

Mobile Integrated Health and Heart Failure

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Abstract

Purpose: To evaluate a Mobile Integrated Health Program that was developed and implemented to reduced hospital readmissions.

Methodology: A retrospective chart review for MIH program evaluation in a large suburban healthcare system in northern New Jersey. The chart review consisted of 125 records of patients greater than age 18 with documented heart failure from January 2017 to July 2019 and were measured to determine patient interventions, patient return to hospital, and financial savings.

Results: Home visits were provided for 125 visits. Two groups received home visits: symptom-based group and the scheduled visit group. Each patient received a physical exam. A total of 44 symptom-triggered visits occurred with 15 (34%) transported to the emergency department and 81 scheduled visits occurred with 3 (4%) transported to the hospital. The difference was statistically significant. Additional analyses included comparisons of visits per quarter and patient interventions including patient and family education.

Implications for Practice: This program evaluation demonstrated cost savings, as well as potential for less nonemergent 911 activations, and home interventions with education post-hospital discharge to avoid ED recidivism that can led to hospital readmissions. This program evaluation identifies gaps in discharge education as well as home needs that are unable to be identified during admissions. MIH programs have the tools to educate and help patients manage chronic illness at home and prevent worsening symptoms.

Keywords: mobile integrative health, heart failure, hospital readmissions, program evaluation

Mobile Integrated Health and Heart Failure

Six million Americans have been diagnosed with heart failure which is responsible for greater than 700,000 annual hospital admissions (Mirkin, Enomoto, Caputo, & Hollenbeak, 2017). The Centers for Medicare and Medicaid Services (CMS, 2019) identified heart failure to have one of the six most excess readmission ratios (ERR) when determining the amount of hospital readmissions (CMS, 2019). The Affordable Care Act of 2012, Section 3025, established a hospital readmissions reduction program (HRRP) to reduce financial reimbursement to hospitals with the goal of reducing readmissions (CMS, 2019). With the goal of improving patient outcomes and reducing hospital readmissions in patients with heart failure, mobile integrated health (MIH) programs have been designed and charged with the task of reducing thirty-day readmissions after inpatient admission in the setting of a few diagnoses; heart failure, pneumonia, chronic obstructive pulmonary disease (COPD), and acute myocardial infarction (AMI) (Rising, Victor, Hollander, & Carr, 2014).

In response to the need to reduce hospital readmissions in certain patients, the National Association of Emergency Medical Technicians (NAEMT) identified the concept of Mobile Integrated Health and Community Paramedicine as a strategy to assist in this effort. This concept has developed over the years as it has been well documented that many 911 calls are about chronic conditions and their inability to provide self-care. The NAEMT identifies that often these patients are transported to the hospital, however, many times the patient could benefit from treatment or assistance at home (NAEMT EMS 3.0 Committee, 2018).

In an effort to improve patient care, over the past few decades pre-hospital providers have been progressive in the prehospital arena. Emergency Medical Services (EMS) have introduced the concept of community paramedicine, or Mobile Integrated Health (MIH)

programs. These programs have trained providers paramedics and/or registered nurses who are able to go into the home, assess the patient who called 911 to determine if it is an emergency, and then treat and transport appropriately, or assist the patient at home. These providers are able to assist patients with managing chronic illnesses at home. The providers are able to do conduct assessments, identify patients' individual needs, identify gaps in discharge planning, and help reduce EMS transport costs, ED recidivism, and hospital readmissions (NAEMT EMS 3.0 Committee, 2018).

MIH programs are evolving and becoming more prevalent in response to the initiatives by the IOM, CMS and the Affordable Care Act to enact change and improve patient outcomes and avoid 30-day hospital readmissions. The expectation of this project is to evaluate an MIH program and to identify the impact of the program for patients and potential cost savings for the hospital.

Background & Significance

The Affordable Care Act of 2012 instituted a financial penalty of 3% for excessive hospital readmissions that took effect in 2015. Of the total patients who were hospitalized for heart failure, 67.4% were subsequently transported to the hospital for heart failure between the years of 2008 and 2010; 67.4% of them were readmitted to the hospital within 30 days of an inpatient hospital admission (Ziaieian & Fonarow, 2016). Day three post discharge was found to be the day for the highest readmission rates during this time frame (Ziaieian & Fonarow, 2016). The Hospital Readmissions Reduction Program (HRRP) was developed by the Department of Health and Human Services, section 3025, of the Affordable Care Act of 2012. Heart failure is one of the six diagnoses that the ERR ratio of predicted to expected readmissions

identified (CMS, 2018). CMS includes all unplanned readmissions that occur after the initial admission in the 30-day period or patients readmitted to the same hospital or other acute care hospital for regardless of the diagnosis (CMS, 2018). The National Institute for Healthcare Improvement report that patients are successfully managed at home with specific intervention sets for patients at home (Institute for Healthcare Improvement, 2019a) .

A valuable approach to avoid readmissions is to identify strategies for health systems to reduce hospitalizations or re-hospitalizations. First and foremost is the need for patient education starting early during the inpatient hospital stay and continuing until discharge. Early initiation of discharge planning procedures will help to identify the home care needs for the patient upon discharge. Another strategy to address readmission is careful medication reconciliation and outpatient follow up appointments which includes communication with outpatient providers and services depending on individual patient needs. The evidence shows that a single intervention does not contribute to reduction in rehospitalization, but multiple interventions are demonstrating a greater success in keeping patients at home and out of the hospital (Ziaecian & Fonarow, 2016).

Initially MIH programs were designed in rural communities that did not have easy access to healthcare and often had poorer health outcomes. In the United States, one of the earliest programs was in New Mexico in 1992. MIH programs historically were started with community paramedicine. Paramedics were trained to go into the community and evaluate and follow up with patients in their homes. After the implementation of the Affordable Care Act in 2012, the concept of MIH was revisited for more than rural communities. The terms community paramedicine or mobile integrated health care to describe a new community-based model of health care, that has been implemented in the emergency medical services (EMS) systems. The

focus of these programs allows for healthcare to occur in the community, home or outpatient setting which avoids unnecessary ED visits as well as readmissions (Choi, Blumberg, & Williams, 2016). MIH programs are now found across the United States and are focusing on the needs of individual healthcare systems. Each program is unique in that it is tailored to individual communities, health systems, and state prehospital guidelines and protocols that fall within individual state guidelines. Many communities have noted increased numbers of 911 activations when there is not a need for 911 since it is a non-emergency. Unnecessary emergency medical service (EMS) activations have led to hospital readmissions that were potentially avoidable if EMS had not been activated through the 911 system (Scharf, Bissell, Trevitt, & Jenkins, 2018). The use of MIH in the non-emergency situation contributes to healthcare cost savings. In the United States 30% of ED visits are non-emergent, with a \$750 billion annual cost. The use of MIH programs have demonstrated positive health outcomes, patient outcomes, and a reduction of hospital readmissions as well as a reduction in ED recidivism (Nejtek, Aryal, Talari, Wang, & O'Neill, 2017). MIH activation might benefit the patient and reduce the costs of using 911 systems and allow the 911 units to remain available for acute emergencies.

In an effort to address factors that contributed to heart failure readmissions, Retrum et al., (2013) did a qualitative study to incorporate the patients' perspectives of contributory factors of readmissions for heart failure. The authors identified five common themes. Patients expressed that distressing symptoms such as dyspnea or discomfort from edema, unavoidable progression of heart failure, the influence of the environmental and psychological factors, adherence with medical recommendations and self-care, and health system factors caused them to activate EMS. Although worsening physical symptoms and progression of disease are aspects that are difficult to avoid, the other factors might be avoidable. Self-care and social factors include support,

family, accessibility to follow up care and accessibility to medications at home to help patients avoid activating EMS. Self-care and adherence with medical recommendations are as simple as monitoring daily patient weights, diet restrictions, self-care, food preparation, and medication organization which patients reported their most common need. Health system factors were comprised of patients reporting discharges sooner than the patient was ready, concern for continued diuresis at home, and concerns for follow up appointments and discharge planning uncertainties at the time of discharge (Retrum et al., 2013). The avoidable factors are able to be identified and addressed by MIH programs. These are factors that are identified by the NAEMT as aspects of the MIH program and outpatient interventions that have contributed to the reduction of transports to the hospital and therefore reducing the number of readmissions for heart failure in patients with chronic illnesses, complaints, and comorbidities (NAEMT EMS 3.0 Committee, 2018)

In 2009, the Hospital to Home initiative was started by the American College of Cardiology and the Institute for Healthcare Improvement in an effort to reduce thirty-day readmissions for heart failure patients. A study was done in Southeast Michigan between May 1, 2012 and April 30, 2013 (Baker, Oliver-McNeil, Deng, & Hummel, 2015). The researchers designed a follow up program for patients being discharged to home with the diagnosis of heart failure to follow up with a provider in 7 days and 14 days after discharge from the hospital. The authors compared preintervention rates of less than thirty-day readmissions and intervention rates of patients with heart failure less than thirty-day hospital readmissions. The researchers found a significant decrease in thirty-day readmission rates for patients diagnosed with heart failure. This can reduce the health care costs of thirty-day readmission heart failure costs (Baker et al., 2015).

MIH programs allow for intervention services at home 24 hours a day, seven days a week. MIH programs that are tailored to the health system's needs, individual needs, and community needs build strong out of hospital health care relationships and treatment plans outside of the hospital. These programs fill the gap for patients. Patients are able to contact a provider after hours and have a MIH provider come to them and assist them regardless of the time of day. Patients have access to a provider to assist them in whatever their need might be. A trained provider is able to assist, assess, and determine what is necessary. If the patient is acutely ill or considered to be in extremis or near death, they have immediate care and intervention. If they need assistance with medications, or home safety the provider is able to identify the obstacle and get the patient the resources needed to continue to remain at home (Peck, 2015).

Needs Assessment

The existing program was instituted a year and a half ago and the impact on patient outcomes, readmission rates and financial risks and benefits had not been evaluated. There was a need to evaluate the strengths and weaknesses of this program and consider potential revisions to address challenges and share with administration achieved outcomes. An analysis of strengths, weakness, opportunities and threats (SWOT) was conducted for program evaluation.

