MOBILE INTEGRATED HEALTHCARE: A PROGRAM TO REDUCE

READMISSIONS FOR HEART FAILURE

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List of Abbreviations

- ANA American Nurses Association
- CMS Centers for Medicare and Medicaid Services
- CP Community Paramedic
- DNP Doctorate of Nursing Practice
- DRG Diagnosis-related group
- DSRIP Delivery System Reform Incentive Payment
- ED Emergency Department
- EQ-5D EuroQol EQ-5D tool
- EQ-5D-3L EuroQol 5D-3L tool
- HF Heart Failure
- IHI Institute for Healthcare Improvement
- MedPAC Medicare Payment Advisory Commission
- MIH Mobile Integrated Healthcare
- MIH HF RAP . .Mobile Integrated Healthcare Heart Failure Readmission Avoidance Program
- MIHP Mobile Integrated Healthcare Provider
- NP Nurse Practitioner
- PDSA Plan-Do-Study-Act
- U.S. United States
- VASVisual Analog Scale

Abstract

Problem: The burden of high healthcare costs affects patients, providers, and society as a whole. There is a small number of individuals that are responsible for repeated, excessive use of Emergency Department (ED) and inpatient hospital services. These individuals often have chronic conditions. Heart failure (HF) is a chronic condition affecting 5.8 million persons in the United States (U.S.; Hall, S., & DeFrances, 2012) and accounts for about a million hospitalizations yearly and 24.6% of 30-day rehospitalizations yearly (Centers for Medicare & Medicaid Service, 2014). As of October 1, 2012, the Centers for Medicare and Medicaid Services (CMS) was required to reduce payments to hospitals for excess readmissions for several conditions including HF (Centers for Medicare and Medicaid Services, 2014). Reducing readmissions for HF requires coordinated, safe, and cost-efficient alternative solutions for providing the most effective care in the most efficient manner for these patients.

Project Objective: The objective of this project was to examine the readmission rates, cost of care, and health status of enrollees of the Mobile Integrated Healthcare Heart Failure Readmission Avoidance Program (MIH HF RAP) administered by MedStar Mobile Healthcare (MedStar) in the Ft. Worth, TX, area.

Project Method: MedStar's MIH HF RAP database was examined during the enrollment timeframe of October 1, 2013, through September 30, 2015 with 90-day follow-up reporting through December 31, 2015. Descriptive measures of the readmission rates (0-30 days, 31-60 days, and 61-90 days), cost of care based on the number of ED visits and hospital readmissions calculated using CMS payment rates, and enrollees' health status measured by the EuroQol EQ-5D-3L instrument were analyzed.

Findings: The data from a total of 94 MIH HF RAP enrollees were analyzed. An additional analysis of a subset sample of 64 enrollees who were also part of a separate outcomes project was performed. The number of readmissions and associated costs of care declined as predicted in both the total and subset samples. The numbers of ED visits and associated costs of care, although significantly higher than predicted, also declined over the 90-days post-enrollment in the MIH HF RAP in both the total and subset samples. The perceived health status of the enrollees improved from enrollment to graduation from the program in both the total and subset samples.

Conclusions: This MIH HF RAP is an interdisciplinary approach that can be used to accomplish reductions in ED visits and hospital readmissions of HF patients, reduce the costs of care, and improve patients' perceived health status. Further evaluation of MIH HF RAPs in other communities is needed to ensure the positive outcomes can be replicated in other regions.

The cost of healthcare spending in the U.S. has grown substantially since 1970 (from \$74 billion dollars in 1970 up to \$2.9 trillion dollars in 2012) while the life expectancy and mortality rates for most leading causes of death are higher than in comparable countries. Diseases of the circulatory system are the number one cause of death in the U.S. This death rate is considerably higher than in comparable countries such as Australia, Canada, Denmark, France, Germany, Japan, Netherlands, New Zealand, Norway, Sweden, Switzerland, and the United Kingdom (Levitt, Claxton, Cox, Gonzales, & Kamal, 2014; Squires & Anderson, 2015). Many factors inside and outside of the health system affect health status and access to medical care. Changes in the delivery of healthcare in the future will directly impact the cost of care and its ultimate outcomes. There are many facets to the health system. This requires healthcare delivery to be an interdisciplinary effort. Healthcare providers of all levels and multiple specialties must collaborate to help patients with chronic diseases navigate the healthcare system, care for themselves, and achieve their highest possible level of health.

One innovative healthcare delivery model is Mobile Integrated Healthcare (MIH) programs. Mobile Integrated Healthcare programs have demonstrated reduced unnecessary transports to the Emergency Department (ED) and admissions to the hospital in many settings (Hoyle, Swain, Fake, & Larsen, 2012; Mason, Knowles, et al., 2007; Tadros et al., 2012; Widiatmoko, Machen, Dickinson, Williams, & Kendall, 2008); reduced costs (Dixon et al., 2009; Martin-Misener, Downe-Wamboldt, Cain, & Girouard, 2009; Tadros et al., 2012; Widiatmoko et al., 2008); safety in care provision (Hoyle et al., 2012); and high patient and provider satisfaction levels with the intervention (Machen, Dickinson, Williams, Widiatmoko, & Kendall, 2007; Swain, Al-Salami, Hoyle, & Larsen, 2012). These programs are innovative interventions that focus on intercepting and intervening with patients to potentially minimize their need to access the ED, the main point of entry for readmission to the hospital.

Problem

There is a small number of individuals that are responsible for repeated, excessive use of ED and inpatient hospital services. These are the same individuals who are using expensive emergency medical transportation resources to reach those services (Vinton, Capp, Rooks, Abbott, & Ginde, 2014). One subset of this population consists of those persons with chronic diseases.

Heart failure (HF) is a chronic condition and common cause of hospital admission. It is associated with frequent readmissions. Heart failure accounts for 7.6% of all hospitalizations (Jencks, Williams, & Coleman, 2009) and 24.6% of 30-day rehospitalizations (Centers for Medicare & Medicaid Service, 2014; Hall et al., 2012). In 2012, the healthcare costs for HF in the U.S. exceeded \$30 billion, most of which is associated with hospitalizations, including readmissions. By 2030, projections show that the total cost of HF will increase almost 127% to \$69.7 billion from the 2012 costs (Heidenreich et al., 2013).

In a study of Medicare beneficiary claims data from 2003-2004, Jencks, Williams, and Coleman (2009) found that 19.6% of those discharged from a hospital with any diagnosis-related group (DRG) were rehospitalized within 30 days and 34% were rehospitalized wihtin 90 days. Approximately 10% of these rehospitalizations were likely to have been preventable. Additionally, the rehospitalized patients stayed an average of 0.6 days longer than those in the same DRG who had not been hospitalized within the prior six months. The estimated cost of unplanned rehospitalizations in this study was \$17.4 billion. These findings were similar to the

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Medicare Payment Advisory Commission's (MedPAC) report (2008) of an 18% 30-day readmission rate at a cost of \$15 billion .

Based on these data, MedPAC recommended to reduce payments to hospitals with high readmission rates for selected conditions. As of October 1, 2012, the Centers for Medicare and Medicaid Services (CMS) was required to reduce payments to hospitals with excess readmissions for patients with several conditions including HF (Centers for Medicare and Medicaid Services, 2014). Reducing readmissions for HF patients requires coordinated, safe, and cost-efficient alternative solutions for providing optimal care in the most efficient manner for these high risk patients.

Objective

The objective of this project was to examine the readmission rates, cost of care, and health status of enrollees of the Mobile Integrated Healthcare Heart Failure Readmission Avoidance Program (MIH HF RAP) administered by MedStar Mobile Healthcare (MedStar) in the Ft. Worth, TX, area.

Project Questions

- How does the care provided by the MIH HF RAP affect a HF patient's 0-30-, 31-60-, and 61-90-day readmission rates?
- 2. What is the cost savings of the MIH HF RAP for patients with HF?
- 3. What is the health status of HF patients before and after using the MIH HF RAP?

Definitions

Mobile Integrated Healthcare Readmission Avoidance Program

Mobile Integrated Healthcare is <u>conceptually defined</u> as a "novel delivery strategy for an inter-professional practice of medicine . . . intended to serve a range of patients in the out-of-

hospital setting by providing 24/7 needs-based at-home integrated acute care, chronic care and prevention services" (Beck et al., 2012, p. 2). In this project, MIH was <u>operationally defined</u> as a program focused on minimizing the number of hospital readmissions for patients with HF through the use of paramedics to provide 24/7 needs-based, at-home care with the following structure: (1) performance of an in-depth medical assessment, (2) development of a customized care plan based on that assessment, and (3) periodic visitation and/or telephone contact with the patient and family to support them in following the care plan until they can manage on their own. This program includes direct care, education, and referral to appropriate community resources on an individualized basis (Agency for Healthcare Research and Quality, 2013b).

