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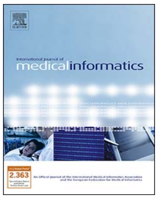

# Barriers to technology use among older heart failure individuals in managing their symptoms after hospital discharge

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## ARTICLE INFO

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## ABSTRACT

*Background:* In North America, heart failure (HF) is the leading cause for hospital readmission. Supportive technology, such as computers and tablets, could potentially assist patients with self-care to manage their condition after hospital discharge; however, older individuals have difficulties in adopting technology to manage their condition.

*Method:* This study used a mixed methods design to identify barriers to technology use in HF self-care. In the qualitative phase, semi-structured interviews were conducted with 18 HF patients and 10 informal caregivers or care partners (CP). In the quantitative phase, five questionnaires were administered to 15 patients and 8 CP: Montreal Cognitive Assessment; Short Literacy Survey and Subjective Numeracy Scale; Self-Care of HF Index; Knowledge Assessment Questionnaire; and Patient Activation Measure.

*Results:* In the qualitative phase, five themes emerged regarding engagement in self care and technology use: knowledge level of HF; level of willingness to ask questions related to HF; confidence level in making health-related decisions individually; level of technology usage in daily activities; and self-recording of health measurements. Quantitative analysis found that most HF patients had mild cognitive impairment (MCI), adequate health numeracy levels to understand and manage their health condition, high confidence levels in managing their condition and willingness to engage in self-care. There was variation in willingness to adopt technology.

*Conclusion:* Patients were willing to engage in HF self-care however they relied on CPs who were more willing to ask questions about HF. Technology tools may assist in HF self-care, but they must be tailored for use among older individuals.

## 1. Introduction

In Canada, heart failure (HF) is the leading cause of hospital readmission due to increasing prevalence and associated comorbidities [1–4]. Despite the availability of comprehensive post discharge disease management programs, readmission rates within six months remain high [5–8]. Following hospital discharge, individuals with HF are expected to engage in self-care by managing their medications, diet, and lifestyle. Self-care includes adherence to prescribed therapies, recognition of HF symptoms and taking appropriate actions to avert clinical deterioration [9]. Older HF patients may have difficulty with frequent monitoring, access to adequate health care resources, and social support [9,10]. Informal caregivers or care partners (CP) (e.g. family member, spouse, partner), often play an important role in assisting HF patients with self-care [11]. While some studies suggest that adequate HF self-care is associated with improved health outcomes, and a decrease in the number and duration of hospitalizations [12–14]. Other studies showed no benefits [15,16].

With the advance of technology, clinical decision support systems (CDSS) have been developed to assist individuals in self-care. CDSS can provide reminders to improve care, enhance clinical performance and support decision-making [17–19]. To date, there have been no studies evaluating the role of CDSS using technology (i.e. web-based programs, tablets, computers, cell phones) to support HF self-care. To promote

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self-care, CDSS must be designed to meet the needs of individuals with HF and their CP.

Technology based self-care tools can be used for self-monitoring, e.g. daily weight measurement, and modifying treatment accordingly, with the support of the healthcare professional team [20]. Despite this, many older patients with chronic diseases do not adopt these applications as they do not believe that it will affect their quality of life [21]. The objective of this study is to identify potential barriers to implementing technology to support self-care in older HF patients.

## 2. Methods

### *2.1. Design*

We used a sequential explanatory mixed methods design consisting of qualitative and quantitative phases to investigate the barriers to and solutions for a technology based decision support tool (DST) to support self-care in older HF patients and their CP. We began with a semi-structured qualitative interview followed by the administration of validated questionnaires. This study was approved by the Hamilton Integrated Research Ethics Board, and informed consent was obtained from the patients and CPs. Each study participant received a one-time $20 gift card.

### *2.2. Patient recruitment*

A convenience sample of patients with or without CPs attending the Heart Function Clinic at Hamilton General Hospital were invited to participate in this study. Inclusion criteria were: age ≥ 65 years, English-speaking, and no clinical diagnosis of dementia, and attending the Heart Function Clinic for at least 6 months. Patients were contacted by telephone and invited to participate in the study by a research assistant (LN) between July and October 2014.

### *2.3. Data analysis*

Qualitative Phase: Protocols and Data Collection. A trained Health Sciences student (LN) conducted one-hour semi structured interviews at the Heart Function Clinic between July and October 2014. Prior to the interviews, patients and CPs were asked to complete a short survey evaluating the use of technology in general, such as the use of computers and telephones. This survey was developed by an expert in qualitative research and electronic health applications (NA) and a cardiologist with HF expertise (CD) [22]. The survey can be completed in approximately 10 min. Chi-square tests of proportion was conducted to compare survey responses between patients and CPs with a statistical significance level of 0.05.