Strengths of evaluating the MIH program include the stakeholders who are involved and are engaged in the success of the MIH program. Organizational management is engaged in the success of the program and committed to demonstrating the importance of MIH to the administration of the health system. The frontline management are paramedics and nurses who are actively engaged in the program and further development of the program. The MIH program evaluation strengths that are also identified are community support, consistently meeting

response times, collaboration with stakeholders, strong relationships with standards and working groups. MIH has a wealth of knowledge in communication, maintaining community relationships, participating in community events, engaging in community education and are aware of the needs of the community they serve. EMS and MIH has a vast knowledge of the area and location of the areas of the community, the community resources, and the areas of need for education in the community. Further strengths for the MIH program are the communications, operations, transportation modalities and options in the community for patients to access care, and the providers have a vast knowledge of medical emergency care and treatment protocols.

Weaknesses of program evaluation are having a lack of adequate number of MIH trained staff as the program expands. Additional weaknesses are the number of people aware of the program, the amount of people who are referred to the program, and the lack of funding for the program at the present time. The formal training required for the providers has been limited to only a few providers, a handful of providers have been sent to training programs such as train the trainer programs. Individual training of providers is time consuming and maintaining competency takes time as well. Some of the vehicles and equipment are antiquated and there is a cost to maintain these vehicles. There are other initiatives within the health system focused on heart failure patients and follow up after discharge. There is a risk of lack of consistent funding dependent on insurance reimbursements and funding from other sources. There is a potential need for constant updating of communication systems and equipment. There is potential to transportation barriers such as access and egress to patients that are in need of time sensitive responses.

Opportunities for the success of this program are external. First and foremost an evaluation of the MIH program findings might reflect that this program is successful and

beneficial to patients and the health system. A successful pilot program might lead to expansion of the program. Other opportunities might be Medicare reimbursements in accordance with CMS recommendations of avoidance of heart failure patients from returning to the hospital and avoiding a 3% penalty for readmissions. The CMS guidelines will allow for further support and structure to avoid readmission. There are many growth opportunities in MIH at this time with the CMS initiatives the growth and development of MIH is crucial to keep patients healthy at home and avoid hospital readmissions. MIH may begin to fill in the gaps in healthcare and interacting with stakeholders will hopefully fill in the gap and bridge relationships between the MIH program and acute care facilities allowing for better integration with the healthcare system. There are rapid changes in ongoing evolution of mobile technology which contributes to the improvement of MIH and better access for patients involved in MIH. Electronic medical record (EMR) keeping allows for provider access from not only the hospital but remote access during the MIH vehicle or home visit. The use of video conferencing also allows for MIH providers to contact a higher medical authority or to consult a specialist through video conferencing as necessary for collaboration with the patient's PCP or consultant to determine if it is necessary to transport the patient or if treatment can be initiated at home and outpatient follow up can be arranged.

Threats of evaluating a program include finding that this program is not effective. Subsequently if the program is not effective participants or employees' positions might be lost. There is a potential for reduction in Medicare reimbursements, or a reduction in funding. MIH programs are becoming more prevalent and lucrative, other area health systems might present as a threat and encroach on this MIH programs catchment area. Some stakeholders might not fully understand the MIH program the EMS system and therefore might not gain a full understanding

of the program or the full potential of the MIH program. There is a risk for a lack of an integrated approach of the health system such as political challenges, resistance to change, competing interests, or priority differences. There might be concerns about electronic devices and privacy or security compromise or a breach of EMRs. Technology advances could be too great while quickly making computers, phones or other devices obsolete. Further threats from a financial standpoint would be increasing healthcare costs, increased program costs, lack of funding and reimbursement, as well as not having enough providers to keep up with the demands of the program.

Problem Statement

All new programs should be evaluated for effectiveness and achievement of the intended goals and objectives. Program evaluations allow for feedback to strengthen the program's operations, improving the participants outcomes. If the program goals are not met, the intentions might not be as effective. The MIH program has not been evaluated since its inception and is vulnerable to poor outcomes and even closure.

Clinical Question

The clinical question guiding this project was: Since the implementation of the Mobile Integrated Health (MIH) program how did interventions from the MIH program impact 30-day hospital returns or readmissions in patients with a documented diagnosis or history of heart failure?

Aims & Objectives

The aim of this evaluation is to determine if program outcomes are being met, including a decrease in thirty-day readmissions, a financial cost savings for patients and the health system, as well as a program evaluation demonstrating the importance of the MIH program has been achieved. The objectives include:

- Analyze the MIH home visits during the past 18 months for patients with a diagnosis or history of heart failure and determine if the patient was treated at home or needed to return to the hospital.
- Analyze interventions to determine if there was a decrease in 30-day hospital readmission for heart failure patients during the past 18 months.
- Analyze financial savings to determine if there is a cost savings to the hospital by using the MIH program.

Review of Literature

In identifying literature for possible inclusion, the databases PubMed, Ovid, Essential Evidence Plus, CINAHL, Ovid, and Google Scholar were searched with the key words and terms of heart failure, mobile integrated health, community paramedicine, mobile health, homecare, home discharge teaching, emergency medical services patient follow, emergency medical services discharge teaching, program evaluation, mobile integrated health program evaluation, pilot program evaluation, community health program implementation and evaluation, and alternate transportation destination waiver. Database searches were limited to articles to those published between 2005 and 2019. Studies were limited to those written in English and to North America and the United Kingdom. MIH cost savings, MIH programs and Readmission

rates and program implementation and evaluation are common themes found in relation to the clinical problem and the clinical question. Article abstracts were reviewed and 17 articles were deemed relevant to the clinical question and subsequently critically appraised using the Johns Hopkins appraisal tool from which three major themes were identified (see Appendix A).

MIH Cost Savings

According to the Institute for Healthcare Improvement (2019b) the annual cost of all hospital readmissions is approximately \$30 billion. Many of these readmissions are preventable and the evidence-based practice reflects that education, support in the hospital and out of the hospital is important for both the patients and their families. Furthermore, developing an effective education programs for patient and their families have improved better outpatient care for patients and families (Institute for Healthcare Improvement, 2019a). In 2011, \$1.7 billion was spent on readmission for 134,500 heart failure patients (Mirkin et al., 2017). MedStar's program in Texas found to have financial savings of \$30,343 in Medicare charge avoidance was achieved as well as an avoidance of \$7,620 per person from October of 2013 to February of 2015. A MIH program in Nova Scotia demonstrated a 23% reduction of ED recidivism between 2002 and 2003. Further programs began to develop, Nevada implemented MIH programs which devolved a focus on alternative transportation, direct telephone lines to nurses, and community paramedicine programs in the home (Choi et al., 2016). Programs were designed for very rural settings, where there was minimal access to healthcare. According to Nejtek et al. (2017) \$750 billion are spent annually on ED visits that are classified as non-emergent, this is approximately 30% of ED visits. In a community in Tarrant County Texas the annual ED visits were 368,000 and 56% were non-emergent or primary care visit complaints. In Nevada, the implantation of MIH programs decreased avoided 1100 ED visits, 190 transports, which decreased the hospital

readmission rate by 5%. This study looked at data collection for 2009 to 2012 assessing the frequency of patients activating the 911 system. The intervention included biweekly home visits that were done by trained providers to educate patients, assess the home and living situation as well as conduct patient assessments. Other interventions, such as laboratory draws, medication administration, injections, and developing patient goals were implemented. Over a 61-90-day time frame patients demonstrated improvements; 38% had increased mobility, 70% demonstrated improved self-care, 57% improved in performing usual activities before the program, overall 31.5% of the participants reported that they felt an improvement in their overall health (Nejtek et al., 2017). Scharf et al. (2018) assessed the frequency of EMS calls in an urban area and assessed the impact on ED boarding, cost, and readmission rates. They identified that many of the patients activating the EMS system were non-emergent requests and also identified that these patients had multiple comorbidities. In an effort to decrease EMS and ED utilization as well as decrease hospital readmissions they implemented a mobile integrated community health (MICH) program with a goal of decreasing readmissions and increasing interventions at home for patients that qualified for the MICH program (Scharf et al., 2018). A pre and post study done in South Carolina with 193 participants 68 patients enrolled in the MIH program compared to 125 patients not enrolled where the authors identified a cost benefit analysis of (U.S Department of Health and Human Services, Office of Disease Prevention and Health Promotion, 2018)\$205.78 per MIH visit. The average cost of EMS 911 activation cost was \$312 per 911 dispatch. The average inpatient cost per day for patients was \$1,531 and an average emergency department visit was \$449.00. The study showed a \$18,198 post marginal benefit which was greater than a 20% return on the investment of MIH program implementation (Bennett, Yuen, & Merrell, 2017).

MIH Programs and Readmission Rates

Between 2007 and 2009 heart failure was the leading diagnosis when identifying common diagnoses of patient readmissions in less than thirty days after hospital discharge. These patients were multiple ethnicities between the ages of 65-74, 75-84, and 85 years of age or greater. There was a total of 1,330,157 hospitalizations for heart failure. Of these patients 24.8% (108,992) were readmitted to the hospital in less than 30 days of discharge. When looking at the five most common readmission diagnoses, heart failure was the leader at 55.9% of less than thirty-day readmissions for the most common diagnoses identified by the Centers for Medicare and Medicaid Services. Approximately 67.6% of the heart failure diagnosis readmissions return to the hospital between day zero (day of discharge) and day 15. Greater than 30% of the readmissions returned to the hospital between days 16 to 30 (Dharmarajan et al., 2014).

Many of the patients that have been enrolled in the pilot MIH programs have multiple comorbidities. These patients have benefited from MIH programs and visits in the home. Each individual has specific needs and treatment plans tailored to their individual diagnoses. Heart failure is only one of many diagnoses and is complicated by other comorbidities, lifestyle habits, and daily activities and needs. By tailoring MIH programs to the community and health system needs, this may improve the needs of the individual as well (Scharf et al., 2018).

Nuckols et al., (2018) studied 30-day hospital return rates in readmissions, observation status, and emergency department visits in 201 hospitals. This study took place in Nebraska, Georgia, Tennessee, and South Carolina. These four states represent 7% of the population of the United States. The researchers looked at readmissions, observations status and emergency department visits. The time they compared were 2009 to 2010 and 2013 to 2014. They found that the number of returns have remained stable or have increased in patients with private

insurance, but the number of hospital readmissions among patients with Medicare showed increased numbers of observation status and a decrease in the readmission rate (Nuckols et al., 2018). This is concerning for patients since they will still have a potential for increased costs and financial responsibility that might have been covered if they were in the status of admission. The CMS reports that when placed in the observation status by the hospital, the patient might be responsible for fees that Medicare would have covered if they were in an admission status (Center for Medicare Advocacy, 2017).