Mobile Integrated Healthcare is different from other forms of case management and home healthcare in that the MIH providers (MIHP) are available to respond to patients who enroll in the program in person 24 hours a day, seven days a week (Erich, 2013). Many patients who are in the MIH programs routinely used the Emergency Medical Services (EMS)/9-1-1 system as a healthcare safety net. When HF patients need help and cannot call another provider for whatever reason, they will call 9-1-1. Since MIHPs are imbedded in EMS, they are available to intervene to stabilize a patient when he or she needs it or to provide education, reassurance, or appropriate follow up arrangements if emergency care is not required. Reducing the numbers of unnecessary transports to the ED and potential readmissions save hospitals a considerable amount of cost (MedStar, 2014; Tadros et al., 2012; Widiatmoko et al., 2008). Mobile Integrated Healthcare programs are designed to fill gaps in care, not to duplicate existing services (Erich, 2013). Mobile Integrated Healthcare providers are "navigators to appropriate care" who are responsible for assisting patients in obtaining the care they need rather than providing it themselves (Farris, 2014; Farris & Swayze, 2014). Hospital-based case management programs are limited by patients' use of multiple facilities for care. Since the EMS is often the initial provider prior to transport to any hospital, the EMS-based MIH program provides continuity of care across multiple hospitals and health systems (Tadros et al., 2012).

Persons at Risk for Readmission

Readmission is <u>conceptually defined</u> as an unplanned "admission to a . . . hospital within 30 days of a discharge from the same or another . . . hospital"(Centers for Medicare and Medicaid Services, 2014) . This readmission may be for any diagnosis (American College of Emergency Physicians, 2015). <u>Operationally</u>, patients with HF at risk for readmission were those individuals who:

- 1. were identified by a hospital case manager or physician as being at risk for a 30-day readmission;
- 2. had a 30-day readmission previously; or
- were still in the hospital, typically on a 30-day readmission for HF (MedStar, 2014; M. Zavadsky, personal communication, September 25, 2014).

The Medicare Hospital Quality Chartbook 2014: Performance Report on Outcome Measures (Centers for Medicare & Medicaid Service, 2014) provided the median 30-day readmission rates and median 30-day post-discharge ED visit rates for six-month periods for this project. The calculated average median 30-day readmission rate is 23% with a range of 1.65% to 54.58%. The calculated average median 30-day post-discharge ED visit rate is 7.25% with a range of zero percent to 30.3%. For this project, the actual readmission rates and actual ED visit rates for the 0-30-days post-enrollment into the MIH HF RAP were measured and compared to the median calculated 30-day readmission rates of 23% for readmissions and 7.25% for ED visits. The actual 31-60- and 61-90-day readmission rates and ED visits were compared to the actual 0-30-day readmission rates and ED visits.

Cost of Care

The cost of care is <u>conceptually defined</u> as the expenses (monetary value) of providing healthcare. Operationally, the cost of care was calculated in two ways and compared between expected and actual costs. For ED visits, cost of care was <u>operationally defined</u> as the number of ED visits multiplied by the average payment of an ED visit for a person over the age of 18 years (\$1,062, range of \$1,062-\$1,097) per the *Health, United States, 2012: With Special Feature on Emergency Care* report (National Center for Health Statistics, 2013). For hospital readmissions, cost of care was <u>operationally defined</u> as the number of hospital readmissions multiplied by the average total payment for the hospital admission for DRGs 291-293 (various statuses of HF; \$4,829, range of \$4,829-\$10,859) per the *National and State Summaries of Inpatient Charge Data, FY2013: DRG Summary for Medicare Inpatient Prospective Payment Hospitals, FY2013* report (Centers for Medicare and Medicaid Services, n. d.).

Health Status

Health status is <u>conceptually defined</u> as an individual's level of health as assessed by subjective and/or objective measures (U. S. National Library of Medicine, 2014). In <u>operational</u> <u>terms</u>, each MIH HF RAP enrollee's health status was measured using the EuroQol EQ-5D-3L (EQ-5D-3L) health status survey. The EQ-5D-3L is a standardized tool consisting of two parts. The first part consists of five dimensions: (1) mobility, (2) self-care, (3) usual activities, (4) pain/discomfort, and (5) anxiety/depression. Each dimension has three levels: (1) no problems, (2) some problems, and (3) extreme problems. The respondent is asked to indicate his/her health state at the current time by marking the single most appropriate level statement for each of the five dimensions. The second part is a 100-point visual analog scale (VAS) on which respondents draw a line between zero (worst imaginable health state) and 100 (best imaginable health state). The information from the two parts of the tool provides a quantitative measure of each respondent's own assessment of his or her health status (van Reenen & Oppe, 2015).

Background and Significance

Heart Failure

Heart failure is a serious, debilitating, chronic condition in which the heart's ability to pump adequate amount of blood to meet the body's needs is compromised. Age, race, other congenital or acquired heart and medical conditions, and obesity increase the risk of developing HF. Common HF manifestations include activity-limiting shortness of breath or dyspnea, chest pain or pressure, fatigue, edema, and weight gain. The treatment plan for managing HF can be complex with lifestyle changes, polypharmacy, and regular medical appointments. Despite treatment, HF is a progressive disease that can be managed but not cured (National Heart Lung and Blood Institute, 2015).

Readmissions for HF are multifactorial and focused on troublesome physical symptoms (e.g. recurrent edema or shortness of breath). These symptoms are influenced by other comorbidities and the progression of the chronicity of HF. Psychological and social environment factors affect a HF patient's ability to (1) adhere to lifestyle changes in diet and activity and (2) obtain necessary medications and medical follow up. The health system can also increase a patient's risk of being readmitted when there is lack of care coordination between the inpatient and outpatient settings, deficient communication among providers and with patients, and provider attitudes and insensitivity to the challenges of living with HF (Retrum et al., 2013). As HF is a complex, chronic condition, HF patients require significant care coordination, communication, and resources. If any of these components is inadequate, the disease will be suboptimally managed and patients will be at risk for repeated and excessive use of healthcare resources including readmissions.

Mobile Integrated Healthcare Providers

The overall problems of repeated and excessive emergency services and inpatient hospital usage and strategies for addressing them is found in both United States-based and international literature for more than 20 years. Bigham, Kennedy, Drennan, and Morrison (2013) presented a systematic review of 11 international studies, primarily from the United Kingdom, that discussed strategies for dealing with this problem; no studies from the U.S. were found in this systematic review. The reports from the U.S. are essentially anecdotal (Erich, 2013; Kanne, 2014; Kirkwood, 2009; Shah et al., 2010; Walston, 2015). Krumperman (2010) offers a historical review of community paramedicine/MIH and illustrates its value in providing safe, effective, cost-efficient care to patients whose health issues do not require ED services. A review of the literature, both from the U.S. and internationally, reveals only one anecdotal three-month pilot relating to the results of these strategies on readmission rates for HF patients. Seven weeks into the pilot, the readmission rate was zero and the patients, family members and caregivers gave positive feedback about this MIH HF RAP (Erich, 2013). Three main themes found in the literature relating to MIHPs were: safety, cost effectiveness, and patient satisfaction with the care MIHPs provide.

There are data to support that MIHPs provide safe and appropriate care in the field when patients are not transported to the ED (Hoyle et al., 2012; Mason, Knowles, et al., 2007; Mason, Knowles, Freeman, & Snooks, 2008; Swain et al., 2012). The vast majority of patients treated and not transported to the ED for further evaluation did not require an unplanned ED visit or

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admission in the subsequent seven (Hoyle et al., 2012; Mason et al., 2008; Swain et al., 2012) to 28 days following the MIHP encounter (Mason, Knowles, et al., 2007). Additionally, Mason et al. (2007) found no significant difference in 28-day mortality rates between geriatric patients treated by MIHPs and those in the control group.

The cost effectiveness of using MIHPs is also demonstrated repeatedly in the literature (Dixon et al., 2009; Jensen & Kuntz, 2014; Mason, Knowles, et al., 2007; Mason, O'Keeffe, Coleman, Edlin, & Nicholl, 2007; Tadros et al., 2012; Widiatmoko et al., 2008). Mulitple studies in the United Kingdom demonstrated the cost effectiveness of MIHPs through decreased numbers of ambulance transports, ED visits, and hospital admissions (Dixon et al., 2009; Mason, Knowles, et al., 2007; Mason, O'Keeffe, et al., 2007; Tadros et al., 2012; Widiatmoko et al., 2009; Mason, Knowles, et al., 2007; Mason, O'Keeffe, et al., 2007; Tadros et al., 2012; Widiatmoko et al., 2009; Mason, Knowles, et al., 2007; Mason, O'Keeffe, et al., 2007; Tadros et al., 2012; Widiatmoko et al., 2008). In the U.S., Jensen and Kuntz (2014) illustrate cost savings with a case study of a single person with multiple physical and psychosocial issues who excessively used the EMS system for care and transport to the ED. In the first year of the MIH program's intervention, the cost savings to that community through reduction of system use by just that one person was \$163,533 (68%).

