitive impairment, review, self-care, systematic

Background

Heart failure (HF) is a syndrome of reduced cardiac output, such that the heart cannot maintain adequate tissue perfusion.[1] Quality of life for individuals with HF may be reduced by symptoms of breathlessness, limb edema, and fatigue, often resulting in disturbed sleep, reduced capacity for coping with normal daily activities or employment, and deteriorating mental well-being.[2] The prevalence of HF is 1% to 2% of the general population, but that increases significantly with age, rising sharply to 10% for individuals around 70 years of age.[3] In a comprehensive literature review of epidemiological studies of HF, the overall prevalence ranges from 1% to 12%, with variation caused mainly by methodological differences between studies.[4] As the population ages, the burden of HF can be expected to increase in many countries.[3,5]

There is growing recognition of the importance of effective self-care in the management of HF.[3,6] The inability to undertake self-care activities is well recognized as a contributing factor for increased hospital admission in patients with HF.[7,8] Self-care in this context has been described as a naturalistic decision-making process involving knowledge, experience, skill, and compatibility with personal values.[9] Theoretically, the concept of self-care

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in HF has been explained in terms of 3 discrete yet overlapping components. These are self-care maintenance (involving activities associated with symptom monitoring and treatment adherence), self-care management (where patients recognize and respond to their symptoms by implementing self-care activities), and self-care confidence (acts as a mediator and moderator of the outcomes of the self-care process).[9] Recommendations for patient behaviors or activities to promote self-care include advice regarding medication, fluid and sodium management, nutrition and weight management, smoking cessation, alcohol limitation, and physical activity,[10] commonly described as the "domains" of self-care in the context of HF.

Specific tools have been developed and validated to measure self-care in patients with HF, the most commonly cited being the Self-care in Heart Failure Index (SCHFI)[11] and the European Heart Failure Self-care Behaviour Scale.[12] Both tools were developed based on an initial concept analysis to construct scale items and subsequent psychometric testing using pooled data drawn from multicenter studies; however, it should be noted that these tools rely on patient self-report, which may underreport or overreport actual self-care ability, and a single assessment may not reflect variation in self-care over time.

Self-care in HF patients involves a complex cognitive decision-making process; however, the pathophysiology and symptoms associated with HF may have an adverse impact on cognitive functioning.[13] Therefore, it is reasonable to consider the potential contribution of cognitive function on engagement in self-care in HF. Cognition describes the intellectual functions required to manage independently within one's environment. These include memory, language, attention, visuospatial ability, behavior, and executive functions.[13] Cognition in aging persons follows along a spectrum ranging from normal function to severe impairment, known as dementia. Mild cognitive impairment (MCI) is described as an intermediate step between normal cognitive function and dementia that make performance of some activities of daily living more difficult than usual (eg, unable to organize medications or appointments without a memory aid or take care of finances) but are not severe enough to impair basic activities of daily living (eg, dressing, eating, toileting).[14] Formal diagnosis of MCI requires evidence of abnormalities on neuropsychological testing (1.5 SD below age-standardized mean) in at least 1 cognitive domain, with or without memory impairment.[15]

The presence of cognitive impairment is well documented in patients with HF, with a prevalence ranging between 25% and 75%,[16–19] depending on the definition used and the cognitive domains tested. The Mini-Mental State Examination (MMSE)[20] is a widely used instrument for cognitive testing in older persons, with or without HF.[16,21,22] However, it is acknowledged that the MMSE is not sensitive for detecting MCI and has limited sensitivity to executive functions.[22,23] In other words, people with HF and MCI will often score within the normal range on the MMSE, and therefore, the presence of MCI is missed.[21,24,25] The Montreal Cognitive Assessment (MoCA) is recommended for use in patients with vascular disease[26] and is sensitive to cognitive deficits detected in older HF patients. Recent studies have reported a prevalence of MCI, as defined by a total MoCA score lower than 26, in 54% to 75% of older patients with HF.[27–29] Difficulties with memory, attention, psychomotor speed, verbal learning, and executive functions are the most common types of cognitive deficits reported.[30,31] It is often difficult to detect MCI in a clinical setting without formal cognitive testing or specifically asking about signs such as a decline in managing finances, organizing medications, or performing other usual instrumental activities.[14]

