

**Title:**

HeartMapp: Theory-Based mHealth Intervention for Self-Care and Behavior Change in Heart Failure

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**Session Title:**

Innovative Cardiovascular Secondary Prevention Interventions

**Keywords:**

Heart Failure, Mobile intervention and Self-care

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### **Abstract Summary:**

Poor self-care is associated with quality of life and hospital admissions in heart failure. Therefore a mobile health application is proposed to improve self-management in heart failure.

### **Content Outline:**

#### Introduction

1. Poor self-care is associated with quality of life and hospital admissions

2. Mobile health application is proposed to improve self-management in heart failure.

#### Body

- Main Point # 1Development of the mobile health application “HeartMapp
- A. Supporting point #1 Theory-based intervention.
  1. Used Intervention, Motivation, and Behavioral change model
  2. Alpha and beta testing completed to determine usability of HeartMapp
- Main point Pilot testing of the HeartMapp for usability and potential efficacy
  - 1. Supporting point #2 Pilot RCT completed
    - a) clinically meaningful improvement in HF self-management among participants who used HeartMapp.
    - b) Knowledge of HF improved in the HeartMapp group while it declined in the control group.

#### III. Conclusion

1. Our preliminary work demonstrated feasibility of HeartMapp in clinical settings.
2. Given the struggle of heart failure patients with cognitive deficit that impede self-care, we propose to elaborate upon and reconstruct a trial ready HeartMapp that include cognitive training that track and enhance cognitive functions.

### **Topic Selection:**

Innovative Cardiovascular Secondary Prevention Interventions (25531)

### **Abstract Text:**

**Purpose:** The purpose is to develop and test a mobile application known as HeartMapp to improve heart failure outcomes.

**Background:** Heart failure (HF) is a progressive disease that affects 6.5 million Americans with costs exceeding \$37 billion annually. Incidence of HF is increasing, with more than 650,000 new cases diagnosed annually and 10 million cases expected in the U.S. by 2020 (Benjamin et al., 2018). Presently, treatments for HF are largely comprised of drug therapies targeting pathophysiology or complex educational interventions targeting self-care practices (Yancy et al., 2017). Evidence indicate a strong association between self-care and quality of life (Britz & Dunn, 2010) and hospital readmissions (Sahebi et al., 2015). It is projected that by 2030 the cost estimates of treating patients with HF will be 3-fold higher at \$160 billion in direct costs (Heidenreich et al., 2013), indicating a need for novel intervention to curb the escalating cost.

HeartMapp is a comprehensive, unique mobile health application designed to improve self-management in heart failure (HF). The theoretical constructs of behavioral change model “Intervention, Motivation, and Behavioral change” (IMB) drove the design of this human-mHealth app interface to improve efficacy (Fisher, Fisher, & Harman, 2003). Given the complexity of the health care ecosystem, stakeholders (n=125) including patients, physicians, nurses, and administrators from hospitals, nursing homes, home healthcare agencies, and insurance companies were interviewed around the U.S. over a 3-month period. The Business Model Canvas provided an in-depth understanding for the testing of nine, key building blocks, particularly the customer discovery process from these interviews in the development of HeartMapp (Athilingam, Jenkins, Zumpano, & Labrador, 2018). The current “HeartMapp” intervention includes 14-HF self-care components: a knowledge library, individualized self-management plan with motivational prompts, and behavior tracking on key strategies including HF symptom assessment, medication management, exercises (deep breathing and walking), vital sign monitoring (weight and blood pressure), and feedback of performance statistics (Athilingam et al., 2016). Alpha and beta testing were completed on 37 participants (25 patients with HF and 12 healthcare workers) during the development process and HeartMapp underwent extensive enhancement before clinical testing.

**Methods:** A randomized pilot study of 18 patients with HF (mean age 67 years) was completed to assess feasibility in a clinical context and to obtain pilot data on clinical outcomes of self-management and quality of life (Athilingam, Jenkins, Johansson, & Labrador, 2017).

**Results:** We found clinically meaningful improvement in HF self-management among participants who used HeartMapp (n=9) for 30 days compared to an attention control group (n=9) who received a general HF education app for 30 days. Participants in the HeartMapp group had a significant mean score change in self-care management (8.7 vs 2.3; t=3.38; p=0.006) and in self-care confidence (6.7 vs 1.8; t=2.53; p=0.028). Knowledge of HF improved in the HeartMapp group while it declined in the control group (3 vs -.66; t=2.37; p=0.037). Quality of life score declined by 2 points in the HeartMapp group, whereas the control group score declined by 9 points (p=.18). A mean of 78% engagement with HeartMapp (time stamped online when patients

accessed HeartMapp components) was noted among all nine participants randomized to HeartMapp; 44% (4/9) accessed HeartMapp daily and completed daily assessment of HF symptoms and exercise (walking and breathing) and 56% of participants (5/9) accessed HeartMapp features over 24/30 days or 80% of the time (Athilingam et al., 2017).

**Conclusion:** Our preliminary work demonstrated feasibility of HeartMapp in clinical settings and justified evaluating HeartMapp in an adequately powered randomized trial. However, adopting self-care behaviors are often challenging for patients due to concomitant cognitive impairments seen in 30% to 80% of HF patients (Pressler et al., 2010). Multiple studies have shown a direct relationship between cognitive deficits and difficulty with self-care (Cameron et al., 2010; Leto & Feola, 2014; Pressler, Kim, Riley, Ronis, & Gradus-Pizlo, 2010). Thus, there is currently an urgent unmet need for novel patient-centered interventions that are easy to use by older adults with HF that suffer cognitive difficulties and lack social support. In the improved application, we propose to elaborate upon and reconstruct a trial ready HeartMapp that include a communication feature for social support with family and providers and cognitive training that track and enhance cognitive functions.