

The effectiveness of patient-centered self-care education for adults with heart failure on knowledge, self-care behaviors, quality of life, and readmissions: a systematic review

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Executive summary

Background

Patient-centered self-care education is an educational approach that employs meaningful, targeted education tailored to an individual patient's needs, preferences, and values. Patient-centered educational approaches may empower patients with heart failure to be successful in self-care management and improve outcomes.

Objective

To evaluate the effectiveness of patient-centered self-care education for adults with heart failure on knowledge, self-care behaviors, quality of life, and readmissions.

Inclusion criteria

Types of participants

Adult patients, 18 years and older, with a diagnosis of heart failure.

Types of interventions

All types of patient-centered, self-care education interventions for adult patients with heart failure provided by any health care provider.

Types of outcomes

Heart failure knowledge, heart failure self-care behaviors, heart failure-related quality of life, heart failure admissions or readmissions within one-year post intervention.

Types of studies

Randomized controlled trials.

Search strategy

The search strategy aimed to find relevant published and unpublished studies in the English language between January 1990 and July 2013. Several electronic databases were searched: CINAHL, Pubmed, PsychINFO, EMBASE, CENTRAL, ERIC, Scopus, and DynaMed. A search for gray literature was also performed.

Methodological quality

Two reviewers evaluated the included studies for methodological quality using standardized critical appraisal instruments from the Joanna Briggs Institute.

Data collection

Data were extracted using a standardized data extraction instrument from the Joanna Briggs Institute.

Data synthesis

Due to clinical heterogeneity between included studies, statistical meta-analysis was not possible. Results are presented in a narrative form.

Results

A total of seven articles describing five randomized controlled trials and one pseudo-randomized trial were included. Four studies demonstrated reduced readmissions with only one reaching statistical significance at six months follow-up (11.4% intervention, 44.2% control, $P=0.01$). Five studies demonstrated an improvement in quality of life with only one reaching statistical significance between baseline and 12 months follow-up ($P=0.002$). One study measured knowledge and demonstrated a statistically significant improvement at the 12 months follow-up ($P=0.05$). One study measured self-care and demonstrated a statistical significant improvement among the intervention group at one month ($P<0.001$) and three months ($P=0.005$) compared with the control. These statistical significant findings indicate the positive effects of the intervention by demonstrating an improvement in outcomes as measured by patients experiencing a more productive

quality of life, an increase in heart failure-related knowledge, improved self-care behaviors, and decreased readmission rates post intervention.

Conclusions

Patient-centered self-care education for adult patients with heart failure may have a positive benefit in reducing heart failure readmissions and improving heart failure-related knowledge, self-care behaviors, and quality of life. Factors that may influence outcomes include a multidisciplinary team approach and reinforcement of individualized advice with emphasis during care transitions.

Implications for practice

Utilization of a multidisciplinary team in a variety of settings with ongoing reinforcement of individualized goals and objectives, while continually assessing patient-specific needs, may be necessary in effecting care delivery.

Implication for research

Future studies may consider interventions inclusive of more diverse ethnic populations of varying literacy and socio-economic levels, promoting generalizability of findings. Greater details specific to the patient-centered aspect of the intervention, including optimal time-frames for duration should be determined.

Keywords

Heart failure; patient education; patient-centered care; readmission; self-care; heart failure knowledge; quality of life

Background

Over the last decade, heart failure (HF) has become a growing epidemic.¹ Currently, HF impacts over 5.7 million people in the United States of America (USA),¹ more than 15 million people in Europe,² approximately 500,000 people in Canada,³ and 277,800 people in Australia.⁴ Despite evidence-based therapies in HF, the prevalence and incidence of HF and attendant mortality have progressively increased over the past 25 years.⁵ The projected HF prevalence in 2030 is expected to further increase by 25%.⁶

HF is a complex clinical syndrome that is caused by cardiac dysfunction either in systole, diastole, or both, resulting in impairment of the left ventricle causing dilatation, hypertrophy, or both.⁷ HF is associated with adverse outcomes, including high rates of hospitalization, readmission, and mortality, in addition to poor quality of life (QoL). Non-adherence with a complex medical regiment, sodium and fluid restriction, and lifestyle recommendations; a lack of understanding of the HF disease process; and a lack of knowledge about signs and symptoms related to decompensation can lead to recurrent worsening of HF symptoms, hospital readmission, and impaired QoL.^{8,9}

HF is the most common disease resulting in hospital admission for patients who are 65 years and older.⁹ Hospital readmission is the consecutive admission to the same hospital, a different hospital, or another acute care facility related to a specific condition for which treatment was

rendered on a previous hospitalization.¹⁰ Approximately 25% of patients with HF are readmitted within 30 days following hospital discharge and 50% are readmitted within six months of discharge.^{9,11} The 30-day hospitalization rate for patients with HF in the USA is currently reported to be 24.7%.¹⁰ These high rates of readmission are capturing attention as subsequent hospitalizations lead to worsening morbidity and mortality, decreased QoL, and increased costs of care. Readmissions may be secondary to improper or ineffective treatment, the education strategy used, a lack of patient participation in the medical regimen, the lack of knowledge related to or the inability to perform self-care behavior, or the failure on the part of the patient to take action in order to prevent further decompensation.¹²

Patient education is necessary for the effective management of HF symptoms.¹³ The evidence-based practice guidelines from the American College of Cardiology Foundation/American Heart Association (ACCF/AHA),¹⁴ the Heart Failure Society of America (HFSA),⁷ and the European Society of Cardiology (ESC)² recommend that patients with HF receive individualized education and counseling, with an emphasis placed on self-care. It has been shown that hospitalized patients with HF who received HF education have a 20% improvement in medication compliance after one year.¹⁵ Intensive, systematic, tailored, and planned education and support has been shown to be effective in improving self-care behaviors in patients with HF.¹⁶

The aim of HF patient education is to provide information that assists patients in acquiring the knowledge and skills necessary to understand and manage their condition. The components of HF patient education as outlined by current practice guidelines from ACCF/AHA, HFSA, and ESC include the following: (a) an understanding of the causes of their HF; (b) medication indications; (c) the importance of medication adherence; (d) potential causes of HF decompensation; (e) recognition of escalating symptoms; (f) HF disease management strategies; (g) low-sodium diet; (h) restriction of alcohol intake; (i) restriction of fluid intake; (j) smoking cessation; (k) physical activity; (l) behavioral strategies to promote treatment adherence; and (m) the need for ongoing follow-up with a health care provider.^{2,7,14} HF education has been demonstrated to empower patients to take care of themselves, prevent and manage symptoms, prevent hospital readmissions, reduce morbidity and mortality, reduce costs, and improve QoL.^{17,18}

HF education focused around symptom management is an essential component to improving patient outcomes. It includes the need for patients to understand the signs and symptoms of HF; recognize a new onset of symptoms or change in symptoms (such as weight gain greater than two pounds within two days or five pounds within one week, worsening shortness of breath, chest pain, edema, abdominal bloating, or fatigue); understand the importance of daily weights; and associate weight gain with volume overload and worsening HF. Patients need to understand how to respond to a change in symptoms, which at a minimum should include contacting their health care provider. HF patient education should also include information about the importance of medication adherence (consistently taking medication as prescribed), adjusting diuretics based on weight, maintaining a balanced exercise regimen, sleep and rest cycles, and adhering to smoking cessation.¹⁹ Providing individualized education to patients with HF may aid in their understanding of the treatment plan and incorporation of self-care behaviors into daily routines.

The Institute of Medicine defines patient-centered care as the provision of care that is respectful and responsive to a patient's preferences, needs, and values, and perceives patients as leaders of their clinical care.²⁰ It is important to understand how patients view their health and what outcomes they deem to be important. A core tenet of patient-centered care is that patients manage their own care, while collaborating with the health care team in making treatment decisions.²¹ Patient-centered care is the right care, the highest quality care, and the most cost effective care for patients, provided through a team approach.²² Patient-centered care depends upon effective communication, empathy and the development of a partnership between providers and the patient to improve patient care outcomes.²³ The Institute of Medicine recommends the inclusion of a patient's cultural traditions, preference, values, social circumstances, and lifestyles into the patient-centered approach to care.²⁰ Patient-centered care represents a care approach strategy geared toward meeting the individual patient's needs and preferences as part of the treatment plan to achieve desired outcomes.²⁴ Patient-centered care focuses on the patient, not the disease, while empowering individual patients to become knowledgeable and more informed about their diagnosis, successfully manage their symptoms, and engage in self-care behaviors.

Self-care is the process in which individuals perform daily activities to maintain health.²⁵ Self-care includes the activities that individuals, families, and communities undertake with the intention of enhancing health, preventing disease, limiting illness, and restoring health.²⁶ Appropriate self-care can minimize potential health problems, improve QoL, and decrease care delivery costs in patients with HF.²⁷ Self-care incorporates the principles of self-maintenance and self-management.²⁸ HF self-management involves patients who are active in the management of their condition and make appropriate adjustments to their self-care behaviors or treatment plan based on self-assessment.²⁸ Self-management is the process by which a patient utilizes acquired knowledge and skills to maintain a sense of wellness.²⁸ These skills include coping with lifestyle changes necessary to be successful in living with a chronic condition, as well as having the ability to adjust and work through physical and emotional challenges while engaging in a daily routine to manage care needs at an optimal level.²⁹

The goal of patient-centered self-care education is to inform and increase a patient's knowledge and self-care capabilities using an individualized approach in an effort to achieve desired outcomes: improved HF knowledge, improved self-care behaviors, improved QoL, and reduced readmissions. HF education is the provision of information on HF geared at improving knowledge, clinical outcomes, patient's overall cardiac status, functional capacity, and QoL, as well as to reduce mortality.⁷ A patient's HF knowledge can be measured by valid and reliable instruments such as the Atlanta Heart Failure Knowledge Test (A-HFKT).³⁰

Self-care behaviors include medication adherence, symptom monitoring, dietary adherence, fluid restriction, weight monitoring, smoking cessation and management of symptoms.¹⁸ Self-care behavior can be measured by valid and reliable instruments such as the Self-Care Heart Failure Index (SCHFI)³¹ or the European Heart Failure Self-Care Behavior Scale (EHFScBS).³²

QoL represents the interpretation of the ease with which patients are able to cope with the impact of a disease on a daily basis and maintain a normal lifestyle. QoL refers to a patient's perception of health and the impact of treatment on health status.³³ QoL can be measured by valid and

reliable instruments such as the generic Short Form 36 (SF-36),³⁴ or HF-specific instruments such as the Minnesota Living with Heart Failure Questionnaire (MLHFQ)³⁵ or the Kansas City Cardiomyopathy (KCCQ).³⁶

Hospital readmission is defined as the consecutive unplanned or planned admission to the same hospital or another acute care hospital related to a previous hospitalization regarding a specified condition.¹⁰ Patients are typically tracked at discharge and each readmission for any cause within a prescribed time period is tallied.

The Joanna Briggs Institute Database of Systematic Reviews and Implementation Reports, the Cochrane Database of Systematic Reviews, MEDLINE, and CINAHL were searched for previously conducted systematic reviews related to education for patients with HF. Six reviews of the literature were identified.^{12,17,18,37-39} Only two^{37,39} of these reviews included a critical appraisal of the identified studies to meet the definition of a systematic review. These six reviews of the literature looked at HF education interventions in general; none looked specifically at patient-centered, self-care education interventions. See Appendix I for details on the objectives, methods, results and conclusions of these identified reviews. These identified reviews contained studies published through 2010. None of the prior reviews used a comprehensive search strategy; they did not include a search of gray literature to uncover all evidence related to the question asked and reduce the risk of publication bias.

The current review sought to identify all studies that evaluate the effectiveness of patient-centered, self-care education compared with general, non-individualized education strategies for adult patients with HF, while identifying any additional evidence created since the prior literature reviews were conducted. This review looked specifically at the effects of patient-centered, self-care education on HF knowledge, self-care behaviors, QoL, and readmissions. In addition, this review sought to determine the most effective approach to deliver patient-centered, self-care education to adult patients with HF.

The objectives, inclusion criteria, and methods of analysis for this review were specified in advance and documented in a protocol.⁴⁰

Review objective

The objective of this review was to synthesize the best available evidence regarding the effectiveness of patient-centered self-care education for adult patients with HF relating to HF knowledge, self-care behaviors centered on HF, HF-related QoL, and HF readmissions within one year of an index hospitalization.

A secondary objective of this review was to determine the most effective education approach for interventions included in the review to deliver patient-centered self-care education to adult patients with HF.

Inclusion criteria

Type of participants

This review considered studies that include all adult patients, 18 years and older, of any race, ethnicity or gender with a diagnosis of HF regardless of etiology, severity, duration of HF, or presence of comorbid conditions.

Types of intervention

This review considered all types of patient-centered, self-care education interventions for adult patients with HF provided by any health care provider, regardless of frequency, duration and intensity. For this review, patient-centered, self-care education interventions were defined as interventions designed towards the patient as a unique individual, taking into consideration a patient's individual needs, preferences, and values. The patient was the central focus of the planned intervention with a goal of meeting patient specific self-care educational goals and desired outcomes.

Comparator intervention

This review considered as comparators standard care or non-patient-centered education programs such as written or videotaped education materials that had not been individualized to a patient's specific needs, preferences, or values.

Type of outcomes

This review considered studies that include the following outcomes as measured by valid and reliable instruments within one year post-intervention:

- HF knowledge such as knowledge related to the general pathophysiology of HF, treatment strategies, and signs/symptoms of HF as measured by valid and reliable instruments such as the Atlanta Heart Failure Knowledge Test (A-HFKT).
- HF self-care behaviors including, but not limited to, HF management, symptom monitoring, and implementation of treatment strategies as measured by valid and reliable instruments such as the Self-Care Heart Failure Index (SCHFI) or the European Heart Failure Self-Care Behavior Scale (EHFScBS).
- HF-related QoL related to areas such as maintaining physical activity and exercise, symptom burden, self-efficacy, and maintaining social interaction and support, as measured by valid and reliable instruments such as the generic Short Form 36 (SF-36), or HF-specific instruments such as the Minnesota Living with Heart Failure Questionnaire (MLHFQ) or the Kansas City Cardiomyopathy Questionnaire (KCCQ).
- HF admissions or readmissions within one year post intervention. For this review, hospital readmission is the consecutive admission to the same hospital, a different hospital, or another acute care facility related to a specific condition for which treatment was rendered on a previous hospitalization.

Type of studies

The review considered randomized controlled trials (RCTs) for inclusion to enable the identification of current best evidence regarding the effectiveness of patient-centered self-care education for adult patients with HF.

Search strategy

The search strategy aimed to find both published and unpublished studies. A three-step search strategy was utilized in this review. An initial limited search of MEDLINE and CINAHL was undertaken followed by an analysis of the text words contained in the title and abstract, and of the index terms used to describe an article. A second search using all identified keywords and index terms was then undertaken across all included databases. Thirdly, the reference lists of all identified reports and articles were searched for additional studies. Studies published in the English language were considered for inclusion in this review.

The concept of patient-centered care was highlighted by the 2001 Institute of Medicine report, *Crossing the Quality Chasm*.²⁰ This report calls for the delivery of care that is not only safe and effective but is guided by the patient's preferences, needs, and values. Since its publication, hospitals have incorporated patient-centered care into their health care delivery systems.⁴¹ In addition, the prior systematic reviews outlined above on general HF patient education interventions identified studies published beginning in the 1990s. Therefore, this review considered studies published from January 1990 through July 2013 for inclusion to identify the best evidence regarding the effectiveness of patient-centered self-care interventions for patients with HF.

The databases searched included: PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Excerpta Medica Database (EMBASE), PsycINFO, Cochrane Central Register of Controlled Trials (CENTRAL), Education Resources Information Center (ERIC), Health Source: Nursing/Academic Edition, Scopus, DynaMed.

The search for unpublished studies included: New York Academy of Medicine, ProQuest Dissertations & Theses, Health Sources Nursing/Academic Edition, ClinicalTrials.gov, Google Scholar, Virginia Henderson International Nursing Library, World-Cat, and websites for: Heart Failure Society of America and American Association of Heart Failure Nurses.

