The effectiveness of computer-based learning in hospitalized adults with heart failure on knowledge, re-admission, self-care, quality of life, and patient satisfaction: a systematic review protocol

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Review question/objective
In hospitalized adults with heart failure, what is the effect of computer-based learning strategies versus usual care on knowledge, re-admission, self-care, quality of life, and patient satisfaction?

Background
Heart failure (HF) is a chronic debilitating disease with a poor prognosis.¹ A widely accepted definition of HF is “a complex clinical syndrome that can result from any structural or functional cardiac disorder that impairs the ability of ventricles to fill with or eject blood which includes diastolic as well as systolic heart failure”.² This disease may present as complaints of dyspnea, fatigue, orthopnea and peripheral edema. Clinical diagnosis can be confirmed with an echocardiogram, demonstrating decreased ejection fraction, structural changes or hemodynamic
abnormalities. One of the main goals in treatment of HF is to improve quality of life (QOL) and self-care, while minimizing the healthcare expenditure related to this disease.

HF is a progressive disease that affects approximately 4% of the population worldwide (about 26 million). In the United States (US) nearly 5.7 million people are affected with HF. In Europe, it is estimated that over 15 million people suffer from HF and in Australia, the incidence is close to 300,000 (1.5-2%). It is difficult to appreciate the global impact of HF due to the lack of a consistent means of accurate reporting, especially from countries in Asia and Africa. It is also difficult to obtain an accurate assessment of gender differences in HF due to under-representation of women in clinical trials. Due to the persistent and growing incidence of HF, changes have occurred in treatment. Redirecting the focus on post-hospitalization care, patient self-management, and QOL has resulted in decreased hospital re-admission. Patient education has become an integral component of HF management.

Despite these efforts, HF often leads to frequent hospitalizations and impaired QOL. According to the Centers for Disease Control (CDC), in 2010 there were one million hospitalizations related to HF in the US. It is estimated that approximately 25% of these patients will be readmitted to hospital within 30 days of discharge. A major goal of Healthy People 2020, a US initiative to improve national healthcare, is to reduce hospital readmission rates due to HF.

The mortality rate of HF increases with frequent hospitalizations. In the Fall of 2012, the Centers for Medicaid and Medicare Services (CMS) implemented a program that aims to reduce reimbursement of services based on readmission rates for HF. Currently CMS provides health insurance to almost 48 million Americans. This initiative prompted many hospitals to bring HF to center stage, focusing on the quality of care during hospitalization and meticulous discharge planning. The Joint Commission (TJC), a non-profit organization in the US that accredits health care organizations and programs, has identified the importance of discharge instructions/education for HF by including it as a benchmark core quality indicator for hospitals. Failure to meet benchmarks on quality indicators for HF may demonstrate poor quality of care or missed opportunities of coordination of care for patients.

One of the main purposes of HF education is to assist the patient in learning and thus gaining the knowledge and skills required to adhere to the treatment plan. Patient education can facilitate learning and knowledge acquisition to influence the attitudes and behavior required to improve health. Therefore, patients are more likely to remain motivated and involved in self-care decisions. The patients’ HF knowledge can be measured with tools such as the Atlanta Heart Failure Knowledge Test (A-HFKT) or the Dutch Heart Failure Knowledge Scale which are valid and reliable tools.

Self-care is a decision making process of performing daily activities to maintain health, prevent illness, and manage chronic disease. HF self-care management is the ability of the individual to adhere to the prescribed regimen, identify the signs and symptoms, and take action when symptoms occur. Self-care behavior can be measured with tools such as the European Heart
Failure Self-Care Behavior Scale (EHFScBS), or the Self-Care Heart Failure Index (SCHFI), Both are valid and reliable tools.

QOL can be improved with patient education on self-care management. QOL is a multidimensional concept that includes self-reported measures of physical, emotional, social, and mental health. Compared to the general population, the QOL in HF patients is more compromised. The distressing symptoms of HF may lead to decreased physical activity, poor QOL and an increase rate of hospital readmissions. QOL can be measured with tools such as the European QOL-5 Dimensions (EQ-5D), the Minnesota Living with Heart Failure Questionnaire (MLHFQ), or the Nottingham Health Profile (NHP), all valid and reliable tools.

Patient satisfaction has also been linked to better outcomes. Patient satisfaction is demonstrated by how patients value their care. It is a comparison between the patient’s subjective standards and their healthcare experiences. Satisfied patients are more likely to adhere to the treatment plan. One of the main goals in the treatment of HF is to provide education that will enhance the patients’ knowledge and understanding of the disease process and treatments, thereby improving the patients’ ability to engage in self-care and adhere to the treatment plan. Adherence to a treatment regimen will improve one’s clinical condition which may ultimately lead to greater patient satisfaction. Patient satisfaction can be measured by valid and reliable tools such as the Patient Satisfaction Questionnaire (PSQ), or the Newcastle Satisfaction with Nursing Scale (NSNS) which measures patient satisfaction with nursing care.

