

NURSE WILLINGNESS TO IMPLEMENT IPAD-BASED
EDUCATION IN THE CARE OF
HEART-FAILURE PATIENTS

by

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A Scholarly Project submitted in partial fulfillment
of the requirements for the degree

of

Doctorate of Nursing Practice

in

Family and Individual Health

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DEDICATION

I dedicate this project to my husband and family for their never-failing patience and encouragement. Thank you for motivating me to never give up on my goals and dreams. I am forever grateful to have you in my life.

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I would like to take this opportunity to thank my committee chair, Dr. Jennifer Sofie, DNP, APRN, ANP, FNP. I would not have been successful in this project without her guidance and support. She goes above and beyond to guide students in their journeys. In my opinion, she is the world's best chair. I would also like to thank my faculty committee members, Dr. Sandra Benavides-Vaello, PhD, MPaff, RN, Dr. Polly Petersen, PhD, RN, and Dr. Charlene Winters, PhD, APRN, BC for providing their time and expertise in the project development.

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ABSTRACT

The aim of this Doctorate of Nursing Practice (DNP) scholarly project was to investigate nurse willingness to accept the use of technology for implementation of standardized heart-failure self-care education in an acute-care setting. Integrating iPads into the usual acute-care workflow presents challenges for nurses. A pre-implementation and post-implementation questionnaire, based on the Davis model (1989) of perceived usefulness and perceived ease of use of technology, were created to evaluate nurse willingness to adopt the technology. Both questionnaires include a section for comments. Nurse participants attended a competency skills day prior to implementation of iPad-based patient education. Participants completed the pre- questionnaire, reviewed a demonstration of iPad use, viewed an Agency for Healthcare Research teach-back video, and completed a nurse competency checklist. The checklist included a nurse demonstration of the use of the iPad-based education and verbal acknowledgement of how to use the teach-back method. The post- questionnaire was completed six months after implementation of the iPad-based patient education. Data from the pre- and post-questionnaires were evaluated and the nurse-written comments reviewed for the final analysis. Overall, nurses had high levels of perceived usefulness and perceived ease of use with implementation of iPads for heart-failure self-care education, and the iPads will continue to be utilized in the acute-care setting.

INTRODUCTION

Background

Improving the quality of the care provided for heart-failure patients is essential for improving the life expectancy and decreasing hospital readmission rates. The prevalence of this chronic disease is high with approximately 5 million patients living with heart failure in the United States (Hernandez, 2013). The Centers for Disease Control and Prevention (CDC) reported that 1 in 9 deaths that occurred in the United States in 2009 were related to heart failure and approximately one-half of the patients diagnosed with heart failure will die within five years (2015). Heart failure has become a common hospital discharge diagnosis, and heart-failure exacerbation is a leading cause of hospital readmissions within 30 days of discharge (Gardetto, 2011). According to Andrietta, Moreira, and Barros (2011), outcomes for patients with heart failure could be improved if more emphasis was placed on self-care promotion such as sodium restriction and daily monitoring of weight.

Patients diagnosed with heart failure face a difficult road trying to make lifestyle adjustments to prevent heart-failure exacerbations. Several of these lifestyle adjustments include day-to-day disease management utilizing self-care abilities such as increased physical activity and improved dietary intake. Many patients struggle to adhere to treatment recommendations, which leads to increased healthcare costs and poor outcomes (Moser & Watkins, 2008). A standardized educational program can help patients learn how to complete daily self-care tasks, teach patients how to mitigate the medical

ramifications of heart failure, and help patients walk through the emotional aspects of chronic disease management (Smeulder et al., 2009).

Hospitalizations due to heart-failure exacerbations are potentially preventable if patients can recognize the warning signs of decompensation and seek treatment for their chronic disease (Wakefield, Boren, Groves, & Conn, 2013). Lack of adherence to treatment plans has been associated with heart-failure exacerbation and hospital readmission (Barnason, Zimmerman, & Young, 2011). Increasing patient awareness of appropriate treatment regimens is important for decreasing the risk of complications. There is a critical need to educate patients about heart-failure self-care prior to an initial hospital admission or readmission into an acute-care hospital setting (Bryant & Gaspar, 2014). Interventions that have proven efficacy in improving self-care of heart-failure patients need to be further evaluated for implementation into clinical practice.

Setting

The setting for this DNP scholarly project is a hospital located in rural Montana. The hospital provides healthcare services to approximately 97,000 residents of a five-county region in Southwest Montana and is a not-for-profit 123-bed facility accredited by the Joint Commission (H. Ireland, personal communication, March 21, 2016). The setting will be referred to as Treasure State Hospital for the purposes of this paper. The medical unit at Treasure State Hospital is an inpatient unit that provides acute care to adult patients from young adult to geriatric. The medical unit is located on the third floor of the hospital and consists of thirty-six private patient rooms split equally between the east and

south wing of the unit. The inpatient unit provides patient care services for acute conditions such as neurological and circulatory impairment, gastrointestinal disorders, infection processes, and heart and lung conditions. Patients receive education during their hospital stay regarding their medical condition and progress.

Heart-failure Hospitalizations

The DNP student, a staff registered nurse employed by Treasure State Hospital, had the opportunity to observe and actively participate in the process of providing heart-failure self-care education for patients admitted to the medical unit. The previous process for heart-failure self-care education was providing patients with written heart-failure education and an outdated DVD upon admission when the admitting physician ordered the Chronic Heart Failure (CHF) pathway intervention. Nurses would then chart in the CHF pathway intervention that the heart-failure education was provided during the hospitalization. The patients did not have the opportunity to watch the ten-minute DVD in the hospital due to a lack of DVD players in the patient rooms. The DVD program does recommend completing daily weights and avoiding added salt, but the program does not encourage patient engagement or provide a description of heart failure (Milner-Fenwick, Inc., 2006). The written education was produced by the StayWell Company, LLC, and provided valuable patient education. However, nurses did not typically thoroughly review the written education with patients during their hospitalization (H. Ireland, personal communication, March 21, 2016).

The aforementioned process was the extent to which heart-failure education was provided. The inpatient education from nurses pertaining to heart failure lacked standardization, and minimal emphasis was placed on improving self-care behaviors to prevent hospital readmissions. Staff nurses expressed frustration, through informal conversations with the DNP student, regarding the lack of time during a busy 12-hour shift to provide high-quality and comprehensive heart-failure self-care education. Administration also communicated support for initiatives targeted towards reducing heart-failure readmissions.

Another concerning factor regarding the absence of a standardized heart-failure self-care education program was that Treasure State Hospital was one of five hospitals in Montana who were penalized for high, all-cause, unplanned readmission rates from 2011 to 2014 (Talwani, 2015). Hospital Compare, an online guide created by the Centers for Medicare & Medicaid Services (CMS) to provide information about hospitals' quality of care, reports the national rate of heart-failure readmissions as 21.6% (CMS, 2017). The average reported 30-day readmission rate for heart-failure patients from 2011 to 2014 at Treasure State Hospital was 23% (CMS, 2017). The hospital has reduced all-cause, unplanned readmission rates by 10% in the last few years, according to an article published in Montana News, by initiating care coordination programs to assist patients with transitioning between the inpatient and outpatient settings (Talwani, 2015). The rate of heart-failure readmissions at Treasure State Hospital is comparable to the national average; however, areas remain that still need improvement including improving heart-failure self-care education on the medical unit. A literature review was conducted to

determine if the evidence supported implementation of a standardized self-care education program to decrease unplanned hospitalizations.

LITERATURE REVIEW

The evidence supports implementation of a standardized heart-failure education program into clinical practice (see Appendix A for evidence evaluation and synthesis tables of selected studies). CINAHL, Cochrane, Medline, and PubMed databases were searched. Inclusion criteria limited articles to sources published in English only. Date limitations were set to articles published in 2000 and later. Search terms included nurs*, hospital readmission, heart failure, self-care, maintenance, education, standardized, and program.

Importance of Self-care Management

Two of the research studies demonstrated an association between self-care management and reduced hospital admissions. For example, a cohort study of 287 patients was conducted at the Rajaie Cardiovascular Medical and Research Center in Tehran, Iran, to determine the relationship between self-care activities and readmission rates in patients with heart failure (Sahebi, Mohammad-Alia, Ansari-Ramandi, & Naderi, 2015). Patients were divided into two groups, adequate self-care and improper self-care, based upon scores from the Self-care Heart Failure Index (SCHFI) questionnaire (Sahebi et al., 2015). Results showed significant association ($p = .006$) of self-care management with hospital readmission (Sahebi et al., 2015).

Bryant and Gasper (2014) implemented a self-care education program based on improving heart-failure knowledge and management for patients receiving home visits by nurse practitioners. The average number of readmissions due to heart failure during the

six-month period prior to the program implementation was 1.39 (SD = 1.54) with a range from zero to five hospitalizations, and none of the participants experienced a hospital readmission due to heart-failure exacerbation during the six-month period after participation in the educational program (Bryant & Gasper, 2014). Maru, Byrnes, Carrington, Stewart, and Scuffham (2016) conducted a systematic review of randomized control trials comparing a heart-failure self-care program to routine care and discovered 27 studies that reported statistically significant reductions in hospital admissions and/or mortality with implementation of a standardized heart-failure education program resulting in overall healthcare utilization cost reductions.

Effectiveness of Self-care Education Programs

Two research studies looked specifically at the effectiveness of self-care education programs in improving patient heart-failure self-management and quality of life outcome measures. Shao, Chang, Edwards, Shyu, and Chen (2013) randomized patients attending cardiac clinics into an intervention group receiving a 12-week self-management program designed to promote self-efficacy and a control group who also received telephone calls and usual care from clinic nurses. Participants in the intervention group were significantly more likely to maintain self-care behaviors such as low sodium diet adherence and daily weighing (Shao et al., 2013). Otsu and Moriyama (2011) conducted a randomized control trial to determine the effectiveness of an educational self-care program consisting of six 30-minute, nurse-directed, heart-failure education sessions. The researchers discovered that the scores of the MacNew Heart Disease

Health-related Quality of Life Instrument, consisting of subscales involving emotional, physical, and social conditions, were significantly improved at 6, 9, and 12 months in the intervention group when compared to the control group (Otsu & Moriyama, 2011).

Self-care Management Barriers

Self-care management has been identified as a key factor in decreasing heart-failure exacerbations and reducing hospital readmission rates, but barriers exist that prevent optimal engagement with healthy behaviors. According to Siabani, Leeder, and Davidson (2013), supportive environments and acknowledgement of patient values encouraged patients to adhere to treatment plans for heart failure, while a lack of trust in healthcare professionals and a failure to provide practical self-care education prevented patients from engaging in heart-failure self-care behaviors. The researchers created a systematic review of qualitative studies and identified unskilled educators, provider lack of knowledge of self-care instructions, improper program planning, and lack of ongoing support from providers as barriers to self-care maintenance described by patients (Siabani et al., 2013).

Standardized Education Program Recommendations

Ross, Ohlsson, Blomber, and Gustafsson (2014) conducted a mixed-method study to compare individualized and standardized heart-failure self-care education programs, and the results of their research demonstrated no statistical difference between a standardized and individualized heart-failure educational program in patient

empowerment scores and patient satisfaction. This finding supports implementation of a standardized education program for heart-failure self-management. Wang et al. (2014) theorized that lifestyle modifications may be overwhelming for patients and chose to focus on only implementing one self-management strategy to decrease hospital readmissions. The researchers conducted a randomized controlled trial comparing usual care with an intervention on weight management education alone, and both the adherence to weight monitoring and the rate of hospital readmissions were significantly improved in the intervention group (Wang et al., 2014). Welsh et al. (2013) designed a six-week education intervention focusing on low-sodium diet adherence and discovered that dietary sodium intake was significantly lower ($F=7.3$, $df = 1,29$, $p = .01$) in the intervention group at the six-month follow-up. Education programs in resource-poor healthcare settings could focus on one standardized self-care heart-failure intervention and still improve hospital readmission rates.

Pinkerman et al. (2013) developed a guideline to impact the care of adult patients with a diagnosis of heart failure. The guideline includes pharmacologic and non-pharmacologic management of heart-failure patients. The non-pharmacologic management recommendations included providing dietary instructions about low sodium diet adherence, simplifying medication regimens as much as possible, and inclusion of exercise instruction in any comprehensive heart-failure program (Pinkerman et al., 2013).

Technology and Change Implementation

Further review of the literature was conducted to explore the use of technology in patient education and nursing workflow after establishing that the evidence supported implementation of a standardized heart-failure education program into clinical practice. The same literature search strategy and databases were used. The search terms included nurs*, technology, technology acceptance model, education, and heart failure. Research studies conducted by Emmi Solutions, LLC, were also reviewed. Emmi education is the software purchased by Treasure State Hospital for patient education that was previously only utilized in the outpatient setting.