The initial keywords used were: heart failure, patient education, patient-centered care, readmission, self-care, knowledge, and quality of life.

Full list of keywords used were: heart failure, cardiomyopathy, education, counseling, counselling, disease management, patient education, health education, teach, teaching, health knowledge, knowledge, education, self-monitoring, self-maintenance, self-management, self-monitoring, self-care, readmit, admit, admission, readmission, patient readmission, hospitalization, hospitalisation, rehospitalization, rehospitalisation, quality of life.

See Appendix II for the detailed search strategy used in each database searched.

Assessment of methodological quality

Quantitative papers selected for retrieval were assessed by two independent reviewers for methodological quality prior to inclusion in the review. The reviewers used the standardized critical appraisal instruments from the Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument (JBI-MAStARI) (Appendix III). A cut off point for acceptable methodological quality for studies to be included in this review was not determined in the review protocol. Subsequently, that authors decided that the studies identified for inclusion were to have met a minimum of five out of 10 questions from the standardized critical appraisal instrument from JBI-MAStARI, with questions six through 10 being the most important requiring a yes response, in order to have been considered of adequate quality for inclusion in the review. Any disagreement that arose between the reviewers was resolved through discussion, or with a third reviewer.

Data extraction

Data from quantitative studies were extracted by two independent reviewers using the standardized data extraction tool from JBI-MAStARI (Appendix IV). The data extracted included specific details about the interventions, populations, study methods, and outcomes of significance to the review question and specific objectives. Any disagreement that arose between the reviewers was resolved through discussion or with a third reviewer.

Data synthesis

Due to the clinical and methodological heterogeneity of the included studies, statistical pooling via meta-analysis was not possible. The results are presented in narrative form.

Review results

Description of Studies

A comprehensive database search of the literature yielded a total of 14,942 potentially relevant papers; 202 duplicates were removed. After a review of the titles and keywords 14,559 papers were excluded. One hundred eighty-one full text papers were retrieved for further review, as additional information beyond the abstracts was needed to determine if the paper met the inclusion criteria for this review. After reviewing the full text papers, 174 were excluded on the basis that they were non-patient-centered interventions. A total of seven papers were appraised for methodological quality. Appendix V details the list of excluded studies and the reasons for exclusion. Figure 1 outlines the different stages of the process for identifying relevant studies for inclusion in this systematic review.

A total of seven papers describing six different interventions were included in this review. Two papers by Jaarsma et al.^{16,43} reported details of the same RCT.

The interventions varied based on the clinical characteristics of the intervention delivered, the length of the intervention, the duration of follow-up, and the outcomes being measured. The participants in the included studies ranged in age from 61-81 years and were predominantly Caucasian females. The sample sizes of the included studies ranged from 121-314. The interventions delivered ranged in duration from 2.5 hours of education to up to nine months of ongoing education and reinforcement. See Appendix VI for details of the included studies.

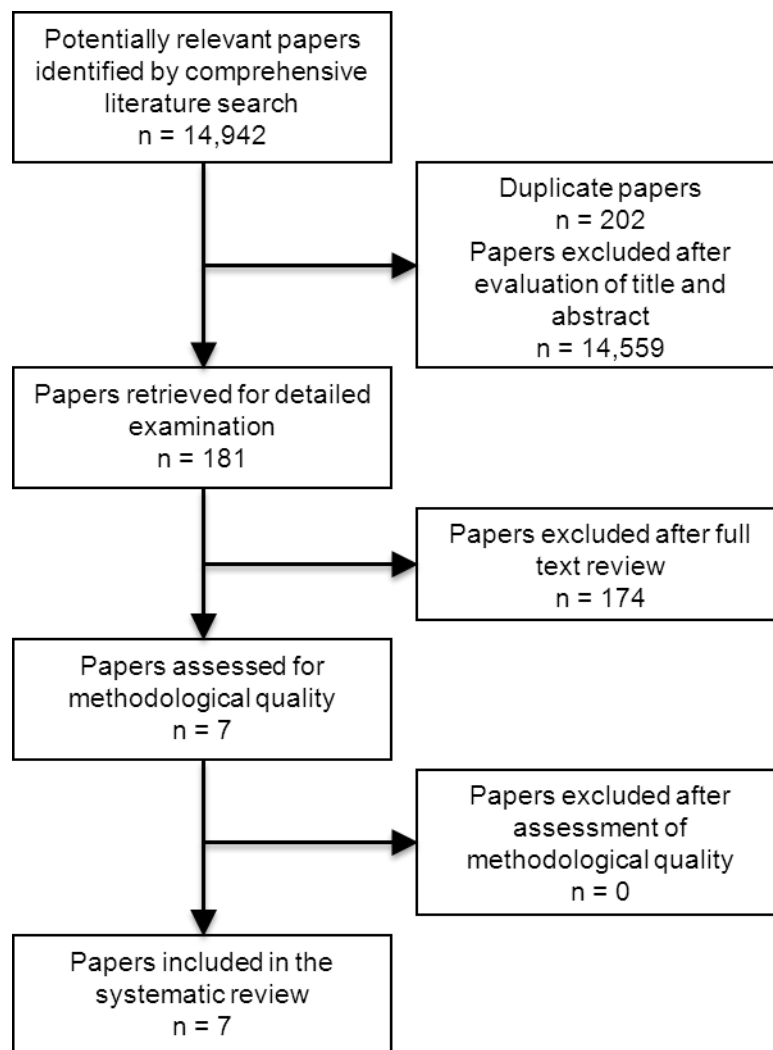


Figure 1: Flowchart of identification of studies for inclusion

Methodological quality

A total of seven articles describing six interventions that met the inclusion criteria were identified from a comprehensive search of the literature. Five studies were RCTs and one was a pseudo-randomized controlled trial. All studies were published between 1999-2013. All seven papers were determined to be of adequate quality for inclusion after being assessed for methodological quality using the appropriate JBI-MAStARI Critical Appraisal Tool (Appendix III). The inclusion criteria required that articles meet the minimum response requirement of five out of 10 questions answered “yes” on the JBI-MAStARI critical appraisal instrument, with questions 6, 7, 8, 9, and 10 being the most important questions to be answered “yes”. See Table 1 for details of the assessment of methodological quality for the included studies.

Five of the included studies were RCTs. The method of randomization of the studies included: stratified in blocks of four,⁴² drawing from an envelope,^{16,43} drawing lots,⁴⁴ a univariate discrete pseudorandom number generator,⁴⁵ and computer-generated random numbering.⁴⁶ One study⁴⁷

stated that patients admitted to a medical ward were randomly selected but the study authors did not detail the method of randomization. After discussion, the authors decided to include this pseudo-randomized study in the review as a limited number of heterogeneous RCTs were identified for inclusion and this intervention and its outcomes added to the discussion of the effectiveness of patient-centered-self-care education for patients with heart failure.

Baseline demographics and characteristics between intervention and control groups were similar in all included studies. The interventions were varied based on the clinical characteristics of the intervention delivered, length of the intervention, the duration of follow-up, and the desired outcome being measured.

Table 1: Methodological quality

Number of studies included and excluded

Number of studies included	Number of studies excluded
6	0

Randomized/pseudo-randomized controlled trials

Citation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Jaarsma et al.,1999 ^{16,43}	Y	U	Y	Y	U	Y	Y	Y	Y	Y
Martensson et al., 2002 ⁴⁴	Y	U	U	U	U	Y	Y	Y	Y	Y
Murray et al., 2007 ⁴⁵	Y	U	Y	U	Y	Y	Y	Y	Y	Y
Gwardry-Sridhar et al., 2005 ⁴²	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Doughty et al., 2001 ⁴⁶	Y	N	Y	Y	U	Y	Y	Y	Y	Y
Anderson et al., 2005 ⁴⁷	N	U	U	U	U	Y	Y	Y	Y	Y
%	83.3	16.7	71.4	66.7	33.3	100	100	100	100	100

Characteristics of included studies

Study by Anderson et al.⁴⁷

Anderson et al.⁴⁷ conducted an pseudo-randomized controlled trial at Bridgeport Hospital, Bridgeport, Connecticut, USA, from January 1, 1996 to March 31, 1997. A total of 276 participants, 50 years or older, admitted to the hospital with a diagnosis of HF and an ejection fraction less than 40% were included in the study.

The intervention group consisted of 44 patients who received inpatient education, discharge planning, telephone follow-up, and home-care visits. The educational intervention was delivered by a cardiac nurse educator and was geared toward improving patient knowledge and self-

management of the disease process, as measured by a decrease in HF readmissions at one month and six months post-discharge.

The patient-centered component of this intervention included individually targeted patient education sessions delivered by a cardiac nurse educator, dieticians, and physical therapists. Patients received one hour-long individualized in-depth instruction with a nurse educator supplemented with a HF brochure. Patients also received 30 minutes of personalized instruction from the nutritional department and an individualized activity plan from a physical therapist. Each discipline provided reinforcement of the education prior to discharge. Further details on the patient-centered component of this intervention were not described by the study authors.

The intervention group also received a six-week home care clinical pathway allowing for six to 20 visits by a cardiac trained homecare nurse. The goal of the home care visits was to empower patients while concentrating on individualized educational objectives in addition to continually assessing patient participation in self-care activities. A brief follow-up telephone interview and evaluation of the patient's status by a nurse case manager occurred within two weeks post hospital discharge. Significant findings were communicated to the attending physician and homecare nurse.

The control group consisted of 77 patients who received usual in-hospital education from the regular nursing staff as per a standard HF protocol without supplemental dietary and physical therapy consultations. These patients received routine post-discharge home health care from nurses without specialized cardiac training and no telephone follow-up.

*Study by Doughty et al.*⁴⁵

Doughty et al.⁴⁶ conducted an RCT at Auckland Hospital, New Zealand, between March and August 2001. A total of 197 patients with HF with a mean age of 73 years, New York Heart Association (NYHA) class III-IV HF symptoms, and an ejection fraction less than 40% who were admitted to the general medical wards at the hospital were enrolled in this study.

The intervention group consisted of 100 patients with HF who received one-on-one education with a study nurse and post-discharge follow-up visit with a general practitioner and a HF clinic.

At the initial clinic visit occurring two weeks post hospital discharge, a comprehensive review of the patient's clinical status was conducted to identify any acute symptoms. Patients received one-on-one education by a study nurse at each clinic visit. Each patient was given a diary for logging daily weights, medication records, clinical notes, and appointments. Patients were taught self-management approaches to address potential red flags such as weight changes. Patients were also provided with an educational booklet that covered HF-related topics.

Patients had weekly follow-up visits for six weeks alternating between their general practitioner and the HF clinic. In addition, the intervention group also received group education sessions; each class lasted for 1.5-2 hours occurring twice within six weeks after hospital discharge and again after six months. Data related to HF readmissions and HF-related QoL were collected after 12 months.

The patient-centered component of this intervention included individualized advice and reinforcement of education including an exercise schedule, dietary management, and close monitoring of body weight. Further details on the patient-centered component of this intervention were not described by the study authors.

The control group consisted of 97 patients who received standard care, including follow-up with their general practitioner, which was not detailed by the study authors.

*Study by Gwadry-Sridhar et al.*⁴²

Gwadry-Sridhar et al.⁴² conducted an RCT at the London Health Sciences Center, Victoria Campus – Southwestern Ontario, Canada between November 1998 and April 2000. A total of 134 patients (mean age of 72 years) with a diagnosis of HF and an ejection fraction less than 40% who were admitted to the hospital were enrolled in the study.

The intervention group consisted of 68 patients who received two HF booklets and watched a HF education video in addition to receiving education by a multidisciplinary team. The multidisciplinary team that delivered the educational intervention consisted of a pharmacist and a nurse or educator. A certified pharmacist accredited in patient counseling trained the team who delivered the intervention. Patients received a total of 2.5 hours of education over a 48 to 96-hour period a few days prior to and in some cases shortly after discharge. The intervention focused on optimizing patient participation with medication use and general directions on diet and lifestyle recommendations. Data related to HF knowledge and HF-related QoL were collected after 12 months.

The patient-centered component of this intervention included personalized feedback incorporating the patient's life circumstances, lifestyle knowledge, and medical therapy. Components of the intervention included oral, written, visual props, and media videos. Written materials incorporated in the intervention were appropriate for understanding at an eighth-grade level. Further details on the patient-centered component of this intervention were not described by the study authors.

The control group consisted of 66 patients who received only the HF booklets and video without the multidisciplinary team interaction.

Study by Jaarsma et al.^{16,43}

Jaarsma et al.^{16,43} published two papers described the outcomes of one RCT that was conducted on the cardiology ward at University Hospital in Maastricht, Netherlands from May 1994 to March 1997. A total of 186 patients at least 50 years of age and older (mean age of 73 and 58% male) and literate in Dutch who were admitted to the cardiology ward with a diagnosis of HF for at least three months prior to admission and current symptoms of HF (NYHA class III-IV) were included in this study.

The intervention group consisted of 84 patients who received intensive, systematic, planned HF education and a standardized nursing care plan by a study nurse including four visits in the hospital, one telephone follow-up post-discharge, and one home visit within 10 days after discharge. The total number of hours of interaction with the nurse was not reported. The patients were followed up for nine months. Outcome data related to cardiac-caused readmissions, HF-

related self-care, and QoL (measured by four tools, one of which was HF-specific) were collected by patient interview at one, three, and nine months after discharge.

During the hospital stay, the nurse assessed the patient's needs, provided an information card on HF signs and symptoms, and discussed discharge planning. Within one week after discharge, the study nurse called the patient to assess potential problems and make an appointment for a home visit. During the home visit, the study nurse reinforced and continued to provide education as warranted by the patient's condition. The intervention included teaching on consequences of HF in daily life, recognition of warning signs and symptoms of HF, sodium restriction, fluid restriction, and participation in the treatment plan.

The patient-centered component of this study included assessment of patient education and counseling needs, provision of support for the patient and family, and discussion of individual challenges such as social interaction, sexual function, and limited access to their general practitioner. The information provided to the patient and family about specific patient needs was reinforced at each visit. Further details on the patient-centered component of this intervention were not described by the study authors.

The control group consisted of 95 patients who received standard care without structured education, telephone follow-up, or home visits with individualized education by the study nurse.

Study by Martenenson et al.⁴⁴

Martenenson et al.⁴⁴ conducted a cluster RCT at eight primary health care centers in two cities in south-eastern Sweden from April 1999 to April 2000. A total of 153 patients aged 18 years or older, with a diagnosis of HF (NYHA class II-IV), and residing within the catchment area were enrolled in the study.

The intervention group consisted of 78 patients. The intervention group received a single two-hour education and counseling session. The education session occurred in the patient's home and included the patient's family and caregivers. The education included written and verbal material as well as an interactive HF CD-ROM focusing on the patient's needs and skills to improve their self-care management, such as restricting fluids, reducing sodium intake, weight monitoring, detection of deteriorating symptoms (e.g. fluid retention, shortness of breath, edema), and directions on how to adjust diuretic medication when fluid retention occurred.

The intervention group also received monthly telephone follow-up for one year except at three and 12 months when a home visit occurred. The intervention was delivered by primary health care nurses and physicians who received specialized training from a HF nurse and cardiologist. Data related to HF-related QoL were collected at three and 12 months follow-up.

The patient-centered component of this intervention included individualized education focusing on a patient's needs and skills. Further details on the patient-centered component of this intervention were not described by the study authors.

The control group consisted of 75 patients who were assigned to standard care. In this study, standard care consisted of team-based care and home visits from primary health-care physicians,

nurses, assistant nurses, and physiotherapists. The team providing the standard care services did not receive the specialized HF training.

*Study by Murray et al.*⁴⁵

Murray et al.⁴⁵ conducted an RCT at a primary care clinic affiliated with Wishard Health Service in Indianapolis, Indiana, USA, from February 2001 to June 2004. A total of 314 participants from four general medicine practices, a cardiology clinic, and Wishard Memorial Hospital, who were 50 years or older from a large inner-city with an indigent population and a diagnosis of HF (NYHA class II-III) with an ejection fraction of less than 50%, were enrolled in the study. The included patients planned to receive all of their care and prescriptions at Wishard Hospital, used at least one HF medication, were not using or planning to use medication container adherence aide (e.g. pill boxes), had access to a telephone, and were not hearing impaired.