Dharmarajan et al. (2013) looked at the years 2007 to 2009 and identified repetition of diagnoses and timing. Between 2007 and 2009, 1,330,157 hospital 30-day readmissions were identified for heart failure; it found 329,308 (24.8%) were related to heart failure. Heart failure was the most common diagnosis that drew 30 days or less readmissions to the hospital. The recommendation was to develop or use programs to reduce the hospital readmissions starting with a goal of at least 30 days (Dharmarajan et al., 2013).

In Pennsylvania, Mirkin et al. (2017) assessed the 30-day readmission risk factors for heart failure patients by doing a retrospective cohort analysis of statewide data from multiple hospitals in Pennsylvania. Six million Americans have a congestive heart failure diagnosis and the hospital admission rate for those greater than age 64 is 18 per 1000 people annually, and 25% of these patients were found to be readmitted in 30 days or less after hospital discharge. The authors looked at Pennsylvania hospitals and identified multiple commonalities in patients that were readmitted with a congestive heart failure diagnosis. The sample consisted of 155,146 patients with 22.8% 35,294 patients were readmitted in 30 days. Of the admitted patients 72,343 (46.6%) were discharged home after the initial admission, 40,383 (26%) to a skilled nursing facility, and 40,046 (25.8%) to home with home nursing visits. The highest return rates were

those who were discharged to skilled nursing facilities with a 25.8% hospital readmission rate. This group of patients were mostly comprised of older females compared to the other groups. Followed by those discharged to home with home nursing visits, 24.9%, and the least were those discharged without assistance to home with a 19.9% readmission rate (Mirkin et al., 2017).

MedStar, a MIH program in Texas, implemented readmission program for patients with congestive heart failure (CHF) diagnosis and designed the program in conjunction with cardiology and implemented the readmission program. The program demonstrated those patients enrolled in the MedStar program had a readmission rate of 16.3% compared to the National median of 23% in 2013 (Choi et al., 2016).

There is a vast amount of evidence-based research on the care of heart failure patients, and it is beneficial and important to have a detailed plan for care at home. Many of the patients that are less than 30-day readmissions are those that do not have clear, concise and detailed instructions. Many of the patients are unable to manage or afford their medications, need diet education, are unable to access healthy or appropriate food, or are unable to understand or process the skills to manage their heart failure and care for themselves at home without assistance (Institute for Healthcare Improvement, 2019b).

Program Implementation and Evaluations

MIH programs are in pilot stages and evaluation tools are important. Each program needs to evaluate outcomes based on the individual program objectives and is essential to demonstrate program outcomes (Staffan, Swayze, & Zavadsky, 2017). Process evaluation is necessary to look into the structure of the program, identify strengths, weaknesses, and if interventions were implemented (Saunders, Evans, & Joshi, 2005). Process evaluations are important to determine if the program implementation went as planned as well as to identify challenges and successes.

Process evaluation not only assists in understanding the implementation, but also allows the evaluator to determine the health promotion program was successful (Saunders et al., 2005). The Federal Interagency Committee on EMS (FICEMS) and the National EMS Advisory Council (NEMSIC) developed a model to guide in the development of a model for EMS agencies to develop, implement, and evaluate EMS systems. FICEMS and NIMSEC recommend that after design and implementation follow up with quality improvement and evaluations are important for program growth and development. Pilot testing is important in the implementation stage to obtain information for program evaluation (Lang et al., 2012). The EMS Outcomes Project (EMSOP) and the EMS Cost Analysis Project (EMSCAP) have established a structure to identify the costs of MIH interventions at the administrative level, overhead, equipment, and training and other program associated costs, however this tool is limited and is unable to measure the final outcome of patient care.

MIH program evaluation is necessary to ensure that MIH programs are delivering patient centered care. Many resources are invested on the startup of MIH programs. At that time stakeholders and many others are involved in the design and implementation of the programs; however, a large factor is program evaluation. The evaluation of a MIH program impact on patients and healthcare as well as healthcare costs, cost savings, and the measurement of these factors are essential for the longevity and growth of an MIH program (Red Flash Group Medtronic Philanthropy, 2014). Over many centuries, medicine has evolved leading to the necessity of program evaluation in the advancement and progression of the evolution of healthcare (Red Flash Group Medtronic Philanthropy, 2014). It is important that MIH programs have performance markers that are met, and program evaluation is important to ensure the implementations are appropriate and that patients are receiving the patient centered care the

program intended. Factors that should be evaluated are operations, healthcare quality and total cost of care. Operational measures examples are process or operational outcomes such as interventions done in the home, the number of evaluations, and the referral origin of the patient (Red Flash Group Medtronic Philanthropy, 2014). Calculation of cost savings is important for survival of the program as well as growth and expansion of the program evaluation of the MIH program should be utilized in Triple Aim in accordance with the recommendations of the Institute for Healthcare Improvement. The Quadruple Aims focus on improving safety and administering safe care as well as evaluating the effectiveness and outcomes of patient centered care, including the patient's overall experience as well as patient satisfaction, MIH experience, the quality of care as well as patient access to healthcare. The second aim is better health with a goal of improvement of population health. Finally, the third aim is lower costs, this goal is intended to reduce the overall cost of per-capita healthcare is not just the cost to the healthcare system, but to the patient as well (Red Flash Group Medtronic Philanthropy, 2014).

Evaluation of a MIH program is important as it demonstrates importance and value for the stakeholders. Without evaluation of a new program, the intended outcomes will not be measured, and effectiveness or sustainability might not be reflected to the stakeholders. Previous program models have begun with pilot programs, then after evaluation and adjustments made that were found in program evaluation MIH programs have grown (Ranganathan, 2016). Program evaluation should focus on patient health outcomes, satisfaction, access, safety, and overall financial expenses to both the patient and the healthcare system. Evaluations that are done prematurely might lead to inaccurate outcomes that might have a negative impact on the MIH program or further program development. Program evaluation should include quantitative and qualitative data to ensure adequate data for a thorough evaluation. The evaluation of the

patient experience is important; however, the evaluation also needs to include provider experiences and feedback, both quantitative and qualitative (Ranganathan, 2016).

Process evaluation is necessary to look into the structure of the program, identify strengths, weaknesses, and if interventions were implemented. Evaluation is important to determining if the overall program is successful (Saunders et al., 2005). There has been variability in health programs in the past, program evaluations and program measurement focus on quality assurance as well as importance and sustainability. Process evaluations are performed with stakeholders in collaboration with the planning team in an effort to address important issues and concerns that might be unveiled in the setting of health promotion programs. Well planned out and theory-based program evaluations are necessary in program evaluation. Process evaluation not only assists in understanding the implementation, but also allows the evaluator to determine the health promotion program was successful (Saunders et al., 2005).

Theoretical Framework

The intent of this DNP project was to explore the effect of the mobile integrated health (MIH) program on 30-day readmissions in patients with heart failure. The program was started based on the assumption that it would provide improved patient outcomes along with the potential to have a strong financial savings for both the patient and the health system. The program has existed for two years but had yet to be evaluated. Evaluating the program required a framework or model that is evidence-based and can guide the process of evaluating the outcomes of the program.

The purpose of evaluation research is to gain insight about a program and its operations and to see what is effective. Evaluation of a program can help to re-engage the program

participants and determine if everyone is still committed to the program. Evaluation can also help to identify lessons learned (Patton & Patton, 1990). A cost-benefit analysis can help to determine if the program is successful or should be eliminated but this is not just related to money. Measurement of success or failure is often a matter of agreement. Evaluation of the program will help to identify if the desired outcomes were mutually supported by the participants. Essentially, research seeks to demonstrate results while program evaluation seeks to improve programs (Patton & Patton, 1990).

The Research and Evaluation Bureau of Kent State University uses a Layered Evaluation Strategy (LES) to do evaluation research. The Bureau at Kent State University has been conducting evaluation research for more than 50 years (Patton & Patton, 1990). The theory was developed by a multidisciplinary staff of educators, healthcare providers and human services who have years of research experience (Research and Evaluation Bureau, 2019). This model is used as a basis for ongoing evaluation research. The three layers are (1) participant background factors (2) program factors and (3) outcomes. Both quantitative and qualitative data is used to identify facilitators, barriers, and best practices relevant to any program design and implementation (Research and Evaluation Bureau, 2019). Visual application of this strategy/model to this project can be found in Appendix B but is outlined below.

The participants in the program are patients with a history of or diagnosis of CHF who have been hospitalized and discharged to home. Other participants are the care providers, (i.e., paramedics and registered nurses on the Specialty Care Transport Unit) as well as the care managers, bedside nurses, and patient providers who make the referral to the MIU. The participants included in the program evaluation will need to have a documented diagnosis of heart failure to meet inclusion criteria for the program evaluation. The comparison group is

identified as patients with a history of heart failure discharged without referral to the MIH program. A review of the medical records will allow the researcher to determine if the participants meet the inclusion criteria.

The second component is that of the program. The goal of this MIH program is to assist patients with a diagnosis of heart failure after hospital discharge at home to optimize their ability to care for themselves. The relevant characteristics of the program include but are not limited to the provision of services to assist participants with home care, evaluate needs of the patients in their home, and to evaluate the patient's health status. Patient education includes but is not limited to diet, medication regimens, outpatient follow up appointments, need for assistance with transportation to and from their medical appointments, and identify other patient needs to avoid re-admission to the hospital. Common aspects of the MIH providers' assessments include (a) identifying areas patients can improve upon at home to improve their home care, (b) safety, (c) perform their activities of daily living (ADLs), and (d) arrange follow up and to avoid the need to return to the emergency department or hospital readmission. Helping and identifying participants needs with home care will not only assist with home care needs but allow for the MIH provider to identify obstacles or challenges that the patient is facing at home; which will therefore determine what further assistance or education the patient might need. Evaluation of the needs at home include but are not limited to assessing the need for assistive devices for ambulation or safety concerns that could be identified such as loose stairs, handrails, or other any other safety concern that might put the patient at risk. The MIH provider has the ability to evaluate the patient's health status, perform physical exams and determine if there is intervention that could be made in the home. An example would be contacting the patient's provider to discuss potential medication changes, closer outpatient follow up, or the need for our patient