Patients and their caregivers have reported that they are very satisfied with the care they receive from MIHPs. Overall patients appreciated being able to receive care and remain in their own homes (Hoyle et al., 2012; Knowles, Mason, & Colwell, 2011; Machen et al., 2007; Mason, Knowles, et al., 2007). Mason et al. (2007) administered the EuroQol EQ-5D (EQ-5D) questionnaire, a measure of general health status, to patients at three and 28 days after the initial EMS/MIHP encounter. They found no significant differences in reported health outcomes between the persons treated by MIHPs and those receiving standard EMS care and transport to the ED; the persons treated by MIHPs reported no worsening of physical health status.

EuroQol EQ-5D-3L Tool

The EQ-5D-3L was developed in 1990. It is a standardized measure of general health status for adults aged 18 years and older that provides a simple descriptive profile and a single index value for health status. It is a simple tool consisting of five dimensions of health in which repondents check a single response statement in each of five dimensions and place a single mark on a VAS indicating their current health state (Appendix A). Due to its simplicity, respondents are able to self-complete this tool in less than five minutes (Szende, Janssen, & Cabases, 2014; van Reenen & Oppe, 2015). The tool's validity and reliability has been evaluated in multiple studies conducted around the world involving persons having various diseases (Agborsangaya, Lahtinen, Cooke, & Johnson, 2014; De Smedt et al., 2012; Dyer, Goldsmith, Sharples, & Buxton, 2010; Janssen, Birnie, Haagsma, & Bonsel, 2008). Population norms from 24 countries are available for comparison as there are cross-country differences in EQ-5D outcomes related to a country's economic and health system characteristics (Szende et al., 2014).

De Smedt (2012) examined data related to 8,745 patients with stable coronary disease from 22 European countries and calculated an overall Cronbach's alpha of 0.73 (range 0.58 to 0.82 between countries) for all measures which is an acceptable to good level of internal consistency. The EQ-5D index correlated with the EQ VAS for overall health perception. Dyer, Goldsmith, Sharples, and Buxton (2010) conducted a systematic review of 66 randomized controlled trial and observational studies that used the EQ-5D in patients with cardiovascular disease including HF. Their purpose was to evaluate the validity and reliability of the EQ-5D as an outcome measure in that population. Convergent validity using Spearman rank correlations was moderate to strong. The EQ-5D had less discriminative validity as it was less likely to detect clinical changes than other disease-specific measure tools particularly when the change in disease severity was small. Good reliability of the EQ-5D Index and VAS was shown. Janssen, Birnie, Haagsma, and Bonsel's study (2008) of the EQ-5D showed strong convergent validity with Spearman rank coefficients between the EQ-5D-3L indices and the VAS ranging from 0.88 to 0.99. The test-retest reliability showed a fair average intraclass correlation coefficient of 0.52 on the EQ-5D index and 0.51 on the VAS.

Five dimensions are evaluated in the descriptive section of the EQ-5D-3L: (1) mobility, (2) self-care, (3) usual activities, (4) pain/discomfort, and (5) anxiety/depression. Respondents are directed to indicate their health state by marking the one appropriate box (no problems, some problems, extreme problems) next to each dimension. Each level is represented by a number (1 is no problems, 2 is some problems, 3 is extreme problems). These numbers are purely ordinal. They are combined from each of the five dimensions to create a unique health state. Missing responses and ambiguous responses (e.g., more than one level box is checked in a single dimension) are recorded as 9. Data from the five dimensions can be presented in a table with the proportion of reported problems (levels 1-3) for each dimension. This table can be separated to include proportions per subgroup such as before and after treatment (Szende et al., 2014; van Reenen & Oppe, 2015).

The EQ VAS (Appendix A) directs respondents to self-rate their current health on a vertical, 100-point VAS with endpoints labeled as "Best imaginable health state" (100) and "Worst imaginable health state" (0) by drawing a line on the scale at the appropriate level on the scale. The VAS is scored as the numerical value at which the patient's mark crossed the VAS (0-100). Again, missing and ambiguous values have a unique code. Data from the VAS are best presented as a measure of central tendency (e.g., mean) and a measure of dispersion such as a

standard deviation or 25th and 75th percentiles if the data are skewed (Szende et al., 2014; van Reenen & Oppe, 2015).

Significance to Nursing

Advanced practice nurses are an important part of the healthcare team and need to work in collaboration with other disciplines such as medicine, therapy services, nutrition, and EMS. Each member of the healthcare team is responsible for providing safe, effective, and costefficient care that complements the care provided by other disciplines. Currently the healthcare system is poorly organized to meet the challenges of providing the full complement of services to people with chronic health conditions such as HF. Failure of healthcare professionals and organizations to collaborate and build upon each others' strengths results in missed opportunities for care, duplication of services, and poorer health outcomes (Institute of Medicine, 2001).

The Institute for Healthcare Improvement's (IHI) Triple Aim Initiative (2014) describes a three dimensional approach to optimizing health system performance:

- 1. Improving the patient experience of care (including quality and satisfaction);
- 2. Improving the health of populations; and
- 3. Reducing the per capita cost of healthcare.

In optimizing the healthcare system, the IHI believes "it's important to harness a range of community determinants of health, empower individuals and families, substantially broaden the role and impact of primary care and other community based services, and assure a seamless journey through the whole system of care throughout a person's life" (2014, para. 5). Using MIHPs to broaden the impact of primary care and community based services helps patients to successfully transition from acute care (i.e., ED, inpatient hospitalization) to maintenance care (i.e., outpatient clinic).

The American Nurses Association (ANA) has issued a position statement on MIH in a document entilted *ANA's Essential Principles for Utilization of Community Paramedics*. In this document the role of the EMS MIHP is referred to as the community paramedic (CP). The ANA supports initiatives which facilitate all members of the healthcare team working in cooperation with each other in the fullest extent of their education and training to provide safe, quality healthcare to all patients. The ANA sets forth four essential principles for the CP.

- Role competence: CPs must undergo uniform education and clinical training consistent with the role and functions of the CP. This should be from an accredited program in and mandated by state statute, rules, and regulations. Competence in the CP role should be measured on a continuing basis.
- 2. Interdisciplinary teamwork: Registered nurses are the coordinators of patient care. It is vital that CPs communicate and cooperate with registered nurses.
- 3. Accountability: CPs should be accountable for themselves, to the community they serve, and to a regulatory agency.
- 4. Evaluation: The role of the CP "requires ongoing evaluation to determine effectiveness and inform healthcare providers and policy makers as to needed changes" (p. 4). Not only should this evaluation focus on resource management and cost reduction, but also on improved patient outcomes, patient satisfaction, and a decrease in adverse outcomes (American Nurses Association, 2014).

The American Association of Colleges of Nursing states that Doctorate of Nursing Practice (DNP) graduates are recognized by their abilities to conceptualize new care delivery models, facilitate collaborative interdisciplinary teams, provide patient care by themselves and with others in collaborative partnerships (American Association of Colleges of Nursing, 2006; American Association of Colleges of Nursing & Task Force on the Implementation of the DNP, 2015). Healthcare delivery requires both intra- and interdisciplinary collaboration and the DNPprepared nurse can play a major role in the collaborative partnerships and provide substantive content and support to initiatives that improve health outcomes (Campbell-O'Dell, 2016). The MIH HF RAP is one of those initiatives to improve health outcomes.

Nurses and nurse practitioners (NP) have been members of some MIH teams described in the literature. Machen et al.'s (2007) pilot study involving a nurse and paramedic team that responded to low-priority ambulance calls reported high patient satisfaction with having a nurse on the responding team. Additionally, the nurse and paramedic felt that the combination of their knowledge and skills allowed them to manage the calls effectively and to provide an improved quality of patient care. Walsh and Little (2001) describe a small feasibility study of an NP working in a paramedic role responding to EMS calls. While the NP may have spent more time at the scene diagnosing and treating the patient than a conventional EMS team would have, transport to the ED was avoided for up to one third of the calls. Patients were satisfied with the care provided, particularly when transport to the ED was avoided.

This project analyzing the MIH HF RAP is of great importance to advanced practice nurses as healthcare evolves and strives to become more efficient and cost-effective through the mandates of the Affordable Care Act (ACA; Centers for Medicare and Medicaid Services, 2014). Heart failure is a common, chronic condition that often results in hospital admission and frequent readmissions and CMS is reducing payments to hospitals with excess readmissions for HF. It is essential for advanced practice nurses to collaborate with other healthcare disciplines to explore new ways to improve care for HF patients to reduce the number of readmissions. Patients with chronic diseases such as HF require both on-going maintenance support and intermittent crisis support. A crisis may be any event (e.g., loss of insurance, loss of medications, change in living conditions, exacerbation of other health conditions, other stressors, etc.) that places the patient at risk for an exacerbation of the chronic disease. Successful transitional care interventions are multifaceted and start early in the hospitalization, including rapid contact within two to three days post-discharge, facilitating communication among all healthcare providers, and addressing the breadth of patient concerns (e.g., medical, social, economic) post-discharge (Retrum et al., 2013). A MIH HF RAP fulfills these requirements, helps to mitigate the crisis, and supports the patient's return to a maintenance level for his/her condition. Advanced practice nurses are key personnel in the delivery of healthcare to patients with chronic diseases and need to collaborate with other healthcare professionals and programs such as the MIH HF RAP to mitigate the problem of excess HF readmissions.