Self-care imposes a high cognitive demand on patients with HF, and emerging evidence suggests that patients with MCI may experience difficulty with self-care,[25,32,33] although the evidence for this association is arguably limited. Evaluation and synthesis of current evidence are important to inform clinical practice; identifying whether MCI can affect specific domains or general aspects of self-care in patients with HF will enable clinicians who support patients in developing knowledge, skill, and confidence in self-care to take account of the influence of cognitive function.

This article reports a systematic review that aimed to synthesize the best available evidence for an association between MCI and self-care in adults who have been diagnosed with chronic HF. The review question was as follows: What is the evidence for an association between MCI and self-care, measured in 1 or more of the self-care domains related to HF, in adults who have a diagnosis of chronic HF? A review protocol was registered with the Joanna Briggs Institute (protocol 642).

Methods

We adopted the Preferred Reporting Items for Systematic Reviews and Meta-Analyses approach[34] to systematic review and narrative synthesis. The inclusion criteria were primary quantitative studies that recruited adult patients (≥18 years) who have a diagnosis of chronic HF, at any stage of the New York Heart Association (NYHA) classification of HF, regardless of sex, age, ethnic origin, or any comorbidity. Our inclusion criteria were articles that excluded patients who had preexisting dementia or known severe cognitive impairment and that used validated instruments to measure cognitive function or impairment that were sensitive to MCI and also measured self-care capability or activities then sought to describe the relationship between these factors. For the purposes of this review, MCI was defined as evidence of impairment on a validated tool or diagnostic battery in individuals whodo not have cognitive impairment that

is severe enough to interfere with their basic activities of daily living; studies that conducted cognitive testing using only the MMSE were excluded, as this test is not sensitive to MCI. Definitions of self-care could include management of diet (including healthy diet, salt, and fluid intake), medicines management, avoidance of risk factors for disease progression/deterioration, and symptom awareness and management. Measurement of self-care may be performed using validated tools, or more simple measures (such as percentage of missed medications).

Our search strategy was reviewed by an information management specialist and aimed to find both published and unpublished (indexed) studies. We conducted a systematic search of electronic databases, including Medline, EMBASE, CINAHL, PsycINFO, CSA Sociological Abstracts, AARP Ageline, SocINDEX, ISI Web of Science: Social Sciences Citation Index and Science Citation Index Expanded, Ethos, and MedNar. As the concept of self-care in HF developed in the mid-1990s, a date limit of 1995 was set for the database search; because of resource constraints, only articles with English abstract were included in the search. A 3-phase search strategy was used. The initial search used 3 keywords or phrases: *heart failure*, *cognitive*, and *self-care*. These terms were combined using the "AND" Boolean operator and entered into Medline, CINAHL, and MedNar databases. Retrieved articles were reviewed to identify keywords contained in the title and abstract, as well as index terms used to describe the article. A second search using all identified keywords and index terms plus theoretically derived terms from the self-care literature was then performed across all included databases (Table 1). Third, the reference list of all identified reports was searched for additional studies. There was no other attempt to identify gray literature in the area of interest (search completed March 14, 2014).

All citations located by the search were screened by 2 reviewers for relevance based on the title and abstract. Thereafter, the full text of selected articles or theses was assessed independently by 2 reviewers using the specified inclusion criteria, before appraisal of methodological quality using a standardized critical appraisal instrument from the Joanna Briggs Institute (JBI-MAStARI). The Figure demonstrates the selection process adopted.

Data from included studies were extracted onto a standardized template by 1 reviewer and independently confirmed by a second, with any discrepancies resolved through discussion with a third reviewer. Data items included study setting; method; demographic data such as age, sex, and cohabitation status; disease-specific data (commonly NYHA classification); and a wide variety of outcome measures pertaining to the 2 areas of interest for this review (cognitive impairment and self-care), including descriptive statistics and results from regression analyses indicating association between outcome measures.