Innovative Educational Intervention

Trends in patient education have been following the contemporary shift from text-based methods to incorporating audiovisual and interactive technology-based teaching methods (McDermott & While, 2013). iPad-based patient education is more engaging than traditional patient-teaching printouts. Adoption and implementation of health information technology (HIT) is encouraged by the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009, and well-integrated HIT will support patient empowerment, care coordination, improved patient outcomes, and quality improvement (Bauer, Thielke, Katon, Unutzer, & Areal, 2014). Albert, Buchsbaum, and Li (2007) suggest that both seeing and hearing information will increase the likelihood that patients will comprehend and retain information, and that the advantage of video education is that educational material can be viewed at an individual pace and in a

relaxing environment. The researchers conducted a prospective study using a sample of 112 patients hospitalized for heart-failure exacerbation and results demonstrated that the patient group randomized to video-based education had a significant increase in overall self-care behavior score ($P < 0.01$) (Albert et al., 2007).

Emmi Solutions, LLC, (2015a) conducted a comprehensive study of approximately 100,000 Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) surveys from 29 hospitals located across the United States and determined that patients who viewed an Emmi educational program had higher HCAHPS scores. Jersey City Medical Center (JCMC) utilized Emmi patient-engagement programs to increase patient satisfaction scores on nursing-related questions and standardize patient education with the goal of re-designation of Magnet Recognition (Emmi Solutions, LLC, 2015b). Emmi programs had a positive impact on enhancing the patient experience, improving clinical outcomes, and increasing patient and staff engagement scores at JCMC (Emmi Solutions, LLC., 2015b). Emmi patient-engagement programs were being utilized by outpatient services at Treasure State Hospital for several years with the goal of eventually implementing Emmi education in the acute-care setting.

Commitment to Change

Understanding potential barriers for implementation of technology is important for successful and sustainable change. Weiner, Amick, and Lee (2008) state that a predictable pattern emerges when leaders neglect to prepare their organization for change. The undesirable outcomes include a stall in the change effort as resistance grows, failure of the change effort, or the change effort experiences a false start and is unable to

recover (Weiner et al., 2008). A goal of this DNP scholarly project was that the change effort would not experience these issues and that the nurses on the medical unit would embrace the use of technology for heart-failure education. Holt, Helfrich, Hall, and Weiner (2010) argue that individual and collective readiness is necessary for a successful change implementation and that readiness for change involves both psychological and structural factors. Therefore, belief in the change is necessary for people to adopt the change. Holt et al. (2010) state that the psychological factors that influence acceptance of change include "...individual and collective attitudes, beliefs, and intentions" (p.51). Effective change implementation will not occur without the commitment of the organizational members to the change.

Technology Acceptance Model

Davis (1989) states that individuals will tend to use or not use technology to the extent they believe that the benefits of usage outweigh the difficulty of using the technology and to the extent they believe the technology will improve their job performance. These theoretical concepts are defined as perceived usefulness and perceived ease of use and eventually have become known as the Technology Acceptance Model (TAM). Holden and Karsh (2008) state that the TAM can be used to predict whether users will accept or reject health information technology. The unintended consequences of implementing health information technology when the technology does not fit well with the current system is underuse, misuse, workarounds, sabotage, and abandonment (Langley et al., 2009). Healthcare workers cannot simply be told they

should use the technology. Belief that the technology will result in improvement needs to be present for effective change to happen.

Perceived usefulness is defined as the extent an individual believes that the technology will improve their work performance (Davis, 1989). Perceived ease of use is defined as the extent an individual believes that the technology is easy to use or otherwise the degree of effort to operate is minimal (Davis, 1989). Interestingly, Davis (1989) discovered that perceived usefulness was more strongly associated with technology usage than perceived ease of use. Meaning people will be more likely to cope with some amount of difficulty when using the technology if the technology improves work performance, but will be more likely to reject the technology if it does not perform a useful function (Davis, 1989).

The TAM has become widely utilized to understand the adoption of technology in healthcare, especially for E-Learning (Abdullah & Ward, 2016). King and He (2006) conducted a meta-analysis of the technology acceptance model using 88 published studies and concluded that the theoretical concepts are highly reliable and may be used in a variety of contexts. The researchers also developed a similar conclusion to Davis's (1989) that perceived usefulness has a profound effect on participants' behavior and usage of the technology (King & He, 2006).

Strudwick (2015) conducted an integrative review of 20 studies that specifically applied the TAM to investigate the use of technology among nurse participants. Results of the review revealed that both perceived ease of use and perceived usefulness correlate with nurse acceptance of the technology. A nurse is more likely to utilize the technology

if the nurse believes that the technology is easy to use and useful for patient care (Strudwick, 2015). Two studies discovered that adding a high-quality training program was statistically significant for influencing perceived ease of use and perceived usefulness (Strudwick, 2015). The researchers theorized that the nurses will become familiar with the technology and understand the benefits of the technology through high-quality training and therefore will be more likely to accept the technology as a result (Strudwick, 2015).

Nurses play an integral role in the successful implementation of an innovative technology into the nursing workflow. Communicating the value and advantages of the technology while providing high-quality education is important for nurse acceptance of the intervention. Implementation of innovative technology will disrupt the usual nursing workflow and require nurses to learn new skills to utilize the technology for patient education. High-quality training and value communication are both examples of strategies to support nurses with adopting innovative technology.

Purpose

The review of the literature has demonstrated positive outcomes, such as reduced hospital readmissions, when comparing a heart-failure self-care educational intervention to usual care. Pinkerman et al. (2013) provided specific recommendations for non-pharmacologic management interventions, such as dietary instruction about sodium restriction and education about signs and symptoms of heart-failure exacerbation, that should be included as part of a comprehensive educational program in a guideline for

heart-failure patients. Bryant and Gasper (2014) suggested that heart-failure self-care education with practical applications can improve self-care behaviors, which results in a decrease of heart-failure hospital readmissions. Overall, the literature supports implementation of a standardized heart-failure self-care education program into clinical practice. The objective of this DNP scholarly project was to implement a standardized heart-failure self-care education program on the medical unit at Treasure State Hospital using iPads to view Emmi education.

Supporting Theory

Dorothea Orem's Self-Care Theory of Nursing supports implementation of interventions designed to improve self-care, because the theory encompasses the idea that self-care can be taught and improved (Pina Queiros, Santos Vidinha, & Almeida Filho, 2014). Patients can learn how to participate in self-care measures such as medication adherence, sodium restriction, and recognizing symptoms of fatigue and dyspnea. Orem proposed that self-care maintains life and health, and nursing's role is to provide care when a self-care demand or lack of ability to participate in self-care exists (Pina Queiros et al., 2014). The core concept of Orem's theory is self-care, which is defined as the ability of individuals to take specific actions to maintain and support life and well-being (Pina Queiros et al., 2014). Orem's theory will guide nurses through the nursing process of assessing patient's need for nursing care, identifying self-care requisites that are lacking, identifying self-care skills that the patient currently possesses, and developing a plan of care to meet self-care needs (Pina Queiros et al., 2014).

Ineffective self-care management occurs when patients lack knowledge of the actions necessary to manage a chronic disease such as heart failure. According to Souza Carneiro et al. (2016), self-care management behaviors can be learned to make daily healthy choices and nurses can utilize health education to promote new knowledge that motivates patients to implement decision-making that supports healthy living. Orem's Self-Care Theory of Nursing provides a framework for identifying that a self-care deficit exists, for assessing the patient's ability to learn self-care management skills, and for guiding implementation of education practices. Figure 1 illustrates the application of Orem's Self-Care Theory of Nursing to this DNP scholarly project.

Figure 1. Application of Orem's Self-Care Theory of Nursing

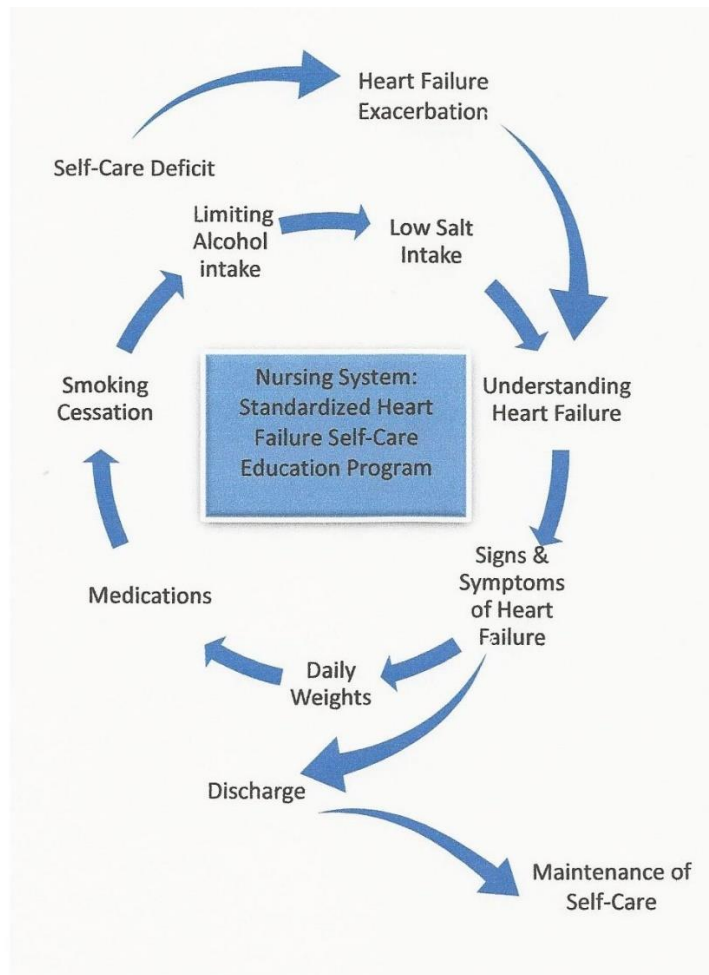


Figure 1. Illustration of the application of Orem's Self-Care Theory of Nursing in the care of heart-failure patients. Nurses identify that a self-care deficit exists and employ the standardized heart-failure self-care education program to promote self-care management.

METHODS

The process completed for developing and implementing the standardized heart-failure, iPad-based education program is reviewed in the following section. The goal of the DNP scholarly project was to investigate nurse willingness to accept the use of iPad-based education in an acute-care setting. Pre-implementation and post-implementation questionnaires were developed to evaluate nurse acceptance of the technology.

Ethical Considerations

The DNP scholarly project was considered exempt from the requirement of review by the Montana State University Institutional Review Board (IRB) in December of 2016. Nurse participants were informed that their identity would not be revealed in the project. Participation in the project was voluntary. Nurse participants were given a number to refer to both the individual and their completed pre- and post- questionnaires. Nurse participants were asked to sign a subject consent form prior to completing the questionnaires, and a copy of the subject consent form was given to nurse participants for their personal records. There were no foreseen risks with participation in the study. The questionnaires were stored in a locked file to which the DNP student had exclusive access. Treasure State Hospital provided the funding to implement the iPad-based education. A potential author conflict of interest is that the DNP student is an employee of Treasure State Hospital.

Sample/Setting

Thirty-three registered nurses who covered both day and night 12-hour shifts were employed on the medical unit when the DNP scholarly project was implemented. Twenty nurses worked primarily day shift and 13 nurses worked primarily night shift. Nurses were asked to voluntarily participate in the project secondary to their employment as a nurse on the medical unit. Nursing experience on the medical unit ranged from seasoned nurses with 30 years of experience to new nursing graduates. As shown in Figure 2, most nurse participants had 1-5 years of nursing experience. Patient-to-nurse staffing ratios in this inpatient acute-care setting are typically 4:1 on day shift and 6:1 on night shift. The charge nurse is typically a free-float charge nurse and is available to answer questions and provide assistance as needed. Patient education is typically completed during the day shift. Consequently, night-shift nurses did receive training for the iPad-based education, but their questionnaire results were not included in the final analysis.