Theoretical Framework

The Plan-Do-Study-Act (PDSA) model (Appendix B) was the theoretical basis for this project. The PDSA model is a simple but powerful tool for improving a process or carrying out a change. The purpose of the model is to determine as quickly as possible if an intervention works and to make adjustments to the intervention as needed to improve the delivery and sustainment of the desired change (Reed & Card, 2016). Three questions must be asked when applying PDSA:

- 1. What is trying to be accomplished?
- 2. How will it be known that a change is an improvement?
- What changes can be made that will result in an improvement? (Minnesota Department of Health, n. d., para. 3)

Once the problem has been identified, the goals of achievement determined, and the intervention chosen, the change needs to be tested in the real work setting. There are four steps in the PDSA cycle:

- 1. Plan: Plan the intervention and the data collection protocol;
- 2. Do: Implement the intervention on a small scale;
- 3. Study: Analyze the data and study the results;
- Act: Based on the data analysis, the intervention is refined, fully implemented and sustained, or abandoned and the PDSA process is begun again (Agency for Healthcare Research and Quality, 2013a; Reed & Card, 2016).

While the PDSA model is conceptually simple and applying it successfully provides a substantial return on the investment of resources, often the core principles or steps of the PDSA model are not executed properly (Reed & Card, 2016). Healthcare is in a constant state of flux and changes and growth occur rapidly. The PDSA process is deliberate and needs to commence with sufficient planning and preparation of both the intervention and the methods for evaluating it. Failure to invest time, effort, and sufficient resources in the planning stage may result in wasted PDSA cycles or even project failure. While PDSA allows for revisions and re-evaluations, it is essential that the problem to be addressed is correctly defined, the causes and contributing factors for it is identified, the key stakeholders are identified and included as appropriate, and the criteria for success is elucidated before the intervention is designed or implemented (Reed & Card, 2016).

The Plan for this project includes the identification of the problem as that of frequent readmissions of patients with HF. The intervention targeting this is the MIH HF RAP. The goals measuring the success of the interventions are the decreases in ED visits and hospital

readmissions in the 0-30, 31-60, and 61-90 days following enrollment into the MIH HF RAP, the resulting cost savings from the decrease in ED visits and hospital readmissions, and an improvement in enrollees' health status. The timeframe for the intervention (Do) of the MIH HF RAP is October 1, 2013, through September 30, 2015, with 90-day follow-up reporting through December 31, 2015. The Act stage will be determined based on the data analysis.

Assumptions

The assumptions for this DNP project were:

- 1. The concept of MIH is not familiar to most healthcare providers.
- 2. Caring for patients with HF costs a significant amount of money.
- 3. Reducing the hospital readmission rates and costs for persons with HF is important to improve the health of this population and to reduce the cost of their care.
- 4. Caring for persons with chronic diseases such as HF requires a multidisciplinary approach.
- 5. Persons with chronic diseases such as HF often have a lesser health state and this state may improve if they are able to manage their diesase better.
- Paramedics with additional training as MIHPs are qualified to manage HF in an outof-hospital setting and they are positioned to impact the hospital readmission rates for persons with HF.

Project Methods

This project was designed to generate outcomes evidence on the concept of utilizing MIH providers to reduce hospital readmission rates of persons who have HF. The methodology used to accomplish this objective provided a description of the outcomes of the selected MIH HF RAP. This description was useful to educate primary care providers, cardiology providers, and ED providers on the value of the MIH HF RAP in terms of caring for their HF patients.

Design

A retrospective cohort design was used in this project. This was an observational design in which the defined cohort was examined using previously collected information to explore the association between an exposure and specified outcomes (Sedgwick, 2014). The cohort group consisted of adults with the diagnosis of HF who were identified as being at risk for readmission within the initial 30 days post-discharge and enrolled in the MIH HF RAP. Enrollees who dropped out of or were dismissed from the program prior to completing the program, were lost to follow up, or died during the 90 days post-enrollment were noted and their data were not included in the data analysis. The specified outcomes were the numbers of ED visits and hospital readmissions in the 0-30, 31-60, and 61-90 day periods following enrollment in the MIH HF RAP, calculated costs of care, and self-reported health status upon enrollment into and graduation from the MIH HF RAP.

Advantages of this project design included that the cost was low by using previously collected data. The short follow up periods between each data collection point decreased the chance of recall bias, increased the probability that the outcomes were measured more consistently, decreased the risk of loss or withdrawal of subjects, and minimized the chance that there would be a change between the risk factors and the outcomes over time.

Disadvantages of this project design included having the ability to infer only association between the exposure and the outcomes, not causation. The subjects in this project were not randomly selected and therefore may not represent the patient population with HF. There may be measurement bias as the Project Director had little control over the variables measured and the recording of the data because these were previously collected by other investigators.

Human Subject Protection

An application for "Human Subjects Determination" (Appendix D) was sent to the Human Subjects Committee, University of Kansas Medical Center, for approval before conducting this project. The Human Subjects Committee determined that the project did not directly involve human subjects and did not require Institutional Review Board review because it was a retrospective project using existing de-identified data that were previously collected and recorded by MedStar. MedStar committed to not release the identification key to the project team.

Methodology

Only the data of those enrollees whose initial enrollment date in the program was on or after October 1, 2013, through September 30, 2015, were analyzed. The data were categorized for each enrollee into numbers of ED visits and numbers of readmissions and the HF RAP enrollees' health status as measured by the EQ-5D-3L survey that was administered upon admission to and graduation from the program. The cost of care was calculated using published average national payments for ED visits and hospital admissions.

Sample

A convenience sample of a single MIH HF RAP was used. The MedStar MIH HF RAP in Ft. Worth, TX, area was chosen because it is a well-established, highly respected program that is a leader in the developing MIH field. Specifically, the sample consisted of the adult, aged 18 years and older, patients whose initial enrollment date in the MedStar MIH HF RAP occurred during the timeframe of October 1, 2013, through September 30, 2015, with 90-day follow-up reporting through December 31, 2015. October 1, 2013, was chosen as the start date as this was the date that the program began participating in the Delivery System Reform Incentive Payment (DSRIP) program with one of the major local health systems and expanded its recording of outcomes measures (D. Ebbett, personal communication, May 8, 2016).

The DSRIP initiatives are part of broader Section 1115 Waiver programs. These programs are part of the evolution of the Medicaid delivery system reform landscape and provide states with significant funding that can be used to support hospitals and other providers in changing how they provide care to Medicaid beneficiaries. The DSRIP initiatives have transformed from finding ways to appropriately finance hospital care to promoting a much wider set of payment and delivery system reforms. Participation in such waivers require rigorous data collection and reporting requirements from providers (Gates, Rudowitz, & Guyer, 2014). Therefore, outcomes measures were tracked more precisely in those patients participating the DSRIP/Section 1115 Waiver program. The participants in the DSRIP/Section 1115 Waiver program were analyzed as the subset sample.

Data Analysis

All the data analyses were done using Microsoft Office Excel 2016. The following analyses were conducted in the total sample and subset sample (enrollees in the DSRIP/Section 1115 Waiver program), respectively.

Readmission rates

Only confirmed readmissions were counted in this data set. If an enrollee was sent to the ED or known to have had an ED visit but an admission could not be confirmed, the visit was counted only as an ED visit not as a readmission. ED visits that resulted in a readmission were also counted as ED visits as the ED visit was preceeded the readmission. The hospital

readmission rates among the MIH HF RAP enrollees were evaluated and compared: (1) the differences between the expected 0-30-days post-enrollment readmission rates and actual 0-30-days post-enrollment readmission rates; (2) the differences between the actual 0-30-day readmission rates and the 31-60-day readmission rates; and (3) the differences between the actual 0-30-day readmission rates and the 61-90-day readmission rates .

The MIH HF RAP enrollees in the total sample were expected to have 22 readmissions in the 0-30 days following enrollment into the program [23% average median readmission rate times the number (94) of MIH HF RAP enrollees (Centers for Medicare & Medicaid Service, 2014)]. The MIH HF RAP enrollees in the subset sample were expected to have 15 readmissions in the 0-30 days following enrollment into the program [23% average median readmission rate times the number (65) of MIH HF RAP enrollees].