referral such as physical therapy that might not have been identified as a need while in the hospital. The intent of sending MIH providers into the home is to avoid the patient returning to the hospital either to the emergency department or for readmission. However, if the patient is acutely ill in extremis, at that time the appropriate intervention the MIH provider has the ability to emergently intervene with advanced life support interventions and transport the patient to the appropriate facility for further intervention, emergency department evaluation, and potentially a readmission if that is what is determined to be in the best interest of the patient. The fidelity of implementation is maintained in a few ways; the providers are trained at the paramedic level or are registered nurses. Each provider then has taken formal initial training as well as annual required training to ensure skills and knowledge level are continued. Further continuing education is provided at biannual companywide training with consisting of both didactic and clinical training. There is consistency in the required documentation in a formal companywide charting program with charts undergoing a quality assurance process to ensure there is adequate documentation as well as to determine if there is a need to improve documentation. Knowledge of satisfaction regarding MIH services can be obtained by random queries of the patients, providers, and referral agents. Best practices can be identified by reviewing the patient record to determine what services are provided and how they are provided; by direct access to patients, telephone, or other means. There are a number of stakeholders that are involved in this program, these include but are not limited to the ambulance company which the MIH program is a part of, clinicians, physicians, and advanced providers with program collaborates with. Further stakeholders would be the department heads and care managers from the units where the referrals are made, as well as the legal department, finance department, the Chief Nursing Officer (CNO), Chief Financial Officer (CFO), the Chief Executive Officer (CEO) and the marketing

department. The evidence based and best practices of the program are consistent with the literature which demonstrates patient improvements and financial savings to both patients and healthcare systems. One aspect of evidence-based practice that is becoming more prevalent in the literature regarding MIH programs is the ability the MIH programs have to tailor to the specific needs of the patients, the healthcare system, and the surrounding communities. These programs are designed specifically to support the needs of the patient and the healthcare system in the specific community (Choi et al., 2016).

Outcomes is the third component of the framework. The impact for the patients can be explored based on readmission rates, number of visits or contacts and improved health status. A non-intentional outcome could be an increase in patient self-care abilities, increased understanding of dietary restrictions or alterations regarding sodium intake, increased awareness of safety concerns in the homes, increased awareness of medication regime and the importance of medication compliance, and increased family support and family member awareness of how to assist the patient. Provider participants may improve home care skills, assessments skills, communication skills with advanced provider, and improved situational awareness. The outcome related to a decrease in cost of care can be evaluated based on individual patient readmission rates. Finally, this program is intended short-term outcome is to reduce the 30-day readmission rate in CHF patients. The long-term outcome may be related to the change in culture needed to sustain home care visits and continue the referrals based on the belief it improves provider/patient satisfaction, improves health outcomes and reduces costs.

Methodology

This retrospective chart review for program evaluation consisted of data collection that reviewed the records of patients referred to the MIH program with a diagnosis of heart failure. Data was collected to determine the number of patients with a diagnosis of or a history of heart failure enrolled in the MIH program who were readmitted to the hospital, or, if interventions were made in the home. Throughout the data collection period, the number of patients discharged with a diagnosis of or a history of heart failure were evaluated for home visits, evaluations, and interventions at home to reduce hospital returns or 30-day readmissions. Other data collection or aspects that were evaluated are identified in detail in the program characteristics however, the number of MHI home visits, interventions and education topics done, and the recommendations made by the MIH providers was identified. At the end of the program evaluation, data from of the number of MIH visits with interventions and education in the home was determined and potential cost savings identified in comparison to the cost of less than 30-day readmission or return visit to the emergency department. The Layered Evaluation Strategy will give the opportunity to identify the evaluation for ongoing research as well as areas of the program that excel and areas to improve on. This framework will guide the strategy of evaluating the practice change. The Outcomes stage may potentially generate new knowledge of this new and growing topic of MIH which potentially could lead to a culture change in the organization. In the DNP project the evidence-based research that will be applied in this framework supports the IOM and CMS recommendations to decrease 30-day readmissions, a reflection of patient outcomes and health, identify financial savings and demonstrate the importance for this program and promote grown in the program to be a leader in the arena of MIH, and be complaint with the CMS and IOM recommendations.

Study Design

The design of the project was a retrospective quantitative quality improvement project comparing patients with a diagnosis of or a history of heart failure enrolled in the MIH program that were readmitted to the hospital and those that did not return to the hospital after hospital discharge. Selected variables related to demographics and interventions will be explored to identify potential relationships to readmission.

Study Setting

The setting for this project was a large tertiary care hospital in a suburban setting in northern New Jersey. Patients enrolled in the MIH program were primarily white, African American, and Hispanic.

Study Population

The program has had approximately 250 patients enrolled in it since its inception. This project will include a convenience sample of men and women who have a diagnosis of heart failure in northern New Jersey. The patients are referred from a large health system comprised of one tertiary care center and four other surrounding community hospitals (a total of five hospitals in the health system). Inclusion criteria included all men and women over the age of 18 years of age with a diagnosis of or history of heart failure that have been referred to the MIH program discharged from the hospital. A review of all charts with a documented diagnosis or history of heart failure was performed from January 1, 2017 to July 31, 2019. The MIH program has two groups.

The symptom triggered group has patients that have been provided with a telephone number to call with questions and/or symptoms after discharge. The phone number is a direct line to the patient transfer center where a nurse answers the phone and is able to triage. If the

nurse determines the patient is in extremis 911 is activated and the patient is transferred to the closest emergency department. If the patient is determined not to be in extremis the Specialty Care Transport Unit (SCTU) is deployed to the patients' home. The SCTU is staffed with a certified Emergency Medical Technician (EMT) and a critical care registered nurse.

The other group in the study (Scheduled Group) participating in the program had a visit scheduled at the time of discharge from care. An experienced paramedic who has been trained in MIH made the visit; this is the MICU aspect of the program. Patients referred to the Scheduled Visit group had access to a MIH provider by telephone. The patient was referred to the MIH program by a care manager or nurse navigator upon the patient's discharge from the hospital. These patients were referred due to concern for follow-up. Many of the patients were without insurance or had exceeded their allotted home visits for the year as determined by their insurance company. Many of the patients had frequent readmissions or had been noncompliant with their outpatient plans and follow up. The MIH provider is able to identify needs at home that contribute to allowing the patient to function and continue to get well at home.

Subject Recruitment/Consent Procedures

A retrospective chart review was done from the implementation of the program and patients with a documented diagnosis or history of heart failure patients was included. As this was retrospective chart review recruitment is not necessary. A waiver of consent was requested as this was a retrospective chart review.

Risks, Harms, and Ethics

Prior to the initiation of the project IRB approval was obtained from the health care system as well as from Rutgers University. Participating in the study posed minimal risk. There was a small possibility that personal health information collected may be inadvertently shared,

however the data was kept on a password protected computer, in a locked office on the premise of the project institution, and the data did not include patient identifiers.

Cost and Compensation

There was no cost to participate in this project. There was no cost to the project team or the health system as this is a retrospective quantitative quality improvement project.

Study Intervention

The list of all occurrences was provided by the program manager. Each occurrence was reviewed for heart failure diagnosis, date, a history of heart failure, patient age, patient gender, patient complaint, if an was intervention done, if education was done, and what the outcome was; transported or not transported and if there were interventions done at home. If there were interventions in the home, which interventions were completed if the patient stayed in the home or was transported to the hospital and if the final disposition of the patient was admission or discharge (see Appendix C for data collection and coding worksheet). This was an evaluation of the MIH program by using the Layered Evaluation Theory. This was done by reviewing all patients enrolled to the MIH program since the implementation of the program. The intent was to identify the cost of a readmission or observation and to identify the number of patients with a history of or a diagnosis of heart failure that were readmitted to the hospital and the number of patients that received interventions at home that did not require transport by the MIH program. The results will be presented to the administration. A final business plan recommendation will be developed for the MIH program for the presentation to administration of the Mobile Health Division.

Outcomes to be Measured

The primary outcome to be measured was the comparison of variables related to patients with a diagnosis of or history of heart failure enrolled in the MIH program who were readmitted to the emergency department or hospital in less than 30 days after discharge, compared to variable of those individuals not readmitted within 30 days after discharge.

Another outcome for this project is to measure the cost savings using diagnosis related group (DRG) estimates of utilizing the MIH program by comparing the cost of a readmission of a patient with heart failure and the cost of a MIH home visit and interventions in their home. Hospital readmission rates will also be measured. This information will be initially entered on an excel spreadsheet for analysis prior to the summary.

Project Timeline

A Gantt chart was used to demonstrate an estimate the project timeline (see Appendix D). The proposal development took place from March to May of 2019. The presentation of the proposal was in May of 2019. IRB submission was June of 2019 with all approvals completed by August of 2019. Implementation of the project began in August. The first step was data collection followed by data analysis in September. The final paper was written in November of 2019 with final presentation and dissemination in December of 2019.

Resources Needed

There were minimal costs related to this subject. This is a retrospective quantitative chart review for a quality improvement project of an evaluation of the MIH program. There is no cost for renewal of SPSS computer software for statistic evaluation. Other costs included the cost of the final poster presentation for the dissemination of the project. The co-investigator was responsible for the cost (see Appendix E for budget).

Evaluation Plan

The co-investigator identified the criteria used to evaluate what was effective or ineffective for the project. Further recommendations will be to develop subsequent steps to look further into evaluation and quality improvement programs to further expand the program. The DNP project team was involved in the evaluation plan with the possibility of including managers and other stakeholders. The overall goal of this project was to evaluate the program for quality improvement to assess the need for improvement and change. The goal was to identify cost savings in patients with a diagnosis of or history of heart failure by utilizing the MIH program and to identify the number of readmissions of patients with a history of or diagnosis of heart failure and the number of patients that had MIH evaluation and interventions in the home that did not require hospital readmission.

Data Maintenance/Security

Medical records were reviewed, and all data was collected on a password protected computer. The password protected computer was kept in a locked cabinet in a locked office at the project institution. The medical records were only be observed by the researcher collecting the data at the project site and kept on a password protected computer. The data collected linked to the personal identifier was destroyed after initial data collection is completed. Charts were provided with an identification (ID) number by the co-investigator to use on both the PHI data collection and quality improvement program evaluation. No personal identifiers were collected. Upon completion of the project, closure of the IRB, and final writing of the manuscript all data will be destroyed in accordance with the project site's requirements. Data will be kept for 7 years.