Figure 2. Years of Nursing Experience

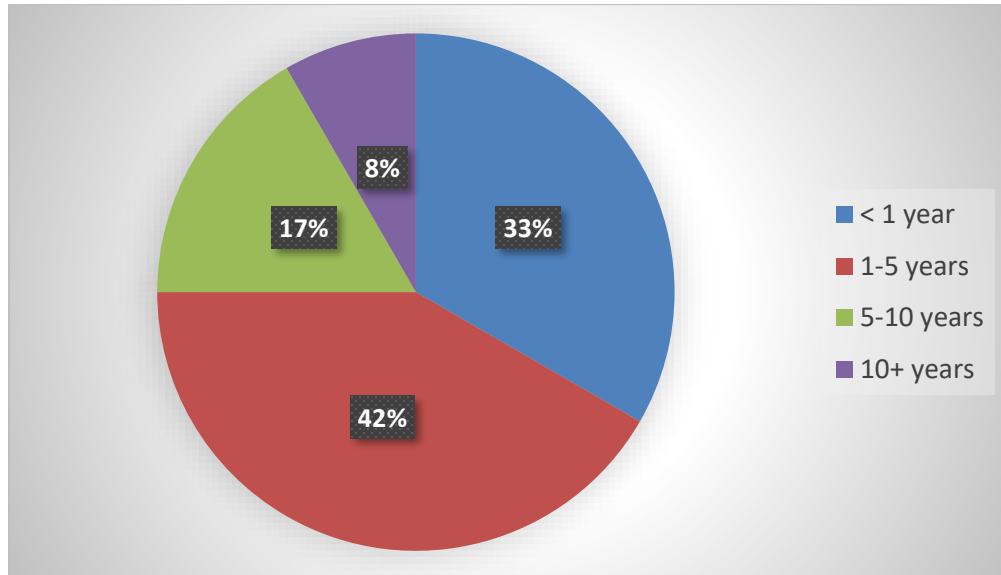


Figure 2. A graphical representation of the years of nursing experience on the medical unit. Nurse participants only are included in this graph

Intervention Design

Introduction to Intervention

A Congestive Heart Failure and Transitions Care Management (CCTM)

Committee was developed at Treasure State Hospital in the spring of 2016, with the goal of improving inpatient and outpatient heart-failure management. The DNP student joined the committee at the request of the medical unit manager after the student proposed improving heart-failure self-care education on the medical unit at Treasure State Hospital. The committee had an interest in improving heart-failure care on the medical unit, but was unsure how to proceed and needed insight from medical-unit staff. A vision was cast

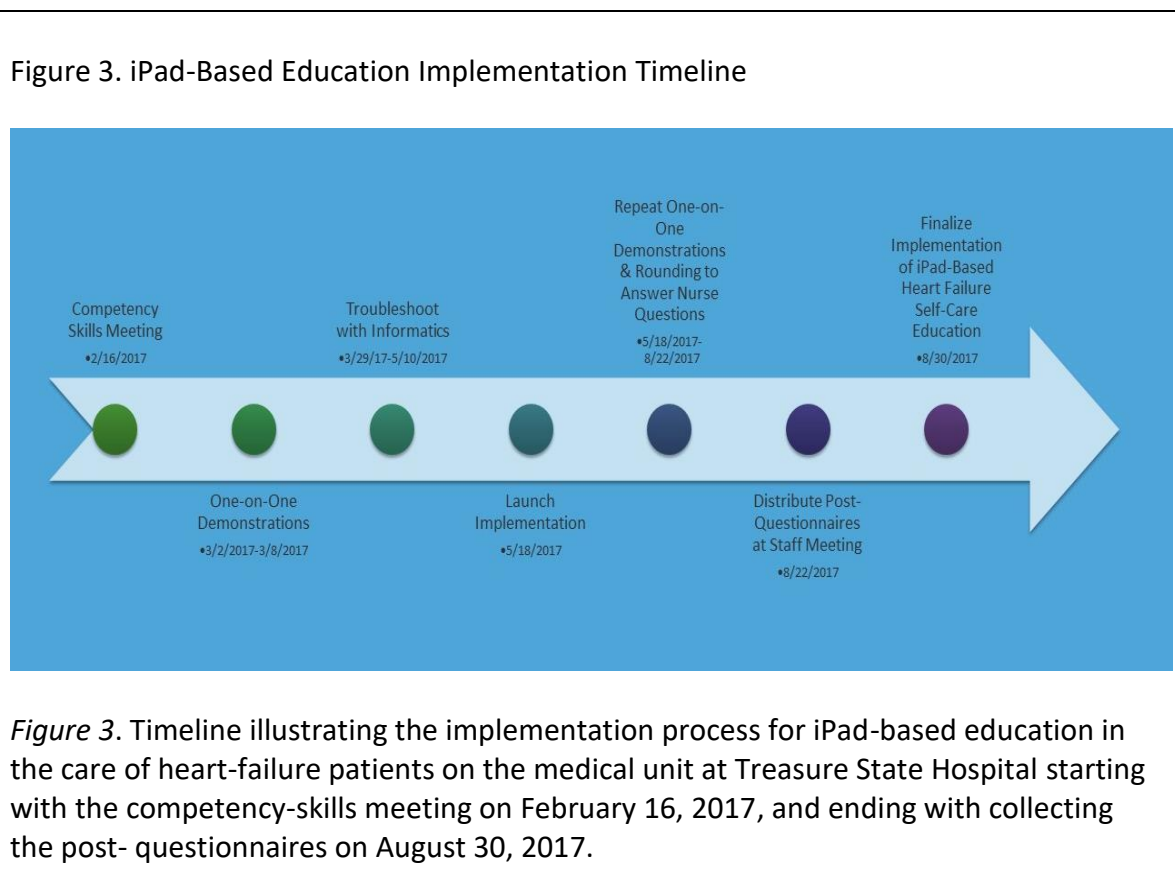
to improve and standardize heart-failure self-care education on the medical unit by implementing evidenced-based iPad education platforms into the nursing workflow.

Technology-based educational approaches are engaging and have been shown to equip patients with the knowledge and skills to manage their chronic disease (Sawyer et al., 2016). The hospital had purchased an annual subscription to Emmi education, a patient-engagement software, but the software was not being utilized in the inpatient acute-care setting. Utilizing Emmi education in the acute-care setting was introduced to the committee as a potential intervention by the patient-centered medical home coordinator employed by Treasure State Hospital. The DNP student was assigned the role of implementing iPad-based education into the nursing workflow on the medical unit at Treasure State Hospital effectively with sustainable results.

Intervention Development

Sawyer et al. (2016) conducted a similar quality-improvement project and implemented iPad-based education in an acute-care setting. The researchers discussed approaches for preparing nurses to implement iPad-based patient education, such as identifying staff to engage in the iPad unit-champion role, defining and communicating the value of iPad-based patient education, formulating roles and competencies, developing safe processes and procedures for device use, developing an infection control protocol, and evaluating nurses' acceptance of the iPads (Sawyer et al., 2016). Following the suggestions from Sawyer et al. (2016), a nurse competency checklist was created (see Appendix B) and a competency-skills meeting was scheduled prior to implementation of Emmi education. A PowerPoint presentation was used on the competency-skills day to

illustrate and discuss the value of implementing iPad-based education. Nurse participants reviewed a demonstration of iPad use and viewed an Agency for Healthcare Research and Quality (AHRQ) teach-back video as part of the skills day. Figure 3 is an implementation timeline for the iPad-based education starting with the competency-skills meeting.



Repeat one-on-one demonstrations were completed with the nurses after the competency-skills meeting to communicate the value of iPad-based education and assist nurses with learning how to utilize the technology. The DNP student conducted rounds during day and night shifts to answer nurse participants' questions and to identify process

and technological issues with iPad use. A guide was created to assist nurses with utilizing the iPads for patient education (see Appendix C). Nurse participants were encouraged to identify patient's need for self-care education and assess the patient's ability to learn self-care management skills. Dorothea Orem's Self-care Theory of Nursing supports assessing patient's learning needs and utilizing health education to promote self-care management (Pina Queiros et al., 2014). Use of the teach-back method was also encouraged to assess patients' understanding of the educational material. The teach-back method is a strategy to assess patients' understanding by asking patients to state back what they have learned using their own words (Peter, Robinson, & Jordan, 2015). The teach-back method has been shown to improve learning outcomes (Peter et al., 2015).

Partnerships

Partnerships were created with various members of the healthcare team throughout the development period. The infection control specialist assisted with creating an infection control protocol for the iPads. The informatics team assisted with integrating Emmi software with the electronic health record (EHR) and with implementing safety measures for the iPads. Meetings were held with different members of the administrative team, such as the chief nursing officer (CNO), to seek administrative approval and ensure the quality of project implementation. CCTM committee members were updated about the status of the project throughout development and implementation.

The informatics team members played a key role in ensuring that Emmi education could be implemented in the acute-care setting. The original project design was to interface the hospital's EHR with the Emmi education software so that, when an

admitting physician ordered the CHF pathway intervention, a passcode would materialize on the nurse's patient status board. The nurse would then enter the individualized passcode into the Emmi education program on the iPads. The informatics team discovered that the two systems would not interact with each other. An additional step was created to solve the inability of the two systems to interface. The current process is that an Emmi education code intervention will automatically generate when the CHF pathway intervention is ordered as part of a heart-failure order set. The charge nurse will then obtain the passcode from the Emmi Manager and enter the passcode into the Emmi education code intervention so that the passcode appears on the patient status board (see Appendix D for directions on entering the Emmi passcode onto the patient status board).

Final Process

Five iPads were purchased using the medical unit's budget and designated for implementing Emmi education. The iPads were stored at the front desk. Patients were only eligible for the iPad-based education if the physician ordered the CHF pathway intervention. The staff nurses assessed patient's readiness for Emmi education. Staff nurses would then obtain the iPad from the front desk and check out the iPad to the patient room under the nurse's name. The nurse introduced Emmi education to the patient on the second day of admission and entered the patient's individualized passcode into the iPad. The passcode was obtained from the patient status board located in the EHR. The passcode was entered by the charge nurse during admission to the medical unit for heart-failure exacerbation. After initiating Emmi education, the nurse would be available for any questions. The nurse then utilized the teach-back method to assess the patient's

understanding of the education. The nurse cleaned the iPad using infection control measures and returned the iPad to the front desk upon completion of the education. The final component was charting in the CHF pathway intervention that Emmi education was completed and that the patient verbalized understanding. Figure 4 provides an illustration of the final process for iPad-based education on the medical unit at Treasure State Hospital.

Figure 4. Process for iPad-Based Education

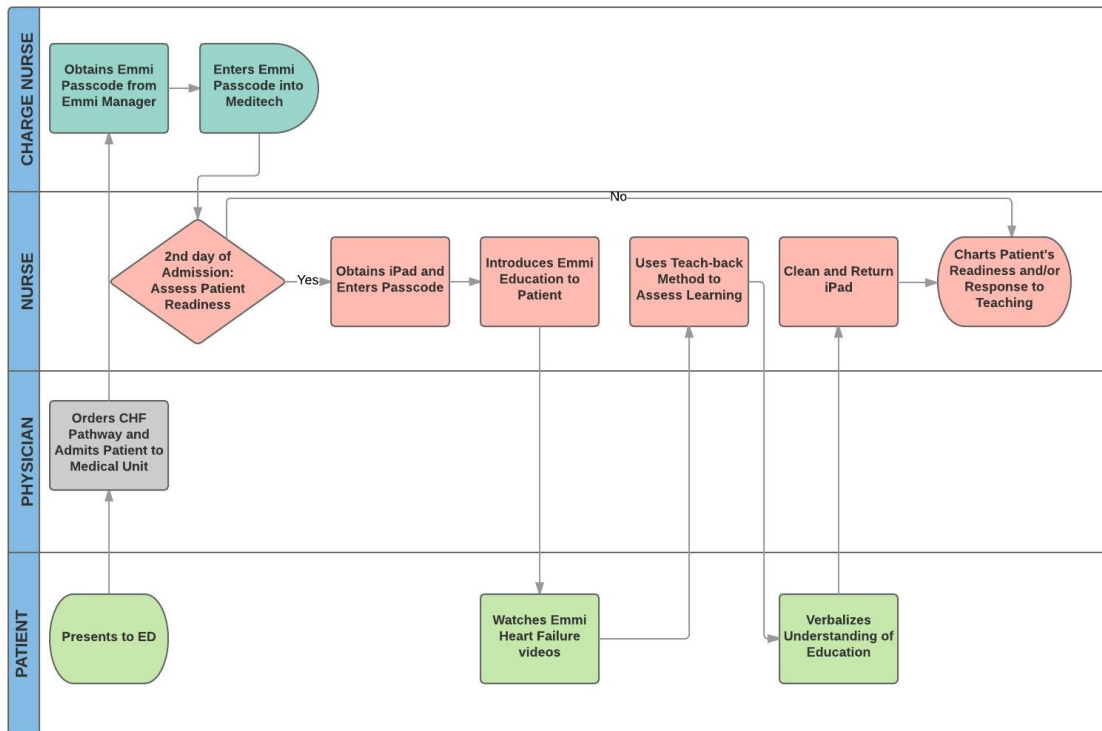


Figure 4. Swim lane diagram illustrating the final process for heart-failure self-care education on the medical unit at Treasure State Hospital. The process begins at admission and ends after the nurse charts the patient’s response to education in the EHR.
ED = Emergency Department

Nurse Willingness to Adopt Technology

The goal of the Doctor of Nursing scholarly project was to investigate nurse willingness to accept the use of iPad-based education in an acute-care setting. In order to analyze a change in nurse behavior, the Davis (1989) model of perceived usefulness and

perceived ease of use for technology users was adapted to evaluate nurse willingness to accept iPad-based education. Self-administered pre- and post- questionnaires using a Likert scale (see Appendix E) were developed to evaluate these theoretical concepts. The multi-item scales for perceived usefulness and perceived ease of use adopted in the questionnaires underwent validity and reliability testing by Davis (1989). The Montana State University Statistical Consulting and Research Services (SCRS) provided assistance with the questionnaire development. Participating nurses on the medical unit completed the questionnaires prior to and post implementation of the iPad-based education. The questionnaires also include a section for comments, and nurses were asked to report any problems with using the technology.