The intervention group included 122 patients who received an assessment of their medication history of all prescriptions, over-the-counter drugs, and dietary supplements, as well as an assessment of their medication knowledge and skills by the study pharmacist. The study pharmacist in the intervention group received advanced training in patient education and cardiovascular pharmacotherapy from a team that included a geriatrician, a HF cardiologist, a behavioral scientist, and a cognitive psychologist.

The intervention pharmacist provided patient-centered verbal instructions and written materials about the medications using a schema approach. This process required that the pharmacist incorporate principles of patient-centered care medication instructions by incorporating the patient's individualized needs and preferences into the plan of care.⁴⁸⁻⁵⁰ The patient education material and instructions were based on the patient's preferences and potential barriers related to the content, format, and language. The instructions were aimed at patients with low health literacy and included easy-to-follow timelines and reminders. The intervention pharmacist assigned each medication category an icon to match the container label, lid, and written patient instructions. The pharmacist monitored each patient's medications, health care issues, body weight, and other data and communicated this information to the patient's providers. Further details on the patient-centered component of this intervention were not described by the study authors. The intervention lasted nine months with an additional three months post-study follow-up period. Data related to HF readmissions and HF-related QoL were collected at six and 12 months.

The control group included 192 patients who received their prescription from pharmacists without specialized training or access to the patient-centered study material.

Results

Heart failure admissions or readmissions within one year post intervention

*Study by Anderson et al.*⁴⁷

Anderson et al.⁴⁷ showed a statistically significant decrease in the HF-related readmission rate in the intervention group at one month and six months compared to the control group (Table 2). The hospital readmission rate at 30 days in the intervention group was 6% compared to 22.1% in the

control group ($p = 0.01$; statistical test not reported by the study authors). At six months, the HF-related readmission rate in the intervention group was 11.4% compared to 44.2% in the control group ($p = 0.01$; statistical test not reported by the study authors). This intervention had a positive effect as demonstrated by fewer HF-related readmissions at six months follow-up in the intervention group compared with the control group.

Table 2: Heart failure-related readmission rates at one month and at six months follow-up of a patient-centered self-care education intervention

	Intervention Group (n = 44)	Control Group (n = 77)	p Value*
One month	6.0%	22.1%	0.01
Six months	11.4%	44.2%	0.01

*Statistical test not reported by the study authors

Data from: Anderson et al., 2005⁴⁷

*Study by Doughty et al.*⁴⁵

Doughty et al.⁴⁶ demonstrated no difference in the number of first readmissions for HF between the intervention and control group (Table 3). There was, however, a statistically significant reduction in the number of subsequent readmissions for HF in the intervention group compared to the control group, (15 versus 42, respectively; $2P = 0.036$ [statistical test not reported by the study authors]). This intervention had a positive effect as demonstrated by fewer subsequent HF-related readmissions in the intervention group compared to the control group.

Table 3: Heart failure-related readmissions over 12 months follow-up of a patient-centered self-care education intervention

	Intervention Group (n = 100)	Control Group (n = 97)	2P Value
First readmission	21	23	Not reported
Subsequent readmissions	15	42	0.036

*Statistical test not reported by the study authors

Data from: Doughty et al., 2002⁴⁶

*Study by Jaarsma et al.*¹⁶

Jaarsma et al.¹⁶ reported cardiac-caused readmission at one, three, and nine months post intervention. The study authors did not separate out HF-related readmissions from other cardiac causes. The intervention group demonstrated eight (10%) patients readmitted at one month, 18 (21%) patients readmitted within three months, and 24 (29%) patients readmitted within nine months. The control group demonstrated 11 (12%) patients readmitted at one month, 23 (24%) patients readmitted at three months, and 37 (39%) patients readmitted at nine months. While there were fewer patients readmitted in the intervention group, there was no statistically

significant difference in readmissions at nine months follow-up between the groups (Chi-square = 2.1, $p = 0.096$. This intervention had a positive effect as demonstrated by fewer cardiac-caused readmissions in the intervention group (although these did not reach statistical significance) when compared to the control group.

Table 4: Patients readmitted for cardiac-causes over 12 months follow-up of a patient-centered self-care education intervention

	Intervention Group (n = 84)	Control Group (n = 95)	Chi-squared, p value
1 months	8 (10%)	11(12%)	Not reported
3 months	18 (21%)	23 (24%)	Not reported
9 months	24 (29%)	37 (39%)	2.1, $p = 0.096$

Data from: Jaarsma et al.,1999¹⁶

*Study by Murray et al.*⁴⁵

In Murray et al.,⁴⁵ the intervention group demonstrated a mean (standard deviation [SD]) HF-related hospital readmission rate at nine months of 0.11 (0.46) compared to 0.15 (0.58) in the control group with an incident rate ratio (95% confidence interval [CI]) of 0.77 (0.28-2.10). While the intervention group demonstrated fewer readmissions, there was no statistically significant difference between the groups. This intervention had a positive effect as demonstrated by fewer HF-related readmissions in the intervention group (although these did not reach statistical significance) when compared to the control group.

Heart failure-related Quality of Life

*Study by Doughty et al.*⁴⁶

In Doughty et al.,⁴⁶ HF-related QoL was measured using the MLHFQ, which includes a physical functioning and an emotional sub-score. On the MLHFQ, a lower score corresponds to a higher HF-related QoL. There were statistically significant improvements in physical functioning between the intervention and control groups from baseline to 12 months (change from baseline -11.1 and -5.8, respectively, $2P = 0.015$ [statistical test not reported by the study authors]). Negative change scores between baseline and 12 months on the MLHFQ indicate an improvement in HF-related QoL; therefore, this intervention demonstrated a greater improvement in HF-related QoL compared to standard care.

There was no statistically significant difference in the change in the emotional sub-score between the intervention group and control groups from baseline to 12 months (change from baseline -3.3 and -3.3 respectively, $2P= 0.97$ [statistical test not report by the study author]). Both the intervention and control group had a similar improvement on the emotional subscale indicating that this intervention had no effect on the emotional component of HF-related QoL when compared to standard care.

*Study by Gwadry-Sridhar et al.*⁴²

In Gwadry-Sridhar et al.,⁴² QoL was measured using and the generic SF-36 and the HF-specific MLHFQ every three months post discharge for one year. The SF-36 includes a physical component summary score (PCS) and mental component summary score (MCS); higher scores indicate better QoL. The SF-36 mean PCS were similar in both groups at all time points. The intervention group had an improvement in QoL from 30.52 to 37.15 from baseline to 12 months compared to 29.13 to 37.38 in the control group ($P = 0.92$ [statistical test not reported by the study author]). While both groups demonstrated a similar improvement in QoL, there was no statistically significant difference between the groups indicating no effect of this intervention on the physical component of QoL when compared to standard care when measured by a generic QoL instrument.

The MCS demonstrated a trend toward improvement in both groups. The intervention group improved from 46.31 to 52.38 from baseline to 12 months compared to 42.74 to 51.94 in the control group ($P = 0.74$ [statistical test not reported by the study authors]). While both groups demonstrated an improvement in the mental component of QoL with a greater improvement seen in the control group, there was no statistically significant difference between the groups indicating no effect of this intervention on the mental component of QoL when compared to standard care when measured by a generic QoL instrument.

For the MLHFQ, there was improvement in both groups from baseline to 12 months. The intervention group improved from 44.03 to 25.75 compared to 44.91 to 32.19 in the control group (a lower score on the MLHFQ indicates a higher QoL). This was a statistically significant improvement in HF-related QoL in the intervention group compared to the control group ($P = 0.002$ [statistical test not reported by the study authors]). This intervention demonstrated a greater improvement in HF-related QoL compared to standard care when QoL was measured by a HF-specific QoL instrument.

*Study by Jaarsma et al.*⁴³

In Jaarsma et al.,⁴³ QoL was measured using four different scales, one of which was HF-specific, to evaluate this multidimensional outcome. Functional capacity was measured using the Heart Failure Functional Status Inventory. Both groups had increased functional status at three months post discharge, but both subsequently decreased by the nine month follow-up. No difference was found between the intervention and control groups between baseline and nine months follow-up (p value and statistical test not reported by the study author). This intervention demonstrated no effect on QoL compared to standard care when measured by this HF-specific functional status instrument.

A questionnaire, which was not identified by the study authors, was used to measure symptoms. There was a statistically significant decrease in the average number of symptoms in both groups at three months ($P < 0.001$ [statistical test not reported by study authors]). However, there was no difference between groups at any time point during follow-up (p value and statistical test not reported by the study authors). The intervention group did demonstrate a statistically significant decrease in symptom severity compared to the control group between baseline and nine months

follow-up ($t = 2.3$, $p = 0.02$; see Table 5). The intervention group also demonstrated a statistically significant decrease in symptom distress compared to the control group between baseline and nine months follow-up ($t = 2.1$, $p = 0.04$; see Table 5). While there was no difference in the number of symptoms between groups, this intervention demonstrated an improvement in symptom distress and symptom severity compared to standard care. A decreased disease burden on a patient post intervention can be considered as a surrogate to an improvement in QoL.

Table 5: Change in symptom severity and symptom distress from baseline to 3 months and baseline to 9 months follow-up of a patient-centered self-care education intervention

	Intervention Group (Mean \pm SD)	Control Group (Mean \pm SD)	Student t test, p Value
Symptom Severity			
Baseline to 3 months	-2.1 \pm 3.6 (n = 33)	-0.7 \pm 3.5 (n = 46)	1.8, 0.07
Baseline to 9 months	-2.6 \pm 3.3 (n = 26)	-0.6 \pm 3.8 (n = 42)	2.3, 0.02
Symptom Distress			
Baseline to 3 months	-2.5 \pm 4.0 (n = 38)	-1.3 \pm 3.7 (n = 53)	1.5, 0.14
Baseline to 9 months	-2.6 \pm 3.3 (n = 30)	-0.8 \pm 3.7 (n = 48)	2.1, 0.04

SD = Standard Deviation

Data from: Jaarsma et al., 2000⁴³

Psychosocial adjustment to illness was measured using the Psychosocial Adjustment to Illness Scale (PAIS). There was a statistically significant improvement in psychosocial adjustment, demonstrated by a decrease in total PAIS scores, in both groups from baseline to nine months follow-up (intervention: $t = 2.3$, $P = 0.03$; control: $t = 2.3$, $P = 0.03$). There was no difference between groups at any time point during follow-up (p value and statistical test not reported by the study authors). Both the intervention and the control groups demonstrated similar improvements in PAIS scores indicating that there was no difference in psychosocial adjustment as a result of this intervention when compared to standard care.

Overall well-being was measured using Cantril's Ladder. The intervention patients reported a statistically significant improvement in well-being compared to the control group from baseline to one month follow-up (intervention group [mean \pm SD]: 6.8 \pm 2.2 to 7.2 \pm 1.5; control group [mean \pm SD]: 6.3 \pm 2.2 to 6.4 \pm 2.1; $t = 2.1$, $p = 0.04$). However, well-being scores decreased in both groups below baseline scores by the nine months follow-up (intervention group: 6.7 \pm 1.9; control group: 6.2 \pm 2.1). The results indicate an initial, short-term effect of this intervention compared to standard care, as demonstrated by a greater improvement in well-being in the intervention group

when compared to the control group at one month follow up; however, this effect from the intervention was not sustained long-term as both groups had a subsequent decline in well-being.

*Study by Martensson et al.*⁴⁴

In Martensson et al.,⁴⁴ QoL was measured using the generic SF-36 and the HF-specific MLHFQ at baseline, three months, and 12 months follow-up. On the SF-36, the intervention group demonstrated preserved QoL in all dimensions at the three months and 12 months follow-up. The control group showed a statistically significant impairment in role functioning due to physical limitations ($p = 0.035$ [statistical test not reported by the study authors]) and vitality ($p = 0.029$ [statistical test not reported by the study authors]) at the three months follow-up. At the three months and 12 months follow-up, the control group demonstrated a statistically significant deterioration in physical functioning ($p = 0.035$, $p = 0.001$, respectively [statistical test not reported by the study authors]), role function due to emotional limitation ($p = 0.001$, $p = 0.022$, respectively [statistical test not reported by the study authors]), and the MCS ($p = 0.017$, $p = 0.047$, respectively [statistical test not reported by the study authors]).

The study demonstrated a statistically significant improvement in role functioning due to physical limitation at three months in the intervention group compared to control group ($p = 0.008$ [statistical test not reported by the study authors]); there was a tendency toward improvement in vitality and social functioning ($p = 0.051$, $p = 0.056$, respectively, [statistical test not reported by the study authors]). However, the differences between groups disappeared by the 12 months follow-up (p value and statistical test not reported by the study authors). This intervention demonstrated a short-term improvement in QoL compared to standard care as measured by a generic QoL instrument, but the effects of this intervention on QoL were not maintained through the 12 months follow-up period.

The MLHFQ showed no statistically significant mean differences between or within groups at baseline or at the three and 12 months follow-up in total scores or the emotional or physical sub-scale scores (p value and statistical test not reported by the study authors). This intervention demonstrated no improvement in QoL as compared to standard care when measured by a HF-specific QoL instrument.

*Study by Murray et al.*⁴⁵

In Murray et al.,⁴⁵ HF-related QoL was measured by the Chronic Heart Failure Questionnaire. The intervention group showed improvement in HF-related QoL from baseline to six months and 12 months follow-up by 0.28 and 0.39, respectively, compared to 0.21 and 0.24, respectively in the control group ($P = 0.52$ at six month, $P = 0.21$ at 12 months [statistical test not reported by the authors]). This intervention had a positive effect as demonstrated by a greater improvement in HF-related QoL in the intervention group when compared to standard care, although this difference did not reach statistical significance.

Heart failure knowledge

*Study by Gwady-Sridhar et al.*⁴²

Gwady-Sridhar et al.⁴² measured HF knowledge using the Knowledge Acquisition Questionnaire at the end of the education intervention and at 12 months follow-up. At 12 months follow-up, the mean \pm SD change in knowledge score in the intervention group was 2.24 ± 2.46 (95% CI 1.63-2.85) and in the control group was 1.38 ± 2.16 (95% CI 0.85-1.91). The intervention group had a statistically significant increase in knowledge at the conclusion of the intervention ($P=0.02$ [statistical test not reported by the study author]). The knowledge gained in the intervention group was maintained through the 12 months follow-up period ($P = 0.05$ [statistical test not reported by the study author]). This intervention demonstrated a greater improvement in HF knowledge compared to standard care.

Heart failure self-care behaviors

*Study by Jaarsma et al.*¹⁶

In Jaarsma et al.,¹⁶ patients' self-care ability was measured by the Appraisal of Self-care Agency (ASA) Scale and self-care behavior was measured by the Heart Failure Self-Care Behavior Scale at baseline, three months, and nine months follow-up.

Both groups improved their self-care abilities between baseline and three months follow-up; however, the intervention group showed a decline in self-care abilities between the three months and nine months follow-up while the control group demonstrated continued improvement in self-care abilities at nine months follow-up. There was no statistically significant difference in self-care abilities between groups at any time point (Table 6). This intervention demonstrated no improvements in self-care abilities when compared to standard care as measured by the ASA.

Both groups demonstrated an improvement in self-care behavior at one month follow-up. However, self-care-behavior declined at the three months and nine months follow-ups although they remained higher than baseline at these time points (Table 6). At the one month follow-up, there was a statistically significant improvement in the intervention group compared to the control group ($t=3.8$, $P<0.001$). This statistically significant improvement in self-care behavior in the intervention group compared with the control group was maintained at the three months follow-up ($t = 2.9$, $P = 0.005$), but not sustained to nine months follow-up ($t = 1.6$ and $P = 0.11$). This intervention demonstrated a greater improvement in HF self-care behaviors when compared to standard care during the short-term that was not sustained through nine months follow-up when measured by the Heart Failure Self-Care Behavior Scale.