Data Analysis Plan

Descriptive statistics were used to describe the sample of participants. The descriptive statistics included age range of patients, the variance of patient and the standard deviation of the measures of central tendency, the mean, median, and mode for variables collected. Regression analysis was used to explore significant variables of the project including demographics and interventions (standard treatment and/or education) related to readmissions of individuals with heart failure who received MIH treatment. The statistical software package SPSS and Mini Tab was used for completion of data analysis. Coding was used to aid the analysis of variables identified as: gender, age, diagnosis, home interventions, and less than 30 days hospital readmission. The level of statistical significance for this study was established as $p < 0.05$ for all analyses.

Results

Analysis of both groups of the program (Symptom Group or Scheduled Group) was done using SPSS and Mini Tab. The retrospective chart review for program evaluation included home visits conducted from January 1, 2017 to July 31, 2019. Each patient that had a home visit had a documented diagnosis of heart failure in their past medical history. There are two groups in the program: Symptom triggered visits (Symptom Group) triggered by the patient or family calling for assistance, and scheduled visits (Scheduled Group) set up at the time of discharge. There were a total of 125 visits between the two sections of the program. All 125 patients had a physical exam/assessment by the MIH provider, all further interventions were beyond the assessment.

This study included a total of 125 (n=125) out-patient adults with a history of heart failure. The primary outcome measure was to determine if program outcomes are being met, including a decrease in thirty-day readmissions, a financial cost savings for patients and the health system, as well as a program evaluation demonstrating the importance of the MIH program has been achieved. Other outcomes were to identify patient visits with or without interventions and education by the MIH providers that assisted in the patient staying at home or if the patient needed to be transported to the ED for further evaluation and/or treatment. Most of the participants in each group were male (59%). Most of the patients in each group were 71 years of age or older (n=73, 58%). Table 1 shows age and gender for each group. There was no statistical difference between the groups related to demographics. Using a Mann Whitney test the p value was .06 indicating there was not a statistical difference. Age failed normality testing SCTU median is 75.5, IQR is 70, Q3 is 80.75. The MICU median is 71, IQR 60.5, and Q3 is 82.

Table 1

Demographics

	Symptom Group (n=44)	Scheduled Group (n=81)	Total (N=125)	Significance
Age	(n,%)	(n,%)	(N,%)	
< 50	0(0%)	7(8%)	7(6%)	0.051*
50-60	2(5%)	13(16%)	15(12%)	0.083*
61-70	16(36%)	16(20%)	32(26%)	0.054*
71+	26(59%)	45(56%)	73(58%)	0.850*
Gender				0.257^
Male	26(59%)	56(59%)	82(66%)	
Female	18(41%)	25(31%)	43(34%)	

*p-value calculated using Fisher's Exact.

^p-value calculated using Chi-Square.

The frequency of visits are listed in Table 2. A Chi square was used to determine if there was statistical differences in the frequency of the visits. The quarters were defined as quarter 1,

quarter 2, quarter 3, and quarter 4. Quarter one is defined as January, February, March; quarter two is April, May, June; quarter three is July, August, September; and quarter four is October, November, December. There was not a significant association between the quarters and the two groups. There does not appear to be a seasonal or quarterly difference in the frequency of visits between the groups.

Table 2

Frequency of Visits

	Symptom Group (n=44)	Scheduled Group (n=81)	Total (n=125)	
Quarter 1	11	19	30	0.095 [^]
Quarter 2	8	22	30	0.095 [^]
Quarter 3	12	30	42	0.095 [^]
Quarter 4	13	10	23	0.095 [^]

[^]p-value calculated using Chi-Square since there were no low case counts the categorical variables were analyzed as a group so it is one p value

The date of visit was documented, confirmation of a diagnosis of heart failure, history of heart, age, gender, reason for visit, and if there was an intervention documented if there was education with the patient and/or family member. The same interventions and education components were evaluated from both groups of the MIH program. Each of the groups were evaluated for the outcomes of treated and not transported, or treated and transported to the hospital, as well as the final disposition such as admit/out-patient observation.

The intervention categories were intravenous medication administration, oral (PO) medication administered/adjusted after discussion with provider, breathing treatment administered, assessment of activities of daily living, safety assessment/evaluation, need for transport to hospital identified, medication reconciliation reviewed and/or pill box refill schedule, would care done, 12 Lead EKG done, and physical exam. There was also a category for other interventions which were documented but not captured in the listed categories. The

education categories were medication education, nutrition/diet education, discharge instructions clarified and reviewed, safety education, disease process education, out-patient education, symptom education, and medical equipment education and clarification. Education also had other category to capture education topics that were covered and not in the listed categories.

The Symptom Group (SCTU) of the program had 44 home visits, the average age of the patients was 75 years old, including 26 (59%) males and 18 (41%) females. All of the visits had documented physical exams / patient assessments. Of the 44 home visits 42 (95%) of patients had at least one intervention documented by the provider. Of the 44 visits 21(48%) of patients had at least one education topic documented by the provider. A total of 15 (34%) visits resulted in patients being transported to the emergency department. The symptom group summary can be found in Table 3.

Table 3
Symptom Group (SCTU) Summary

No. of visits	44
Average age	75 yrs.
Gender	
Male	26 (59%)
Female	18 (41%)
No. visits with at least one intervention	42 (95%)
Types of interventions	
IV Medication Administer	7 (16%)
PO Medication Administer or Adjusted	5 (11%)
Breathing Treatment	2 (5%)
Activity of Daily Living	1 (2%)
Safety Assessed	3 (7%)
Need for Transport to Hospital	15 (34%)
Medication Reconciliations and / or Pill Box Refill Schedule	2 (5%)
Wound Care	1 (2%)
12 Lead EKG	23 (52%)
Other	35 (80%)
No. visits with at least one education	21 (48%)
Types of education	
Medication Education	13 (30%)
Nutrition / Diet Education	6 (14%)
Discharge Education / instruction Clarification	2 (5%)
Safety Education	6 (14%)
Disease Process Education	5 (11%)
Out-patient Resource Education	2 (5%)
Symptom Education	14 (32%)
Medical Equipment Education	3 (7%)
Other	5 (11%)
No. of people transported	15 (34%)
Transported location (out of 15)	
MMC	1 (7%)
NMC	8 (53%)
CMC	0(0%)
OMC	0(0%)
HMC	3 (20%)
Other	3 (20%)

The Scheduled Group (MICU) of the program had 81 home visits, the average age of the patients was 71 years old, including 56 (69%) males and 25 (31%) were females. All of the

visits had a documented physical exam / patient assessment. Of the 81 home visits 77 (95%) had at least one intervention documented by the provider. Of the 81 home visits, 80 (99%) had at least one education topic documented by the provider. A total of 3 (4%) patients were transported to the emergency department. See Table 4 for a summary of the scheduled group (MICU).

Table 4
Scheduled Group (MICU) Summary

No. of visits	81
Average age	70 yrs.
Gender	
Male	56 (69%)
Female	25 (31%)
No. visits with at least one intervention	77 (95%)
Types of interventions	
IV Medication Administer	0 (0%)
PO Medication Administer or Adjusted	2 (2%)
Breathing Treatment	2 (2%)
Activity of Daily Living	52 (64%)
Safety Assessment/Evaluation	38 (47%)
Need for Transport to Hospital	6 (7%)
Medication Reconciliations and/or Pill Box Refill Schedule	56 (69%)
Wound Care	8 (10%)
12 Lead EKG	0 (0%)
Other	51 (63%)
No. visits with at least one education	80 (99%)
Types of education	
Medication Education	67 (83%)
Nutrition / Diet Education	51 (63%)
Discharge Education / instruction Clarification	20 (25%)
Safety Education	16 (20%)
Disease Process Education	8 (10%)
Out Patient Resource Education	7 (9%)
Symptom Education	29 (36%)
Medical Equipment Education	16 (20%)
Other	49 (60%)
No. of people transported	3 (4%)
Transported location (out of 3)	
MMC	2 (67%)
NMC	1 (33%)
CMC	0 (0%)
OMC	0(0%)
HMC	0 (0%)
Other	0 (0%)

The tertiary care center in the hospital system, one of five hospitals in the system, was used to determine frequency of care rendered to those with heart failure. In June 2019, this facility cared for 313 patients with a history of heart failure as they presented to the ED. A total of 163 patients (53%) were admitted, 58 (36%) of those admitted were placed in outpatient observation, and 89 (28%) of the patients were discharged home from the ED.

In July of 2019, of the 286 patients with a history of heart failure that presented to the ED, 174 (61%) were admitted, 40 (23%) of the admitted patients were placed in out-patient observation, and 72 (25%) were discharged.

In August of 2019, 339 patients with a history of heart failure presented to the ED where 175 (52%) were admitted, 52 (30%) of the admitted patients were placed in out-patient observation, and 112 (33%) were discharged to home. In September of 2019, a total of 258 patients with a documented history of heart failure presented to the ED, 125 (48%) were admitted, 45 (36%) placed in out-patient observation and 88 (34%) were discharged to home. The final admitting diagnoses of the admitted patients was not necessarily heart failure. Over a four-month time span (June – September 2019), 1,196 individuals were admitted to the ED with a history of heart failure. For all months, except September (48%) more than half of the individuals presenting to the ED with HF or a history of HF were admitted to the facility. Of those admitted, between 23 – 45% were admitted for observation. Between one-quarter (25%) and one-third (34%) of patients were discharge home after evaluation in the ED. See Table 5 for a summary of evaluation and disposition of ED admissions for heart failure.

Table 5

Evaluation and Disposition of ED Admissions for Heart Failure (HF)

Month	ED visits History of HF	Admitted n(%)	Observation Unit n(% admitted)	Discharged to home n(%)
June 2019	313	163(52%)	58(19%)	89(28%)
July 2019	286	174(61%)	40(14%)	72(25%)
Aug 2019	339	175(52%)	52(15%)	112(33%)
Sept 2019	258	125(48%)	45(18%)	88(34%)
Total	1196	637(53%)	195(16%)	361(30%)

This study was unable to identify if the patients who were assessed in the home and seen in the ED resulted in hospital admissions, were placed in out-patient status, or discharged from the ED. The disposition of the patients after ED admission was not discoverable. It is thought that because the visits involved patient assessments by providers that those that returned to the ED likely were readmitted or placed in outpatient observation. The hospital system was able to provide overall readmission rates for a diagnosis of heart failure. Importantly, a single patient may have had more than one MIH visits. The initial visit would have been within 30 days of hospital discharge; however, but the exact timing of the MIH visit was not retrieved.