The pre- questionnaires were distributed and collected at the competency-skills meeting on February 16, 2017. The post- questionnaires were placed in nurse participants' mailboxes prior to a staff meeting on August 22, 2017. Only the nurse participants that had utilized the iPad-based education during the implementation period were asked to return the post- questionnaires to the DNP student by August 30, 2017. The nurse participants that had an opportunity to use the iPad-based education were reminded by the DNP student to return the post- questionnaires during two separate workdays.

Analysis

Holbrook, Krosnick, and Pfent (2007) evaluated national surveys with response rates ranging between 5% and 54% and concluded that research studies with low response rates are only marginally less accurate than research studies with high response

rates (as cited in Morton, Bandara, Robinson, & Carr, 2012). Although a minimum response rate has not been established, statistically significant conclusions about a target population are more likely if you receive more responses (University of Wisconsin-Madison, 2010). The University of Wisconsin-Madison (2010) survey center usually receives a 60-70% response rate for mailed surveys and a 30-40% response rate for web surveys. A greater response rate will help provide more reliable and useful data, but low response rates can still provide valuable information.

The DNP scholarly project was designed to verify that the principal factors affecting technology usage were perceived usefulness and ease of use, as well as explore how these factors change over the course of the project implementation, by completing a confirmatory factor analysis. However, the pre- and post- questionnaires did not qualify for the statistical comparison due to unpredicted factors reviewed in the upcoming outcomes section. The scale items for perceived usefulness and ease of use were entered in a Microsoft Excel spreadsheet saved in the DNP student's password-protected, personal laptop. Averages of the Likert scale items for both the pre- and post-questionnaires were calculated.

The comment section was used to determine specific issues with the iPads that contributed to how the nurse participants viewed the technology's ease of use. Action steps were derived from the post- questionnaire comments to improve the technology's ease of use. Comments were grouped together based on the comments primarily referring to perceived ease of use, to perceived usefulness, or to the anticipated or actual patient

experience. The comments, labeled with the number assigned to the nurse participant, were also categorized by pre-implementation and post-implementation.

RESULTS

Overall, the nurse participants maintained a high level of perceived usefulness throughout the implementation of the iPad-based education despite encountering technological issues. The nurse participants generally believed that the iPad-based education would be useful for their job. The project outcomes were communicated with the medical unit manager and CCTM committee members.

Questionnaire Response Rate

There were a total of 20 pre- questionnaires distributed by the student investigator to the day shift nurses. A total of 10 pre- questionnaires were returned. A rapid staff turnover occurred during the implementation period, and two pre- questionnaires were excluded from the final analysis, because the nurses either moved to a new city or transitioned into a different position within Treasure State Hospital. The resulting response rate was 44% (n=8) after excluding the two nurse participants. A total of 20 post- questionnaires were also distributed by the student investigator to the day shift nurses with a total of 8 post- questionnaires returned producing a response rate of 40% (n=8). The nurses were informed that they should return the post- questionnaire only if they had an opportunity to use the iPads for patient education in the clinical setting. As a result, the nurse participant group who completed the pre- questionnaires was not identical to the group that completed the post- questionnaires.

Perceived Ease of Use

Perceived ease of use is defined, within the context of this DNP scholarly project, as the extent the nurse believes that the iPad-based education is easy to use or the degree of effort to operate the iPads is minimal. In the first section of the pre- and post-questionnaires, there are six questions referring to perceived ease of use. A Likert scale was used with “strongly disagree” labeled as 1 and “strongly agree” labeled as 5. Results reported include the number of nurses answering each question (n), a mean (M) Likert score for each question, and the standard deviation (SD) for both the pre- and post-questionnaires. Each mean was rounded to the nearest whole number and each standard deviation was rounded to the nearest tenth. Table 1 provides the results of the nurses’ perceived ease of use for the iPad-based education.

Table 1: Mean Likert Scores for Perceived Ease of Use

Mean Likert Scores for Perceived Ease of Use							
Question	Pre- Questionnaire			Post- Questionnaire			
	n	M	SD	n	M	SD	
1. Learning how to operate iPad-based education would be/was easy for me	8	5	0.4	8	5	0.5	
2. I would find/found it easy to get iPad-based education to do what I want it to do	8	5	0.7	8	4	1.3	
3. My interaction with iPad-based education would be/was clear and understandable	8	5	0.5	8	5	1.0	
4. I would find/found iPad-based education to be flexible to interact with	8	5	0.7	8	5	1.0	
5. It would be/was easy for me to become skillful at using iPad-based education	8	5	0.5	8	4	1.0	
6. I would find/found iPad-based education easy to use	8	5	0.4	8	4	1.0	

Most nurses strongly agreed that learning how to operate the iPad-based education was easy after participating in the nurse-competency-skills meeting ($M = 5$, $SD = 0.4$) and after implementation of the iPad-based education ($M=5$, $SD = 0.5$). In general, the nurses found iPad-based education easy to use both before ($M=5$, $SD = 0.4$) and after using the technology in the acute-care setting ($M=4$, $SD = 1.0$). Figure 5 provides a graphical representation of the mean Likert scores for perceived ease of use. The results were unexpected, because problems with iPad use were encountered during the implementation period and the nurses informally notified the DNP student of the issues. Nurse participants also reported problems they encountered with the iPads in the comment section of the post- questionnaire.

Figure 5. Pre- and Post- Questionnaires' Mean Likert Scores for Perceived Ease of Use

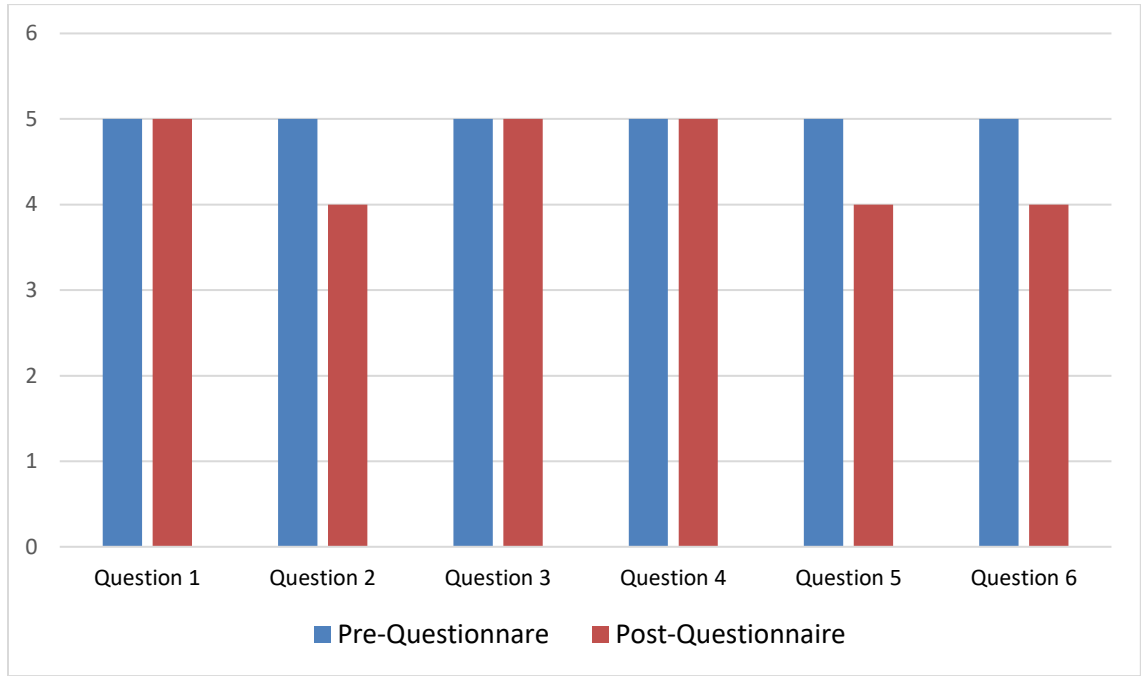


Figure 5. Cluster column chart representing the pre- and post- questionnaires' mean (M) Likert scores for perceived ease of use. The questions correspond to the six questions pertaining to perceived ease of use on the questionnaires.

Perceived Usefulness

Perceived usefulness is defined, within the context of this DNP scholarly project, as the extent the nurse believes that the iPad-based education will improve patient education. In the second section of the pre- and post- questionnaires, there are six questions referring to perceived usefulness. Similarly, results are reported as the number of nurse participants who answered each question (n), the mean (M), and the standard deviation (SD). Table 2 provides the results of the nurses' perceived usefulness of the iPad-based education.

Table 2: Mean Likert Scores for Perceived Usefulness

Question	Pre- Questionnaire			Post- Questionnaire		
	n	M	SD	n	M	SD
1. iPad-based education would allow/allowed me to complete education more quickly	8	5	0.5	8	4	0.7
2. iPad-based education would improve/improved patient satisfaction	8	5	0.5	8	4	0.7
3. iPad-based education would save/saved nurses' time	8	4	1.0	8	4	1.0
4. iPad-based education would improve/improved patient's understanding of heart failure	8	5	0.5	8	4	0.7
5. iPad-based education would make/made teaching patients about heart failure easier	8	5	0.5	8	5	0.7
6. Overall, I believe iPad-based education would be/is useful in my job	8	5	0.5	8	5	0.9

Interestingly, the mean (M) Likert scores for perceived usefulness were marginally decreased after implementation of the iPad-based education as shown in Figure 6. Expected results were that perceived ease of use would decrease more during implementation when compared to perceived usefulness. Nonetheless, the nurses generally believed that the iPad-based education would be useful for their job before implementation (M=5, SD =0.5) and after implementation (M=5, SD = 0.9). A potential factor influencing the perceived usefulness of the iPad-based education after implementation is the ability of the intervention to save nurses' time (M=4, SD =1.0) and complete education more quickly (M=4, SD=0.7).

Figure 6. Pre- and Post- Questionnaires' Mean Likert Scores for Perceived Usefulness

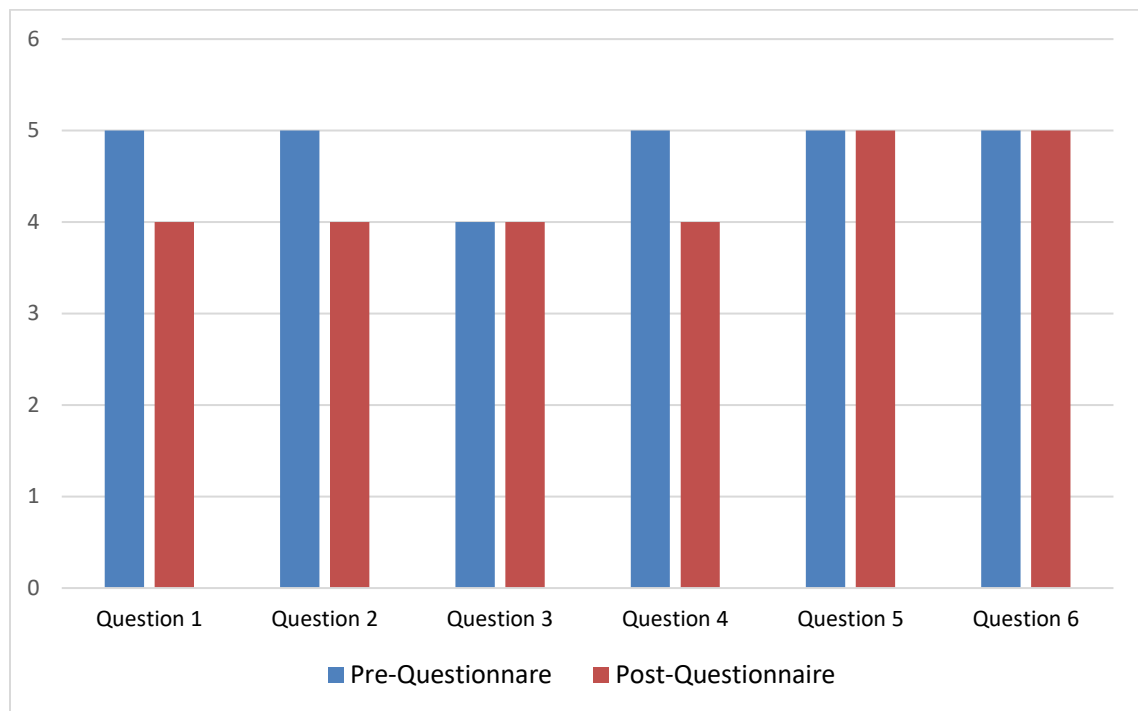


Figure 6. Cluster column chart representing the pre- and post- questionnaires' mean (M) Likert scores for perceived usefulness. The questions correspond to the six questions pertaining to perceived usefulness on the questionnaires.