Table 6: Self-care abilities and self-care behavior at baseline, 3 months, and 9 months follow-up of a patient-centered self-care education intervention

	Intervention Group (n = 58)	Control Group (n = 74)	Student t test, p Value
Self-care abilities			
Baseline	88.6 ± 11.2	92.1±11.3	1.6, 0.11
3 months	92.5 ± 11.5	94.2 ± 12.9	0.74, 0.46
9 months	90.9 ± 12.8	96.4 ± 13.7	2.2, 0.3
Self-care behavior			
Baseline	8.7 ± 3.1	9.4 ± 3.1	1.2, 0.21
1 months	14.2 ± 2.9	12.2 ± 2.9	3.8, <0.001
3 months	12.2 ± 3.1	10.6 ± 3.2	2.9, 0.005
9 months	11.2 ± 3.1	10.3 ± 2.8	1.6, 0.11
Data from: Jaarsma et al., 1999 ¹⁶			

Discussion

Patient-centered care places an emphasis on patient education and self-care strategies geared towards informing and empowering individual patients about their diagnosis and managing their own care. The objective of this review was to evaluate the effectiveness of patient-centered self-care education for adults with HF on HF knowledge, HF-related self-care behaviors, HF-related QoL, and HF readmission. A comprehensive search of the literature identified seven articles describing five RCTs and one pseudo-randomized controlled trial on patient-centered self-care education for patients with HF.

Four studies^{16,45-47} evaluated readmission. One study⁴⁷ showed a statistically significant reduction in readmission in the intervention group; the other three studies^{16,45,46} showed a trend toward reducing readmission that did not reach statistical significance. The patient-centered self-care education interventions that were used in the studies which showed trends toward reduced readmissions included needs assessment, counseling and support for patient and family;¹⁶ individualized instructions about medications;⁴⁵ and individualized advice, reinforcement, and exercise plans.⁴⁶ The study that showed a statistically significant reduction in readmissions used individually targeted patient education regarding self-care activities, activity planning, and nutrition.⁴⁷

Five studies⁴²⁻⁴⁶ evaluated the effects of patient-centered self-care education on QoL. One of the studies⁴² used personalized feedback encompassing life circumstances, lifestyle knowledge, and medical therapy to demonstrate a statistically significant improvement in QoL at 12 months follow-up. Three studies^{43,45,46} using individualized patient-centered self-care education reported a positive trend toward improvement in QoL and one study⁴⁴ in which the provided education was focused on patient's needs and skills demonstrated no difference in QoL as compared with controls.

The one study⁴³ that examined the effects of patient-centered self-care education on self-care abilities showed no statistically significant improvement in self-care abilities as a result of the intervention, but there was a positive trend toward improved self-care abilities by nine months post discharge. The study showed that at one month post discharge, the intervention group had a statistically significant improvement in self-care behaviors as compared to the control group and continued to demonstrate improvements at three months and at nine months follow-up, although the improvement at nine months was not statistically significant.

Only one study⁴² evaluated the effects of patient-centered self-care education on HF knowledge with the intervention group reporting a statistically significant increase in knowledge scores at discharge and one year compared to the control group.

The use of patient-centered self-care educational strategies for adult patients with HF has not resulted in any decline in outcome measures in the studies included in this review. Several studies demonstrated that patient-centered self-care education, when used as part of a comprehensive disease management strategy, may have a positive benefit in reducing readmissions and improving HF knowledge, self-care, and QoL. As a result of the lack of details provided in the included studies related to the study interventions, the authors of this review were unable to recommend any one intervention as being more effective than another.

The evidence from the studies included in this review suggests that multidisciplinary teams may enhance the outcomes from patient-centered self-care education.^{42,44-47} One of the studies⁴⁷ using a multidisciplinary team to deliver the intervention demonstrated a statistically significant reduction in readmission and three studies⁴⁴⁻⁴⁶ reported a trend toward reduced readmissions. One study⁴² demonstrated a statistically significant improvement in QoL with a multidisciplinary team delivering the patient-centered self-care education intervention and two studies^{45,46} that used multidisciplinary teams to provide the education reported a trend toward improved QoL.

The implementation of a multidisciplinary team approach has previously been shown to improve HF care.⁵¹ Multidisciplinary teams empower patients as active partners in their care⁵² while improving patient satisfaction and perceived effectiveness of care.⁵³ Multidisciplinary team members can coordinate and integrate patient-centered self-care education strategies to address the range of problems and needs of a patient, such as self-care ability, knowledge, exercise, and diet. Multidisciplinary team members provided patients with different viewpoints, which may further enhance the teaching-learning process. For example, in one study⁴⁷ a team of three providers (namely a cardiac nurse educator, dietitian, and physical therapist) delivered the hospital-based stage of the patient-centered intervention. The dietitian and the physical therapist provided discipline-specific personalized advice while the cardiac nurse functioned as the team leader in addition to providing an in-depth HF educational session and follow-up visits before and after discharge of the patient from the hospital. In another study,⁴⁶ the multidisciplinary team provided HF education to patients in integrated primary and secondary care settings. A team of one cardiologist and one nurse educator delivered one-on-one and group educational sessions; information was reinforced by the study nurse in subsequent follow-up visits.

The multidisciplinary intervention in two of the studies^{44,45} provided the patient-centered self-care HF education in a two-stage process. In one study,⁴⁴ the first stage involved the use of clinical

experts (one HF nurse educator and one cardiologist) to train 29 primary care nurses and 10 primary care physicians who then delivered the patient-centered self-care HF education to the patients. This first stage used a multidisciplinary team to provide specialized knowledge to the general practitioner who would ultimate care for the patient with HF. Another study⁴⁵ used a similar model where a multidisciplinary team of investigators, included pharmacists with advanced training in patient education and cardiovascular pharmacotherapy, a cardiologist with expertise in heart failure, a behavioral scientist, and a cognitive psychologist, provided specialized HF training to the pharmacist who delivered the patient-centered self-care education to the patient.

The studies included in this review^{16,43-47} suggested that reinforcement of patient-centered self-care education may also increase the likelihood of achieving positive outcomes. The stress and anxiety that comes with a diagnosis of HF could impair a patient's ability to assimilate information making repeated reinforcement necessary for good outcomes.⁵⁴ Positive reinforcement increases the likelihood that a desired behavior will occur. In the studies of patient-centered self-care HF education under review, reinforcement was also used to ensure that the effect of the education did not dissipate over time. This is consistent with other literature that demonstrates the significance of reinforcement on self-care behaviors.⁵⁵

In the included studies^{16,43-47} reinforcement was provided through feedback and supportive education during encounters while the patient was in the hospital, at home visits, during one-on-one sessions, at group session, or via telephone. In Murray et al.,⁴⁵ the pharmacist reinforced the education using an easy-to-follow written timeline to remind patients when to take their medications. Anderson et al.⁴⁷ provided education about HF during the hospital by the nurses and multidisciplinary team and continued this education during follow-up home visits.

The Institute of Medicine²⁰ defined patient-centered care as individualized care that is respectful of, and responsive to a patient's preferences, needs, and values, and ensures that the patient's values guide all clinical decisions. Individualized advice and tailored education that optimally incorporates a patient's perspective is fundamental to patient-centered self-care education. Individualized advice related to HF education may enhance self-care education and may improve outcomes. From the studies included in this review, it is suggested that individualized advice and feedback related to life circumstances, lifestyle knowledge, and medical therapy may be used to improve patient outcomes. This is consistent with results reported in the literature from patient-centered self-care interventions in other chronic conditions.⁵⁶⁻⁶⁰ It has been shown that individualized education can motivate patients with HF to perform regular self-measurements (e.g. blood pressure, pulse, and weight) that may translate into reduced costs of care.⁶¹ The failure of a cardiac teaching program to elicit behavioral changes may be due to a lack of an individualized approach to self-care education.⁶²

The studies included in this review suggest that continuing patient-centered self-care education through transition of care may be important in achieving positive outcomes.^{16,42-44,47} The Centers for Medicaid and Medicare defined transition of care as the movement of a patient from one setting of care (e.g. hospital, ambulatory primary care practice, ambulatory specialty care practice, long-term care, home health, or rehabilitation facility) to another.⁶³ Care transitions occur between and within settings, as well as across health states of a patient and between providers. Care

transitions challenge health care providers to deliver information and appropriate interventions in order to support patients with regards to their physical status and other aspects.⁶⁴ In-hospital education is essential for all cardiac patients.⁶⁵ Continuing that education through an effective transition of care to support ongoing patient-centered self-care education is important for improving outcomes for patients with HF.

Spehar et al.⁶⁶ analyzed data from a cohort of 30-day readmissions, including 127 patients with HF. Their study identified communication issues between patients and providers, providers and caregivers, and between different providers to be among several factors that affected seamless transition from hospital to home. They reported that patients' perceptions of what might have prevented readmission included longer in-hospital stabilization, enhanced patient education, involvement in the decision-making process, increased assurance of medication/treatment effectiveness prior to discharge, home health nursing, and timeliness of follow-up appointments.

Studies^{16,43,47} included in this review showed that when patient-centered self-care education was provided in an inpatient HF ward and continued with post-discharge reinforcement in the community setting, improved outcomes were seen. Post-discharge reinforcement with minimal lag time, home visits to continue teaching, and structured telephone support were used to enhance the outcomes. This is consistent with evidence in the literature that has demonstrated the positive benefits of care transitions. Care transitions, using multidisciplinary teams to reinforce HF care, have been shown to be important in reducing readmission for patients with HF.^{67,68}

Limitations

This systematic review has a few limitations. This review only sought articles published in the English language. It is unknown if there are studies in other languages that focused on patient-centered self-care education for patients with HF to reduce hospital readmission rates or improve patient's HF knowledge, self-care behaviors, or QoL. The studies included in this review had small sample sizes, which limits the reliability of the results. Most studies were conducted with an older population, thereby limiting the generalizability of their results to a younger and possibly healthier population of patients with HF. The duration of many of the included interventions were short. Short interventions may be unable to sustain positive outcomes through extended follow-up periods.

This review sought outcomes related to HF readmissions, HF-related QoL, HF self-care behaviors, and HF knowledge. While HF-specific instruments are available to measure these outcomes, some studies included in this review used generic instruments, which may be less sensitive in assessing these outcomes in a HF population. Given the limited number of studies identified that evaluated the effectiveness of patient-centered self-care education interventions on patients with HF, the authors decided to include these generic outcomes in this narrative review.

The included studies were heterogeneous in content, consistency, and intensity (the number of hours of educator interaction with the patient as well as the frequency of contact during the intervention) of the educational interventions, as well as reinforcement approaches. This heterogeneity makes comparison of the outcomes of these studies difficult. None of included studies provide specific details regarding the patient-centered self-care education approaches.

This limits the reproducibility of any of the included interventions into clinical practice. Because of the lack of details, recommendations as to the most effective patient-centered self-care approach cannot be made.

Studies to date on patient-centered self-care education for patients with HF are limited, with more emphasis being placed on general HF education and related outcomes as opposed to the specific individuals' needs.

Conclusions

The use of patient-centered self-care educational strategies for adult patients with HF has not resulted in any decline in outcome measures in the studies included in this review. Several studies demonstrated that patient-centered self-care education, when used as part of a comprehensive disease management strategy may have a positive benefit in reducing readmissions and improving HF knowledge, self-care, and QoL. Patient-centered self-care education is essential for patients with HF, but this education may be more effective if delivered by a multidisciplinary team and supplemented with reinforcement of individualized advice, especially through periods of care transitions.

Implications for practice

Patient-centered self-care HF education may reduce readmissions and improve HF knowledge, self-care, and QoL. Patient-centered self-care education may be delivered in inpatient settings, primary care or specialty clinics, or pharmacy-based clinics. Patient-centered self-care education that is delivered by a multidisciplinary team may reduce readmissions and promote HF knowledge, self-care, and QoL in patients with HF (JBI Level of Evidence = 2). Reinforcement of the education may be crucial in the process of the delivery of patient-centered self-care education. Patient-centered self-care education should be supplemented with ongoing reinforcement of the learning goals and objectives while continuously assessing for patient specific needs (JBI Level of Evidence = 2). The continuation of patient-centered self-care education across transitions of care may enhance positive outcomes for patients with HF (JBI Levels of Evidence = 2). A multicomponent HF education program can optimize the likelihood of achieving outcomes such as reduced readmissions and improved HF knowledge, self-care, and QoL.

Implications for research

There is limited quantitative evidence that has been generated on the concept of patient-centered self-care educational approaches for patients with HF. Future studies should focus on further evaluating patient-centered self-care education interventions on larger sample size of more diverse ethnic populations of varying literacy and socio-economic levels to improve generalizability of findings. Future research should provide greater details as to the patient-centered aspects of the interventions to allow for reproducibility. Optimal time frames for the duration of patient-centered self-care educational interventions need to be determined in order to achieve sustainable results. Studies on the effectiveness of nurse practitioner led multidisciplinary teams are needed.

Conflicts of interest

No relationships to disclose.

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Appendix I: Characteristics of prior reviews of the literature examining heart failure patient education

Author (year)	Barnason, Zimmerman, and Young, 2011³⁸
Review Objective	To determine the effectiveness of interventions to improve heart failure self-care and patient-related factors, such as knowledge about heart failure, self-efficacy for heart failure self-care, and beliefs regarding heart failure self-care.
Methods	Database searched: MEDLINE, PsycINFO, Cochrane database of clinical trials, and CINAHL. Years searched: 2000-2010. Critical appraisal of included studies not performed.
Inclusion Criteria	Non-pharmacological interventions to improve self-care in patients with heart failure. Both treatment and control groups received standard heart failure education. Measured self-care or other patient-related factors associated with self-care. Studies written in the English language and published between 2000-2010.
Number of Included Studies	19 randomized controlled trials.
Author's Conclusions	Cognitive-behavioral interventions were the most frequently used method to improve self-care behaviors. Findings demonstrated increased knowledge among intervention group participants, supporting the efficacy of augmenting standard heart failure patient education.
Difference between review and current protocol	The review focused on any interventions to improve self-care of patients with heart failure including self-maintenance, self-management behaviors, self-monitoring of patients, and patient-related factors. The proposed review will focus specifically on heart failure education interventions that are patient-centered.

Author (year)	Boren, Wakefield, Gunlock, and Wakefield, 2009³⁹
Review Objective	To identify educational content and techniques that led to successful patient self-management and improved outcomes in heart failure education programs. To determine what outcome measures are used to evaluate the effectiveness of education.
Methods	Databases and years searched: MEDLINE (1966-2007), CINAHL (1982-2007) and the Cochrane Central Register of Controlled Trials (last quarter 2007). The Jadad Scale was used to assess the quality of included papers.
Inclusion Criteria	Self-management education program with patient specific outcome measures. The study authors identified no specific outcomes measures, as

	one purpose was to determine what outcomes measures were in use to evaluate education programs. Studies written in the English language.
Number of Included Studies	35 randomized controlled trials.
Author's Conclusions	This review supports the benefits of education interventions in heart failure management. Verbal teaching supplemented with written materials was the method used in 34 of the included studies. The most common topics reviewed were medications and side effects, as well as symptom monitoring and management. Knowledge and behavior improved in most studies.
Difference between review and current protocol	This review focused on knowledge and disease management interventions in general. While this review looked at patient-specific outcome measures, the interventions included were not specifically patient-centered. The proposed review will focus on patient-centered interventions aimed to provide the necessary knowledge and skills that would meet specific patient needs related to heart failure care management as opposed to provider decisions tailored towards meeting heart failure educational needs for individual patients.