There are five hospitals in the suburban health system. The hospitals have been deidentified and are referred to as hospital 1, hospital 2, hospital 3, hospital 4, and hospital 5. The annual 30-day readmission rates were obtained from the system for 2017 and 2018. The symptom-based group had 0 patients transported to hospital 1, 3 of 44 patients were transported to hospital 2, 1 of 44 patients were transported to hospital 3, 8 of 44 patients were transported to hospital 4 and 0 of 44 patients were transported to hospital 5. 3 of the 44 were transported to hospitals not in the health system. Of the scheduled visit group 0 of 81 patients were transported to hospital 1, 0 of 81 were transported to hospital 2, 2 of 81 were transported to hospital 3, 1 of

81 were transported to hospital 4, 0 of 81 were transported to hospital 5 and 0 of 81 were transported to out of system hospitals.

Table 6 reflects the 2017 and 2018 annual readmission rates. Table 7 reflects the hospitals MIH visit patients were transported to. There was no statistical significance in the hospital destinations the MIH visit patients were transported to between the symptom group and the scheduled group.

Table 6

2017 and 2018 HF Hospital Readmissions System Wide

	Hospital 1	Hospital 2	Hospital 3	Hospital 4	Hospital 5
2017	17.6%	19	16.7%	20.7%	14%
2018	16.9%	15.7%	16.6%	22.2%	14.4%

Table 7

MIH Visit Destinations of Transports

	Hospital 1	Hospital 2	Hospital 3	Hospital 4	Hospital 5	Out of system hospital
Symptom group (n=44)	0 visits	3 visits (20%)	1 visit (7%)	8 visits (53%)	0 visits	3 visits (20%)
Scheduled group (n=81)	0 visits	0 visits	2 visits (67%)	1 visit (33%)	0 visits	0 visits
Significance	Not applicable	p>0.9990	p>0.056	p>0.999	Not applicable	p>0.999

Estimated Cost of ED Visit for HF

Individual treatment for patients included in this study were not retrievable because data were deidentified. However, three experts (two MDs and one APN) provided consensus on a

standard testing and interventions expected for patients with HF assessed in the ED. Such interventions included: electrocardiogram, obtaining intravenous access, oxygen supplementation, chest x-ray, routine blood work, cardiac enzymes, and intravenous diuretics. The author was unable to obtain all of the costs however the costs that were able to be obtained: complete blood count with differential (CBC-D), troponin, brain natriuretic peptide (BNP), basic metabolic profile (BMP), coagulation studies (PT/PTT), intravenous furosemide, continuous positive pressure ventilation (CPAP), basic life support (BLS) transport, and advanced life support (ALS) transport. The estimated per person cost of these interventions totaled \$5,328.00 per ED visit. Therefore, a reduction of transportation to the ED in the symptom activated group alone of 29 patients that were not transported to the emergency department, representing the 66% of patients in the symptom activated group in the MIH program have a potential cost savings of \$154,512.00 in heart failure patients not returning to the ED.

This initial review of the Mobile Integrated Health program reflects modest value in reducing readmissions for patients with a history of heart failure. A difference in readmission following home visits for Symptom visits (34%) versus Scheduled visits (4%) provides a framework for monitoring of individuals with HF in the community. Two proportion tests were used to analyze comparison between the patient visits transported between the two groups. There is a significant difference in the symptom-based group 15 of 44 (34.1%) patient visits were transported to the hospital compared to the scheduled visit group were transported to 3 of 81 (3.7%) $p < 0.001$.

Two proportion test were run between the symptom group and the scheduled group to determine if there was a difference in the number of interventions between the two groups. In the symptoms group 42 of 44 (95%) visits had documented interventions and in the scheduled group

77 of the 81 (95%) patients had at least one intervention documented. There was not a statistical difference between the two groups $p=0.921$. However, two proportion tests were run between the symptom group and the scheduled group for education interventions. There was a significant difference between the symptom group and the scheduled group regarding education. The symptom group had 21 of 44 (48%) education interventions documented and the scheduled group had 80 of 81 (99%) visits where at least one education intervention was documented $p<0.001$.

Discussion

This program evaluation identified some opportunities for improvement. The MIH program was initiated and designed to assist patients post discharge to continue to improve at home. Upon assessment of the patient in their home the providers on the symptoms-based setting had an assessment at home. Although 34% of the patients were transported back to the hospital 66% of the patients were able to receive further intervention at home and avoided the inconvenience and cost of transport to the hospital and subsequent care. The registered nurses were able to assess the patient, identify necessary interventions, and speak with the provider. Plan adjustments such as medication changes, further out patient follow up appointments, and interventions were able to be done in the patient's home. The registered nurses were able to contact the patient's provider and discuss the case with them.

In the symptom visit group, 95% of the visits received at least one intervention at home, with 30% of the visits having documented education done at home. Education included 30% regarding medication and 32% had education regarding symptoms done during the visit. It is likely that many of these complaints would have precipitated 911 activations or emergency department returns for interventions had they not been addressed.

The scheduled visit group (MICU) of the program included an assessments of all patients for each visit. Four percent (4%) of the scheduled visit group ended in transport to the hospital, therefore 96% of the home visits did not require transport to the hospital. The focus of this section of the program is identifying barriers at home and focusing on outpatient follow up which mitigates for unnecessary returns to the hospital due to gaps in discharge teaching or noncompliance in follow up. The scheduled visits group had 95% of visits with at least one intervention documented at home. Most (69%) of the interventions were related to medication reconciliation or pill box refills and medication schedules. About the same number (64%) of the visits documented interventions regarding activity of daily living assessments and assistance; and, 63% of the visits had documented interventions that fell into the “other” category. These (“other”) interventions included but were not limited to patient weight monitoring, arranging appointments or rescheduling missed out patient appointments, contacting providers for medication refills, or arranging for food delivery or home care deliveries. Many of the other interventions were providing patients with the ability to document weights, blood sugars, and blood pressures. The scheduled visit providers were able to identify the need for social service involvement after assessing the living conditions patients were in. Many (47%) of the visit’s documentation addressed home safety assessment and 99% of the visits had education documented. Observed more often than the symptom group, 83% of the documented education was regarding medication education, 63% of the visits documented education regarding nutrition and diet requirements. For this group, 60% of the visits documented education that was incorporated into the “other” category such as but not limited to smoking cessation, wound care teaching, when to use glucose monitoring, the importance of monitoring weight, and rescue

breathing techniques. One quarter (25%) of the visits documented reinforcing hospital discharge instructions and education.

Much of the MICU scheduled group interventions and education parallels the concerns patients expressed in the qualitative study by Retrum et al. (2013). The patients expressed concerns regarding distressing symptoms, unavoidable progression of heart failure, environmental factors medication regimen adherence being factors that precipitated the activation of 911(Retrum et al., 2013). Therefore, the program provides substantial support to individuals living with HF and allows them to both remain in the comfort of their home while avoiding stressful and costly readmissions.

Limitations

There were some limitations identified at the completion of the chart reviews. The date of hospital discharge was not documented in the charting system which is difficult to identify if the visits were within 30 days of discharge. The charting system did not have a documented hospital disposition; therefore, it is not clear in the EMS charting if the patients were admitted, placed in outpatient observation, transferred or discharged to home. The documentation did not consistently capture discharge diagnosis versus history of heart failure; however, heart failure was consistently documented in the past medical history category. This study tracked the total number of MIH visits, the frequency of visits to each patient was tracked.

The financial costs of admission assessment for individuals with heart failure is based on an estimation and not billed or realized costs this data was unavailable. Nevertheless, the information remains valuable in quantifying the value of scheduled visits in the home for individuals living with HF.

Summary

The symptom group (SCTU) of the program was designed as a resource for patients when they felt or exhibited concerning symptoms after hospital discharge. These patients were identified by the hospital care teams and care management for potential to need assistance upon discharge. Even with 15 (34%) of 44 patients returning to the hospital 66% of the visits resulted in the patient receiving interventions at home and following up in their providers' office. This demonstrates the potential that with program growth and increased referrals more patients potentially can be cared for at home and monitored in the out-patient settings. The scheduled group (MICU) of the program demonstrated that with 81 home visits and 3(4%) of patients being transported to the hospital that education and preventive care allowed for patients to be stay in the comfort of their own home. Follow up as an out-patient allowed providers in the home to identify and address concerns, problems and obstacles during their recovery in real time. As the program grows and expands patients potentially will have improved outcomes and improvement in their health status at home with the assistance of trained providers utilizing positive reinforcement and potential hazards in real time and preventing the worsening symptoms at home from lack of understanding or compliance at home.

Implications/Recommendations

Based on the results of this study the program evaluation indicates a fiscally responsible way to assist patients in the adjustment after discharge from the hospital. The findings from this study supports findings of other pilot studies reported previously (Choi et al., 2016). The MIH programs have the unique capability to be designed to tailor to the needs of the healthcare system. Patients have a direct line to assistance post discharge to assist in their needs once they

are at home. This ranges from symptoms both acute or non-acute, questions, concerns, and individual needs. The ability to have a professional clinical nurse answering the phone allows for the appropriate deployment and utilization of resources. This allows for less unnecessary 911 activations which in turn will keep EMS units available for emergencies and decrease the risk to the public for unnecessary activations. The average cost of a 911 activation is \$312 per dispatch, this is prior to patient contact, emergent interventions and transport to the hospital (Bennett et al., 2017). The average cost of an MIH visit specific to this program is approximately \$200. Avoiding a 911 transport to an emergency department avoids at minimum \$3,945.00 in treatment and transport costs before the addition of the mileage fees billed to patients by the health system. Avoiding an ED admission results in a savings of at minimum of \$5328.00 per individual with moderate to severe respiratory symptoms associated with heart failure.

Patients will be able to be treated in the comfort of their own home. CMS has identified that upon 911 activations that patients are transported to the emergency department which contributes to ED recidivism, overcrowding and the potentially unnecessary readmissions. The ET3 pilot programs have been designed to identify other means for patients to access healthcare when they don't necessarily require evaluation and treatment in the ED. The idea is that patients' providers will be able to identify if the patient is able to be transported to outpatient facilities such as urgent cares, primary care provider offices, nursing homes, rehabilitation centers, dialysis centers or other destinations that will decrease ED recidivism and potential for decreased readmissions (ET3 Model CMS.gov, 2019). This MIH program has the potential to be a leader in the ET3 program and recommendations by the utilizing the MIH providers to determine the patient necessitates transport if there is a need for transport to the ED or an alternate destination.