Hospital readmission is defined as returning to the same hospital or another acute hospital following a prior admission for HF within one year. A readmission can be the result of incomplete treatment, providing poor care, poor discharge coordination, or incomplete discharge planning. Hospital readmission rates can be measured using tools such as the Center for Medicaid and Medicare’s Risk Standardized Readmission Rates Model (RSRR). The RSRR model is endorsed by the National Health Quality Forum and gives a measure of hospital performance based on readmission rates.

The American Heart Association (AHA) strongly emphasizes the use of written discharge instructions and educational materials that address diet, activity level, discharge medication use, weight monitoring, and follow-up appointments to be given at the time of discharge. Discharge instructions/education facilitates patients and caretakers in their learning process and knowledge acquisition necessary to care for themselves at home. Medical complications and rates of hospital readmission have the potential to be successfully reduced by carefully designed discharge educational interventions.

Improved patient education at time of discharge may increase knowledge acquisition, decrease hospital readmission, and enhance self-care, QOL, and patient satisfaction. Studies have demonstrated that the addition of illustrations to written discharge instructions can improve patient comprehension and retention of instructions. The use of follow-up phone calls 48 hours after discharge in which hospitals call patients to assess their health status and treatment plan is another strategy that has been employed.
Care transition intervention strategies have been developed utilizing a transition coach to work closely with the patient ensuring that the treatment plan post discharge is effective.\textsuperscript{47,48,49,50}

A relatively new intervention is the use of the computer as a medium to deliver educational materials. Computer-based education, also known as computer-based/assisted-learning, is the application of supportive educational media including simulation, cognitive tools for learning and video-conferencing to aid in knowledge acquisition through teaching, learning and assessment among other modalities.\textsuperscript{51,52}

Computer-based learning considers, facilitates, and integrates the unique needs of the patient population.\textsuperscript{53,54} Comprehension and retention of knowledge can potentially prevent recurrence of illness and reduce hospital readmission which are dependent on the adaptability of the intervention to the learner's needs.\textsuperscript{55} HF most often affects older adults who may require specific adaptive educational considerations such as modifications to computer learning including visual and auditory requirements unique to each learner.\textsuperscript{56} The adaptability of computer-based learning also has the potential to enhance the specific linguistic and cultural preferences for the HF population in order to succeed in building the patient's comprehension.\textsuperscript{56}

A literature review was conducted that focused on computer-based approaches to education for patients with chronic diseases such as diabetes, cancer, cardiovascular disease, and asthma across all age groups. This literature review supports the use of a computer-based approach as an effective strategy for patient education pertaining to knowledge transfer and skill acquisition by patients.\textsuperscript{51}

Furthermore, a randomized controlled trial (RCT) on computer-based learning for patients with chronic HF conducted in heart failure clinics, demonstrated significant outcomes resulting in increased knowledge related to HF.\textsuperscript{57}

It is the intention of this systematic review to determine if computer-based learning will improve knowledge, reduce HF readmission and enhance self-care, QOL, as well as patient satisfaction in adults hospitalized with HF.

**Keywords**

heart failure, cardiomyopathy, computer-based learning, computer-based education, computer assisted learning, adults, hospitalization and hospitalisation.

**Inclusion criteria**

**Types of participants**

This review will consider studies that include all adults of any ethnicity, race or gender, 18 years of age or older who are hospitalized with a primary or secondary diagnosis of HF, and with any existing comorbidities. Participants with cognitive or sensory impairment will be excluded.
Types of intervention(s)

This review will consider studies that evaluate computer-based learning focused on HF education inclusive of but not limited to diet, activity level, medications, weight monitoring, follow-up appointments, and knowledge of other signs and symptoms in the hospital setting prior to discharge compared with standard education such as face to face instructions with individuals or groups, using written educational materials administered by healthcare professionals.

Types of outcomes

This review will consider studies that include the primary outcome measure of knowledge. This outcome can be measured with tools such as the A-HFKT or Dutch Heart Failure Knowledge Scale.

This review will also consider studies that include secondary outcome measures of self-care, QOL, patient satisfaction, and readmission. Self-care can be measured with tools such as the EHFScBS. QOL can be measured using tools such as the EQ-5D, MLHFQ or NHP. Patient satisfaction can be measured using tools such as the PSQ or NSNS. Readmission can be measured using tools such as the RSRR.

Types of studies

This review will consider RCTs as the highest level of evidence. In the absence of RCTs, other research designs such as non-randomized controlled trials or quasi-experimental, before and after studies, prospective and retrospective cohort studies, case control studies and analytical cross-sectional studies will be included.

Search strategy

The search strategy aims to find both published and unpublished studies. A three-step search strategy will be utilized in this review. An initial limited search of PubMed and CINAHL will be undertaken followed by analysis of the text words contained in the title and abstract, and of the index terms used to describe the article. A second search using all identified keywords and index terms will then be undertaken across all included databases. Thirdly, the reference lists of all identified reports and articles will be searched for additional studies. Only studies published in English will be considered for inclusion in this review. Studies published from 1970 to the present will be considered for inclusion in this review. This is because the use of computer-generated patient learning can be seen as early as 1970.