TABLE 1 Summary of Search Terms Used Across All Included Databases

S1	MM ''Heart Failure +''
S2	''Cardiac failure''
S3	''Ventricular failure''
S4	''Pulmonary oedema'' OR ''Pulmonary Edema''
S5	''Dyspnoea+''
S6	S1 OR S2 OR S3 OR S4 OR S5
S7	MM ''cognitive impairment''
S8	''Mild cognitive impairment''
S9	''Cognitive disorders+''
S10	''Cognitive dysfunction''
S11	''Cognitive function''
S12	''Executive function''
S13	S7 OR S8 OR S9 OR S10 OR S11 OR S12
S14	MM ''Self-care+''
S12	''Self-management''
S13	''Medicines management''
S14	''Medication management''
S15	''Medication adherence''
S16	''Exercise''
S17	''Diet''
S18	''Diet, sodium-restricted''
S19	''Fluid intake''
S20	''Fluid restriction''
S21	''Smoking''
S22	S14 OR S15 OR S16 S17 OR S17 OR S18 OR S19 OR S20 OR S21
S23	S6 AND S13 AND S22

A heterogeneous range of data collection tools were used for assessment of variables and data aggregation or meta-analysis was not possible; instead, findings extracted from all included studies were inserted into a matrix for ease of comparison for narrative synthesis. Measures used to assess cognitive function and self-care were highlighted to identify possible similarities; outcomes were classified as self-care related to either medication adherence (a specific focus of several studies) or a broader range of self-care activities. Studies were further categorized into those that demonstrated a statistically significant association between MCI and self-care and those that did not. Table 2 presents summary details of the 10 studies[25,35,39–43] included in this comparative matrix. All were observational correlation designs, published as full-text articles between 2006 and 2014; 2 studies[42,43] included mixed methods; and 1 study[38] was a comparative cohort design. Eight studies were conducted in the United States,[35–39,41,43] 1 was conducted in Australia,[25] and 1 in Canada.[40]

Results

Ten studies were included in the review, involving a total of 1842 patients. Sample size ranged from 29 to 557 participants. One study[42] purposively sampled extreme cases (poor or expert in self-care; n = 29), and another[43] used a purposive homogenous sampling technique. All other studies recruited convenience samples that met inclusion criteria.