Author (year)	Boyde, Turner, Thompson, and Stewart, 2011¹⁷
Review Objective	To review educational interventions that have been implemented for heart failure patients and assess their effectiveness.
Methods	Database searched: CINAHL, MEDLINE, PsycINFO, EMBASE, and the Cochrane Library. Years searched: 1998-2008. Authors did not specify any language restrictions. Critical appraisal of included studies not performed.
Inclusion Criteria	Heart failure educational interventions defined as pre-specified learning activities where the educational interventions were evaluated either directly by knowledge or self-care abilities, or indirectly by readmission rates, mortality, or quality of life.
Number of Included Studies	19 randomized controlled trials.
Authors' Conclusions	15 of the included studies demonstrated an improvement in the outcome measured after implementation of the heart failure education strategy. Educational interventions varied considerably in delivery methods and duration, as well as the outcome measures that were used for the evaluation. One-on-one education interventions were most common. Verbal teaching was the most common but least effective method. Verbal teaching should be combined with another method to provide reinforcement. Four studies included a patient assessment prior to employing the education strategy. A patient-centered approach to education based on educational theory and

	evaluated appropriately may assist to develop an evidence base for patient education.
Difference between review and current protocol	This review focused on general educational intervention approaches such as written materials, a multi-disciplinary team approach, and group sessions. The proposed review will focus on patient-centered educational interventions in the promotion of heart failure self-care as priority over provider determined interventions in meeting specific patient's educational needs.

Author (year)	Ditewig, Blok, and van Veenendaal, 2010³⁷
Review Objective	To examine the effectiveness of self-management interventions compared to standard care on mortality, all-cause hospital readmissions, heart failure hospitalization rate, and quality of life in patients with heart failure.
Methods	Databases searched: MEDLINE, CINAHL, EMBASE and the Cochrane Library. Years searched: 1996-2009. The Delphi list of randomized controlled trials was used to assess the quality of included papers.
Inclusion Criteria	Studies evaluating heart failure self-management interventions compared to standard care. Outcome measures: mortality, all-cause hospital readmission, heart failure hospitalization rate, and quality of life. Language restriction did not apply.
Number of Included Studies	19 randomized controlled trials.
Author's Conclusions	Heart failure self-management programs, as part of a multifaceted heart failure program, demonstrated a positive effect on readmissions, mortality, and quality of life. Ten of the included studies contained interventions that empowered patients to perform self-monitoring; however, outcomes directly related to this component were not reported. Included studies demonstrate methodological shortcomings impairing validation of the effectiveness of one specific self-management intervention on outcomes for patients with heart failure.
Difference between review and current protocol	This review looked at the effectiveness of self-management interventions as part of multifaceted heart failure programs in patients with heart failure, The effectiveness of the comprehensive programs on outcome measures were assessed. The proposed review will focus specifically on the effectiveness of patient-centered self-care education for adults with heart failure on knowledge, self-care behaviors, quality of life, and readmissions.

Author (year)	Fredericks, Beanlands, Spalding, and Da Silva, 2010¹⁸
Review Objective	To determine what approach, mode, and dose is most effective in producing changes in heart failure patient education.
Methods	Databases searched: CINAHL, MEDLINE, the Cochrane Library, EMBASE, HEALTHSTAR. Years searched: 1986-2008. Critical appraisal of included studies not performed.
Inclusion Criteria	Educational Intervention involving the provision of self-care information to adult patients with heart failure. The outcomes assessed were related to self-care knowledge, self-care behaviors, and experience of symptoms. Studies published in the English language from 1986-2008.
Number of Included Studies	47 randomized controlled trials and 22 quasi-experimental studies.
Authors' Conclusions	The most effective means of delivery of heart failure patient education is through individualized education using a combination of media on a one-to-one basis over multiple sessions.
Difference between review and current protocol	This review focused on the most effective teaching method of heart failure patient education such as individualized education, combined teaching methods, one-to-one teaching method, and in multiple sessions of patient education. The proposed review will look specifically at patient-centered interventions focusing on heart failure education to improve knowledge, quality of life, self-care behaviors, and readmission.

Authors (year)	Yehle and Plake, 2010¹²
Review Objective	To better understand how to structure educational interventions for heart failure patients to improve self-efficacy for self-care behaviors.
Methods	Databases searched: PUBMED, MEDLINE, CINAHL, the Cochrane Library, ERIC, Academic Search Premier, Health Sources: Nursing/Academic Edition. Years searched: 1996- 2009. Studies written in the English language. Critical appraisal of included studies not performed.
Inclusion Criteria	Educational interventions for patients with heart failure that assessed self-efficacy as an outcome. Studies published in English language. Dissertations and non peer-reviewed studies were excluded.
Number of Included Studies	Nine randomized controlled trials, two treatment only studies, and one cross-sectional study.
Authors'	The included studies confirmed that self-efficacy is an important component

Conclusions	of interventions to improve self-care. No one approach to enhance self-efficacy was identified. One on one interventions reported improved self-efficacy in nine of the included studies. None of the included studies described specific components of the intervention that could impact self-efficacy.
Difference between review and current protocol	This review focused on standard heart failure education including information about heart failure, symptoms, medication, exercise, diet, fluid restriction, and activities. This review concluded that it is not the amount of education that improves self-efficacy but some other factors that may include ones unknown at the present time. The proposed review will evaluate patient-centered approaches to self-care education for patients with heart failure.

Appendix II: Search strategies

PubMed search strategy

#1	("heart failure"[MeSH Terms] OR "heart failure"[All Fields]) OR ("cardiomyopathies"[MeSH Terms] OR "cardiomyopathies"[All Fields] OR "cardiomyopathy"[All Fields])
#2	("education"[All Fields] OR "education"[MeSH Terms]) OR ("counselling"[All Fields] OR "counseling"[MeSH Terms] OR "counseling"[All Fields]) OR ("disease management"[All Fields] OR "disease management"[MeSH Terms]) OR ("patient education as topic"[MeSH Terms] OR "patient education"[All Fields]) OR ("health education"[MeSH Terms] OR "health education"[All Fields])) OR ("teaching"[MeSH Terms] OR "teaching"[All Fields] OR "teach"[All Fields])
#3	("quality of life"[MeSH Terms] OR "quality of life"[All Fields]) OR (readmission[All Fields]) OR ("patient readmission"[MeSH Terms] OR "patient readmission"[All Fields]) OR ("hospitalisation"[All Fields] OR "hospitalization"[MeSH Terms] OR "hospitalization"[All Fields])) OR readmit[All Fields] OR (rehospitalisation[All Fields] OR rehospitalization[All Fields]) OR (admit[All Fields] OR admission[All Fields] OR ("self care"[MeSH Terms] OR "self care"[All Fields]) OR "self management"[All Fields]) OR "self maintenance"[All Fields] OR "self monitoring"[All Fields] OR ("knowledge"[MeSH Terms] OR "knowledge"[All Fields])) OR "health knowledge, attitudes, practice"[MeSH Terms]
#4	("1990/01/01"[PDAT] : "2013/07/31"[PDAT]) AND English[lang]
#5	#1 and #2 and #3 and #4

Cumulative Index to Nursing and Allied Health Literature (CINAHL) search strategy

S1	(MH "Heart Failure") OR "heart failure"
S2	(MH "Myocardial Diseases") OR "cardiomyopathy" OR "cardiomyopathies"
S3	S1 OR S2
S4	(MH "Education") OR "education"
S5	(MH "Counseling") OR "Counseling" OR "counselling"
S6	(MH "Disease Management") OR "disease management"
S7	(MH "Patient Education") OR "patient education" OR (MH "Patient Discharge Education")
S8	(MH "Health Education") OR "Health education"
S9	(MH "Teaching") OR "teach"
S10	teaching
S11	S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10
S12	(MH "Readmission") OR "patient readmissions" OR " readmission*"
S13	(MH "Hospitalization") OR "hospitalization*"
S14	hospitalisation* or rehospitalisation* or rehospitalization*
S15	readmit* OR admit* OR admission*
S16	S12 OR S13 OR S14 OR S15
S17	(MH "Self Care") OR "self care"
S18	"self management"
S19	"self-monitoring"
S20	"self maintenance"

S21	S17 OR S18 OR S19 OR S20
S22	(MH "Knowledge") OR "knowledge"
S23	(MH "Health Knowledge") OR "health knowledge"
S24	S22 OR S23
S25	(MH "Quality of Life") OR "quality of life"
S26	S16 OR S21 OR S24 OR S25
S27	S3 AND S11 AND S25 AND S26
S28	Published Date: 19900101-20130731

PsycINFO search strategy

S1	(DE "Cardiovascular Disorders" OR "heart failure" OR "cardiomyopathy" OR "cardiomyopathies")
S2	DE "Client Education" OR DE "Disease Management" OR DE "Health Education" OR DE "Health Knowledge" OR DE "Health Promotion" OR "patient education"
S3	DE "Teaching" OR "teaching" OR "teach"
S4	DE "Counseling" OR "counseling"
S5	"education"
S6	"disease management" OR "health education" OR "health knowledge"
S7	S2 OR S3 OR S4 OR S5 OR S6
S8	DE "Quality of Life"
S9	(DE "Self Management") OR "self maintenance" OR "self care"
S10	(DE "Hospital Admission") OR (DE "Hospitalization") OR "readmission" OR "hospitalisation" OR admit* OR "reshospitalization" OR "rehospitalisation"
S11	(DE "Health Knowledge") OR (DE "Knowledge (General)")
S12	"self management" OR "self monitoring"
S13	hospitalization OR admission
S14	knowledge
S15	"quality of life"
S16	S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15
S17	S1 AND S7 AND S16 AND Limiters - Publication Year: 1990-2013

Excerpta Medica Database (EMBASE) search strategy

#1	'cardiomyopathy'/de OR 'cardiomyopathy' OR 'cardiomyopathies'
#2	'heart failure'/de OR 'heart failure'
#3	#1 OR #2
#4	'education'/de OR education
#5	'disease management'/de OR 'disease management'
#6	'patient education'/de OR 'patient education'
#7	'health education'/de OR 'health education'
#8	'teaching'/de OR teaching OR teach
#9	#4 OR #5 OR #6 OR #7
#10	'knowledge'/de OR knowledge
#11	'self care'/de OR 'self care'
#12	'self monitoring'/de OR 'self monitoring'
#13	'self maintenance' OR 'self management'
#14	'hospital readmission'/de OR readmission OR readmit OR admit OR admission

#15	'hospitalization'/de OR hospitalization OR hospitalisation
#16	rehospitalization OR rehospitalisation
#17	'quality of life'/de OR 'quality of life'
#18	#10 OR #11 OR # 12 OR #13 OR #14 OR #15 OR #16 OR #17
#19	#3 AND #9 AND #18 AND ([adult]/lim OR [aged]/lim) AND [english]/lim AND [embase]/lim AND [1990-2013]/py

The Cochrane Central Register of Controlled Trials (CENTRAL) search strategy

#1	MeSH descriptor: [Heart Failure] explode all trees
#2	MeSH descriptor: [Cardiomyopathies] explode all trees
#3	#1 or #2 or cardiomyopathy or cardiomyopathies or "heart failure"
#4	MeSH descriptor: [Education] explode all trees
#5	MeSH descriptor: [Counseling] explode all trees
#6	MeSH descriptor: [Disease Management] explode all trees
#7	MeSH descriptor: [Patient Education as Topic] explode all trees
#8	MeSH descriptor: [Teaching] explode all trees
#9	MeSH descriptor: [Health Education] explode all trees
#10	#4 or #5 or #6 or #7 or #8 or #9 or Counselling or "patient discharge education" or teach or "patient teaching" or education or teaching or "disease management" or counseling or education
#11	MeSH descriptor: [Quality of Life] explode all trees
#12	#11 or "quality of life"
#13	MeSH descriptor: [Patient Readmission] explode all trees
#14	MeSH descriptor: [Hospitalization] explode all trees
#15	#13 or #14 or Readmit or admission or readmission or admit or hospitalization or Rehospitalisation or rehospitalization or rehospitalisation
#16	MeSH descriptor: [Self Care] explode all trees
#17	#16 or "self maintenance" or "self monitoring" or "self management" or "self care"
#18	MeSH descriptor: [Knowledge] explode all trees
#19	MeSH descriptor: [Health Knowledge, Attitudes, Practice] explode all trees
#20	#18 or #19 or "health knowledge" or "patient knowledge" or "knowledge"
#21	#11 or #15 or #17 or #20
#22	#3 and #10 and #21

Education resources information center (ERIC) search strategy

#1	DE "Cardiovascular Disorders" OR "heart failure" OR "cardiomyopathy" OR "cardiomyopathies"
#2	(DE "Client Education" OR DE "Disease Management" OR DE "Health Education" OR DE "Health Knowledge" OR DE "Health")
#3	DE "Quality of Life"
#4	(DE "Self Management") OR "self maintenance" OR "self care"
#5	(DE "Hospital Admission") OR (DE "Hospitalization") OR "readmission" OR "hospitalisation" OR admit* OR "reshospitalization" OR "rehospitalisation"
#6	(DE "Health Knowledge") OR (DE "Knowledge (General)")
#7	DE "Teaching" OR "teaching" OR "teach"
#8	DE "Counseling" OR "counseling"
#9	"education"

#10	"disease management" OR "health education" OR "health knowledge"
#11	"self management" OR "self monitoring"
#12	hospitalization OR admission
#13	Knowledge
#14	"quality of life"
#15	Limiters - Publication Year from: 1990-2013

Health Source Nursing/Academic Edition search strategy

#1	(("heart failure" OR cardiomyopathy OR cardiomyopathies))
#2	((education or teach* OR counseling OR "disease management" OR counselling))
#3	(("quality of life" OR readmission OR readmit OR admit OR admission OR hospitalization OR hospitalisation OR rehospitalization OR rehospitalisation OR "self care" OR "self management" OR "self maintenance" OR "self monitoring" OR knowledge))
#4	#1 AND #2 AND #3 [Limiters - Published Date: 19890101-20130731]

Scopus

#1	(TITLE("heart failure" OR cardiomyopathies OR cardiomyopathy))
#2	(TITLE-ABS-KEY(education OR teach* OR counseling OR "disease management"))
#3	(TITLE-ABS-KEY("self monitoring" OR "self maintenance" OR "self management" OR "self care" OR readmit OR admit OR admission OR readmission OR hospitalization OR hospitalisation OR rehospitalization OR rehospitalisation OR "quality of life" OR knowledge))
#4	PUBYEAR > 1989
#5	(LIMIT-TO(LANGUAGE, "English"))
#6	#1 and #2 and #3 and #4 and #5

Dynamed search Strategy

#1	Heart Failure
#2	Heart-failure specific patient education
#3	Patient education for hospitalized patients
#4	Discharge planning
#5	Structured Disease Management
#6	Self-management
#7	#1 AND #2 AND #3 AND #4 AND #5 AND #6

Virginia Henderson International Nursing Library Search Strategy

#1	"heart failure" OR "cardiomyopathies" OR "cardiomyopathy"
#2	"education" OR "teach" OR "counseling" OR "disease management"
#3	"self monitoring" OR "self maintenance" OR "self management" OR "self care" OR readmit OR admit OR admission OR readmission OR hospitalization OR hospitalisation OR rehospitalization OR rehospitalisation OR "quality of life" OR "knowledge"
#4	#1 AND #2 AND #3

	[Limited between 1990 and July 2013]
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New York Academy of Medicine search strategy

#1	"heart failure" AND education
#2	Limited to: In:eng AND itemtype:("GREYLIT") AND pubyear:[1990 TO 2013]

ClinicalTrials.gov search strategy

#1	("heart failure" OR cardiomyopathies OR cardiomyopathy)
#2	(education OR teach* OR counseling OR "disease management")
#3	Completed
#4	Studies With Results
#5	Adult, Senior received from 01/01/1990 to 07/15/2013
#6	#1 and #2 and #3 and #4 and #5

Google Scholar search strategy

#1	*with all words - education
#2	*with all phrase - heart failure
#3	*in the title of the article
#5	*return articles dated 1990-2013
#6	#1 and #2 and #3 and #4 and #5

ProQuest Dissertations & Theses search strategy

#1	("health knowledge" OR knowledge OR "self monitoring" OR "self maintenance" OR "self management" OR "self care" OR readmit OR admit OR admission OR hospitalisation OR hospitalization OR rehospitisation OR rehospitization OR readmission OR "patient readmissions" OR "quality of life")
#2	(education OR counseling OR counselling OR "disease management" OR teach*)
#3	(cardiomyopathies OR cardiomyopathy OR "heart failure")
#4	#1 AND #2 AND #3 AND pd (>19891231) [Limited by: Date: After December 31 1989]

World-Cat search strategy

#1	'kw: heart failure, education, self-care behavior, quality of life, knowledge, readmission Limited to: '1990 to 2013'
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Appendix III: JBI MAStARI appraisal instrument

JBI Critical Appraisal Checklist for Randomised Control / Pseudo-randomised Trial

Reviewer Date

Author Year Record Number

	Yes	No	Unclear	Not Applicable
1. Was the assignment to treatment groups truly random?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Were participants blinded to treatment allocation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Was allocation to treatment groups concealed from the allocator?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Were those assessing outcomes blind to the treatment allocation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Were the control and treatment groups comparable at entry?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were groups treated identically other than for the named interventions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in the same way for all groups?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include Exclude Seek further info.