The Participant's Viewpoint

Pre-implementation

Two nurse participants included a comment in the section provided at the bottom of the pre- questionnaire (n=2). Six nurse participants did not include a comment on the pre- questionnaire (n=6). One nurse participant wrote, "I am not super good at technology, so I'd take this into consideration" (Nurse participant 3, personal communication, February 16, 2017). The nurse participant's viewpoint regarding

technology in general may have influenced the perceived ease of iPad use in the acute-care setting. The other comment was positive regarding implementation of iPad-based education in the care of heart-failure patients.

Post-implementation

Three nurse participants did not include a comment on the post- questionnaire (n=3) and five participants did include a comment (n=5). One nurse participant reported that the patients who viewed the iPad-based education were poor candidates due to physical and mental abilities resulting in lower perceived usefulness scores (n=1). Two nurse participants commented on the patient experience (n=2). One of these nurses expressed concern that a patient thought the education was boring, while the other nurse thought the iPad-based education was an excellent educational tool and wished that the iPad-based education was available for other conditions such as diabetes and chronic obstructive pulmonary disease (COPD).

Finally, two nurse participants' written comments primarily referred to ease of iPad use (n=2). Both nurses had positive comments about the perceived usefulness of the iPad-based education, but they also encountered similar technological problems with the iPads. Nurse participant 5 stated the following:

The iPad-based education is a great idea and very informative. Unfortunately, I found technical difficulty after watching four modules, it would not advance to the next module. It would then log out and require a new log in without completing all modules. I like what I heard through a teaching aspect (personal communication, August 30, 2017).

A few staff nurses on the medical unit also verbalized, through informal conversations, similar technological issues with the iPads that occurred occasionally while the patients were watching the iPad-based education.

DISCUSSION

Anticipated Outcome

The purpose of the DNP Scholarly project was to implement a standardized heart-failure self-care education into the nursing workflow, using evidence-based iPad education platforms, effectively with sustainable results. Davis (1989) suggests, within the context of this project, that nurses will tend to use or not use iPad-based education to the extent the nurses believe the benefits of usage outweigh the difficulty of using the iPads and to the extent they believe the intervention is useful for patient education. The nurses on the medical unit at Treasure State Hospital collectively needed to believe the intervention was beneficial for a successful change implementation to occur. Davis (1989) discovered that perceived usefulness was more strongly associated with usage than perceived ease of use. The anticipated outcome of the project was that the nurses would maintain a high level of perceived usefulness throughout the intervention, which would then support continued usage of the iPad-based education.

Successes and Difficulties

The iPad-based education experienced technological issues during the implementation phase. The initial complication was overcoming the inability of the EHR and the Emmi education software to interface. The complication delayed the start date for implementing the iPad-based education on the medical unit after the competency skills meeting. The informatics team spent a great deal of time communicating with Emmi

Solutions, LLC, to construct a solution. A new process was created by adding an additional step, which allowed the charge nurses to enter the passcode into the Emmi education code intervention. Implementation of the standardized heart-failure self-care education program would not have been achieved without the support of the informatics team.

In the future, delaying the introduction of the intervention to the nursing staff until the intervention has been thoroughly tested would be beneficial for encouraging nurse support for the project. The postponement of the intervention due to technological issues created confusion among the nursing staff regarding the process for heart-failure self-care education. Several repeat demonstrations of the iPad-based education were necessary, during the implementation phase, secondary to the delay resulting in increased time demands on the DNP student.

Another technological issue occurred during the implementation phase. The iPads would occasionally freeze during the educational videos, and the nurse was required to re-enter the passcode and patient's date of birth. The nurse participants maintained high levels of perceived usefulness ($M=5$, $SD=0.9$) despite encountering technological issues. The perceived ease of use was impacted by the technological issues as evidenced by the post-questionnaire comments, but most nurse participants continued to find the iPad-based education easy to use after implementation ($M=4$, $SD =1.0$).

Davis (1989) emphasizes that perceived ease of use may be a precursor to perceived usefulness or otherwise perceived ease of use has a causal influence on perceived usefulness. The nurse participants are more likely to have higher perceived

usefulness scores if minimal effort is necessary to operate the iPad-based education. Therefore, implementing a solution to prevent the iPads from freezing during the patient education is important for continued usage of the iPad-based education in the care of heart-failure patients.

The Evidence

The objective of this DNP scholarly project was to implement a standardized heart-failure self-care education program on the medical unit at Treasure State Hospital using iPads to view Emmi education. The evidence supports implementation of a standardized heart-failure self-care education program into clinical practice. For example, while conducting a systematic review of randomized control trials, Maru et al. (2016) discovered 27 studies that reported statistically significant reductions in hospital admissions and/or mortality with implementation of a standardized heart-failure self-care education program. The evidence also supports the use of technology to educate patients about heart-failure self-care. For example, Albert et al. (2007) reported a significant increase in overall self-care behavior scores after the intervention group watched video-based education ($P < 0.01$).

The successful implementation of the iPad-based education intervention hinged on the dedicated support and commitment of the nurses to evidence-based practice. Perceived usefulness has a profound effect on nurses' behavior and usage of technology (King & He, 2006). Overall, the nurse participants on the medical unit at Treasure State

Hospital believed that the iPad-based education was useful for heart-failure self-care education in the acute-care setting ($M=5$, $SD=0.9$).

King and He (2006) recommend, based on a meta-analysis of 88 studies, that the technology acceptance model can be used in a variety of contexts. The theoretical concepts of perceived ease of use and perceived usefulness can be applied to future projects pertaining to implementation of technology into clinical practice. Future plans for patient care at Treasure State Hospital include disseminating the project results to other units of the hospital and implementing additional Emmi education on the medical unit for various disease states. The support of the nursing staff will be critical for successful implementation of iPad-based education throughout the hospital.

Financial Implications

The financial cost of the iPad-based education was contained to the purchase of iPads for the medical unit. Raising funds was not required for the iPad purchase, and the funds allocated for the iPads were included in the medical unit budget. An opportunity cost related to the purchase of the iPads was dedicating a portion of the budget to the iPads' purchase that could have been set aside for a different line item. Potential future financial implications that would impact the iPad-based education include termination of the annual subscription to Emmi education and/or purchase of a new EHR system. Both implications would require creating a new process for iPad-based education on the medical unit at Treasure State Hospital.

The Doctorate of Nursing Practice Role

The uptake of health information technology in the clinical setting is increasing at a rapid pace (Wu, When-Shen, Lin, Greenes, & Bates, 2008). According to Zaccagnini and White (2014),

...technology impacts safety (order entry [OE] decreased prescribing errors), effectiveness (clinical reminders), enhancement of patient-centered care (increases clinical knowledge through the Web resources), timeliness (e-health), and efficiency, all domains of interest for DNP clinical care and professional education (p.146-147).

The DNP scholarly project provided insight into strategies for successful integration of technology into the clinical environment, which will be valuable for the student's future DNP role.

The DNP scholarly project has also provided an opportunity to practice clinical scholarship. Zaccagnini and White (2014) state that clinical scholarship places emphasis on inquiry, outcomes, and evidence to support clinical practice. The DNP is distinguishable from other advanced practice degrees, because the DNP combines knowledge, expert skill, and translation of research to improve patient care (Zaccagnini & White, 2014). "This skill comes from additional formal education, experience, and the translation, application, and evaluation of research in practice" (Zaccagnini & White, 2014, p.67). The DNP student will take the skills obtained from completing the DNP scholarly project into the student's future DNP role.

Limitations

Internal Validity

A potential limitation in the internal validity of the results was the personal relationship the DNP student had with the nurses as a staff nurse on the medical unit at Treasure State Hospital. The limitation may have affected the nurse participants' responses to the questionnaires in an effort to support the DNP student. Measures implemented to address this problem included assigning a number to nurse participants to compare pre- and post- questionnaires, emphasizing that the responses would remain anonymous to hospital administration and in the study, and ensuring that the DNP student would treat the nurse participants' identity with professional standards of confidentiality. The DNP student also emphasized the importance of reporting any issues with the iPads to develop solutions.

Project Design

The project design as well as the timing of the data collection limited the quality of the results. As discussed previously, the implementation of the iPad-based education was affected by the inability of the EHR and the Emmi education software to interface after the pre- questionnaires were completed at the competency skills meeting. The DNP student also introduced potential bias by postponing the administration of the post-questionnaire to allow time for creating a solution to the technological issue, for completing the one-on-one demonstrations, and for the nurses to experience the iPad-

based education. The original project design did not allow an adequate amount of time for most nurses to use the iPads for patient education.

Generalizability

A limitation that affects generalizability of the results is the small sample size. Implementing the intervention using a large sample population as well as administering the pre- and post- questionnaires to the same sample group would strengthen the statistical and clinical significance of the results. The results also may not be generalizable to other hospitals that do not hold an annual subscription to Emmi education. However, the technology acceptance model and overall design of this project could be applied to other acute-care units in rural hospitals if adapted to the specific setting.

Conclusion

The implementation of technology into the nursing workflow continues to be a challenge, and this DNP scholarly project has provided a glimpse into both the challenges and potential solutions to successful implementation of iPad-based education. The results revealed that the nurses on the medical unit at Treasure State Hospital generally believed the intervention was useful for patient education, which contributed to a successful change implementation undeterred by the challenges the nurses encountered during the implementation phase.

The technology acceptance model is a valuable tool for evaluating implementation of technology into healthcare, and has been widely researched outside of

healthcare (Holden & Karsh, 2008). Holden & Karsh (2008) recommend further research studies to explore additional theoretical motivator variables and relationships that can be added to the technology acceptance model. Internally, a future evaluation is needed to evaluate the longevity of the iPad-based education on the medical unit at Treasure State Hospital, especially given the additional steps added to circumnavigate the inability of the two systems to integrate. Additional projects should also explore patient perceptions of the iPad-based education.

Overall, the nurses maintained a high level of perceived usefulness throughout the implementation of iPad-based education. The technological issue encountered during the implementation and reported by the nurses on the post- questionnaire will be addressed and a solution developed. The iPad-based education will continue to be used on the medical unit at Treasure State Hospital, and the results will be disseminated to other units throughout the hospital.

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APPENDICES

APPENDIX A

EVALUATION AND SYNTHESIS TABLES

Evaluation Table of Primary Research Studies

Citation	Design/Method	Sample/Setting	Major Variables Studied and their Definitions	Measurement of Major Variables	Data Analysis	Study Findings	Strength of the Evidence
1) Brennan, P. F., Casper, G. R., Burke, L. J., Johnson, Kathy A., Brown, R., Valdez, R. S., . . . Sturgeon, B. (2010). Technology-enhanced practice for patients with chronic cardiac disease:	Randomized Controlled Trial (RCT)	282 patients enrolled <ul style="list-style-type: none"> • N=146 for intervention • N = 136 for usual care Participants recruited from a single home care agency in a mid-western state; 5 total agency offices were studied	Independent variable was the nursing practice model <ul style="list-style-type: none"> • Usual care – care based on nurse’s assessment of patient needs • TEP – nurses plan and provide nursing care and use technology tools Physical/mental functional	SF-12; SCHFI; MILQ; Organization specific patient satisfaction survey; Self-report of hospitalization or unplanned service use	Data was collected at baseline and weeks 1,4,8,12, and 24; MCAR test used to check missing data; random-effects modeling strategy; post hoc multiple-comparison tests	The intervention did not reduce unplanned service use; analysis die reveals a significant difference between TEP and usual care for physical and mental health	Level of evidence: II <i>Weakness:</i> Researchers did not explain how the participants were randomized; the degree of implementation of the educational tools was at the discretion of the nurse <i>Strengths:</i> Participants were randomized to either the intervention or control groups;