The databases to be searched include:
PubMed, CINAHL, The Cochrane Central Register of Controlled Trials (CENTRAL), EMBASE, PsycINFO, Healthsource: Nursing/Academic edition, Academic Search Premiere, ERIC.

The search for unpublished/Grey literature will include:


Initial keywords to be used will be: heart failure, cardiomyopathy, computer-based learning, computer-based education, computer assisted learning, adults, hospitalization and hospitalisation.

**Assessment of methodological quality**

Papers selected for retrieval will be assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardized critical appraisal instruments from the Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument (JBI-MAStARI) (Appendix I). Any disagreements that arise between the reviewers will be resolved through discussion, or with a third reviewer.

**Data collection**

Data will be extracted from papers included in the review by two independent reviewers using the standardized data extraction tool from JBI-MAStARI (Appendix II). The data extracted will include specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives. Authors of primary studies will be contacted for missing information or for clarification of information. Data will be extracted from studies that report at least one of the outcomes or any combination of outcomes.

**Data synthesis**

Quantitative data will, where possible be pooled in statistical meta-analysis using JBI-MAStARI. All results will be subject to double data entry. Effect sizes expressed as odds ratios (for categorical data) and weighted mean differences (for continuous data) and their 95% confidence intervals will be calculated for analysis for RCT and quasi-experimental designs. Heterogeneity will be assessed statistically using the standard Chi-square and also explored using subgroup analysis based on the different study designs included in this review. Where statistical pooling is not possible, the findings will be presented in narrative form. This narrative will be divided in categories according to type of study design first, i.e., RCTs with sub-categories listed according to outcomes. In addition, tables and figures will be included to aid in data presentation where appropriate.
Conflicts of interest

None

Acknowledgements

This review will partially fulfill degree requirements for successful completion of the Doctor of Nursing Practice Program at Pace University, College of Health Professions, New York, NY for Hemlata J. Carr FNP-BC, AnneMarie McDermott FNP-BC, Hengameh Tadbiri FNP-BC, Anne-Marie Uebbing FNP-BC.
References


57. Strömberg A, Dahlström U, Fridlund B. Computer-based education for patients with chronic heart failure: a randomised, controlled, multicentre trial of the effects on knowledge, compliance and quality of life. Patient Education & Counseling, Dec 2006; 64(1-3); 128-35.
Appendix I: Appraisal instruments

MAStARI appraisal instruments

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

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Unclear</th>
<th>Not Applicable</th>
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<tr>
<td>1. Was the assignment to treatment groups truly random?</td>
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<td>2. Were participants blinded to treatment allocation?</td>
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<td>3. Was allocation to treatment groups concealed from the allocator?</td>
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<td>4. Were the outcomes of people who withdrew described and included in the analysis?</td>
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<td>5. Were those assessing outcomes blind to the treatment allocation?</td>
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<td>6. Were the control and treatment groups comparable at entry?</td>
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<td>7. Were groups treated identically other than for the named interventions</td>
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<td>8. Were outcomes measured in the same way for all groups?</td>
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<td>9. Were outcomes measured in a reliable way?</td>
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<tr>
<td>10. Was appropriate statistical analysis used?</td>
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**Overall appraisal:**
- Include ☐
- Exclude ☐
- Seek further info. ☐

Comments (Including reason for exclusion)

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doi: 10.11124/jbrisir-2013-984
### JBI Critical Appraisal Checklist for Descriptive / Case Series

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<tr>
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<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>1. Was study based on a random or pseudo-random sample?</td>
<td>☐</td>
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<td>2. Were the criteria for inclusion in the sample clearly defined?</td>
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<td>3. Were confounding factors identified and strategies to deal with them stated?</td>
<td>☐</td>
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<td>4. Were outcomes assessed using objective criteria?</td>
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<td>5. If comparisons are being made, were there sufficient descriptions of the groups?</td>
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<td>6. Was follow up carried out over a sufficient time period?</td>
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<td>7. Were the outcomes of people who withdrew described and included in the analysis?</td>
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<td>8. Were outcomes measured in a reliable way?</td>
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<td>9. Was appropriate statistical analysis used?</td>
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Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

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doi: 10.11124/jbisrir-2013-984
### JBI Critical Appraisal Checklist for Comparable Cohort/Case Control

**Reviewer**  
**Date**  
**Author**  
**Year**  
**Record Number**

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<td>1. Is sample representative of patients in the population as a whole?</td>
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<td>2. Are the patients at a similar point in the course of their condition/illness?</td>
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<td>3. Has bias been minimised in relation to selection of cases and of controls?</td>
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<td>4. Are confounding factors identified and strategies to deal with them stated?</td>
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**Overall appraisal:**  
- Include ☐  
- Exclude ☐  
- Seek further info. ☐

**Comments (Including reason for exclusion)**

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Appendix II: Data extraction instruments

MASTARI data extraction instruments

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

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Continuous data

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