Comments (Including reason for exclusion)

Appendix IV: JBI MASTARI data extraction instrument

**JBI Data Extraction Form for
Experimental / Observational Studies**

Reviewer Date

Author Year

Journal Record Number

Study Method

RCT Quasi-RCT Longitudinal
 Retrospective Observational Other

Participants

Setting _____

Population _____

Sample size

Group A _____ Group B _____

Interventions

Intervention A _____

Intervention B _____

Authors Conclusions:

Reviewers Conclusions:

Study results

Dichotomous data

Outcome	Intervention () number / total number	Intervention () number / total number

Continuous data

Outcome	Intervention () number / total number	Intervention () number / total number

Appendix V: Excluded studies and reasons for exclusion

Agren S, Evangelista LS, Hjelm C, Stromberg A. Dyads affected by chronic heart failure: A randomized study evaluating effects of education and psychosocial support to patients with heart failure and their partners. *Journal of Cardiac Failure*. 2012;18(5):359-66.

Reason for exclusion: Not a patient-centered intervention.

Agrinier N, Altieri C, Alla F, Jay N, Dobre D, Thilly N, et al. Effectiveness of a multidimensional home nurse led heart failure disease management program-A French nationwide time-series comparison. *International Journal of Cardiology*. 2013;168(4):3652-8.

Reason for exclusion: Not a patient-centered intervention.

Aguado O, Morcillo C, Delas J, Rennie M, Bechich S, Schembari A, et al. Long-term implications of a single home-based educational intervention in patients with heart failure. *Heart and Lung*. 2010;39(6 Suppl):S14-22.

Reason for exclusion: Not a patient-centered intervention.

Albert NM, Buchsbaum R, Li J. Randomized study of the effect of video education on heart failure healthcare utilization, symptoms, and self-care behaviors. *Patient Education and Counseling*. 2007;69(1-3):129-39.

Reason for exclusion: Not a patient-centered intervention.

Ara S. A literature review of cardiovascular disease management programs in managed care populations. *Journal of Managed Care Pharmacy*. 2004;10(4):326-44.

Reason for exclusion: Not a patient-centered intervention.

Arcand JA, Brazel S, Joliffe C, Choleva M, Berkoff F, Allard JP, et al. Education by a dietitian in patients with heart failure results in improved adherence with a sodium-restricted diet: A randomized trial. *American Heart Journal*. 2005;150(4):716.e1-5.

Reason for exclusion: Not a patient-centered intervention.

Artinian NT, Magnan M, Christian W, Lange MP. What do patients know about their heart failure? *Applied Nursing Research*. 2002;15(4):200-8.

Reason for exclusion: Not a patient-centered intervention.

Artinian NT, Magnan M, Sloan M, Lange MP. Self-care behaviors among patients with heart failure. *Heart and Lung*. 2002;31(3):161-72.

Reason for exclusion: Not a patient-centered intervention.

Assareh AR, Alasti M, Beigi S, Fayyazi S. Effect of discharge education on quality of life and hospital readmission in patients with heart failure: Is it effective? *Journal of Tehran University Heart Center*. 2008;3(1):17-20.

Reason for exclusion: Not a patient-centered intervention.

Atienza F, Anguita M, Martinez-Alzamora N, Osca J, Ojeda S, Almenar L, et al. Multicenter randomized trial of a comprehensive hospital discharge and outpatient heart failure management program. *European Journal of Heart Failure*. 2004;6(5):643-52.

Reason for exclusion: Not a patient-centered intervention.

Austin J, Williams R, Ross L, Moseley L, Hutchison S. Randomised controlled trial of cardiac rehabilitation in elderly patients with heart failure. *European Journal of Heart Failure*. 2005;7(3):411-7.

Reason for exclusion: Not a patient-centered intervention.

Bakan G, Akyol AD. Theory-guided interventions for adaptation to heart failure. *Journal of Advanced Nursing*. 2008;61(6):596-608.

Reason for exclusion: Not a patient-centered intervention.

Baker DW, Asch SM, Keeseey JW, Brown JA, Chan KS, Joyce G, et al. Differences in education, knowledge, self-management activities, and health outcomes for patients with heart failure cared for under the chronic disease model: The improving chronic illness care evaluation. *Journal of Cardiac Failure*. 2005;11(6):405-13.

Reason for exclusion: Not a patient-centered intervention.

Baker DW, Dewalt DA, Schillinger D, Hawk V, Ruo B, Bibbins-Domingo K, et al. The effect of progressive, reinforcing telephone education and counseling versus brief educational intervention on knowledge, self-care behaviors and heart failure symptoms. *Journal of Cardiac Failure*. 2011;17(10):789-96.

Reason for exclusion: Not a patient-centered intervention.

Baker DW, DeWalt DA, Schillinger D, Hawk V, Ruo B, Bibbins-Domingo K, et al. "Teach to goal": Theory and design principles of an intervention to improve heart failure self-management skills of patients with low health literacy. *Journal of Health Communication*. 2011;16(Suppl 3):73-88.

Reason for exclusion: Not a patient-centered intervention.

Balk AH, Davidse W, Dommelen P, Klaassen E, Caliskan K, Burgh P, et al. Tele-guidance of chronic heart failure patients enhances knowledge about the disease. A multi-centre, randomised controlled study. *European Journal of Heart Failure*. 2008;10(11):1136-42.

Reason for exclusion: Not a patient-centered intervention.

Barbareschi G, Sanderman R, Leegte IL, van Veldhuisen DJ, Jaarsma T. Educational level and the quality of life of heart failure patients: A longitudinal study. *Journal of Cardiac Failure*. 2011;17(1):47-53.

Reason for exclusion: Not a patient-centered intervention.

Barlow J, Wright C, Sheasby J, Turner A, Hainsworth J. Self-management approaches for people with chronic conditions: a review. *Patient Education and Counseling*. 2002;48(2):177-87.

Reason for exclusion: Not a patient-centered intervention.

Barnason S, Zimmerman L, Hertzog M, Schulz P. Pilot testing of a medication self-management transition intervention for heart failure patients. *Western Journal of Nursing Research*. 2010;32(7):849-70.

Reason for exclusion: Not a patient-centered intervention.

Barnason S, Zimmerman L, Young L. An integrative review of interventions promoting self-care of patients with heart failure. *Journal of Clinical Nursing*. 2012;21(3-4):448-75.

Reason for exclusion: Not a patient-centered intervention.

Belardinelli R, Georgiou D, Cianci G, Purcaro A. Randomized, controlled trial of long-term moderate exercise training in chronic heart failure: effects on functional capacity, quality of life, and clinical outcome. *Circulation*. 1999;99(9):1173-82.

Reason for exclusion: Not a patient-centered intervention.

Belardinelli R, Georgiou D, Scocco V, Barstow TJ, Purcaro A. Low intensity exercise training in patients with chronic heart failure. *Journal of the American College of Cardiology*. 1995;26(4):975-82.

Reason for exclusion: Not a patient-centered intervention.

Benatar D, Bondmass M, Ghitelman J, Avitall B. Outcomes of chronic heart failure. Archives of Internal Medicine. 2003;163(3):347-52.

Reason for exclusion: Not a patient-centered intervention.

Bennett SJ, Hays LM, Embree JL, Arnould M. Heart Messages: a tailored message intervention for improving heart failure outcomes. Journal of Cardiovascular Nursing. 2000;14(4):94-105.

Reason for exclusion: Not a patient-centered intervention.

Bleumink GS, Knetsch AM, Sturkenboom MC, Straus SM, Hofman A, Deckers JW, et al. Quantifying the heart failure epidemic: Prevalence, incidence rate, lifetime risk and prognosis of heart failure. The Rotterdam Study. European Heart Journal. 2004;25(18):1614-9.

Reason for exclusion: Not a patient-centered intervention.

Blue L, Lang E, McMurray JJ, Davie AP, McDonagh TA, Murdoch DR, et al. Randomised controlled trial of specialist nurse intervention in heart failure. BMJ. 2001;323(7315):715-8.

Reason for exclusion: Not a patient-centered intervention.

Bocchi EA, Cruz F, Guimaraes G, Pinho Moreira LF, Issa VS, Ayub Ferreira SM, et al. Long-term prospective, randomized, controlled study using repetitive education at six month intervals and monitoring for adherence in heart failure outpatients: The REMADHE trial. Circulation: Heart Failure. 2008;1(2):115-24.

Reason for exclusion: Not a patient-centered intervention.

Boren SA, Wakefield BJ, Gunlock TL, Wakefield DS. Heart failure self-management education: a systematic review of the evidence. International Journal of Evidence Based Healthcare. 2009;7(3):159-68.

Reason for exclusion: Not a patient-centered intervention.

Boxer RS, Dolansky MA, Bodnar CA, Singer ME, Albert JM, Gravenstein S. A randomized trial of heart failure disease management in skilled nursing facilities: Design and rationale. Journal of the American Medical Directors Association. 2013;14(9):710.e5-11.

Reason for exclusion: Not a patient-centered intervention.

Boyde M, Turner C, Thompson DR, Stewart S. Educational interventions for patients with heart failure: a systematic review of randomized controlled trials. Journal of Cardiovascular Nursing. 2011;26(4):E27-35.

Reason for exclusion: Not a patient-centered intervention.

Boyne JJ, Vrijhoef HJ, Spreeuwenberg M, De Weerd G, Kragten J, Gorgels AP. Effects of tailored telemonitoring on heart failure patients' knowledge, self-care, self-efficacy and adherence: A randomized controlled trial. European Journal of Cardiovascular Nursing. Epub ahead of print April 29 2013. DOI: 10.1177/1474515113487464.

Reason for exclusion: Not a patient-centered intervention.

Brandon AF, Schuessler JB, Ellison KJ, Lazenby RB. The effects of an advanced practice nurse led telephone intervention on outcomes of patients with heart failure. Applied Nursing Research. 2009;22(4):e1-7.

Reason for exclusion: Not a patient-centered intervention.

Brotons C, Martínez M, Rayó E, Morralla C, Ballarín E, Pérez E. Randomised clinical trial to evaluate the efficacy of a multi-factorial intervention to reduce hospitalisation and improve the quality of life of patients with heart failure. Atención primaria / Sociedad Española de Medicina de

Familia y Comunitaria. 2005;36(5):280-3.

Reason for exclusion: Not a patient-centered intervention.

Caldwell MA, Peters KJ, Dracup KA. A simplified education program improves knowledge, self-care behavior, and disease severity in heart failure patients in rural settings. *American Heart Journal*. 2005;150(5):983.e7-12.

Reason for exclusion: Not a patient-centered intervention.

Chang BH, Hendricks AM, Slawsky MT, Locastro JS. Patient recruitment to a randomized clinical trial of behavioral therapy for chronic heart failure. *BMC Medical Research Methodology* [Internet]. 2004;4:8. DOI: 10.1186/1471-2288-4-8. Available from: <http://www.biomedcentral.com/1471-2288/4/8>

Reason for exclusion: Not a patient-centered intervention.

Cline CM, Israelsson BY, Willenheimer RB, Broms K, Erhardt LR. Cost effective management programme for heart failure reduces hospitalisation. *Heart*. 1998;80(5):442-6.

Reason for exclusion: Not a patient-centered intervention.

Colonna P, Sorino M, D'Agostino C, Bovenzi F, De Luca L, Arrigo F, et al. Nonpharmacologic care of heart failure: Counseling, dietary restriction, rehabilitation, treatment of sleep apnea, and ultrafiltration. *American Journal of Cardiology*. 2003;91(9a):41f-50f.

Reason for exclusion: Not a patient-centered intervention.

Cruz F, Issa VS, Ayub-Ferreira SM, Chizzola PR, Souza GE, Moreira LF, et al. Effect of a sequential education and monitoring programme on quality-of-life components in heart failure. *European Journal of Heart Failure*. 2010;12(9):1009-15.

Reason for exclusion: Not a patient-centered intervention.

Dahl J, Penque S. The effects of an advanced practice nurse-directed heart failure program. *Dimensions of Critical Care Nursing*. 2001;20(5):20-8.

Reason for exclusion: Not a patient-centered intervention.

Dansky KH, Vasey J, Bowles K. Use of telehealth by older adults to manage heart failure. *Research in Gerontological Nursing*. 2008;1(1):25-32.

Reason for exclusion: Not a patient-centered intervention.

Dansky KH, Vasey J, Bowles K. Impact of telehealth on clinical outcomes in patients with heart failure. *Clinical Nursing Research*. 2008;17(3):182-99.

Reason for exclusion: Not a patient-centered intervention.

Davis KK, Mintzer M, Dennison Himmelfarb CR, Hayat MJ, Rotman S, Allen J. Targeted intervention improves knowledge but not self-care or readmissions in heart failure patients with mild cognitive impairment. *European Journal of Heart Failure*. 2012;14(9):1041-9.

Reason for exclusion: Not a patient-centered intervention.

de la Porte PW, Lok DJ, van Veldhuisen DJ, van Wijngaarden J, Cornel JH, Zuithoff NP, et al. Added value of a physician-and-nurse-directed heart failure clinic: results from the Deventer-Alkmaar heart failure study. *Heart*. 2007;93(7):819-25.

Reason for exclusion: Not a patient-centered intervention.

DeBusk RF, Miller NH, Parker KM, Bandura A, Kraemer HC, Cher DJ, et al. Care management for low-risk patients with heart failure: a randomized, controlled trial. *Annals of Internal Medicine*. 2004;141(8):606-13.

Reason for exclusion: Not a patient-centered intervention.

Del Sindaco D, Pulignano G, Minardi G, Apostoli A, Guerrieri L, Rotoloni M, et al. Two-year outcome of a prospective, controlled study of a disease management programme for elderly patients with heart failure. *Journal of Cardiovascular Medicine*. 2007;8(5):324-9.

Reason for exclusion: Not a patient-centered intervention.

Delgado DH, Costigan J, Wu R, Ross HJ. An interactive Internet site for the management of patients with congestive heart failure. *Canadian Journal of Cardiology*. 2003;19(12):1381-5.

Reason for exclusion: Not a patient-centered intervention.

DeWalt DA, Broucksou KA, Hawk V, Baker DW, Schillinger D, Ruo B, et al. Comparison of a one-time educational intervention to a teach-to-goal educational intervention for self-management of heart failure: Design of a randomized controlled trial. *BMC Health Services Research*. [Internet]. 2009;9:99. DOI: 10.1186/1472-6963-9-99. Available from: <http://www.biomedcentral.com/1472-6963/9/99>

Reason for exclusion: Not a patient-centered intervention.

DeWalt DA, Malone RM, Bryant ME, Kosnar MC, Corr KE, Rothman RL, et al. A heart failure self-management program for patients of all literacy levels: A randomized, controlled trial [ISRCTN11535170]. *BMC Health Services Research*. [Internet]. 2006;6:30. DOI: 10.1186/1472-6963-6-30. Available from: <http://www.biomedcentral.com/1472-6963/6/30>

Reason for exclusion: Not a patient-centered intervention.

DeWalt DA, Pignone M, Malone R, Rawls C, Kosnar MC, George G, et al. Development and pilot testing of a disease management program for low literacy patients with heart failure. *Patient Education and Counseling*. 2004;55(1):78-86.