Cost of care

The cost of care savings for ED visits was the difference between the expected and actual cost of ED visits. The cost of ED visits (expected or actual) was calculated by mutiplying the number of ED visits (expected or actual at 0-30 days, 31-60 days, and 61-90 days) by \$1,062. This was a conservative estimate as it uses the lower value of the average payment for an ED visit for a person over the age of 18 years of \$1,062-\$1,097 per ED visit as noted in the *Health*, *United States, 2012: With Special Feature on Emergency Care* report (National Center for Health Statistics, 2013). The following cost of care savings for ED visits were calculated and compared in the total sample and in the subset sample: (1) the difference between cost of care for expected and actual ED visits during 0-30 days post-enrollment in MIH HF RAP; (2) the difference between cost of care for actual ED visits during 0-30 days and 31-60 days post-

enrollment in MIH HF RAP; and (3) the difference between cost of care for actual ED visits during 0-30 days and 61-90 days post-enrollment in MIH HF RAP.

The MIH HF RAP enrollees in the total sample were expected to have 7 ED visits in the 0-30 days following enrollment into the program [7.25% average median ED visit rate times the number (94) of MIH HF RAP enrollees in the total sample (Centers for Medicare & Medicaid Service, 2014)]. Therefore, the expected cost of care for ED visits was \$7,434.

The MIH HF RAP enrollees in the subset sample were expected to have 5 ED visits in the 0-30 days following enrollment into the program [7.25% average median ED visit rate times the number (65) of MIH in the total sample]. Therefore, the expected cost of care for ED visits was \$5,310.

The cost of care savings for hospital readmissions was the difference between the expected and actual cost of hospital readmissions. The cost of hospital readmissions (expected or actual) was calculated by mutiplying the number of hospital readmissions (expected or actual at 0-30 days, 31-60 days, and 61-90 days) by \$4,829. This was a conservative estimate as it uses the lower value of \$4,829 -\$10,859 (values rounded) per admission as noted in the *National and State Summaries of Inpatient Charge Data, FY 2013: DRG Summary for Medicare Inpatient Prospective Payment Hospitals, FY2013.* The following cost of care savings for hospital readmissions were calculated and compared in the total sample and in the subset sample: (1) the difference between cost of care for expected and actual hospital readmissions during 0-30 days and 31-60 days post-enrollment in MIH HF RAP; (2) the difference between cost of care for actual hospital readmissions during 0-30 days and 61-90 days post-enrollment in MIH HF RAP.

The enrollees in the total sample were expected to have 22 hospital admissions in the 0-30 days following enrollment into the program [23% (Centers for Medicare & Medicaid Service, 2014) times the number (94) of MIH HF RAP enrollees in the total sample]. Therefore, the expected cost of care for hospital readmissions was \$106,238.

The enrollees in the subset sample were expected to have 15 hospital admissions in the 0-30 days following enrollment into the program [23% times the number (65) of MIH HF RAP enrollees in the subset sample]. Therefire, the expected cost of care for hospital readmissions in the subset sample was \$72,435.

Health status

The health status for each enrollee was measured using the EQ-5D-3L survey both at the time of enrollment into the MIH HF RAP and upon graduation from the program. Only enrollees who had both enrollment and graduation surveys done were analyzed for greater accuracy in determining differences within enrollees in the sample. The modes for each dimension of the enrollment and graduation responses were reported because the enrollee's numerical responses within the levels of each health dimension are ordinal. Data from the VAS were presented as a measure of central tendency (mean) and a measure of dispersion (25th and 75th percentiles as the data were skewed). Each dimension and the VAS was compared upon enrollment and graduation to discern if there were any changes in the enrollees' self-reported health states.

Results

Sample Characteristics

Table 1 in Appendix E summarizes the characteristics of the total and subset samples. There were 114 total enrollees in the MIH HF RAP during the project timeframe. A subset of 84 of those enrollees were involved in the DSRIP/Section 1115 Waiver program. Of the 114 total enrollees, one enrollee returned to the hospital for admission during the enrollment assessement and died six days later; this patient was not included in the analysis. Of the remaining 113 enrollees, 19 of them were subsequently disenrolled due to various reasons (i.e., dropped out of or were dismissed from the program prior to completing the program, or were lost to follow up). The data from the remaining 94 enrollees were analyzed in the total sample.

The initial subset sample of 84 enrollees contained the one decedent noted above and all 19 of the disenrolled cases. This left 64 enrollees for analysis in the subset sample.

Readmission Rates

The expected 0-30 day post-enrollment readmission rate for patients with HF in the total sample was calculated to be a total of 22 readmissions. The actual 0-30 day post-enrollment readmission rate for the HF patients in the MIH HF RAP in the total sample was 18 patient readmissions. The actual 31-60 day post-enrollment readmission rate for the HF patients in the MIH HF RAP in the total sample was 16 readmissions. The actual 61-90 day post-enrollment readmission rate for the HF patients in the MIH HF RAP in the total sample was eight readmissions.

The expected 0-30 day post-enrollment readmission rate for the patients with HF in the subset sample was calculated to be a total of 15 readmissions. The actual 0-30 day post-enrollment readmission rate the HF patients in the MIH HF RAP subset sample was 17 readmissions. The actual 31-60 day post-enrollment readmission rate the HF patients in the MIH HF RAP subset sample was 15 readmissions. The actual 61-90 day post-enrollment readmission rate the HF patients in the MIH HF RAP subset sample was 15 readmissions.

Cost of Care

Appendix F Table 2 illustrates data on ED visits, hospital readmissions, and cost of care in the total and subset samples. The expected 0-30 day post-enrollment ED visit rate for patients with HF in the total sample was calculated to be a total of seven ED visits in the 0-30 days following enrollment into the program for an expected cost of \$7,434. The actual number of 0-30 day post-enrollment ED visits for the HF patients in the MIH HF RAP total sample was 53 for an actual cost of \$56,286. The 31-60 day post-enrollment ED visit rate for the HF patients in the MIH HF RAP in the total sample was 41 visits for an actual cost of \$43,542. The 61-90 day postenrollment ED visit rate for the HF patients in the MIH HF RAP in the total sample was 33 visits for an actual cost of \$35,046. The actual number of 0-30 day post-enrollment ED visits for HF patients in the MIH HF RAP in the total sample was 46 visits greater than expected with a cost \$48,852 higher than expected. However, the numbers of ED visits for HF patients in the MIH HF RAP in the total sample at 31-60 days and 61-90 days decreased from the number of 0-30 day ED visits by 12 and eight visits respectively with costs decreasing by a corresponding \$12,744 and \$8,496.

The expected 0-30 day post-enrollment ED visit rate for patients with HF in the subset sample was calculated to be a total of five ED visits in the 0-30 days for an expected cost of \$5,310. The actual number of 0-30 day post-enrollment ED visits for the HF patients in the MIH HF RAP subset sample was 42 for a cost of \$44,604. The 31-60 day post-enrollment ED visit rate for the HF patients in the MIH HF RAP subset sample was 37 visits for an actual cost of \$39,294. The 61-90 day post-enrollment ED visit rate for the HF patients in the MIH HF RAP subset sample was 25 visits for an actual cost of \$26,550. The actual number of 0-30 day post-enrollment ED visits for the HF patients in the MIH HF RAP subset sample was 37 visits for an actual cost of \$26,550. The actual number of 0-30 day post-enrollment ED visit for the HF patients in the MIH HF RAP subset sample was 37 visits for an actual cost of \$26,550. The actual number of 0-30 day post-enrollment ED visit for the HF patients in the MIH HF RAP subset sample was 37 visits greater

than expected with a cost \$39,294 higher than expected. The numbers of ED visits for the HF patients in the MIH HF RAP in the subset sample at 31-60 days and 61-90 days were lower from the number of 0-30 day visits by five and 12 visits respectively with costs being reduced by \$5,310 and \$12,744.

The expected 0-30 day readmission rate for patients with HF in the total sample was calculated to be 22 readmissions for a calculated cost of \$106,238. The actual 0-30 day readmission rate for the HF patients in the MIH HF RAP in the total sample was 18 readmissions for a cost of \$86,922. The 31-60 day post-enrollment readmission rate for the HF patients in the MIH HF RAP in the total sample was 16 readmissions for an actual cost of \$77,264. The 61-90 day post-enrollment readmission rate for the HF patients ample was eight readmissions for an actual cost of \$38,632. The actual number of 0-30 day post-enrollment readmissions for an actual cost of 0-30 day post-enrollment readmissions for an actual cost of \$38,632. The actual number of 0-30 day post-enrollment readmissions for the the HF patients in the MIH HF RAP in the total sample was four readmissions lower than expected with a cost \$19,316 lower than expected. The numbers of readmissions for the HF patients in the MIH HF RAP in the total sample was four readmissions for the HF patients in the MIH HF RAP in the total sample was four readmissions for the HF patients in the MIH HF RAP in the total sample was four readmissions lower than expected with a cost \$19,316 lower than expected. The numbers of actual cost of the HF patients in the MIH HF RAP in the total sample at 31-60 days and 61-90 days continued to be reduced from the number of 0-30 day readmissions by two and eight readmissions respectively with costs decreasing by a corresponding \$9,658 and \$38,632.