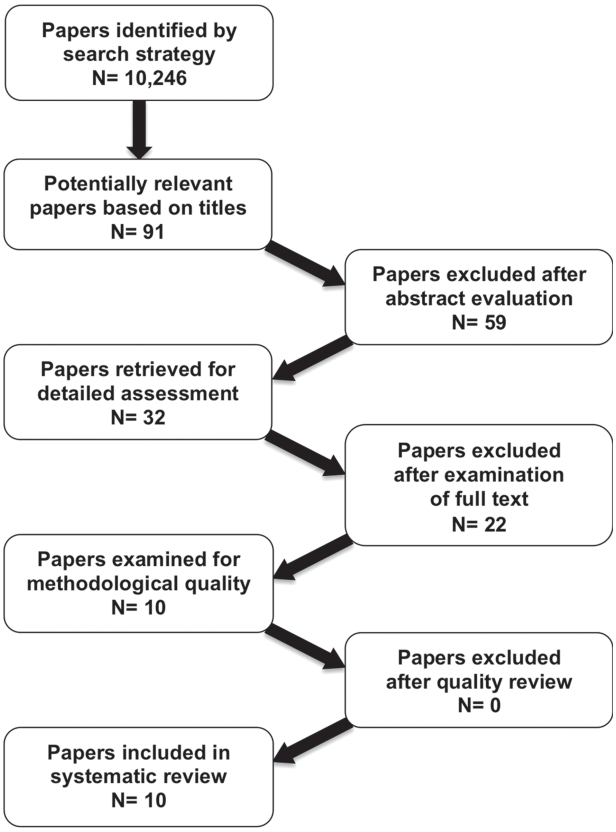

FIGURE. *Selection process.*

Two studies[25,39] recruited HF patients during an hospital admission; the other 8 studies recruited from HF outpatient clinics or management programs.[35–38,40–43] Most of both inpatient and clinic participants were recruited from single facilities, with only 3 studies[25,38,43] recruiting from more than 1 site. Participant ages ranged from 25 to 93 years, with mean ages of 49 to 73 years reported. Two studies targeted older patients (>45 years[25] and >55 years[40]) to increase representativeness of the HF population. Most participants were male. One larger sample study[36] recruited from a veterans' facility, and men constituted 99% of the sample. Eight studies[25,35,36,38,40–43] provided NYHA classification details for participants, indicating functional severity of HF; most participants had at least NYHA stage III HF, suggesting marked limitation in activity due to HF symptoms. Where reported, participants were urban dwelling and predominantly white, although minority groups were represented in most studies. Five studies[25,37,39,41,42] reported whether participants lived alone or with another person; in these samples, most lived with another person, with 13% to 49.7% living alone.

A variety of cognitive assessment tools were used in the reported studies; each included study used at least 1 technique known to be sensitive in detecting MCI. One study used MMSE and MoCA[25]; 2 used MoCA alone[40,41]; 1 used MMSE in combination with a range of other cognitive assessment tools[35]; and the remaining 6 studies used various other assessment tools excluding the more commonly applied MMSE or MoCA.[36–39,42,43] Most articles did not differentiate between degrees of cognitive impairment in their findings (except for Hawkins et al[37]). However, as we included only studies that excluded people with dementia or significant cognitive impairment and that used tools sensitive to MCI, we can infer that the findings represent the association between MCI and self-care.

All included studies measured some dimension of self-care capability or activities as outcomes of interest, addressing either medication adherence or a more comprehensive assessment of self-care activities. Four studies measured medication adherence using various reporting scales[35–38]; 3 studies used the validated SCHFI alone[25,40,42]; 1 study used the European Heart Failure Self-care Behaviour scale[39]; 1 study used SCHFI and the European Heart Failure Self-care Behaviour scale[41]; and 1 study used SCHFI and the Dutch Heart Failure Knowledge Scale.[43]

Review Findings

From the 10 studies reviewed, 8 studies[25,35–41] reported statistically significant results indicating a positive correlation between MCI and self-care ability, with 1 study[43] reporting a negative correlation between MCI and self-care (suggesting poorer cognitive function leads to better self-care). One study[42] did not report *P* values. Only 4 studies[37,39,40,43] reported confidence intervals for the findings related to cognitive function alone; these were wide, suggesting that the effect size may be rather small or of poor precision because of small sample size. However, there is persuasive evidence that MCI affects HF-self-care ability adversely.

Measurement of selected variables was largely heterogeneous in the included studies, with the variety of assessment tools and outcome measures, meaning that meta-analysis was not possible. Therefore, the following results are presented as a narrative synthesis of (*a*) those studies that found a statistically significant association between MCI and some dimension of self-care and (*b*) the single study that reported a negative correlation between MCI and self-care (see Table 2).

Impaired Cognitive Function Leads to Poorer Self-care

Four studies[35–38] demonstrated a statistically significant association between MCI and poorer medication adherence. These studies had reasonable sample sizes (n = 122–280), and each used a combination of validated tests to measure cognitive function, thus increasing the likelihood of detection of MCI. In 3 of 4 studies, medication