<p>Home implementation and evaluation. <i>Heart & Lung: The Journal of Acute and Critical Care</i>, 39(6, Supplement), S34-S46.</p>			<p>status; self-management; QOL; patient satisfaction; unplanned hospitalization</p>				<p>researchers collected several data points during the 3-year field experiment <i>Feasibility:</i> The standardized education program used technology, which could have high startup costs for implementation</p>
<p>2) Bryant, R., & Gaspar, P. (2014). Implementation of a self-care of heart failure program among home-based</p>	<p>Single group; pre-and post-intervention design</p>	<p>Patients 65 years and older with a diagnosis of HF receiving home visits by NPs; N = 18; recruited from a Midwest house call program; participants were enrolled in education</p>	<p>Intervention based on Self-Care of Heart Failure Model; Hospital readmissions related to HF; ability for self-care</p>	<p>Number of readmissions; SCHFI</p>	<p>Differences in pre-and post HF hospital admission data were analyzed using descriptive statistics; SCHFI data was analyzed with a paired t-test</p>	<p>None of the participants experienced a hospital for 6 months following participation in intervention; a significant increase is self-care behaviors</p>	<p>Level of evidence: III <i>Weakness:</i> Small sample size; lack of randomization <i>Strengths:</i> Inclusion/exclusion criteria thoroughly reviewed; use of measurement tool that has</p>

clients. Geriatric Nursing, 35(3), 188-193.		classes				(maintenance, management, confidence)	undergone extensive validity testing <i>Feasibility:</i> Researchers included an implementation program guide for intervention; intervention is low cost and researchers reported a health care cost savings
3) Chaudhry , S. I., Mattera, J. A., Curtis, J. P., Spertus, J. A., Herrin, J., Lin, Z., Krumholz , H. M. (2010). Telemoni	Multicente r, Randomize d Control Trial (RCT)	1653 patients recently hospitalized for HF; randomized to either telemonitoring (n=826) or usual care (n- 872); Participants enrolled from 33 cardiology practices across the U.S. from	Usual care vs. Telemonitorin g; daily HF symptoms; every 30 days symptoms of depression; QOL; patient satisfaction; medication adherence; hospital readmissions	Primary end point was readmission for any reason within 180 days after enrollment; data collected by telephone interviews and record review	Tested primary hypothesis with a chi- square test of independenc e; Kaplan- Meier time- to-event function for readmission or death from any cause; calculated	No significant difference was seen between the two groups in the rate of primary and secondary end points; no adverse events reported during the study period	Level of Evidence: II <i>Weakness:</i> Researchers mention that including medication management or peer support may have enhanced intervention efficacy; lacking description of

<p>toring in patients with heart failure. N Engl J Med, 363.</p>		<p>2006 through 2009</p>			<p>hazard ratio for each end point; number of readmissions and hospital days between two groups analyzed with Wilcoxon rank-sum test</p>		<p>usual care <i>Strengths:</i> The researchers calculated the statistical power and confidence intervals; randomization process was included; staff involved in data collection were blinded to group assignments <i>Feasibility:</i> No significant results shows support for maintaining usual care practices that follow HF guidelines</p>
<p>4) Krumholz, H. M., Amatruda, J., Smith, G.</p>	<p>Prospective, Randomized Control Trial (RCT)</p>	<p>Patients recruited from Yale New Haven Hospital; 88 patients total; n</p>	<p>Hospital readmissions; one- year outcomes; hospital costs</p>	<p>Face-to-face baseline enrollment interview provided</p>	<p>Primary outcome measure was readmission or death;</p>	<p>56.8% in intervention compared to 81.8% in the control group</p>	<p>Level of Evidence: II <i>Weaknesses:</i> Small sample population;</p>

<p>L., Mattera, J. A., Roumani s, S. A., Radford, M. J., . . . Vaccarin o, V. (2002). Randomi zed trial of an educatio n and support interventi on to prevent readmissi on of patients with heart failure. J Am Coll Cardiol, 39.</p>		<p>= 44 for intervention and n=44 for control group</p>		<p>demographic information; clinical information obtained from medical records; Transition Accounting System</p>	<p>secondary end points include HF related readmission, length of hospital stay; cost of readmissions; group characteristic s compared using chi- square test and Wilcoxon rank-sum test; Cox proportional- hazards model assessed readmission free survival</p>	<p>had at least one readmission (RR 0.69); cost of study intervention was \$530 per patient; hospital readmission costs were higher in the control group by an average of \$7,515 per patient; education and support intervention was effective in reducing readmissions and in-hospital costs</p>	<p>study was conducted in 2002 and cost estimates are no longer current; randomization process was not described <i>Strengths:</i> Statistical power was calculated; intervention was thoroughly described <i>Feasibility:</i> The education intervention had health care cost savings; implementing a standardized education program would have low risk for adverse events</p>
<p>5) Otsu, H., &</p>	<p>Randomize d Control</p>	<p>102 Outpatients with HF in</p>	<p>Program completion</p>	<p>MacNew Heart Disease-</p>	<p>Chi-squared tests and t-</p>	<p>Educational self-</p>	<p>Level of Evidence: II</p>

<p>Moriyama, M. (2011). Effectiveness of an educational self-management program for outpatients with chronic heart failure. <i>Japan Journal of Nursing Science</i>, 8(2), 140-152-113p.</p>	<p>Trial (RCT)</p>	<p>Japan; 50 participants in the intervention group and 52 participants in the control group</p>	<p>rate and participant evaluation or program; primary outcomes identified as death or hospital admission due to HF; Secondary outcomes included QOL; process indicators e.g. compliance with a sodium-restricted diet</p>	<p>related Quality of Life Instrument; Physician measured clinical indicators e.g. BNP and recorded the results during examinations; Data collected at baseline and at 3,6, 9, and 12 months</p>	<p>tests or Mann-Whitney U-tests; a repeated comparative two-way ANOVA was carried out on the physiological data</p>	<p>management program was rated as either good or very good by 78.4% of intervention group; No fatality due to HF in either group; Significant differences regarding BNP in the intervention group at 3 months (P=0.032) and at 6 months (P=0.002); level of compliance with medication administration and exercise was higher in the intervention</p>	<p><i>Weaknesses:</i> Education program intervention was provided by the researcher; patients evaluated and treated by one team consisting of a cardiovascular specialist, a nurse, and a researcher with a nurse license <i>Strengths:</i> Includes randomization process and thorough description of education intervention; evidence based HF guidelines were used during program development</p>
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						group	<i>Feasibility:</i> The intervention education program consisted of six HF educational sessions that would be easy to implement and inexpensive
6)	Ross, A., Ohlsson, U., Blomberg, K., & Gustafsson, M. (2015). Evaluation of an intervention to individualize patient education at a nurse-led heart failure clinic: a	Quasi-experimental method	Conducted at nurse-led heart failure clinic in Sweden; control group (n = 41) and intervention group (n=44)	NYHA classification (I-IV); patient satisfaction and empowerment	Review of medical records; EQ; Numeric Rate Scale use to measure patient satisfaction	Chi-square test and independent t-test for baseline differences; Mann-Whitney U-test; Spearman's rank-order correlation	No statistical differences in EQ scores; high degree of satisfaction with the education in both groups Level of Evidence: III <i>Weaknesses:</i> Education only included one session with a nurse discussing education topics for each group; the only difference between the groups was that the intervention group wrote down questions before the education session

<p>mixed-method study. Journal of clinical nursing, 24(11-12), 1594-1602.</p>						<p><i>Strengths:</i> Researchers separated the control and intervention groups to prevent influence on other participants; education provided by the same personnel in both groups</p> <p><i>Feasibility:</i> The control group participated in standardized education while the intervention group participated in individualized education. Results showed that participants were satisfied and empowered</p>
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							in both groups which supports the implementation of a standardized educational program.
7) Sahebi, A., Mohammad-Aliha, J., Ansari-Ramandi, M., & Naderi, N. (2015). Investigation the relationship between self-care and readmission in patients with chronic heart	Well-designed cohort study	Rajaie Cardiovascular Medical and Research Center in Tehran, Iran; n = 287 patients with a diagnosis of reduced ejection fraction less than 35%	Self-care status; hospital readmission	SCHF1 (acquired score > 70 considered to indicate proper self-care); participants followed for 3 months after discharge for readmission	Patients divided into two groups: proper self-care and improper self-care according to SCHFI scores; Kolmogorov-Smirnov test to assess normal distribution; categorical data compared by Chi-square test or Mann-Whitney test; logistic	The most improper domain of the self-care index was self-care maintenance; significant association among age, self-care maintenance, and self-care confidence; 167 of 287 patients were readmitted; most common cause of decompensated HF was pneumonia or	Level of Evidence: IV <i>Weaknesses:</i> Lack of an intervention and randomization of participants <i>Strengths:</i> Use of a validated measurement tool; large sample population size; provided statistical analysis of demographic variables <i>Feasibility:</i> Research study

<p>failure. Research in cardiovascular medicine, 4(1), e25472.</p>					<p>regression model applied for multivariable analysis</p>	<p>UTI; self-care management and confidence showed significant association with readmission</p>	<p>lacks an intervention. However, results do show that self-care activities are correlated with hospital readmissions. Therefore, and education program that improves self-care management and confidence may help improve hospital readmission rates.</p>
<p>8) Shao, J.-H., Chang, A. M., Edwards, H., Shyu, Y.-I. L., & Chen, S.-H. (2013).</p>	<p>Randomized Control Trial (RCT)</p>	<p>HF patients attending cardiac clinics in northern Taiwan were randomly assigned to two groups: control</p>	<p>Intervention group received a 12-week self-management program on self-efficacy for salt and</p>	<p>SeSFC scale; HFSmB scale; HFSD scale; use of health services data gathered from patient medical charts</p>	<p>Data collected baseline and at weeks 4 and 12; data analyzed using SPSS with</p>	<p>Intervention group significantly more likely to perform self-management behaviors; intervention</p>	<p>Level of Evidence: II <i>Weaknesses:</i> Unable to determine which aspects of the self-management</p>

<p>A randomized controlled trial of self-management programme improves health-related outcomes of older people with heart failure. Journal of Advanced Nursing, 69(11), 2458-2469</p>		<p>(n=46) and intervention (n=47)</p>	<p>fluid control; experimental group received usual care with no self-management content</p>		<p>significance level set at 0.05; differences in outcome variables between the two groups were analyzed using repeated-measures ANOVA models; health service use was analyzed using a non-parametric Mann-Whitney U test</p>	<p>group had lower mean HFSD scores than control indicating improvement for HF symptom distress; no significant difference in health service use between intervention and control groups</p>	<p>intervention were more effective; short follow-up measuring study outcomes <i>Strengths:</i> Reliability and validity of measurement tools discussed; randomization process reported; language was translated using the principles of cross-culture translation <i>Feasibility:</i> Education program contained reasonable and cost-effective interventions. The self-management program</p>
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							consisted of one home visit, 4 telephone follow-ups, and completion of a daily HF activity diary.
9) Wang, X.-H., Qiu, J.-B., Ju, Y., Chen, G.-C., Yang, J.-H., Pang, J.-H., & Zhao, X. (2014). Reduction of heart failure rehospitalization using a weight management education intervention. The	Randomized Control Trial (RCT)	Participants recruited from the Cardiovascular Department of the First Affiliated Hospital of Soochow University; 71 HF patients recruited (37 randomized to the control group and 34 randomized to the intervention group)	Control group received usual care and intervention group also received a booklet on WM, scheduled telephone visit once every week in the first month, and an education session; Adherence to weight monitoring; Patients' WM ability;	WM adherence defined as obtaining a measurement 3 days or more in 1 week; WMQ	Baseline characteristics compared by independent-samples student t test; adherence to weight monitoring measured by independent t test; HF related readmission measured using 2 sample t test	Adherence to weight monitoring significantly improved in the intervention group at 6 months; Significant improvement in weight monitoring ability for intervention group; statistically significant reduction in the rate of HF-related readmissions	Level of Evidence: II <i>Weaknesses:</i> Small sample size and short duration of pilot study; lack of documentation pertaining to actions of patients who reported weight gain <i>Strengths:</i> Content of education was based on current guidelines for self-management of HF; researchers

Journal of cardiovascular nursing, 29(6), 528-534.			hospital readmission			in the intervention group compared to the control group (t = 2.22, P = .03)	included a brief description of WM booklet <i>Feasibility:</i> Education intervention simplified by using one self-care measure for focus. Focusing on a single component increases feasibility for resource-scarce areas
10) Welsh, D., Lennie, T. A., Marcinek, R., Biddle, M. J., Abshire, D., Bentley, B., & Moser, D.	Randomized Control Trial (RCT)	Patient recruited from a cardiology clinic, community hospital, and a university hospital; Participants (n=52) were randomized to control group	Dietary Sodium intake; Attitudes, Subjective Norm, and Perceived Behavioral Control related to following a low-sodium	3-day food diaries collected at baseline, 6 weeks, and 6 months; NDSR; DSRQ	Frequency distributions, means and standard deviations, independent t- and Chi-Squared tests used to describe participant characteristic	Dietary sodium intake was significantly lower (F=7.3, df=1,29, p = .01) in the intervention group at the 6-month study endpoint; Total attitudes	Level of Evidence: II <i>Weaknesses:</i> Small sample population; Self-report of dietary intake is subject to bias; DSRQ developed from extensive review of the literature and clinical