The expected 0-30 day readmission rate for patients with HF in the subset sample was calculated to be 15 for a calculated cost of \$72,435. The actual 0-30 day readmission rate for the HF patients in the MIH HF RAP in the subset sample was 17 readmissions for a cost of \$82,093. The 31-60 day post-enrollment readmission rate for the HF patients in the MIH HF RAP in the subset sample was 15 readmissions for an cost of \$72,435. The 61-90 day post-enrollment readmission rate for the HF RAP in the subset sample was seven readmission rate for the HF patients in the MIH HF RAP in the subset sample was seven

readmissions for the HF patients in the MIH HF RAP in the subset sample was two readmissions higher than expected with a cost \$9,658 higher than expected. The numbers of readmissions for the HF patients in the MIH HF RAP in the subset sample at 31-60 days and 61-90 days was less than the number of 0-30 day readmissions by two and eight readmissions respectively with costs decreasing by a corresponding \$9,653 and \$38,632.

Health Status

The enrollees in both the total and subset samples had varying degrees of survey completion ranging from completing no surveys to completing either the enrollment or the graduation survey to completing both surveys. Approximately two thirds of each group completed both the enrollment and graduation surveys. For consistency in interpreting any differences in responses from enrollment to graduation, only the data from enrollees who completed both surveys were analyzed. The modes of the levels from the ordinal responses to each dimension were reported. For the VAS representing health status, the mean response was reported. Since the distribution of the VAS data was not normal, the 25th and 75th percentiles were also reported in lieu of the standard deviation. Table 3 in Appendix G presents data on health status measured by EQ-5D-3L.

The enrollment survey responses from the total sample were as follows:

- 1. Dimension 1: Mobility: mode = 2 I have some problems in walking about.
- 2. Dimension 2: Self-care: mode = 3 I have no problems with self-care.
- Dimension 3: Usual activities: mode = 2 I have some problems with performing my usual activities.
- 4. Dimension 4: Pain/discomfort: mode = 3 I have no pain or discomfort.
- 5. Dimension 5: Anxiety/depression: mode = 3- I am not anxious or depressed.

Health status VAS: mean self-rating = 53, 25th percentile = 32.5, 75th percentile = 60.

The graduation survey responses from the total sample were as follows:

- 1. Dimension 1: Mobility: mode = 3 I have no problems in walking about.
- 2. Dimension 2: Self-care: mode = 3 I have no problems with self-care.
- Dimension 3: Usual activities: mode = 3 I have no problems with performing my usual activities.
- 4. Dimension 4: Pain/discomfort: mode = 3 I have no pain or discomfort.
- 5. Dimension 5: Anxiety/depression: mode = 3 I am not anxious or depressed.
- Health status VAS: mean self-rating = 67, 25th percentile = 50, 75th percentile = 80.

The responses from the subset sample on the enrollment survey were as follows:

- 1. Dimension 1: Mobility: mode = 2 I have some problems in walking about.
- 2. Dimension 2: Self-care: mode = 3 I have no problems with self-care.
- Dimension 3: Usual activities: mode = 2 I have some problems with performing my usual activities.
- 4. Dimension 4: Pain/discomfort: mode = 2 I have moderate pain or discomfort.
- 5. Dimension 5: Anxiety/depression: mode = 3 I am not anxious or depressed.
- Health status VAS: mean self-rating = 51, 25th percentile = 30, 75th percentile = 60.

The responses from the subset sample on the graduation survey were as follows:

- 1. Dimension 1: Mobility: mode = 3 I have no problems in walking about.
- 2. Dimension 2: Self-care: mode = 3 I have no problems with self-care.

- Dimension 3: Usual activities: mode = 3 I have no problems with performing my usual activities.
- 4. Dimension 4: Pain/discomfort: mode = 3 I have no pain or discomfort.
- Dimension 5: Anxiety/depression: mode = 2 I am moderately anxious or depressed.
- Health status VAS: mean self-rating = 68, 25th percentile = 60, 75th percentile = 80.

Discussion

The purpose of this project was to examine the readmission rates, cost of care, and health status of the HF patients that were enrolled in the selected MIH HF RAP. It was anticipated that the MIH HF RAP intervention would decrease the numbers of and costs for ED visits and hospital readmissions in those patients and improve their health status. Decreasing numbers of ED visits and associated costs were noted, but the actual number of ED visits was much higher than expected in both the total and subset samples. The numbers and costs for hospital readmissions, not ED visits, is the criterion CMS uses for determining payment reductions to hospitals, this was an important finding. The improvement in the MIH HF RAP enrolleees' health status from enrollment to graduation was also a positive finding.

The Project Director excluded subjects who were disenrolled prior to completing the program or who died during the program to focus the analysis on the outcomes of the MIH HF RAP. It was important to note how many subjects were disenrolled from or who died during the program since this outcome was not desired. The excluded subjects were noted and all were also part of the subset sample that was analyzed separately. Including the disenrolled subjects may

have artificially decreased the mean number of days enrollees spent in the program. Their EQ-5D-3L data would have been incomplete since these MIH HF RAP patients would have only an enrollment EQ-5D-3L survey completed. Enrollees who completed either the enrollment or graduation EQ-5D-3L surveys were excluded from the health status analysis as an accurate comparison of the responses within the sample could not have been done.

In terms of the sample, it may have been useful to have known the types of insurance of the enrollees (e.g., private insurance, Medicare, Medicaid, none), self-identified race or ethnicity (e.g., African American, Latino, etc.), ages, previous ED visit usage and admission patterns, the degree of severity of HF, and major comorbid conditions as these are known influencers on the types of health problems experienced by people as well as their healthcare seeking patterns (Centers for Medicare & Medicaid Service, 2014; National Center for Health Statistics, 2013). If the enrollees in the sample were at higher risk for ED visits or for admissions due to the severity of their HF, other comorbid conditions, or their previous ED visit and admission patterns, these may have caused the ED visit and admission rates to be greater than expected.

The 0-30 day readmission rate was less than expected in the total sample (18 actual versus 22 expected) and just over the expected number in the subset sample (17 actual versus 15 expected). The subset sample may have been smaller and therefore may have been under powered. The total sample of patients with HF was an at-risk population for early readmission. Possibly the HF patients that were included in the DSRIP/Waiver 1115 program subset sample were at even higher risk for readmission based on their previous ED visit and admission patterns. The findings from this quality improvement project showed that the number of readmissions in both the total and subset samples steadily declined over the 90 days post-enrollment when patients with HF were in the MIH HF RAP.

The lower readmission rate, particularly in the total sample, resulted in a lower actual cost for inpatient care. With the observed reduction in the number of patients readmitted in the 0-30 day time period in the total sample, a major goal for the MIH HF RAP was met. The number of readmissions continued to decrease which was also a positive result as it suggests that these HF individuals were remaining healthy enough to avoid needing inpatient care. The decline in readmissions noted in this analysis of the selected MIH HF RAP is consistent with the reduced readmission rate at the seventh week follow up of the MIH HF RAP reported by Erich (2013) and the reduced readmission rates for patients treated by MIHPs reported by Hoyle et al. (2012), Mason et al. (2008), Swain et al. (2012), at seven days and Mason et al. (2007) reported at 28 days. Dixon et al. (2009), Widiatmoko et al. (2008), and Tadros et al. (2012) also report a cost savings in terms of decreased readmissions.

An unexpected finding in this project was the much higher than expected number of ED visits made by the enrollees. While this number progressively decreased over the 90 days post enrollment in the MIH HF RAP, it still far exceeded the expected rate. Several explanations for this may be offered. One is that the median expected rate of ED visits of 7.25% was potentially significantly lower than the expected rate in this geographic region or population. Another reason for this might be that the usual healthcare utilization patterns for this sample tended toward an unusually high number of ED visits. This would be consistent with another arm of the MIH program that targets patients who use the 9-1-1 system 15 or more times in 90 days (MedStar, 2014). This program arm was not examined in this project. It is possible that an enrollee in the MIH HF RAP could qualify for more than one of the programs and be assigned to just one program. The expected ED visit rate range was from 0% to 30.3% (National Center for Health Statistics, 2013). However, even if the 30.3% rate was used, adjusting the expected ED visit rates

for the total sample to 28 ED visits and for the subset sample to 19 ED visits, does not alter the actual number of HF patients seeking care in the ED. These number of ED visits noted in this project were far higher than expected by the calculation used. Another explanation for the high numbers of ED visits might be that each readmission also was counted as an ED visit since the ED was either definitely or most likely the point of entry for the readmission. The calculations using both ED and readmission rates were performed because these HF patients would incur both ED visit charges and inpatient readmission charges when they were readmitted through the ED. Had the readmissions not had the ED visit also counted, the actual number of ED visits would still have exceeded the calculated 30.3% rates, but would have trended much closer to the calculated rates. The actual ED visits would have been the following for the total and subset samples if the numbers of ED visits resulting in hospital readmissions were not included:

- Total sample would have been 35 ED visits at 0-30 days, 25 at 31-60 days, and 25 at 61-90 days (expected was seven ED visits);
- Subset sample would have been 25 ED visits at 0-30 days, 22 at 31-60 days, and 18 at 61-90 days (expected was five ED visits).