TABLE 2 Included Studies

	Author	Design	Setting	Age; Gender	NYHA Class	Lived Alone	Cognition Outcome Measures	Self-care Outcome Measures	Results and Conclusions
Studies that demonstrated positive correlation between MCI and poorer medication adherence									
1.	Alosco et al (2012)[35]	Retrospective observational correlational study via hierarchical regression analysis Convenience sample of consecutive cases from large HF database Exclusion criteria related to brain function, eg, stroke, head injury with LOC N = 122	HF management program in Ohio, United States	59–77 y (mean, 68 y) F:M 29:93	2–3	Not given	MMSE TMT-A, TMT-B	Lawton Brody ADL Scale Functional ability measured and a range of activities including medication management	Cognitive function showed incremental predictive validity for medication management (R^2 change = 0.14, $P < .001$; no confidence intervals reported). Significant associations are TMT-A with medications, MMSE with driving, and gender with finances. In persons with HF, cognitive performance is an independent predictor of independence in medication management. Persons with poorer cognitive test performance (TMT-A) reported greater difficulty with medication management.
2.	Alosco et al (2013)[36]	Cross-sectional, descriptive study using hierarchical regression analysis N = 197 Excluded people with dementia, other neurological history	OPD cardiology clinics in Ohio	Mean, 68 y F:M 70:127	As %: 1, 0.5%; 2, 84%; 3, 14%; 4, 1.5%	Not given	TMT-A, TMT-B Digit Symbol Coding LNS	Lawton Brody ADL Scale Functional ability measured and a range of activities including medication management	Significant bivariate correlation and between (*a*) executive function (TMT-A) and medication management (correlation coefficient = 0.18, $P < .05$) and (*b*) attention (LNS) and medication management (correlation coefficient = 0.15; $P < .05$). Hierarchical regressions revealed that reduced executive function was independently associated with a decreased ability to manage medications. No confidence interval given.
3.	Hawkins et al (2012)[37]	Prospective observational correlational study via linear regression	HF veterans OPD facility in the United States	33–93 y (mean, 66 y)	Not given	27.3% (68)	Saint Louis University Mental Status	MA Estimator	Compared with no CI, MA significantly worsened by 8 percentage points (78% to 70%, $P = .017$) for patients with MCI but did not continue to worsen for patients with severe CI in the dementia range.

(*continues*)

TABLE 2 Included Studies, Continued

	Author	Design	Setting	Age; Gender	NYHA Class	Lived Alone	Cognition Outcome Measures	Self-care Outcome Measures	Results and Conclusions
		Convenience sample No subjects had known CI before enrolment N = 251		F:M 4:247			Battery of Assessment of neuropsychological status; TMTs; Wechsler Test of Adult Reading; Grooved Pegboard Test; phonemic and semantic verbal fluency tasks; Similarities, Matrix Reasoning, LNS, and Digit Span subtests from the Wechsler Adult Intelligence Scale, 4th edition		Regression analyses revealed a robust association between the presence of CI and MA (P = .017). Among the study variables, only CI was found to have a statistically significant association with MA. Study found that unrecognized CI was highly prevalent and associated with poorer adherence to medication. (These results are not necessarily supported by the confidence intervals, which suggest no difference between groups)
4.	Riegel et al (2011)[38]	Prospective comparative observational correlation study via logistic regression models A stratified sampling technique was used, based on EDS and CI N = 280 (242 completed) Reported attrition and states cohorts became saturated but no specific justification for sample size Excluded if dementia or neurological event	HF outpatient clinics in 3 US hospitals	50–74 (mean 62) F:M 100:180	Majority 3	Not given	Telephone Interview of Cognitive Status PVT TMT-B Digit Symbol-Substitution Test Probed-Memory Recall Task LNS test	MA—Basel Assessment of Adherence Scale	The only cognition measure significantly associated with MA was attention PVT (P = .047; no confidence intervals reported). Nonadherence was significantly more common in those with EDS, regardless of cognitive status (P = .035). Secondary models using the EDS score and the individual cognition test scores showed that cognitive status was not significantly associated with MA (P = .752). EDS may cause lack of vigilance/attention and medication nonadherence, ie, picture more complex than CI alone. The authors acknowledge that those with CI may be underreporting their medication nonadherence.