<p>K. (2013). Low-sodium diet self-management intervention in heart failure: pilot study results. <i>European journal of cardiovascular nursing: journal of the Working Group on Cardiovascular Nursing of the European Society of Cardiology</i>, 12(1), 87-95.</p>		<p>or intervention; control group (n=25); intervention group (n=27)</p>	<p>diet; intervention consisted of 6 weekly sessions by home visit or phone call to provide instruction on behaviors to promote low-sodium diet adherence</p>		<p>s; relationships explored with Person's correlation coefficient; Between group pre- and post-intervention groups were compared with ANCOVA; DSRQ subscales item means examined with independent-samples t-tests</p>	<p>subscale scores were significantly higher in the intervention group at 6 weeks (F=7.6, df = 1,38, p <.01); No differences in Subjective Normal Subscale scores or perceived behavioral control subscale scores</p>	<p>expertise (not previously validated) <i>Strengths:</i> Predetermined randomization schedules used; research framework supported by Theory (TPB); comprehensive dietary nutrient calculation software used to determine sodium intake <i>Feasibility:</i> Implementation of an education process for ensuring low-sodium diet adherence is warranted. A low number of participants reported receiving</p>
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							written instructions for monitoring sodium intake. Disseminating low sodium diet information would be a simple and feasible intervention.
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TEP = Technology enhanced practice; QOL = quality of life; SF-12 = Short Form-12 item measure; SCHFI = Self-Care Heart Failure Index; MILQ = Multidimensional Index for Life Quality Questionnaire for Cardiovascular Disease; MCAR = Little’s Missingness Completely at Random; HF = Heart Failure; NPs = Nurse practitioners; NYHA = New York Heart Association; EQ = empowerment questionnaire; UTI = urinary tract infection; SeSFC scale = Self-efficacy for salt and fluid control; HFSmB = Heart failure self-management behavior scale; HFSD scale = Heart Failure Symptom Distress scale; WM = weight management; WMQ = Weight Management Questionnaire; NDSR = Nutrition Data Systems-Research; DSRQ = Dietary Sodium Restriction Questionnaire; ANCOVA = one-way analysis of covariance; TPB = Theory of Planned Behavior

Rating System for the Hierarchy of Evidence for Intervention/Treatment Questions According to Fineout-Overholt and Melnyk (2015)

- Level I: Systematic review or meta-analysis of all relevant randomized controlled trials (RCTs)
- Level II: Well –designed RCTs
- Level III: Well – designed controlled trials without randomization
- Level IV: Well – designed case-control and cohort studies
- Level V: Systematic reviews of descriptive and qualitative studies
- Level VI: Single descriptive or qualitative studies
- Level VII: Opinion of authorities and/or reports of expert committees

Evaluation Table of Systematic Reviews

Citation	Design/ Method	Sample/ Setting	Major Variables Studied and their Definitions	Measurement of Major Variables	Data Analysis	Study Findings	Strength of the Evidence
1) Barnason, S., Zimmerman, L., & Young, L. (2012). An integrative review of interventions promoting self-care of patients with heart failure. <i>Journal of Clinical Nursing</i> , 21(3/4), 448-475 428p.	Integrative Review <ul style="list-style-type: none"> • Searched 4 databases for a period between 2000-2010 • Used 14 search terms • 19 eligible self-care intervention studies were included 	Total of 3166 study participants; study sample sizes ranged from 18-902 participants; quality of evidence included in review was level II; included hospitalized and clinic patients	Self-Care behaviors; Medication adherence; medication use skills; self-efficacy for HF self-care; HF knowledge; Confidence Level; Depressive symptoms	BMQ; DRUGS; KCCQ; self-care behavior scale; 24-item questionnaire adapted from tool use in REACT study; European Heart Failure Self-Care Behaviour Scale; SCHFI; Beck Depression Inventory – II; 3-day food diary; CALS Food Frequency Questionnaire ; UCLA Social Support	A structured data collection instrument was developed and used to collect data from each published article; the content validity of the data collection tool was supported by the review of two HF content experts; analysis involved synthesizing the findings to draw conclusions regarding interventions	Increased HF knowledge among intervention groups; majority of intervention studies demonstrated improvements in self-care	Level of Evidence: I <i>Weaknesses:</i> Limited follow-up in studies to determine long term benefits; researchers did not provide a thorough description of how they synthesized the data; does not include risk of bias <i>Strengths:</i> Included only studies that focused on a

				Inventory; Health Belief Scales; PKPCT; SMHF scale; EHFScBS; HFKT			self-care intervention; provided the quality of the evidence reviewed <i>Feasibility:</i> Research supported the use of education to improve HF knowledge; difficult to obtain specific effective interventions to implement into practice	
2)	Inglis, S. C., Clark, R. A., McAlister, F. A., Stewart, S., & Cleland, J. G. F. (2011). Which	Systematic review and Meta- analysis • Applied Cochrane methodol ogy for the review	25 peer- reviewed publications (n=8323) and 5 abstracts (n=1482)	Primary outcomes (mortality and hospitalizations) and secondary outcomes (cost, length of stay, and quality of life)	Two expert reviewers independently reviewed the results of each search and applied standard scales to judge study	Meta-analyses were performed according to Mantel-Haenzel methods using a fixed effects model, risk ratios, intention- to-treat, and I ² statistic	Telemonitorin g was effective in reducing the risk of all- cause mortality in patients with CHF, with a 34% reduction [RR 0.66 95%	Level of Evidence: 1 <i>Weaknesses:</i> Excluded other methods of follow-up and management to improve HF outcomes

<p>components of heart failure programmes are effective? A systematic review and meta-analysis of the outcomes of structured telephone support or telemonitoring as the primary component of chronic heart failure management in 8323 patients: abridged</p>	<ul style="list-style-type: none"> • Used 18 search engines and electronic databases • Search period between 2006 to 2008 • Key words included heart failure, cardiac failure, telehealth, telephone, disease management • Studies included in the primary meta-analysis 			<p>quality and risk of bias.</p>		<p>CI0.54-0.81, P <.0001, I²=0%]; STS reduced proportion of patients hospitalized due to CHF by 23%; 11 studies provided cost data and 8 of the 11 reported reductions in healthcare costs</p>	<p>such as nurse-led clinics or home visits; unclear what measurement tools were used in the studies <i>Strengths:</i> Includes risk of bias section; applied Cochrane methodology <i>Feasibility:</i> Possibility of expensive startup costs for TM and STS systems. However, Improvements in patient knowledge and self-care were observed which would</p>
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Cochrane review. Eur J Heart Fail, 13.	(n=25) • Studies included in sensitivity analysis (n=5)						benefit HF patients
3) Maru, S., Byrnes, J., Carrington, M. J., Stewart, S., & Scuffham, P. A. (2016). Systematic review of trial-based analyses reporting the economic impact of heart failure management programs compared with usual	Systematic Review • PRISMA strategy used to ensure systematic selection • Medline, CINAHL, NHS-EED were searched from 1990-2013 • 34 studies included in the final analysis • Studies	Patients recruited at hospital discharge represented 82% (n=28 studies) and 15% recruited from community (n= 5 studies)	Timing of the first post-discharge contact with patients; cost perspective; eight domains developed by AHA as the operational definition for HF-MP interventions	HF Disease Management Scoring Instrument	Study Quality assessed by CHEERS checklist; cost outcomes were converted to 2013 US dollar values	4 studies found a statistically significant all-cause mortality benefit for HF-MPs; Education intervention costs per person per month approximate mean \$120; 17 studies reported a significant reduction in hospital admissions; reduced	Level of Evidence: I <i>Weaknesses:</i> Did not report sample population sizes; did not include evaluation table of literature <i>Strengths:</i> Researchers effectively analyze data from multiple studies located in various countries and convert data to 2013 US dollar

care. European journal of cardiovascular nursing: journal of the Working Group on Cardiovascular Nursing of the European Society of Cardiology, 15(1), 82-90.	based in USA, Australia, Italy, Netherlands, Spain, Sweden, Austria, Canada, Hong Kong, and Ireland					hospital readmissions appeared to be associated with a favorable cost outcome	values in order to compare data <i>Feasibility:</i> Results support the long-term cost savings of educational interventions.
4) Siabani, S., Leeder, S. R., & Davidson, P. M. (2013). Barriers and facilitators to self-care in chronic heart	Meta-Synthesis of Qualitative Studies <ul style="list-style-type: none"> Databases included Medline, EMBASE, CINAHL, Web of Science, 	N = 477 patients; Majority of studies include the NYHA functional classification for their participants	Barriers and Facilitators of self-care in chronic heart failure	Researchers identified barriers and facilitators from the literature and discussed data from the research supporting these	Guideline for critically appraising the evidence adapted from Kuper & Levinson 2008; studies ranked as very good, good, acceptable, or unclear	Atypical symptoms of CHF, complexity of self-care process, insufficient knowledge, comorbidity burden, cognitive	Level of Evidence: V <i>Weaknesses:</i> Studies included rarely used classic qualitative methodologies e.g. ethnography

<p>failure: a meta-synthesis of qualitative studies. SpringerPlus, 2, 320.</p>	<p>Scopus, and Google scholar</p> <ul style="list-style-type: none"> • Peer reviewed articles from 1995-2012 • 25 Studies included 			<p>variables</p>		<p>decline, memory loss, depression, anxiety, and poor communication skills hinder self-care; supportive environments, disavowal coping strategy, trust in providers, spiritual beliefs and optimism were identified as positive contributing factors</p>	<p>or grounded theory; several of the studies included minimal raw data <i>Strengths:</i> Reviewers uses a systematic method for reviewing the articles and included a table reporting the quality of the studies <i>Feasibility:</i> Results could help identify factors that would influence the efficacy of an educational program</p>
<p>5) Wakefield</p>	<p>Systematic</p>	<p>8071</p>	<p>Outcomes of</p>	<p>A coding</p>	<p>Descriptive</p>	<p>Most common</p>	<p>Level of</p>

<p>, B. J., Boren, S. A., Groves, P. S., & Conn, V. S. (2013). Heart Failure Care Management Programs: A Review of Study Interventions and Meta-Analysis of Outcomes. <i>Journal of Cardiovascular Nursing</i>, 28(1), 8-19 12p.</p>	<p>review and Meta-analysis</p> <ul style="list-style-type: none"> • Databases included MEDLINE, CINAHL, and the Cochrane Central Register of Controlled Trials between 1995 and 2008 • 10 search terms used • 35 studies were included 	<p>subjects; the number of interventions within a program ranged from 1 to 7 within individual studies; most commonly used interventions were patient education, symptom monitoring by study staff or patients, and medication adherence strategies</p>	<p>readmissions, emergency department visits, clinic office use, reported costs, mortality, quality of life, patient satisfaction, mood, adherence, knowledge, self-efficacy, and symptom management</p>	<p>frame to extract primary study characteristics was developed by previous experience, narrative review articles addressing HF programs, intervention components reported in the literature, and the authors' previous research in HF; NYHA classification and LVEF were coded from descriptions of samples</p>	<p>statistics were used to describe the reports, methodological features, and nature/frequency of specific interventions; a standardized mean difference effect size was calculated</p>	<p>intervention was patient education (n=31, 89%); all interventions were targeted at individual patients (no group approaches); 21 of 30 studies reported lower mortality rates for treatment subjects; readmission rates were significantly lower in treatment subjects (ES = 0.157, P = .001); cost was significantly lower among treatment subjects;</p>	<p>Evidence: 1 <i>Weaknesses:</i> Studies lacked thorough description of care provided in the control group; many studies lacked teaching content on symptom monitoring; half of the studies did not report sample size, means and SD <i>Strengths:</i> Clear description of outcomes included in meta-analysis; included a thorough description of the data analysis;</p>
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						higher satisfaction and QOL life scores among treatment groups	included a table summarizing the studies <i>Feasibility:</i> Difficult to replicate individual interventions used to due lack of sufficient detail; research supports use of self-care education in HF management programs
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HF = Heart failure; BMQ = Brief Medication Questionnaire; DRUGS = Drug Unassisted Grading Scale; KCCQ = Kansas City Cardiomyopathy Questionnaire; SCHFI = Self-care for Heart Failure Index; PKPCT = Power as Knowing Participation Change Tool; SMHF scale = Self-management of Heart Failure scale; EHFScBS = European HF Self-Care Behaviour Scale; HFKT = Heart Failure Knowledge Test; STS = Structured Telephone Support; TM = telemonitoring; PRISMA = Preferred Reporting System for Systematic Reviews and Meta-Analysis strategy; AHA = American Heart Association; NYHA = New York Heart Association; LVEF = Left ventricular ejection fraction; QOL = quality of life