The higher rate of ED visits underscored the determination that these subjects were at greater risk for readmission and substantiated their selection for enrollment in an intervention to mitigate that risk. It also supported using prehospital care providers to have a major role in that intervention since the majority of the HF subjects were transported to the ED via ambulance. Tadros et al. (2012) studied the use of an EMS-based case management and referral intervention to decrease the number of ED visits in a sample of adults with 10 or more EMS transports to EDs over the previous 12 months. The intervention was associated with a decline in EMS encounters by 37.6% and a decline in the number of ED visits by 28.1% with a 12.7% decrease in ED

charges. They also noted a decrease in the number of admissions by 9.1% with a shorter length of stay and a 5.9% decrease in admission costs. While the numbers of EMS encounters, ED visits, and admissions remained high, they did show a decrease during the study. This was similar to the results found in this project.

What is not known through this project is the number of ambulance transports and ED visits that were avoided due to the presence of a MIHP on-scene and the MIHP's ability to either educate/reassure the patient or to provide necessary interventions (e.g., initiating the diuresis protocol, obtaining a change in treatment plan from the subject's healthcare provider, scheduling an outpatient appointment with the subject's healthcare provider, etc.). Ascertaining this information on avoided ED visits was beyond the boundaries of this project, but may have demonstrated a reduction of additional ED visits beyond the number that actually occurred in this analysis.

The EQ-5D-3L results demonstrated either continuity of independence in or a positive change in the response in each dimension between the enrollment and graduation surveys, with the exception of the subset sample in the dimnesion of anxiety/depression. The mode of the responses for this dimension decreased from 3 (I am not anxious or depressed) to 2 (I am moderately anxious or depressed). This may or may not reflect outcomes of the MIH HF RAP as it was a measure of a single point in time that could be affected by many unrelated variables. Since the mean of the health status VAS increased from 51-53 (total sample-subset sample) on the enrollment survey to 67-68 (total sample-subset sample) on the graduation survey, it would be reasonable to assume that the subjects were enjoying a great level of health upon graduation from the MIH HF RAP than they did upon their enrollment. The positive association of the MIH HF RAP with an improved perception of health suggests that further evaluation and study of this

and other similar programs be conducted to determine if these results are replicated and may be a direct result of the MIH HF RAP.

Another limitation of this project was that the Project Director only examined a single program in one community. Studying other similar programs in other communities or using pooled data from the MIH-CP Outcomes Measures Project (MedStar Mobile Healthcare, n. d.) would help to demonstrate the validity of these results and the ability of such a program to be replicated in other communities. There may also have been selection bias involved as the subjects were not randomized to receive the intervention or not. Measurement bias may have occurred since the project used data previously collected by other individuals and the project team did not have any control over the collection procedures.

Healthcare delivery requires interdisciplinary collaboration, and DNP-prepared nurses have the ability to collaborate within and beyond the discipline of nursing to facilitate new healthcare delivery models to provide patient care themselves and in collaboration with other providers. Nurse practitioners, physicians, EMS providers, and especially patients will benefit from MIH programs such as this MIH HF RAP because it achieves the key elements of the Triple Aim: (1) improving the patient experience of care in terms of quality and satisfaction, (2) improving the health of populations, and (3) reducing the per capita cost of healthcare (Institute for Healthcare Improvement, 2014). The MIHP may be a paramedic, nurse, or even a nurse practitioner. Mobile Integrated Healthcare Providers assess at-risk patients in their homes, provide interventions that can keep the patients from needing expensive ED visits or readmissions, and help to guide these patients back to their primary care and specialist providers for continued, consistent care. The consistency of receiving care from the same provider in the same place facilitates the transition of care from inpatient to outpatient, improves communication, and helps to prevent readmissions (Boutwell, Griffin, Hwu, & Shannon, 2009; Chace, 2015). The DNP-prepared nurse is uniquely positioned to both oversee and guide the care provided by others as well as to provide that care in any appropriate setting.

Conclusion

Healthcare providers are responsible to assist with the health of populations in a costeffective manner while providing quality care with high patient satisfaction. The urgency of implementing improved methods to meet these standards, particularly in HF patients has been accelerated by recent legislation and regulatory mandates. The concept of MIH is an interdisciplinary approach that can be used to accomplish reductions in hospital readmissions of HF patients and reduce the cost of care associated with frequent readmissions while ensuring good health outcomes. Nurses are key players on the healthcare team and must forge collaborative efforts with other disciplines to provide appropriate, timely, and safe care to all persons, particularly those with complex, chronic conditions.

Analyzing the outcomes of this MIH HF RAP provided information that MIH HF RAPs may be associated with positive outcomes for HF patients. There appeared to be improved HF patient perceptions of their health and decreased readmissions rates and therefore the costs associated with them. Further studies are needed using various communities to demonstrate that these results of the MIH HF RAP could be replicated in other locations. Particularly, would patients with HF still have positive outcomes such as reductions in the number of ED visits, readmissions, and improved personal health status.

As the director of this project and as a DNP-prepared nurse practitioner, it is essential that I continue to evaluate and partner with new healthcare delivery models such as this MIH HF RAP for use in my patient population. The DNP-prepared nurse does not work in isolation. The DNP-prepared nurse influences practice changes to achieve measurable outcomes and has an obligation to disseminate these changes and outcomes to both the nursing profession as well as to other related healthcare professions that may benefit from them. The first step in disseminating the results of this project will be to present them at a public presentation of DNP projects at the University of Kansas School of Nursing. Later in the year they will be presented to NPs in the region who do annual, in-home assessments for Medicare Advantage members to provide them information about an innovative program to help reduce HF readmissions.

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Appendix A: EuroQol EQ-5D-3L Questionnaire



Health Questionnaire

English version for the UK

Validated for Ireland

By placing a tick in one box in each group below, please indicate which statements best describe your own health state today.

Mobility



- I have some problems in walking about
- I am confined to

Self-Care

- I have no problems with self-care
- I have some problems washing or dressing myself
- I am unable to wash or dress myself

Usual Activities e.g. work, study, housework, family or leisure activities

- I have no problems with performing my usual activities
- I have some problems with performing my usual activities
- I am unable to perform my usual activities

Pain / Discomfort

- I have no pain or discomfort
- I have moderate pain or discomfort
- I have extreme pain or discomfort

Anxiety / Depression

- I am not anxious or depressed
- I am moderately anxious or depressed
- I am extremely anxious or depressed

To help people say how good or bad a health state is, we have drawn a scale (rather like a thermometer) on which the best state you can imagine is marked 100 and the worst state you can imagine is marked 0.

We would like you to indicate on this scale how good or bad your own health is today, in your opinion. Please do this by drawing a line from the box below to whichever point on the scale indicates how good or bad your health state is today.

Your own health state today

Best imaginable health state

100 Ŧ

9 • 0

8 0 0

7₩0

6♦0

5**€**0

4↓0

3 🖣 0

2 0

1**∓**0

Worst imaginable health state

0





Appendix C: Data Collection Worksheet

Enrollment	Client	Referral	Enrollment	Graduation	# Days	Enrollment Status
ID	ID	Source	Date	Date	in	(Closed/graduated or
					Program	Non-
					_	compliant/revoked or
						Deceased)

(continued)

30-days	# 0-30d	# 0-30 d	# 0-	60-days	# 31-	# 31-60 d	# 31-60-d
Post-	ED	Non-JPS	30d	Post-	60d ED	Non-JPS	Admits
enrollment	visits-	Transports	Admits	enrollment	visits-	Transports	
	JPS	-			JPS	-	

(continued)

90-days	# 61-	# 61-90 d	# 61-	# Surveys	EQ	EQ	EQ	EQ	EQ	EH
Post-	90d	Non-JPS	90d	Complete	1	2	3	4	5	S
enrollmen	ED	Transport	Admit	d						
t	visits	s	s							
	-JPS									

(continued)

GQ1	GQ2	GQ3	GQ4	GQ5	GHS

JPS = John Peter Smith Health System (DSRIP/Waiver 1115 program)

EQ Health state = Health state on enrollment (start date)

EQ_ = EQ-5D-3L dimension number _____ score on enrollment date

EQS = EQ-5D-3L summary index score on enrollment date

GQ Health state = Health state on graduation date

GQ__ = EQ-5D-3L dimension number ____ score on graduation date

GQS = EQ-5D-3L summary index score on graduation date

Appendix D: Human Subjects Determination Application

Human Subjects Determination

Principal Investigator: Janet D. Pierce, Ph.D. Department: KUMC School of Nursing Phone: 913-588-1663 Today's Date: March 9, 2016

STUDY TITLE: Mobile Integrated Healthcare: A Program to Reduce Readmissions for Heart Failure

Briefly state the purpose of the proposed research.