A semi-structured interview guide was proposed by the research team (CD, KK, LN, NA) based on gaps in knowledge identified by a search of current literature on technology use in HF self-care. The guide was developed to inquire how older HF patients manage their condition with or without their CPs. The interview guide was finalized by consensus among research team members (CD, KK, LN, NA). All of the interviews were conducted by the same research assistant (LN). Descriptive and exploratory analysis was used to identify key themes that emerged from the interviews regarding barriers to the use of a technology based HF self-care program. All interviews were audiotaped, transcribed verbatim, anonymized, and thematically coded by the interviewer. The interview transcripts were entered into NVivo 10, and reviewed by two members of the research team (LN and SC).

Quantitative Phase: The questionnaires were administered by a research assistant (LN) and HF nurse (VB) in the following order: a) Montreal Cognitive Assessment (MoCA); b) Subjective Numeracy Scale (SNS); c) Short Literacy Survey (SLS); d) Self-care HF Index (SCHFI); e) Patient Activation Measure (PAM); and f) Knowledge Assessment Questionnaire (KAQ). The MoCA and PAM were administered only to HF patients, all other questionnaires were answered by patients and CPs. The total time to complete the five questionnaires was less than 20 min. To reduce the questionnaire burden, patients and CPs were allowed a pause if additional time was required. Non-parametric *t*-tests were conducted to compare questionnaire responses between patients and CPs with a statistical significance level of 0.05.

#### *2.3.1. Montreal cognitive assessment (MoCA)[23]*

The MoCA was administered to HF patients by VB to assess cognitive function. A score of < 26 out of 30 indicates mild cognitive impairments (MCI). In a validation study, the MoCA was found to have sensitivity to detect 90% of MCI and specificity of 87% [23]. The MoCA has been previously administered in a study to 93 patients with HF, and the MoCA identified more patients with MCI in comparison to the Mini Mental State Exam, another screening tool for dementia ($p = 0.03$) [24]. As demonstrated by previous validation studies, the MoCA was selected for this study because it has been shown to be an effective screening tool to detect MCI in HF patients.

#### *2.3.2. Subjective numeracy scale (SNS) [25]*

The SNS was used to assess arithmetic abilities and preferences in numbers. It contains eight written questions self-reported by subjects. Responses are recorded using a six-point Likert score with a total score of 48; higher scores indicate better perceived numeracy abilities and preferences [25,26]. The SNS has a moderate correlation of 0.57 (95% CI 0.47–0.65, $p < 0.001$) with the Wide Range Achievement Test-4 Math Subtest (WRAT4) [27]. In comparison to the WRAT4, the SNS requires less time to administer and often preferred by patients [27].

#### *2.3.3. Short literacy survey (SLS) [28]*

The SLS was administered to assess health literacy levels [28,29]. The SLS consists of three questions that are read aloud to subjects and responses were scored on a five-point Likert scale with a total score of 15. The SLS has been administered to patients in an adult emergency department setting and had a moderate correlation of 0.33 (95% CI 0.20–0.45, $p < 0.001$) with the Short Test of Functional Health Literacy in Adults (S-TOFHLA), a measure of health literacy, and 0.26 (95% CI 0.13–0.38, $p < 0.001$) with the Rapid Estimate of Adult Literacy in Medicine (REALM), a measure of literacy [27]. The SLS can be easily administered and completed by patients in a few minutes compared to the S-TOFHLA and REALM.

#### *2.3.4. Self-care HF index (SCHFI) [30]*

The SCHFI is a self-reported measure to assess self-care including the maintenance of health functional level and management of symptoms. There are patient and CP specific versions of the SCHFI, which consists of 22 items divided into 3 subscales: self-maintenance, self-confidence, and self-management; each is each scored on a 4-point Likert scale. A score of greater than 70 out of a total score of 100 indicates adequate self-care [30]. The SCHFI has been validated in a study of 760 HF patients with adequate reliability (alpha 0.76) [30]. The SCHFI was selected for this study to identify patients' self-care behaviour, and their ability to manage their weight and adjust their medications accordingly.

#### *2.3.5. Patient activation measure (PAM) [31]*

The PAM assesses patients' knowledge, skills, beliefs, and confidence for managing their health [31]. The PAM is measured on a 100-point scale and consists of four stages depending on patients' level of involvement in their healthcare. For the purpose of this study, the 13-item short version of the PAM was administered to patients [32]. In patients with chronic conditions, a higher PAM score has been shown to be associated with an increase in medication adherence, health functional status, and quality of life [33,34]. The PAM was administered in this study to better understand patients' perception of their level of involvement in HF self-care.