Rating System for the Hierarchy of Evidence for Intervention/Treatment Questions According to Fineout-Overholt and Melnyk (2015)

Level I: Systematic review or meta-analysis of all relevant randomized controlled trials (RCTs)

Level II: Well –designed RCTs

Level III: Well – designed controlled trials without randomization

Level IV: Well – designed case-control and cohort studies

Level V: Systematic reviews of descriptive and qualitative studies

Level VI: Single descriptive or qualitative studies

Level VII: Opinion of authorities and/or reports of expert committees

Evidence Synthesis Table			
Study	Design	Sample Size	Outcome
1 Brennan et al., 2010	RCT	N = 282 patients	Technology enhanced practice did not reduce unplanned service use
2 Bryant & Gaspar, 2014	Controlled Trial without randomization	N = 18 patients	No readmissions during 6-month follow-up; significant increase in self-care behaviors
3 Chaudhry et al., 2010	RCT	N= 1653 patients	No significant difference in hospital readmissions between usual care and telemonitoring
4 Krumholz et al., 2002	RCT	N = 88 patients	Decreased readmission rates and in-hospital costs
5 Otsu & Moriyama, 2011	RCT	N = 102 patients	Decreased BNP levels, improved medication adherence, increased physical activity
6 Ross, Ohlsson, Blomberg, & Gustafsson, 2015	Quasi-experimental method	N = 85 patients	No statistical difference in patient empowerment scores between individualized education and standardized education; high levels of patient satisfaction in both groups
7 Sahebi, Mohammad-Aliha, Ansari-Ramandi, & Naderi, 2015	Cohort Study	N = 287 patients	Results show that self-care activities correlate with hospital readmissions
8 Shao, Chang, Edwards, Shyu, & Chen, 2013	RCT	N = 93 patients	No significant difference in health service use between both groups; intervention group were significantly more likely to perform self-management behaviors and had decreased heart failure symptom distress
9 Wang et al., 2014	RCT	N = 71 patients	Statistically significant reduction in hospital readmissions
10 Welsh et al., 2013	RCT	N = 52 patients	Dietary sodium intake was significantly lower in the

			intervention group
Systematic Reviews			
1 Barnason, Zimmerman, & Young, 2012	Integrative Review	N=3166 patients	Increased heart failure knowledge and improved self-care skills
2 Inglis, Clark, McAlister, Stewart, & Cleland, 2011	Systematic review and Meta-analysis	N = 8323 patients	Mortality and hospital readmission decreased in telemonitoring intervention
3 Maru, Byrnes, Carrington, Stewart, & Scuffham, 2016	Systematic Review		Significant reduction in hospital readmissions and report of cost savings
4 Siabani, Leeder, & Davidson, 2013	Meta-Synthesis of Qualitative studies	N = 477 patients	Hindering factors: atypical symptoms, complexity of self-care, lack of knowledge, comorbidity burden, cognitive decline, poor communication Supporting factors: supportive environments, disavowal coping strategy, spiritual beliefs, trust in providers
5 Wakefield, Boren, Groves, & Conn, 2013	Systematic review and Meta-analysis	N = 8071 patients	Lower mortality rates, lower readmission rates, improved costs, and increase patient satisfaction in treatment groups. Most common intervention was patient education.

APPENDIX B

NURSE COMPETENCY CHECKLIST

Nurse Competency Checklist for iPad-based Patient Education				
Category	Performance Criteria	Preceptor evaluation (Date/Initials)	Validation Completed (Nurse Initials/Date)	Comments
Staff meeting or one-to-one training	1. View Heart Failure Emmi education			
Planning for Patient Education	1. Obtain iPad from charge nurse station and sign out to self and patient room number			
Infection Control	1. Able to state infection control process for iPads			
Emmi education	1. Obtain patient access code from Meditech 2. Log onto Emmi education on iPad 3. Enter patient access code 4. Assist patient with viewing Heart Failure videos 5. Log out of Emmi education and return iPad to charge nurse station			
Evaluation	1. Able to describe importance of teach-back method 2. Able to provide one example of a teach-back heart failure question			

APPENDIX C

USING EMMI EDUCATION FOR CHF PATHWAY

Using Emmi Education for CHF Pathway

1. Is CHF pathway ordered for your patient?
 - a. Start EMMI Heart Failure education on Day 2 of admission
2. Assess learning needs:
 - a. Note: If patient is not capable of understanding the education; then document in the CHF pathway comment section and stop here unless family members are interested in learning more about heart failure
3. Obtain iPad from Charge Nurse Station and check out iPad to patient's room under your name
 - a. Access code: XXXXXXXXXX
 - b. Connect to Treasure State Hospital Guest Network
 - i. Go to "Settings"
 - ii. Click on "Wi-Fi"
 - iii. Click on the blue button titled "Connect"
 - iv. Return to main screen
 - c. Open browser and go to "emmisolutions.com" or google "Emmi"
 - d. Click on "Patient Login" on the top right corner of the website
 - e. Retrieve patient's individualized access code from the Status Board in Meditech
 - f. Enter patient's individualized access code and Date of Birth
 - i. Patient's name will appear at the top of the screen
 1. Click "yes, this is me" or "no, I am a family member"
 2. Next screen is a notification message; Click "I understand"
 3. Click on the Heart Failure module and the videos will appear
4. Bring iPad into patient's room and explain to patient that they will be watching short videos to learn about heart failure
 - a. Explain to the patient that they will need to click on the next video when the first video is done
 - b. Estimated length of time for education is 30 minutes
 - c. When the patient is finished use the teach back method to assess learning
 - i. For example - I want to make sure the videos did a good job of explaining heart failure, can you tell me some of the symptoms of heart failure?
5. Remove iPad from patient's room
6. Clean iPad using alcohol wipes only
 - a. Note: Purple top and bleach wipes destroy the screen
7. Take iPad back to the charge nurse station and check in

APPENDIX D

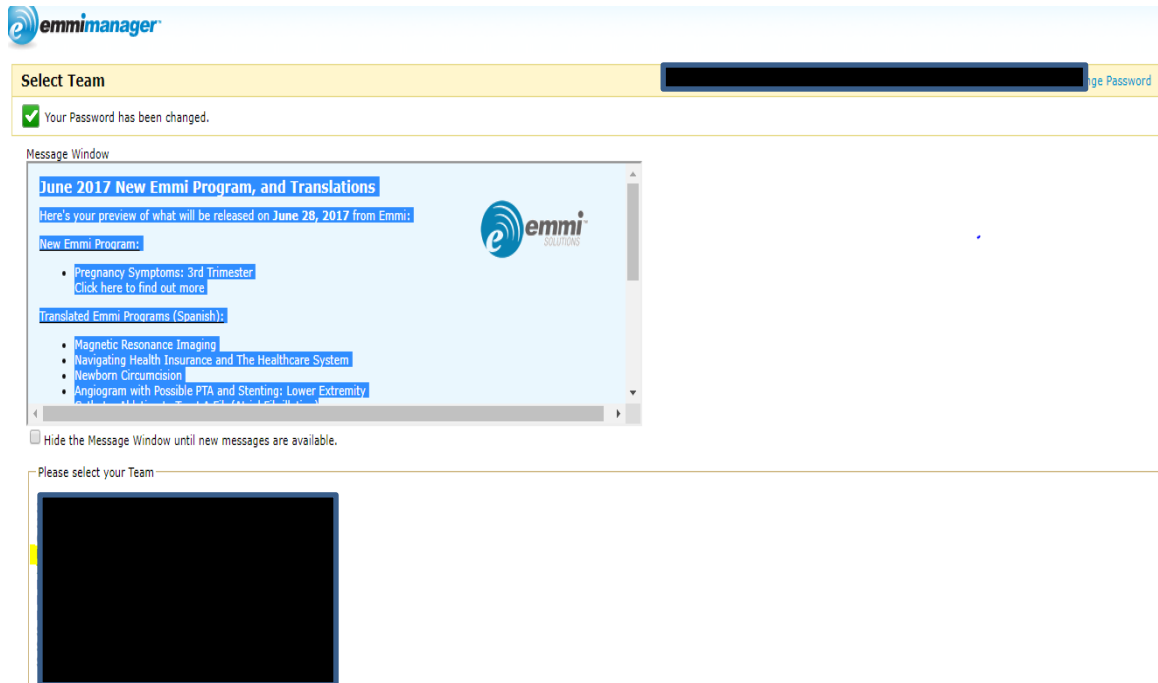
STEPS FOR ENTERING EMMI PASSCODE ONTO THE STATUS BOARD

Steps for Entering Emmi Passcode onto the Status Board

1. When the Hospitalists order the Heart Failure order set an “Emmi Education Code” intervention will reflux

Interventions									
Default Time Mon, Apr 10, 2017 0940 Margaret L Phillips,Rn									
Intervention	Text/Ord	Status	Src	Frequency	History	Next Scheduled	Prtcl	Assoc Data	
CHF Pathway		A	OE	QS		1830			
EMMI Education Code		A	OE	QS	49 mins	1830			
Care Plan: CHF		A	OE	QS		1830			
CHF Nursing Discharge		A	OE	Upon Discharge					

2. Go to www.emmimanager.com on admission
 - a. Username: [REDACTED]
 - b. Password: [REDACTED]
 - c. Click on unit where the order originated (Most CHF pathways are ordered in the emergency room)
 - d. Click on patient. Copy and paste access code into Meditech



3. Enter pass codes into the “Emmi Education Code” intervention and press save

4. The Emmi Education code will then appear on the Status Board. Please see test patient below.

Locations												
Room	Name	Dx	+MRSA	Next Sched Med	Drsg Due Date	Orders	Precautions	Change PICC...	Vanco Tr...	Flu Vac Curre...	Smoking Status	
✓	Code Status	Age/Sex	Attending	+VRE	Interv	Last BM	Results	Hx Falls	Change IV Site	Gent Tro...	Pt Has Exclus...	EMMI Education Code
	Team	Admit	Consulting	+C Diff	Diet	Transfusion	Messages	Cognitive Re...	Change IV Tu...	Tobra Tro...	Influenza Or...	Queued Orders
	3101-1	AMOK, RUN U	Heart failure		PRN		Ack					Current Everyday
		34/F	QUINN, ELIZA...									4546454
		04/07/2017					0 New/ 0 Read					

5. Staff Nurse will take the Emmi education code from the status board and enter code into the Emmi App on the iPads. Please see “Using Emmi Education for CHF Pathway” for directions on operating Emmi education on iPads

APPENDIX E

PRE- AND POST- QUESTIONNAIRES

**Nurse Willingness to Implement iPad-based Education in the Care of Heart Failure Patients
Pre- Questionnaire**

Investigator – Margaret L. Phillips

Subject Name _____

Date of Completion _____

Participation is voluntary and you can choose not to answer any questions you do not want to answer and/or you can stop participating at anytime

Rating Scale (Please check one box for each of the following categories)	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
Perceived Ease of Use					
1. Learning how to operate iPad-based Education would be easy for me					
2. I would find it easy to get iPad-based Education to do what I want it to do					
3. My interaction with iPad-based Education would be clear and understandable					
4. I would find iPad-based Education to be flexible to interact with					
5. It would be easy for me to become skillful at using iPad-based Education					
6. I would find iPad-based Education easy to use					
Perceived Usefulness					
1. iPad-based education would allow me to complete patient education more quickly					
2. iPad-based education would improve patient satisfaction.					
3. iPad-based education would save nurses' time					
4. iPad-based education would improve patient's understanding of heart failure					
5. iPad-based education would make teaching patients about heart failure easier.					

6. Overall, I believe iPad-based Education would be useful in my job.					
Comments (Please include any concerns and general perceptions about the implementation of iPad-based education):					

**Nurse Willingness to Implement iPad-based Education in the Care of Heart Failure Patients
Post- Questionnaire**

Investigator – Margaret L. Phillips

Subject Name _____

Date of Completion _____

Participation is voluntary and you can choose not to answer any questions you do not want to answer and/or you can stop participating at anytime

Rating Scale (Please check one box for each of the following categories)	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
Perceived Ease of Use					
1. Learning how to operate iPad-based Education was easy for me					
2. I found it easy to get iPad-based Education to do what I wanted it to do					
3. My interaction with iPad-based Education was clear and understandable					
4. I found iPad-based Education to be flexible to interact with					
5. It was easy for me to become skillful at using iPad-based Education					
6. I found iPad-based Education easy to use					
Perceived Usefulness					
1. iPad-based education allowed me to complete patient education more quickly					
2. iPad-based education improved patient satisfaction.					
3. iPad-based education saved nurses' time					
4. iPad-based education improved patient's understanding of heart failure					
5. iPad-based education made teaching patients about heart failure easier.					

6. Overall, I believe iPad-based Education is useful in my job.					
Comments (Please include any concerns and general perceptions about the implementation of iPad-based education):					