The purpose of this study is to examine the readmission rates, cost of care, and health status of heart failure patients that were enrolled in the Mobile Integrated Healthcare Heart Failure Readmission Avoidance Program (MIH HF RAP) administered by MedStar Mobile Healthcare (MedStar) in the Ft. Worth, TX. This will be a retrospective review of a deidentified database related to heart failure patients.

Is there funding for this research?

 $\begin{array}{|c|c|} \hline & Yes. If yes, specify: \\ \hline & No \end{array}$

What materials (data, specimens, images, etc.) will be used for the research?

Deidentified data collected by MedStar:

- 1. # of Emergency Department visits
- 2. Hospital readmissions by enrollees
- 3. Enrollees' health status scores using the EQ-5D-3L survey

Are the patients who provided the research materials living or deceased?

All living All deceased Both living and deceased Unknown. Explain

Do all the research materials exist as of today's date?

X Yes

No. If no, answer the questions below in terms of how the materials will be collected.

How were the materials collected or how will they be collected?

Mobile Integrated Healthcare

Collected by MedStar in the course of normal business

For what purpose were the materials collected or for what purpose will they be collected? Program monitoring and evaluation

Who is (was) collecting the materials?

MedStar Mobile Healthcare, Ft. Worth, TX has already collected the material.

If the materials currently exist, how are they being stored?

In a computerized database at MedStar Mobile Healthcare.

Did (or will) the original collection take place under an IRB-approved protocol?

No, the original collection is/was for clinical purposes only.

Yes, KUMC HSC #

Yes, IRB approval at another institution. *Enclose the IRB approval and approved* consent form. Unknown. Explain:

Which individual identifiers or demographics will be associated with the materials when they are viewed by you or released to you for your research? (If none, so indicate)

Names		Ages over 89 years		Street address, city, county, precinct or zipode	
Initials		Identifying # or code #*		Health plan # or other account #	
Phone		Other unique descriptor		Vehicle identifier, serial #, license plate, etc.	
Fax		Facial photos/images		Biometric identifiers (finger/voice/retina)	
E-mail		Social Security Number		Device identifiers or serial numbers	
URL		Certificate/License #s		te of birth, date of death, admit/discharge date	
IP address		Medical Record #s		Other date related to the person (except year	
only) None of the identifiers listed above will be included with the materials used for the study					

*For projects in which a code number is the only identifier received by the KUMC researcher:

What are the elements of the code?

Single number unique to each enrollee

Who holds the key to the code (i.e., the "master list")?

MedStar Mobile Healthcare

	Here is confirmation that this project does not require IRB review. Please let me know if you have any questions.	
	Sincerely,	
	Kyle	
М		59
I	Kyle Stephens, M.A., CIP. Assistant Director	7
-	Human Research Protections Program	,
а	913-588-1240	5
i	kstephens3@kumc.edu	
W	Sent: Friday, April 08, 2016 5:01 PM To: Kyle Stephens <kstephens3@kumc.edu>; Janet Pierce <jpierce@kumc.edu> Subject: RE: Designation as a Quality Improvement Project Kyle, I will obtain the data directly from Matt Zavadsky at MedStar Mobile Healthcare. He is the person authorized to provide it to me and he wrote the letter stating MedStar will not release the identification to me. This letter is at the end of the application. Cathy Hostettler</jpierce@kumc.edu></kstephens3@kumc.edu>	ration
or	From: Kyle Stephens Sent: Friday, April 08, 2016 2:12 PM To: Janet Pierce Cc: Cathy Hostettler Subject: RE: Designation as a Quality Improvement Project	
	Hello Dr. Pierce and Cathy,	
XX 7	I am reviewing this Human subjects determination and I can't seem to locate the webpage where you can request this data from MedStar Mobile Healthcare. Can you send me a link to the page where you can download this data or request the data?	
VV	Sincerely,	
de	Kyle	

https://mail.kumc.edu/owa/?ae=Item&t=IPM.Note&id=RgAAAAA4RixaDq4LQIsrbARvg... 5/27/2016

Luice havet

<u>March 12, 2016</u> Date

RE: Designation as a Quality Improvement Project

Page 1 of 2

 RE: Designation as a Quality Improvement Project

 Kyle Stephens

 Sent
 Tuesday, April 12, 2016 10:52 AM

 To:
 Cathy Hostettler; Janet Pierce

 Attachments: Not Human Subjects Researc~1.doc (34 KB)

Hello Dr. Pierce and Cathy,

Here is confirmation that this project does not require IRB review. Please let me know if you have any questions.

Sincerely, Kyle

Kyle Stephens, M.A., CIP. Assistant Director Human Research Protections Program 913-588-1240 kstephens3@kumc.edu

	Total Sample	Subset Sample (DSRIP/Waiver 1115)
Number of subjects in entire sample group (%)	114 (100%)	84 (74.56% of total sample)
Number graduated		
from program	94 (82.46%)	64 (76.19%)
(% of each sample)		
Number non-		
compliant/ revoked	19 (16.67%)	19 (22.62%)
(% of each sample)		
Number died during		
program	1 (0.88%)	1 (1.19%)
(% of each sample)		
Average number of days in prog	ram	
(range)		
For entire sample	36	
(range)	(9-95)	(4-95)
For graduates	39	37
(range)	(14-95)	(14-95)
For non-compliant/	26	26
revoked (range)	(9-56)	(4-56)
EuroQol surveys completed		
(program graduates only)		
None	11	5
(% of each sample)	(11.70%)	(7.81%)
Enrollment only	10	10
(% of each sample)	(10.64%)	(15.63%)
Graduation only	10	8
(% of each sample)	(10.64%)	(12.50%)
Enrollment and	63	41
graduation	(67.02%)	$(64\ 06\%)$
(% of each sample)	(07.0270)	(07.0070)

Appendix E: Table 1. The Characteristics of the Total and Subset Samples

Notes: Percentages may not equal 100 due to rounding. DSRIP, Delivery System Reform Incentive Payment.

	Total Sample	Subset Sample (DSRIP/Waiver 1115)
ED visits		
and costs		
Expected 0-30 days	7	5
	\$7,434	\$5,310
Actual 0-30 days	53	42
	\$56,286	\$44,604
Actual 31-60 days	41	37
	\$43,542	\$39,294
Actual 61-90 days	33	25
	\$35,046	\$26,550
Readmissions		
and costs		
Expected 0-30 days	22	15
	\$106,238	\$72,435
Actual 0-30 days	18	17
	\$86,922	\$82,093
Actual 31-60 days	16	15
	\$77,264	\$72,435
Actual 61-90 days	8	7
	\$38,632	\$33,803

Appendix F: Table 2. ED Visit, Readmission Rates and Costs of Care in the Total and Subset Samples

Notes: DSRIP, Delivery System Reform Incentive Payment; ED, emergency department.

	Total Sample	Subset Sample (DSRIP/Waiver 1115)				
Enrollment survey (modes for each dimension)						
Dimension 1: Mobility	2 - I have some problems in	2 - I have some problems in				
	walking about.	walking about.				
Dimension 2: Self-care	3 - I have no problems with	3 - I have no problems with				
	self-care.	self-care.				
Dimension 3: Usual	2 - I have some problems with	2 - I have some problems with				
activities	performing my usual	performing my usual				
	activities.	activities.				
Dimension 4:	3 - I have no pain or	3 - I have no pain or				
Pain.discomfort	discomfort.	discomfort.				
Dimension 5:	3 - I am not anxious or	3 - I am not anxious or				
Anxiety/depression	depressed.	depressed.				
Health status: Mean (25 th , 75 th percentiles)	53 (32.5, 60)	51 (30, 60)				
Graduation survey (modes for early and the second s	ach dimension)					
Dimension 1: Mobility	3 - I have no problems in	3 - I have no problems in				
	walking about.	walking about.				
Dimension 2: Self-care	3 - I have no problems with	3 - I have no problems with				
	self-care.	self-care.				
Dimension 3: Usual	3 - I have no problems with	3 - I have no problems with				
activities	performing my usual	performing my usual				
	activities.	activities.				
Dimension 4:	3 - I have no pain or	3 - I have no pain or				
Pain.discomfort	discomfort.	discomfort.				
Dimension 5:	3 - I am not anxious or	2 - I am moderately anxious or				
Anxiety/depression	depressed.	depressed.				
Health status: Mean (25 th , 75 th percentiles)	67 (50, 80)	68 (60, 80)				

Appendix G: Table 3. Health Status Measured by EuroQol EQ-5D-3L in the Total and Subset
Samples

Notes: DSRIP, Delivery System Reform Incentive Payment