Impact on Healthcare Quality/Safety

MIH programs have the ability to fill the gaps that exist for discharged patients that need assistance at home and can bridge the gap for home health care and providers for patients who are post discharge (Nejtek et al., 2017). Many of these patients need assistance in education or understanding of their medication and therapeutic regimens. MIH providers have the ability to educate and identify home needs for patients who are returning home after hospital admissions. This allows for not only identification of physical safety hazards, but also for providers and patients to identify gaps or questions in their care post discharge (Nejtek et al., 2017). Patients enrolled in MIH programs often have multiple comorbidities and often are at a financial disadvantage. The MIH programs are tailored to the specific communities and health system's needs. The MIH providers are familiar with the patients in their communities as well as community resources. This gives an advantage to the providers and the patients to help ensure the patients have the best access to affordable health care to reduce costs, provide complex care, and addressing the needs of the vulnerable populations the MIH program serves (Scharf et al., 2018). Involvement of other collaborating disciplines such as pharmacy has been effective (Crockett et al., 2017). This incorporates not only assistance in patient medication education, but also to ensure the patients have the appropriate medications, doses, and most importantly access to their medications. Pharmacists have the ability to educate the MIH providers or participate in the MIH programs depending on how the programs are designed. Medication compliance is an integral part of patients staying healthy at home (Crockett et al., 2017).

Impact on Health Policy

In an effort to improve patient care, over the past few decades pre-hospital providers have been progressive in the prehospital arena. EMS have introduced the concept of community

paramedicine, or MIH programs. These programs have trained providers, paramedics and / or registered nurses who are able to go into the home, assess the patient who called 911 and determine if it is an emergency exists and then treat the patient and transport appropriately, or assist the patient at home. These providers are able to assist patients with managing chronic illnesses at home. The providers are able to do home assessments, identify patients' individual needs, identify gaps in discharge planning, and help reduce EMS transport costs, ED recidivism, and hospital readmissions (NAEMT EMS 3.0 Committee, 2018).

CMS currently acknowledges EMS transports for payment when patients are transported to acute care hospitals, dialysis centers, nursing homes or skilled nursing facilities and critical access hospitals. CMS has begun to recognize that when 911 is activated and EMS is called patients are transported to the ED. This contributes to ED overcrowding and potentially an admission occurs or an outpatient observation placement status in the hospital. CMS now recognizes that not all transports need to be transported to the ED, therefore many can be triaged and perhaps transported to alternative destinations. This has a high potential to reduce the financial burden on both the patient and healthcare system. Pilot programs are in the developmental phase and will be implemented in 2019 (ET3 Model CMS.gov, 2019).

Implications on Healthcare Policy

The *Crossing the Quality Chasm: A New Health System for the 21st Century*, identifies that there is a need for healthcare changes in the 21st century. This report identifies many Gaps in the healthcare system. A major focus is people are living longer with chronic illnesses. The life expectancy has significantly increased over the past few decades (Committee on Quality of Health Care in America, Institute of Medicine, 2001). The United States healthcare system was not organized for the management of chronic health conditions and did not have the appropriate

services that were necessary to manage patients with these chronic conditions as people began to live longer with chronic illnesses (Committee on Quality of Health Care in America, Institute of Medicine, 2001). The concept of MIH programs parallel a few of the recommendations of this report in Chapter 2 Improving the 21st-Century Health Care System. Recommendation number one discusses the decrease of burden of illness and improvement of health and functioning of the people in the United States (Committee on Quality of Health Care in America, Institute of Medicine, 2001). The second recommendation in the report identifies the concern for safe and timely care. As well as focusing on effective patient centered care that is efficient and equitable (Committee on Quality of Health Care in America, Institute of Medicine, 2001). The MIH programs are focused on safety at home. There is a timely response to the patient and the care is focused on the patient and family that is referred to the program. The patients are cared for in their home environment which is an environment the patient is accustomed to. The home environment also allows the MIH providers the ability to determine safety hazards, allow for efficient and effective care as concerns or potential problems or safety hazards are addressed in the present time of the visits which contributes to efficient and effective care. Efficient care is the avoidance of waste in the context of supplies, ideas, supplies and energy (Committee on Quality of Health Care in America, Institute of Medicine, 2001). The potential for waste or inappropriate testing is decreased, the MIH provider is in the home with the patient the MIH providers focus is to use necessary supplies for interventions, but to also focus on prevention of worsening of symptoms or reoccurrence of symptoms, there is a large amount of patient and family education done. The intent of the MIH program is to avoid hospital return or readmission this is focused on the patient which is consistent with the second recommendation. Patient centered care is responsive to the needs of the individual with the assurance that patient values

guide clinical decisions (Committee on Quality of Health Care in America, Institute of Medicine, 2001). The MIH program focus is to go to the patient home and assist the patient at home with needs to improve their health status, identify needs or barriers to be assure patient improvement based on their individual needs. The patients referred to the MIH program are evaluated and seen in a timely manner. Patients evaluated in the symptoms triggered section are evaluated in 90 minutes of their initial phone call to the hotline. Patients in the scheduled visit section have home visits scheduled in 24 to 48 hours after their discharge from the hospital. According to the *Crossing the Quality Chasm* report access to timely healthcare is reducing wait times and as well as decreasing harmful delays (Committee on Quality of Health Care in America, Institute of Medicine, 2001).

Heart disease and stroke is a topic that is addressed by Healthy People 2020. The Healthy People 2020 identify one of the organization's goals is to reduce cardiac events through early identification and prevention of repeat cardiovascular events and disease (U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion [HHS, ODPHP], 2018). The leading modifiable risk factors for heart disease are high blood pressure, high cholesterol, diabetes, cigarette smoking, obesity, lack of physical activity and unhealthy diet (HHS, ODPHP, 2018). Cardiovascular disease significantly impacts those affected by disparities. The prevalence of risk factors and access to treatment are important aspects of care that affect disparities, along with timely treatment and appropriate treatment (HHS, ODPHP, 2018). MIH programs are able to access patients that are unable to access care. MIH programs were introduced to the United States in the rural Midwest around 1992. These programs were developed for community paramedicine to access patients who were unable to access healthcare (Choi et al., 2016). This MIH program evaluation not only identified multiple interventions that

facilitated patients to recover and improve their health status at home, but there were numerous educational topics and interventions that took place by the providers. Healthy People 2020 identify that prevention of controllable or modifiable risk factors contribute to an improved health status (HHS, ODPHP, 2018)The MIH program providers focus on education of diet and nutrition as well as weight monitoring, blood pressure monitoring, symptom management, blood glucose monitoring and smoking cessation. The MIH program is able to go into the homes of patients that are unable to gain access to care or have had difficulty with follow up appointments, difficulty with understanding follow up instructions or any other hurdles or challenges to overcome after hospital discharge. The MIH program results demonstrate quality safe patient care in the home after discharge.

Implications on Education

A SWOT analysis was done for this MIH program evaluation was able to identify strengths and weakness as well as opportunities and threats. Retrospective chart reviews were done on patients with a diagnosis or history of heart failure. The results of the chart analysis contributed to the identification of program strengths, weakness, opportunities and threats of the program. Analysis of the results and data are helpful for the management teams and administration to identify their program needs. Education is important to sustain the program and to educate the providers. Education is necessary to implement changes. Utilization of the analysis of the results will contribute to a more uniform home assessment, safety assessment, and patient assessment for patients enrolled the MIH program. Although there might need to be some subtle differences in education due to the scope of practice of the providers. There also might be subtle differences secondary to the intent of the visit. If it is a symptoms-driven visit versus a scheduled visit. The identification of the patient care needs of the symptoms driven visit

and the scheduled visit might require further education to providers, the triage nurse on the telephone, and a more detailed protocol for those making program referrals. There will need to be a formally designed competency procedure or protocol. This would contribute to the uniformity of patient care. Also incorporated in the education process would be a uniform documentation procedure. The management, coordinators and providers would have ability to decide on formal safety assessments, identification of goals for patients with heart failure, nutrition education, and other formalized documentation procedures. Communication tools between providers such as a SBAR or other formalized communication tool would also need to be incorporated into the education and annual training process.

After result analysis formulation of a business plan or business strategy will be necessary to present to the healthcare system administration. The SWOT analysis as well as the financial impact of the program include key information necessary for stakeholders and administration. The financial component will need to be prefaced with program education and the importance to patient care and healthcare outcomes. The interventions and provider education topics will be important to add to the education for the administration to have a background understanding to the MIH program. Education is a necessary component of change implementation.

Translation/Sustainability

This DNP project is a program evaluation, the initial program was implemented to assist the health system in avoiding 30-day readmissions after the Affordable Care Act of 2012 implemented penalties for readmissions in 2015. This program was evaluated as a DNP project, however with the ever-changing culture in healthcare program evaluation is beneficial to not only the patients, but stakeholders and to the overall healthcare system. There is a substantial cost to this MIH program, it is important to have a program evaluation goal. Not only did this

program demonstrate utility to the patients but there is a significant cost savings potential. It is important to evaluate and reevaluate programs to determine if the programs remain effective and if changes have been made what the outcomes of the changes are. The results of this program evaluation demonstrate financial savings, a reduction in patients returning to the hospital, and improvement of patient outcomes at home demonstrated by patients receiving interventions and education at home. Presenting this education to the management and administration will be the initial step in translating this information to a larger group. Followed by program design for increased the size of the program. The program design would need to be expanded in order to provide care for a greater number of patients. This would necessitate further training of providers and more formal training in documentation. Public relations would have a role in this as well to ensure the community and providers throughout the health system would have a greater awareness of the program as more detailed information as to what interventions the providers of the program are able to perform in their scope of practice. After demonstration of the potential outcomes of patient improvement at home and the potential to be a leader in the MIH community the expectation is that the management and administration will support this program and will support the success of the program. This program is anticipated to continue after the initial program evaluation. The program evaluation is a starting point for the program to identify positive and negative aspects of the program and trouble shoot and improve the program. This initial program evaluation is a starting point for future expansion and improvement of the program to better contribute to patient outcomes and allow patients to transition home after hospital admission and continue to improve their health status at home. This MIH program has the capability to grow into a program to meet the individual needs of both patients the health system to transition into a program that is able to fulfill the future needs and

expectations of the future changes in healthcare. This is a starting point for future DNP projects in this developing MIH program. Future projects might reevaluate the changes implemented from this project or further expand the program, develop annual competencies, documentation procedures or further expand the program into the rural communities to allow for those with social disparities to have further access to healthcare. This DNP project although largely discusses and focuses on interventions in the prehospital arena, the impact is on more than prehospital care. The impact is on overall healthcare and contributes to a change in the culture of healthcare for the future.