(continues)

TABLE 2 Included Studies, Continued

Author	Design	Setting	Age; Gender	NYHA Class	Lived Alone	Cognition Outcome Measures	Self-care Outcome Measures	Results and Conclusions
Studies that demonstrated positive correlation between MCI and poorer comprehensive self-care activity								
5. Cameron et al (2010)[25]	Prospective observational correlational study via multiple linear regression analysis Convenience sample of consecutive patients N = 93 Dementia, neurological excluded	1 inpatient facility in Australia	62–84 y (mean, 73 y) F:M 27:66	45% NYHA Class 3 5% NYHA Class 4	42% (39)	MMSE and MoCA	SCHFI	Sixty-eight patients (75%) were coded as having MCI and had significantly lower self-care management (P = .01) and self-confidence scores P = .05) (no confidence intervals given). MCI made the largest contribution, explaining 9% of the variance in self-care management. CI, a hidden comorbidity, may impede patients' ability to make appropriate self-care decisions.
6. Hadjuk et al (2013)[39]	Prospective observational cohort study n = 577 Multiple linear regression analysis Screened for delirium	Patients hospitalized with primary or secondary diagnosis of HF 5 inpatient facilities in the United States	Mean age, 71 y F:M 254:323	Not given	287 (49.7%)	5 word immediate and delayed memory test (MoCA), Controlled Oral Word Association Test, DSST	EHFScBS-9	Memory, processing speed, and executive function were impaired in 33.3%, 40.0%, and 56.0% of patients, respectively; more than three-quarters (79%) of patients were impaired in at least 1 of the 3 domains. Overall cognitive status was not associated with performance of self-care activities in multivariable adjusted regression models; however, impairment in specific domains affected self-care. Memory impairment was associated with significantly poorer self-care (P = .006) (β = −1.87; 95% confidence interval, −3.20 to −0.54). Impairments in processing speed and executive function were not significantly associated with self-care in the adjusted models.

(continues)

TABLE 2 Included Studies, Continued

	Author	Design	Setting	Age; Gender	NYHA Class	Lived Alone	Cognition Outcome Measures	Self-care Outcome Measures	Results and Conclusions
7.	Harkness et al (2013)[40]	Observational cross-sectional study using backward regression model Convenience sample of consecutive patients N = 100 Excluded if documented history of CI	Patients with HF attending a heart function clinic in Canada	Mean (SD), 72.4 (9.8) y F:M 32:68	1–3	Not given	Geriatric Depression Scale, MoCA	SCHFI	MCI, as defined by a MoCA score <26, was present in 73% of patients; 21% had an adequate self-care management SCHFI score; and 12% reported symptoms of depression. Participants with a MoCA score <26 vs ≥26 scored significantly lower on the self-care management subscale of the SCHFI (mean [SD], 48.1 [24] vs 59.3 [22], respectively; $P = .035$). Using backward regression, the final model was fitted to self-care management while controlling for age and sex and was significant (with $F = 7.04$, $df = 3, 96$, and $P < .001$), accounting for 18% of the total variance in self-care management ($R^2 = 18.03\%$; confidence interval, 0.787–2.781).
8.	Lee et al (2013)[41]	Prospective observational correlational study via generalized linear modeling and hierarchical linear modeling Convenience sample N = 148 Dementia—excluded	Single HF OPD facility in the United States	44–69 y (mean, 57 y) F:M 57:91	58.8% NYHA Class 3–4	13% (9)	MoCA (range, 0–30), using cutoff scores for the general population (26) and for adults with cardiovascular disease (24)	SCHFI EHFScBS-9 (for consulting behavior)	Using MoCA scores of 26 and 24, respectively, 33.1% and 14.2% of the sample had MCI. Controlling for common confounders, participants with MoCA scores lower than 26 reported self-care comparable with that of participants with MoCA scores of 26 or higher. Participants with MoCA scores <24, however, reported 21.5% worse self-care management ($P = .014$), and 51%, worse consulting behaviors ($P = .001$), compared with participants with MoCA scores of ≥24 (no confidence intervals given). A disease-specific cutoff for MCI reveals marked differences in patients' ability to recognize and respond to HF symptoms when they occur.