Reason for exclusion: Not a patient-centered intervention.

DeWalt DA, Schillinger D, Ruo B, Bibbins-Domingo K, Baker DW, Holmes GM, et al. Multisite randomized trial of a single-session versus multisession literacy-sensitive self-care intervention for patients with heart failure. *Circulation*. 2012;125(23):2854-62.

Reason for exclusion: Not a patient-centered intervention.

Dickson VV, Riegel B. Are we teaching what patients need to know? Building skills in heart failure self-care. *Heart & Lung*. 2009;38(3):253-61.

Reason for exclusion: Not a patient-centered intervention.

Dilles A, Heymans V, Martin S, Droogne W, Denhaerynck K, De Geest S. Comparison of a computer assisted learning program to standard education tools in hospitalized heart failure patients. *European Journal of Cardiovascular Nursing*. 2011;10(3):187-93.

Reason for exclusion: Not a patient-centered intervention.

Ditewig JB, Blok H, Havers J, van Veenendaal H. Effectiveness of self-management interventions on mortality, hospital readmissions, chronic heart failure hospitalization rate and quality of life in patients with chronic heart failure: a systematic review. *Patient Education and Counseling*. 2010;78(3):297-315.

Reason for exclusion: Not a patient-centered intervention.

Domingues FB, Clausell N, Aliti GB, Dominguez DR, Rabelo ER. Education and telephone monitoring by nurses of patients with heart failure: randomized clinical trial. *Arquivos Brasileiros de Cardiologia*. 2011;96(3):233-9.

Reason for exclusion: Not a patient-centered intervention.

Dunagan WC, Littenberg B, Ewald GA, Jones CA, Emery VB, Waterman BM, et al. Randomized

trial of a nurse-administered, telephone-based disease management program for patients with heart failure. *Journal of Cardiac Failure*. 2005;11(5):358-65.

Reason for exclusion: Not a patient-centered intervention.

Dunbar SB, Clark PC, Deaton C, Smith AL, De AK, O'Brien MC. Family education and support interventions in heart failure: a pilot study. *Nursing Research*. 2005;54(3):158-66.

Reason for exclusion: Not a patient-centered intervention.

Duncan K, Pozehl B. Effects of an exercise adherence intervention on outcomes in patients with heart failure. *Rehabilitation Nursing*. 2003;28(4):117-22.

Reason for exclusion: Not a patient-centered intervention.

Dykes PC, Acevedo K, Boldrighini J, Boucher C, Frumento K, Gray P, et al. Clinical practice guideline adherence before and after implementation of the HEARTFELT (HEART Failure Effectiveness & Leadership Team) intervention. *Journal of Cardiovascular Nursing*. 2005;20(5):306-14.

Reason for exclusion: Not a patient-centered intervention.

Ekman I, Wolf A, Olsson LE, Taft C, Dudas K, Schaufelberger M, et al. Effects of person-centred care in patients with chronic heart failure: the PCC-HF study. *European Heart Journal*. 2012;33(9):1112-9.

Reason for exclusion: Not a patient-centered intervention.

Fang J, Mensah GA, Croft JB, Keenan NL. Heart failure-related hospitalization in the U.S., 1979 to 2004. *Journal of the American College of Cardiology*. 2008;52(6):428-34.

Reason for exclusion: Not a patient-centered intervention.

Flynn KJ, Powell LH, Mendes de Leon CF, Munoz R, Eaton CB, Downs DL, et al. Increasing self-management skills in heart failure patients: A pilot study. *Congestive Heart Failure*. 2005;11(6):297-302.

Reason for exclusion: Not a patient-centered intervention.

Fredericks S, Beanlands H, Spalding K, Da Silva M. Effects of the characteristics of teaching on the outcomes of heart failure patient education interventions: a systematic review. *European Journal of Cardiovascular Nursing*. 2010;9(1):30-7.

Reason for exclusion: Not a patient-centered intervention.

Galbreath AD, Krasuski RA, Smith B, Stajduhar KC, Kwan MD, Ellis R, et al. Long-term healthcare and cost outcomes of disease management in a large, randomized, community-based population with heart failure. *Circulation*. 2004;110(23):3518-26.

Reason for exclusion: Not a patient-centered intervention.

Gary R. Exercise self-efficacy in older women with diastolic heart failure: results of a walking program and education intervention. *Journal of Gerontological Nursing*. 2006;32(7):31-9; quiz 40-1.

Reason for exclusion: Not a patient-centered intervention.

Gattis WA, Hasselblad V, Whellan DJ, O'Connor CM. Reduction in heart failure events by the addition of a clinical pharmacist to the heart failure management team: results of the Pharmacist in Heart Failure Assessment Recommendation and Monitoring (PHARM) Study. *Archives of Internal Medicine*. 1999;159(16):1939-45.

Reason for exclusion: Not a patient-centered intervention.

Giliarevskii SR, Orlov VA, Khamaganova LK, Bendeliani NG, Boeva OA, Seredenina EM. Effect

of therapeutic education of patients with chronic heart failure on quality of life and requirement of rehospitalizations. Results of 12 months randomized study. *Kardiologia*. 2002;42(5):56-61.

Reason for exclusion: Not a patient-centered intervention.

Giordano A, Scavini S, Zanelli E, Corra U, Longobardi GL, Ricci VA, et al. Multicenter randomised trial on home-based telemanagement to prevent hospital readmission of patients with chronic heart failure. *International Journal of Cardiology*. 2009;131(2):192-9.

Reason for exclusion: Not a patient-centered intervention.

Gohler A, Januzzi JL, Worrell SS, Osterziel KJ, Gazelle GS, Dietz R, et al. A systematic meta-analysis of the efficacy and heterogeneity of disease management programs in congestive heart failure. *Journal of Cardiac Failure*. 2006;12(7):554-67.

Reason for exclusion: Not a patient-centered intervention.

Gonseth J, Guallar-Castillon P, Banegas JR, Rodriguez-Artalejo F. The effectiveness of disease management programmes in reducing hospital re-admission in older patients with heart failure: A systematic review and meta-analysis of published reports. *European Heart Journal*. 2004;25(18):1570-95.

Reason for exclusion: Not a patient-centered intervention.

Gonzalez B, Lupon J, Herreros J, Urrutia A, Altimir S, Coll R, et al. Patient's education by nurse: What we really do achieve? *European Journal of Cardiovascular Nursing*. 2005;4(2):107-11.

Reason for exclusion: Not a patient-centered intervention.

Grady KL. Self-care and quality of life outcomes in heart failure patients. *Journal of Cardiovascular Nursing*. 2008;23(3):285-92.

Reason for exclusion: Not a patient-centered intervention.

Grady KL, de Leon CF, Kozak AT, Cursio JF, Richardson D, Avery E, et al. Does self-management counseling in patients with heart failure improve quality of life? Findings from the Heart Failure Adherence and Retention Trial (HART). *Quality of Life Research*. Epub ahead of print June 7 2013. DOI: 10.1007/s11136-013-0432-7.

Reason for exclusion: Not a patient-centered intervention.

Gwadry-Sridhar F, Guyatt G, O'Brien B, Arnold JM, Walter S, Vingilis E, et al. TEACH: Trial of Education And Compliance in Heart dysfunction chronic disease and heart failure (HF) as an increasing problem. *Contemporary Clinical Trials*. 2008;29(6):905-18.

Reason for exclusion: Not a patient-centered intervention.

Gwadry-Sridhar FH, Flintoft V, Lee DS, Lee H, Guyatt GH. A systematic review and meta-analysis of studies comparing readmission rates and mortality rates in patients with heart failure. *Archives of Internal Medicine*. 2004;164(21):2315-20.

Reason for exclusion: Not a patient-centered intervention.

Harrison MB, Browne GB, Roberts J, Tugwell P, Gafni A, Graham ID. Quality of life of individuals with heart failure: A randomized trial of the effectiveness of two models of hospital-to-home transition. *Medical Care*. 2002;40(4):271-82.

Reason for exclusion: Not a patient-centered intervention.

Hole T, Grundtvig M, Gullestad L, Flonaes B, Westheim A. Improved quality of life in Norwegian heart failure patients after follow-up in outpatient heart failure clinics: Results from the Norwegian heart failure registry. *European Journal of Heart Failure*. 2010;12(11):1247-52.

Reason for exclusion: Not a patient-centered intervention.

Holst M, Willenheimer R, Martensson J, Lindholm M, Stromberg A. Telephone follow-up of self-care behaviour after a single session education of patients with heart failure in primary health care. *European Journal of Cardiovascular Nursing*. 2007;6(2):153-9.

Reason for exclusion: Not a patient-centered intervention.

Jaarsma T, Abu-Saad HH, Dracup K, Halfens R. Self-care behaviour of patients with heart failure. *Scandinavian Journal of Caring Sciences*. 2000;14(2):112-9.

Reason for exclusion: Not a patient-centered intervention.

Jaarsma T, van der Wal MH, Lesman-Leegte I, Luttik ML, Hogenhuis J, Veeger NJ, et al. Effect of moderate or intensive disease management program on outcome in patients with heart failure: Coordinating Study Evaluating Outcomes of Advising and Counseling in Heart Failure (COACH). *Archives of Internal Medicine*. 2008;168(3):316-24.

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Reason for exclusion: Not a patient-centered intervention.

Appendix VI: Description of included studies

Author (year)	Anderson et al. (2005)⁴⁷
Study method	Pseudo-randomized controlled trial
Participants	Patients 50 years and older admitted to the hospital between January 1, 1996 to March 31, 1997 with a diagnosis of HF and an ejection fraction less than 40%. n = 276
Setting	Bridgeport Hospital, Bridgeport, Connecticut, USA
Intervention	<p>The intervention group consisted of 44 patients who received inpatient education, discharge planning, telephone follow-up, and home-care visits. The educational intervention was delivered by a cardiac nurse educator and was geared toward improving patient knowledge and self-management of the disease process, as measured by a decrease in readmissions at one month and six months post-discharge.</p> <p>The patient-centered component of this intervention included individually targeted patient education sessions delivered by a cardiac nurse educator, dieticians, and physical therapists. Patients received one hour-long individualized in-depth instruction with a nurse educator supplemented with a HF brochure. Patients also received 30 minutes of personalized instruction from the nutritional department and an individualized activity plan from a physical therapist. Each discipline provided reinforcement of the education prior to discharge. Further details on the patient-centered component of this intervention were not described by the study authors.</p> <p>The intervention group also received a six-week home care clinical pathway allowing for six to 20 visits by a cardiac trained homecare nurse. The goal of the home care visits was to empower patients while concentrating on individualized educational objectives in addition to continually assessing patient participation in self-care activities. A brief follow-up telephone interview and evaluation of the patient's status by a nurse case manager occurred within two weeks post hospital discharge. Significant findings were communicated to the attending physician and homecare nurse.</p>
Control	The control group consisted of 77 patients who received usual in-hospital education from the regular nursing staff as per a standard HF protocol without supplemental dietary and physical therapy consultations. These patients received routine post-discharge home health care from nurses without specialized cardiac training and no telephone follow-up.
Outcomes	HF-related readmission measured at one month and six months post discharge.
Results	This study demonstrated a statistically significant decrease in HF-related readmission rate in the intervention group at one month and six months compared to the control group. The HF-related readmission rate at 30 days in the intervention group was 6% compared to 22.1% in the control group ($p = 0.01$; statistical test not reported by the study authors). At six months, the HF-related readmission rate in the intervention group was 11.4% compared to 44.2% in the control group ($p = 0.01$; statistical test not reported by the study authors).

Authors' Conclusions	The comprehensive intervention resulted in a statistically significant reduction in six month HF-related readmission rates.
Reviewers' Comments	<p>The individualized hospital-based education that was supplemented with home care nursing visits empowered patients to contribute to their self-care and to detect subtle changes in their cardiac status. The benefits remained evident at six months post-discharge. The study suggests that in an era of budgetary austerity a brief but intensive patient-centered self-care education program can reduce HF-related readmission in patients with HF.</p> <p>Limitations of this study include a sample size, which limits the reliability of the results. The details of the randomization process were not described by the study author, raising concern for selection bias. The authors recruited few minorities, which limits the generalizability of the results.</p>

Author (year)	Doughty et al. (2001)⁴⁶
Study method	Randomized controlled trial
Participants	Patients with a primary diagnosis of heart failure (NYHA class III-IV and ejection fraction less than 40%) who were admitted to the hospital between March 2001 to August 2001 were enrolled in this study (mean age 73 years old). n = 197
Setting	General medical wards at Auckland Hospital, New Zealand.
Intervention	<p>The intervention group consisted of 100 patients with HF who received one-on-one education with a study nurse and post-discharge follow-up visit with a general practitioner and a HF clinic.</p> <p>At the initial clinic visit, occurring two weeks post hospital discharge, a comprehensive review of the patient's clinical status was conducted to identify any acute symptoms. Patients received one-on-one education by a study nurse at each clinic visit. Each patient was given a diary for logging daily weights, medication records, clinical notes, and appointments. Patients were taught self-management approaches to address potential red flags such as weight changes. Patients were also provided with an educational booklet that covered HF-related topics.</p> <p>Patients had weekly follow-up visits for six weeks alternating between their general practitioner and the HF clinic. In addition, the intervention group also received group education sessions; each class lasted for 1.5-2 hours occurring twice within six weeks after hospital discharge and again after six months. Data related to readmissions and QoL were collected after 12 months. The patient-centered component of this intervention included individualized advice and reinforcement of education including an exercise schedule, dietary management, and close monitoring of body weight. Further details on the patient-centered component of this intervention were not described by the study authors.</p>
Control	The control group consisted of 97 patients who received standard care, including follow-up with their general practitioner, which was not detailed by the study authors.
Outcomes	HF readmission and HF-related QoL measured after 12 months of follow-up.
Results	<p>This study demonstrated no difference in the number of first HF-related readmission between the intervention and control group. There was, however, a statistically significant reduction in the number of subsequent HF-related readmission in the intervention group compared to the control group, (15 versus 42, respectively; 2P = 0.036 [statistical test not reported by the study authors]).</p> <p>HF-related QoL was measured using the MLHFQ, which includes a physical functioning and emotional sub-score. There were statistically significant improvements in physical functioning between the intervention and control groups from baseline to 12 months (change from baseline -11.1 and -5.8, respectively, 2P = 0.015 [statistical test not reported by the study authors]) (A negative change scores indicates an improvement in QoL when measured by the MLHFQ). There was no statistically significant difference in the change in</p>

	the emotional sub-score between the intervention group and control groups from baseline to 12 months (change from baseline -3.3, and -3.3 respectively, 2P= 0.97 [statistical test not report by the study author]).
Authors' Conclusions	This study demonstrated that an integrated primary/secondary care patient-centered self-care education intervention for patients with HF can improve HF-related QoL and reduced HF-related hospital readmissions. The authors suggested that this integrated model used in combination with an individualized approach could produce modest benefits.
Reviewers' Comments	This study suggests that an integrated patient-centered self-care education program targeting patients and their families within a primary and secondary care setting can be effective in improving patient outcomes. Limitations of this study include a small sample size, which may limit the reliability of the results. The lack of reduction in first readmissions may have been caused by the delay in the start of this intervention until after the patient was discharged.