(continues)

TABLE 2 Included Studies, Continued

	Author	Design	Setting	Age; Gender	NYHA Class	Lived Alone	Cognition Outcome Measures	Self-care Outcome Measures	Results and Conclusions
9.	Riegel et al (2007)[42]	Cross-sectional mixed-methods design using extreme case sampling N = 29 Patients with severely impaired cognition were excluded.	Single HF OPD facility in the United States	Given per category F:M 11:18	Majority 3–4	21% (6)	PMR Task DSST	SCHFI	Patients poor in HF self-care had worse cognition, more sleepiness, higher depression, and poorer family functioning. The primary factors distinguishing those good vs expert in self-care were sleepiness and family engagement (although no tests of statistical significance were conducted).
Study that found no statistically significant correlation between CI and poorer comprehensive self-care activity									
10.	Dickson et al (2011)[43]	Concurrent triangulation mixed-methods design; content and correlational analysis with linear regression Purposive homogenous sampling technique Excluded those with dementia or neurological event N = 41 Exclude tests not well described in thesis	2 OPD HF clinics in a large urban medical center in the United States	25–65 y (mean, 49 y) F:M 15:26	41.5% NYHA Class 2 58.5% NYHA Class 3	Not given	DSST PMR	Dutch Heart Failure Knowledge Scale SCHFI	There was a significant negative correlation between cognitive function (DSST) and self-care maintenance ($r = -0.33$ $P = .03$). 95% Confidence intervals are all negative (ie, do not cross 0 as the others do), so this result may be considered significant, although the confidence intervals are very wide, suggesting poor precision due to small sample size (n = 41). There was also a significant, negative correlation between cognitive function (PMR) and self-care management ($r = -0.39$, $P = .049$), indicating that worse cognitive function was associated with better self-care, explained in part by mixed methodology and the qualitative narratives. It could be that some individuals with MCI overestimated their responses on the SCHFI. Reexamination of qualitative results revealed that social support (eg, spouses, children, and friends) played important roles in self-care.

Abbreviations: ADL, activities of daily living; CI, cognitive impairment; DSST, Digit Symbol Substitution Test; EDS, excessive daytime sleepiness; EHFScBS-9, European Heart Failure Self-care Behaviour Scale; HF, heart failure; LNS, Letter Number Sequencing; LOC, loss of consciousness; MA, medication adherence; MCI, mild cognitive impairment; MMSE, Mini-Mental State Examination; MoCA, Montreal Cognitive Assessment; NYHA, New York Heart Association; OPD, outpatient; PMR, Probed Memory Recall; PVT, Psychomotor Vigilance Task; SCHFI, Self-care in Heart Failure Index; TMT, Trail Making Test.

adherence was found to be adversely affected by MCI[35–37]; however, although the fourth[38] found a relationship between the cognitive function of attention, as measured by the Psychomotor Vigilance Test, results indicated that excessive daytime sleepiness, rather than measured cognitive status, is more influential on medication adherence. These findings suggest that the concepts and measurement of cognitive function and excessive daytime sleepiness may require further study to untangle their relative influence.

A further 5 studies[25,39–42] used the Self-care Heart Failure Index or European Heart Failure Self-care Behaviour Scale to measure self-care and demonstrated a statistically significant association between MCI and an adverse effect on self-care activities. Four studies[25,39–41] had relatively large samples (n = 93–577) and reported a statistically significant negative association between MCI (based on MoCA score) and self-care management and help-seeking behaviors. The other study in this grouping, a mixed-methods descriptive study,[42] had a smaller sample size (n = 29), and although reporting that "Patients poor in HF self-care had worse cognition, more sleepiness, higher depression, and poorer family functioning" (p. 235), only mean scores for each type of patient (poor, good, expert in self-care) were provided and statistical testing for differences in scores between patient types was not conducted,

Impaired Cognitive Function Is Not Related to Poorer Self-care

Despite the significant association between MCI and self-care described above, 1 study[43] did not detect this relationship.

Dickson et al[43] acknowledge the "surprising" finding of a negative correlation between their measures of cognitive function and self-care, indicating that poorer cognitive function improves self-care ability, which is intuitively perverse. However, this mixed-methods study had a small sample (n = 41) of relatively young (25–65 years) participants, which may affect the generalizability of findings. In addition, the authors note, "It could be that some individuals with MCI overestimated their responses on the SCHFI… Re-examination of qualitative results revealed that social support (eg, spouses, children, and friends) played important roles in self-care" (p. 183).