Author (year)	Gwadry-Sridhar et al. (2005)⁴²
Study method	Randomized controlled trial
Participants	Patients with a diagnosis of HF and left ventricular ejection fraction less than 40% who were admitted to the hospital between November 1998 and April 2000 were enrolled in the study. n = 134
Setting	The London Health Sciences Center, Victoria Campus – Southwestern Ontario, Canada.
Intervention	The intervention group consisted of 68 patients who received two HF booklets and watched a HF education video in addition to receiving education by a multidisciplinary team. The multidisciplinary team that delivered the educational intervention consisted of a pharmacist and a nurse or educator. A certified pharmacist accredited in patient counseling trained the team who delivered the intervention. Patients received a total of 2.5 hours of education over a 48-96 hours period a few days prior to and in some cases shortly after discharge. The intervention focused on optimizing patient participation with medication use and general directions on diet and lifestyle recommendations. Data related to knowledge and QoL were collected after 12 months. The patient-centered component of this intervention included personalized feedback incorporating the patient's life circumstances, lifestyle knowledge, and medical therapy. Components of the intervention included oral, written, visual props, and media videos. Written material incorporated in the intervention was appropriate for understanding at an eighth-grade level. Further details on the patient-centered component of this intervention were not described by the study authors.
Control	The control group consisted of 66 patients who received only the HF booklets and video without the multidisciplinary team interaction.
Outcomes	HF-related knowledge and QoL (measured by a generic and a HF-specific instrument) measured over a 12 month follow-up period.
Results	This study measured HF knowledge using the Knowledge Acquisition Questionnaire at the end of the education intervention and at 12 months follow-up. At 12 months follow-up, the mean \pm SD change in knowledge score in the intervention group was 2.24 ± 2.46 (95% CI 1.63-2.85) and in the control group was 1.38 ± 2.16 (95% CI 0.85-1.91). The intervention group had a statistically significant increase in knowledge at the conclusion of the intervention ($P=0.02$ [statistical test not reported by the study author]). The knowledge gained in the intervention group was maintained through the 12 month follow-up period ($P = 0.05$) [statistical test not reported by the study author]). QoL was measured using and the SF-36, a generic instrument, and the HF-specific MLHFQ every three months post discharge for one year. The SF- 36 includes a physical component summary score (PCS) and mental component summary score (MCS). The SF-36 mean PCS were similar in both groups at all time points. The intervention group had an improvement from 30.52 to 37.15 from baseline to 12 months compared to 29.13 to 37.38 in the control group ($P = 0.92$ [statistical test not reported by the study author]). While both groups demonstrated an improvement, there was no statistically significant difference between the groups. The MCS demonstrated a trend toward improvement in both groups. The intervention group improved from 46.31 to

	<p>52.38 from baseline to 12 months compared to 42.74 to 51.94 in the control group ($P = 0.74$ [statistical test not reported by the study authors]). While both groups demonstrated an improvement, there was no statistically significant difference between the groups.</p> <p>For the MLHFQ, there was improvement in both groups from baseline to 12 months. The intervention group improved from 44.03 to 25.75 compared to 44.91 to 32.19 in the control group (lower scores indicate greater QoL on the MLHFQ). There was a statistically significant improvement in HF-related QoL in the intervention group compared to the control group ($P = 0.002$ [statistical test not reported by the study authors]).</p>
Authors' Conclusions	HF knowledge and, perhaps, HF-specific QoL improved following an individualized in-hospital educational intervention for patients with HF.
Reviewers' Comments	<p>The study suggests that an individualized patient-centered self-care educational intervention delivered at the time of hospital discharge may be a useful component of HF management.</p> <p>Limitations of this study include a small sample size, which may limit the reliability of the results. While the intervention utilized personalized feedback, scripted text were used by the healthcare providers to elicit initial patient responses.</p> <p>Strengths of this study include the use of a multidisciplinary team to delivery an intervention a brief intervention that was able to show sustained results at 12 months follow-up.</p>

Author (year)	Jaarsma et al. (1999 and 2000)^{16,43}
Study method	Randomized controlled trial (outcomes reported in two separate articles)
Participants	Patients, 50 years of age or older and literate in Dutch, with a history of heart failure for at least three months prior to admission who were admitted to the cardiology ward with symptoms of HF (NYHA class III-IV) (mean age of 73 and 58% male).n= 186
Setting	The cardiology ward at University Hospital in Maastricht, Netherlands.
Intervention	<p>The intervention group consisted of 84 patients who received intensive, systematic, planned HF education and a standardized nursing care plan by a study nurse including four visits in the hospital, one telephone follow-up post-discharge, and one home visit within 10 days after discharge. The total number of hours of interaction with the nurse was not reported. The patients were followed up for nine months. Outcome data related to readmissions, QoL, and self-care behaviors were collected by patient interview at one, three, and nine months after discharge.</p> <p>During the hospital stay, the nurse assessed the patient's needs, provided an information card on HF signs and symptoms, and discussed discharge planning. Within one week after discharge, the study nurse called the patient to assess potential problems and make an appointment for a home visit. During the home visit, the study nurse reinforced and continued to provide education as warranted by the patient's condition. The intervention included teaching on consequences of HF in daily life, recognition of warning signs and symptoms of HF, sodium restriction, fluid restriction, and participation in the treatment plan.</p> <p>The patient-centered component of this study included assessment of patient education and counseling needs, provision of support for the patient and family, and discussion of individual challenges such as social interaction, sexual function, and limited access to their general practitioner. The information provided to the patient and family about specific patient needs was reinforced at each visit. Further details on the patient-centered component of this intervention were not described by the study authors.</p>
Control	The control group consisted of 95 patients who received standard care without structured education, telephone follow-up, or home visits with individualized education by the study nurse.
Outcomes	Cardiac-caused readmissions (HF-related readmission where not separated out), QoL (as measured by four different instruments, one of which was HF-specific), and HF-related self-care behaviors over 9 months of follow-up.
Results	This study reported cardiac-caused readmission at one, three and nine months post intervention. The intervention group demonstrated 8 (10%) patients readmitted at one month, 18 (21%) patients readmitted within three months, and 24 (29%) patients readmitted within nine months. The control group demonstrated 11 (12%) patients readmitted at one month, 23 (24%) patients readmitted at three months, and 37 (39%) patients readmitted at nine months. While there were fewer patients readmitted in the intervention group, there was no statistically significant difference in cardiac-caused readmissions at nine months follow-up between the groups (Chi-square = 2.1, $p = 0.096$).

Patients' self-care ability was measured by the Appraisal of Self-care Agency (ASA) Scale and self-care behavior was measured by the Heart Failure Self-Care Behavior Scale at baseline, three months, and nine months. Both groups improved their self-care abilities between baseline and three months follow-up; however, the intervention group showed a decline in self-care abilities between the three months and nine months follow-up while the control group demonstrated continued improvement in self-care abilities at nine months. There was no statistically significant difference in self-care abilities between groups at any time point (three months: $t = 0.74$, $p=0.46$; nine months: $t = 2.2$, $p = 0.3$). Both groups demonstrated an improvement in self-care behavior at one month follow-up. However, self-care-behavior declined at the three months and nine months follow-ups although they remained higher than baseline at these time points. At the one month follow-up, there was a statistically significant improvement in the intervention group compared to the control group ($t = 3.8$, $P < 0.001$). This statistically significant improvement in self-care behavior in the intervention group compared with the control group was maintained at the three months follow-up ($t = 2.9$, $P = 0.005$), but not sustained to nine months follow-up ($t = 1.6$ and $P = 0.11$).

QoL was measured using four different scales, one of which was HF-specific, to evaluate this multidimensional outcome. Functional capacity was measured using the Heart Failure Functional Status Inventory. Both groups increased at three months post discharge, but decreased by the nine month follow-up. No difference was found between the intervention and control groups between baseline and nine months follow-up (p value and statistical test not reported by the study author).

A questionnaire, which was not identified by the study authors, was used to measure symptoms. There was a statistically significant decrease in the average number of symptoms in both groups at three months ($P < 0.001$ [statistical test not reported by study authors]). However, there was no difference between groups at any time point during follow-up (p value and statistical test not reported by the study authors). The intervention group did demonstrate a statistically significant decrease in symptom severity compared to the control group between baseline and nine months follow-up ($t = 2.3$, $p = 0.02$). The intervention group also demonstrated a statistically significant decrease in symptom distress compared to the control group between baseline and nine months follow-up ($t = 2.1$, $p = 0.04$).

Psychosocial adjustment to illness was measured using the Psychosocial Adjustment to Illness Scale (PAIS). There was as statistically significant improvement in psychosocial adjustment, demonstrated by as decrease in total PAIS scores, in both groups from baseline to nine months follow-up (intervention: $t=2.3$, $P= 0.03$; control: $t = 2.3$, $P = 0.03$). There was no difference between groups at any time point during follow-up (p value and statistical test not reported by the study authors).

Overall well-being was measured using Cantril's Ladder. The intervention patients reported a statistically significant improvement in well-being compared to the control group from baseline to one month follow-up

	(intervention group [mean \pm SD]: 6.8 \pm 2.2 to 7.2 \pm 1.5; control group [mean \pm SD]: 6.3 \pm 2.2 to 6.4 \pm 2.1; $t = 2.1$, $p = 0.04$). However, well-being scores decreased in both groups below baseline scores by the nine months follow-up (intervention group: 6.7 \pm 1.9; control group: 6.2 \pm 2.1).
Authors' Conclusions	Patients' HF-related self-care behavior improved following an intensive, systematic, and individualized education and support intervention by a nurse delivered both in the hospital and at home. There was a trend toward reduced cardiac-caused readmission rates and improved QoL that did not reach statistical significance.
Reviewers' Comments	The study suggests that an individualized patient-centered self-care educational intervention delivered throughout the transition period from hospital to home may be a useful component of HF management. The limitations of this study included the small sample size, which may limit the reliability of the results. This short included an intervention of short duration. The intervention was unable to sustain positive outcome through 9 months of follow-up.

Author (year)	Martenson et al. (2005)⁴⁴
Study method	Cluster randomized controlled trial
Participants	Patients, aged 18 years and older, with a diagnosis of HF (NYHA class II-IV) and a residence within the catchment who attended one of the included primary health care centers between April 1999 to April 2000 area were enrolled in the study. n = 153
Setting	Eight primary healthcare centers in two cities in Southeastern Sweden.
Intervention	<p>The intervention group consisted of 78 patients. The intervention group received a single two-hour education and counseling session. The education session occurred in the patient's home and included the patient's family and caregivers. The education included written and verbal material as well as an interactive HF CD-ROM focusing on the patient's needs and skills to improve their self-care management, such as restricting fluids, reducing sodium intake, weight monitoring, detection of deteriorating symptoms (e.g., fluid retention, shortness of breath, edema), and directions on how to adjust diuretic medication when the fluid retention occurs.</p> <p>The intervention group also received telephone follow-up monthly for one year except at three and 12 months when a home visit occurred. The intervention was delivered by primary healthcare nurses and physicians who received specialized training from a HF nurse and cardiologist. Data related to QoL were collected at three and 12 months follow-up.</p> <p>The patient-centered component of this intervention included individualized education focusing on a patient's needs and skills. Further details on the patient-centered component of this intervention were not described by the study authors.</p>
Control	The control group consisted of 75 patients who were assigned to standard care. In this study, standard care consisted of team-based care and home visits from primary health-care physicians, nurses, assistant nurses, and physiotherapists. These providers did not receive the specialized HF training.
Outcomes	QoL (measured by a generic and a HF-specific instrument) measured over 12 months of follow-up.
Results	<p>In this study QoL was measured by the generic SF-36 and HF-specific MLHFQ at baseline, three months and 12 months follow-up. On the SF-36, the intervention group demonstrated preserved QOL in all dimensions at the three month and 12 month follow-up. The control group showed significant impairment in role functioning due to physical limitations ($p = 0.035$ [statistical test not reported by the study authors]) and vitality ($p = 0.029$ [statistical test not reported by the study authors]) at the three months follow-up. At the three month and 12 month follow-up, the control group deteriorated in physical functioning ($p = 0.035$, $p = 0.001$, respectively [statistical test not reported by the study authors]), the role function due to emotional limitation ($p = 0.001$, $p = 0.022$, respectively [statistical test not reported by the study authors]), and the MCS ($p = 0.017$, $p = 0.047$, respectively [statistical test not reported by the study authors]).</p> <p>The study demonstrated a statistically significant improvement in role functioning due to physical limitation at three months in the intervention group</p>

	<p>compared to control group (P = 0.008 [statistical test not reported by the study authors]). There was a tendency toward improvement in vitality and social functioning (p = 0.051, p = 0.056, respectively, [statistical test not reported by the study authors]). However, the differences between groups disappeared by the 12 months follow-up (p value and statistical test not reported by the study authors).</p> <p>The MLHFQ showed no significant mean differences between or within groups at baseline or at the three and 12 months follow-up in total scores or the emotional or physical sub-scores (p value and statistical test not reported by the study authors).</p>
Authors' Conclusions	A nurse-led patient-centered self-care education in a primary health care setting resulted in limited effects on HF-related QoL, although the effects were maintained to a greater extent in the intervention group.
Reviewers' Comments	<p>The study showed that a patient-centered self-care education intervention delivered in an outpatient setting supplemented with telephone follow up has some effects at maintaining QoL for patients with HF.</p> <p>Limitations of this study include a small sample size, which may limit reliability of results. The patients in this study were fairly stable, which limits study generalizability to more unstable patients.</p>

Author (year)	Murray et al. (2007)⁴⁵
Study method	Randomized controlled trial
Participants	Socioeconomically disadvantaged patients, age 50 years or older with a diagnosis of HF, who were seen between February 2001 to June 2004 at selected general internal medicine practice or a cardiology clinic, or who were being discharge from Wishard Memorial Hospital were enrolled in the study. The selected patients planned to receive all of their care and prescriptions at Wishard Hospital, use at least one HF medication, were not using or planning to use medication container, had access to a telephone, and were not hearing impaired. n = 314
Setting	A primary care clinic affiliated with Wishard Health Service in Indianapolis, Indiana, USA.
Intervention	The intervention group included 122 patients who received an assessment of their medication history of all prescriptions, over-the-counter drugs, and dietary supplements, as well as an assessment of their medication knowledge and skills by the study pharmacist. The study pharmacist in the intervention group received advanced training in patient education and cardiovascular pharmacotherapy from a team that included a geriatrician, a HF cardiologist, a behavioral scientist, and a cognitive psychologist. The intervention pharmacist provided patient-centered verbal instructions and written materials about the medications using a schema approach. This process required that the pharmacist incorporate principles of patient-centered care medication instructions by incorporating the patient's individualized needs and preferences into the plan of care. ⁴⁸⁻⁵⁰ The patient education material and instructions were based on the patient's preferences and potential barriers related to the content, format, and language. The instructions were aimed towards patients with low health literacy and included easy to follow timelines and reminders. The intervention pharmacist assigned each medication category an icon to match the container label, lid, and the written patient instructions. The pharmacist monitored each patient's medications, health care issues, body weight, and other data and communicated this information to the patient's providers. Further details on the patient-centered component of this intervention were not described by the study authors. The intervention lasted nine months with an additional three month post-study follow-up period. Data related to readmissions and QoL were collected at six and 12 months.
Control	The control group included 192 patients who received their prescription from pharmacists without specialized training or access to the patient-centered study material.
Outcomes	HF-related QoL and HF-related hospital readmissions over nine months of follow-up.
Results	In this study, the intervention group demonstrated a mean (SD) HF-related hospital readmission rate at nine months of 0.11 (0.46) compared to 0.15 (0.58) in the control group with an incident rate ratio (95% CI) of 0.77 (0.28-2.10). While the intervention group demonstrated fewer HF readmissions,

	<p>there was no statistically significant difference between the groups.</p> <p>HF-related QoL was measured by the Chronic Heart Failure Questionnaire. The intervention group showed improvement in HF-related quality of life from baseline to six months and 12 months follow-up by 0.28 and 0.39, respectively, compared to 0.21 and 0.24, respectively in the control group (P = 0.52 at six month, P = 0.21 at 12 months [statistically test not reported by the authors]).</p>
Authors' Conclusions	<p>A pharmacist-led intervention for community-based outpatients with HF resulted in a reduced HF readmission rate that showed a trend toward statistical significance. The intervention group maintained their HF-specific QoL post intervention, while HF-related QoL declined in the control group. This study suggested the benefit of an ongoing intervention because the observed effect dissipated when the intervention ceased.</p>
Reviewers' Comments	<p>This study examined the effects of a patient-centered self-care education intervention delivered by a specially trained pharmacist. While the study showed improved adherence to medication during the intervention, limited effects were seen in regards to HF readmissions and HF-related QoL. Limitations of this study include a small sample size, which may limit the reliability of the results. A predominantly indigent population was recruited for the study, which limits generalizability to other populations.</p>