Discussion

Despite the established relationship between HF and cognitive impairment, there is a limited body of evidence investigating the association between MCI and self-care in HF; sensitive measurement of both MCI and self-care can be challenging, and the lack of consistency in the tools used in existing studies hampers the synthesis or comparison of findings. In addition, the quality of the studies reviewed here may have been affected in some cases by the use of small convenience samples drawn from single sites and the use of multiple regression where explanatory variables were not conditioned to remove implicit bias, as discussed below.

In relation to the influence of sample size, the results of studies reported here have been obtained largely through the use of various regression methodologies. Regression is an appropriate methodology and builds on the concept that changes in explanatory variables typically generate proportionate changes in the outcome (or response) process. Broadly speaking, the accuracy with which a regression coefficient is identified is proportional to the square root of the sample size; only the most influential explanatory variables are likely to be identified from small samples. On the basis of the recommendations of Good and Hardin,[44] judging by the sample sizes and number of explanatory variables used in the included articles, at least 2 studies,[37,43] may have some multiple regressions that were potentially too ambitious.

One potential weakness in a number of the articles[25,36,41–43] under review is the absence of multiple regressions in which the explanatory variables are conditioned to remove implicit bias; when investigating the dependence of self-care on explanatory variables, a hierarchical multiple regression is preferable, where the explanatory variables are modified, or conditioned, to remove the effect of explanatory variables that potentially introduce bias, for example, age, gender, depression, and excessive daytime sleepiness.

There are challenges in measuring both cognitive function and self-care in HF; the reported studies used a wide variety of tools to measure cognitive function, limiting comparability and preventing meta-analysis. The MMSE was used in combination with other cognitive tests in 2 of the studies[25,35] included in this review. The MMSE is not sensitive for detecting MCI that impacts on self-care in HF,[21–25] and studies exploring the relationship between cognitive function and self-care need to supplement the MMSE with cognitive tests sensitive to MCI. The MoCA has been shown to be a more sensitive indicator of MCI in HF.[26] The 4 studies[25,39–41] that used MoCA demonstrated an association between MCI and poorer self-care.

Self-care measures in all studies were self-reports, and, as acknowledged by some authors[38,43] reviewed here, individuals may not reliably report self-care, with either overreporting or underreporting of ability or lack of acknowledgement of the role of carers in supporting self-care activities, particularly when MCI is present.

Finally, evidence presented in some studies suggests that predictors of poor self-care are more complex than MCI alone with depression and excessive daytime

What's New and Important

- This article represents a useful and important ''state of best evidence'' on the association between MCI and self-care in HF.
- The evidence for such an association is limited at present; however, 8 studies that used larger samples and more sensitive indicators of MCI found a statistically significant association suggesting that MCI has an adverse impact on self-care in HF.
- We recommend further research to investigate the feasibility and acceptability of routine assessment of cognitive function in HF patients to enable practitioners to tailor interventions to support self-care in the presence of MCI.

sleepiness also being implicated and their relative influence difficult to untangle from cognitive function.

Conclusions

This systematic review and narrative synthesis has found a growing body of evidence regarding the association between MCI and adverse effects on self-care in HF, either in its broadest sense or more specifically in relation to medication adherence. Although some of the research conducted thus far may have limitations due to small sample size and design, the stronger evidence (produced by the use of a wider range of more sensitive measures of MCI, within larger sample studies) suggests that MCI does adversely affect self-care; however, this is based on findings from only 9 studies, 4 of which relate specifically to medication adherence. Further research using sensitive measures to detect MCI in appropriately selected and sized samples for multiple/hierarchical regressions is warranted. While acknowledging the limitations of the studies included in this review, nevertheless, our report represents a useful state of best evidence in this important aspect of HF.

These findings have implications for clinical practice. It is known that HF patients have difficulty with self-care and the influence of cognitive function needs to be considered when providing professional support for self-care in HF, with further research to determine the feasibility and acceptability of cognitive assessment in routine clinical care. Once MCI is recognized, tailored strategies should be developed and evaluated to help patients adapt to the increased challenges in self-care caused by MCI, to improve clinical outcomes for this patient group.

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