Dissemination

This DNP project will be presented to the stakeholders of the ambulance company as well as the health system administration. The initial presentations will take place at the ambulance company during management meetings. A power point presentation will be designed and will identify both the strengths and weakness of the program as well as the opportunities and threats that were identified by the initial SWOT analysis. Charts and graphs will be incorporated to identify the interventions and education done in the home by the providers of both the symptom trigger group as well as the scheduled visits. Recommendations regarding uniform documentation recommendations for the interventions and educations. Recommendations for formal safety assessments and daily living assessment tools will be made after discussions with the providers and the management team. After dissemination to the management team of the ambulance company, presentation to the administration of the tertiary care center of the health system would be the next step. The Chief Nursing Officer and others that are requested by the CNO will be offered a formal presentation of the results. This might include but is not limited to Nursing Research and Education, the Chief Financial Officer (CFO), Chief Executive Officer

(CEO), Chief Medical Officer (CMO), Public Relations, Business Managers, or other stakeholders identified by the management team. A formal business plan will be presented by the DNP project team as well as the operations manager of the ambulance company. A poster presentation will be developed for formal presentation at Rutgers University as well as for public presentations at formal conferences and meetings to share the findings and the recommendations to further improve this MIH program. Furthermore, this information will be disseminated via publications.

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Appendix A

Table of Evidence

	Author & Date	Evidence type	Sample Size, Setting	Study finding that helps answer the EBP Question	Limitations	E L Q
1	Baker, Oliver-McNeil, Deng, Hummel (2015)	Observational Analysis	<p>N= 11 hospitals in Detroit Michigan Area</p> <p>7 hospitals were large teaching hospitals</p> <p>3 hospitals were large non-teaching hospitals in an urban setting</p> <p>1 hospital was a medium sized non-teaching hospital in an urban setting</p>	7 hospitals participation in the Detroit Michigan Area were associated with decreased 30-day readmissions in Medicare patients with heart failure	<p>Data sets used for calculation are administrative,</p> <p>Data sets did not include illness severity, or quality of care out of hospital</p> <p>Financial Data was from Medicare payments, non-Medicare costs are not included</p> <p>Bias due to lack of random assignment of interventions and comparison groups</p> <p>Results might not be generalized outside this study sample</p>	L G q

MOBILE INTEGRATED HEALTH AND HEART FAILURE

2	Mirkin, Enomoto, Caputo & Hollenbeak (2017)	Retrospective analysis	N = 155,146	<p>In 2011, \$1.7 billion was spent on readmission for 134,500 heart failure patients.</p> <p>155, 146 patients with heart failure were admitted, 22.8%, (35,294 patients) had 30-day readmissions</p> <p>Readmitted patients were more likely to have Medicare, from an extended care facility, emergently readmitted, or have had a longer length of stay on the initial admission</p> <p>The authors looked at Pennsylvania hospitals and identified multiple commonalities in patients that were readmitted with a congestive heart failure diagnosis.</p> <p>72,343 (46.6%) of the admitted patients were discharged home after the initial admission, 40,383 (26%) to a skilled nursing facility, 40,046 (25.8%) to home with home nursing visits. The highest return rates were those who were discharged to skilled nursing facilities with a 25.8% hospital readmission rate.</p> <p>This group of patients were mostly comprised of older females compared to the other groups. Followed by those discharged to home with home nursing visits, 24.9%, and the least were those discharged without assistance to home with a 19.9% readmission rate</p>	<p>Data is from one state</p> <p>Large sample size however unable to generalize to outside the individual state</p> <p>Some patients might have been readmitted to out of state hospitals</p> <p>Data is from one year</p> <p>Data is from administration, and clinical aspects of the data are not included due to administrative data</p>	L G q
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MOBILE INTEGRATED HEALTH AND HEART FAILURE

<p>3</p>	<p>Nuckols, Fingar, Barrett, Martsolf, Steiner, Stocks, & Owens (2018)</p>	<p>Retro-spective</p>	<p>N=201 hospitals in Georgia, Nebraska, South Carolina, and Tennessee</p>	<p>looked at thirty-day hospital return rates for emergency department visits, hospital observations, and readmissions in 201 hospitals in four states, Nebraska, Georgia, Tennessee and South Carolina.</p> <p>three diagnoses, myocardial infarction, heart failure, and pneumonia in patients with private insurance placed in observation status increased from 41.4 % to 46.7% (P<.001).</p> <p>30 day return rates in patients with private insurance coincided with a decrease in readmission rate (8.9% to 8.2%), but an increase in observation rates (1.2% to 1.7%) and emergency department visits increase (5.1% to 5.5%)</p> <p>They further looked at the number of readmissions, observations statuses and emergency department visits. The four states they looked at are 7% of the United States population. The sample size was 422,840 between the 2 time periods, 2009 to 2010 and 2013 to 2014. The Those patients with Medicare 27.8% to 32.1% (P<.001), patients with Medicaid 39.5% to 41.8% (P=.03) and those without insurance 49.2% to 52.8% (P=.004). The authors noted that the decrease in readmission rates coincided with the increase in observation rates</p> <p>Heart Failure Results: Medicare patients' readmissions declined (18.3 to 16.9%) observation and emergency department returns increased (1.2% to 1.7% and 5.8% to 6.3%)</p>	<p>4 States were used for data collection</p> <p>Authors report they noted 8% decline in readmission rate from 2010 to 2015 for Medicare patients. They noted hospital trends, but did not look at hospital – level revisits</p>
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MOBILE INTEGRATED HEALTH AND HEART FAILURE

				<p>Medicaid patients the inpatient readmissions were unchanged (18.7%) however the observation increased (2% to 2.7%)</p> <p>Uninsured adults' inpatient readmissions were unchanged at 9.5%. the increased in observation visits 1.3% to 2.0% and increase in emergency department visits increased from 8.0% to 8.6%</p>		
4	Nejtek, Aryal, Talari, Wang, & O'Neill (2016)	Pre and post retrospective evaluation	N=64 participants	<p>Program length 61-90 days, program used biweekly visits, 38% of participants had increased mobility at home, 70% demonstrated increased self-care at home, 58% (45 patients) had improvement of daily activities than prior to program enrollment, 42% reported improvement of pain from prior to enrollment of the program.</p> <p>There was a 61% decreased in ED transports by MIH after program implementation</p> <p>66% decreased in ED visits and ED admissions</p> <p>There was a 56% less Inpatient admissions after program implementation</p> <p>Authors report that the MIH programs has the potential to continue to reduce hospital returns and to allow for more care to be done out of the hospital and the homes to improve outcomes and to reduce readmission rates and remain compliant with CMS initiatives</p>	<p>Authors used a small convenience sample of participants that used an EMS provider</p> <p>Small sample lacked population data necessary for a consort diagram</p> <p>Unable to generalize the results due to small population unable to answer if it helped participants</p> <p>Nonparametric pre and posttest paired allowed for the participant to be their own control therefore there were not risk adjustments</p>	L G q

MOBILE INTEGRATED HEALTH AND HEART FAILURE

5	Dharmarajan, Hsieh, Lin, Bueno, Ross, Horwitz, Barreto-Filho, et al (2013)	Retrospective	N=1330157 Heart failure hospitalizations from 2007 to 2009	<p>1,330,157 heart failure hospitalizations for heart failure were identified</p> <p>24.8% (329,308) of heart failure patients were readmitted</p> <p>The proportion of patients readmitted for the same diagnosis was 35.2%</p> <p>Heart failure was the most common diagnosis that drew 30 day or less readmissions</p> <p>Days 0-3 31% of the patients were readmitted,</p> <p>Days 0-7 34% of the patients were readmitted</p> <p>Days 0-15 35% of the patients were readmitted</p> <p>Days 0-30 35% of the patients were readmitted</p> <p>Median times for heart failure readmissions was 12 days</p> <p>Authors recommend programs be implemented to reduce 30-day readmissions</p>	<p>Data limited to Medicare service fees</p> <p>CMS data claims have limited information</p> <p>Did not look at clinical charts</p>	L G q
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6	Scharf, Bissell, Trevitt, & Jenkins (2018)	Retrospective Secondary Analysis	N=97 participants 41 males 56 females	<p>Patients were complex with multiple comorbidities</p> <p>Implementation of the MIH program in the community has potential to reduce hospital admissions / readmissions</p> <p>83.51% of participants had Medicare as primary insurance</p> <p>11.34% of participants had heart failure diagnosis</p> <p>94.85% of participants had 2 or greater comorbidities, 5.15% of participants had a single co-morbidity</p>	<p>Little variation in ethnicity of participants,</p> <p>Data did not include socioeconomic status / background of patients</p> <p>Self-selection bias as it took place in one county in Maryland</p> <p>Participants had opportunity to accept or decline enrollment in the program</p>	L G qu
7	Retrum, Boggs, Hersh, Wright, main, Magid & Allen (2012)	Qualitative	N=28	<p>5 themes Identified by authors</p> <p>Patient's unavoidable perceptions of their illness</p> <p>Psychosocial factors</p> <p>Distressing symptoms</p> <p>Health system failures</p> <p>Adherence with self-care recommendations</p> <p>Patients prioritized their complaints and perceptions differently</p>	<p>Patients from an academic medical center with heart failure and transplant services</p> <p>Participants were younger ages with diagnosis of left ventricular dysfunction leading to heart failure</p> <p>Patients from one specific metropolitan area</p>	L G qu

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8	Ashton, Duffie, & Millar (2017)	RCT	N=200 2 areas	<p>Financial impact of community paramedicine</p> <p>Renfew, marginal cost per client was \$ 5,675 and \$5,731 for Hastings</p> <p>Cost QALY for Renfew annually is \$67,560 and \$76,413 for Hastings annually</p>	<p>There are few RCTs regarding community paramedicine</p>	L G qu
9	Crockett, Walroth, Degenkoi b, & Jung (2017)	Pilot study	N=6	<p>Visit lasted 1 hour in time by a pharmacist</p> <p>Mean number of medication problems = 2 (identified as incorrect dose & frequency; not having the correct medications or all pf the prescribed medications, or not having refilled the medications)</p> <p>Pharmacist provided interventions including calendar creation for medication schedule, filling medication boxes, medication education, smoking cessation, and education on any barriers identified by the pharmacist</p>	<p>The amount of time the authors spent screening patients for the study</p> <p>ICD-9 codes did not always reflect the diagnosis of heart failure</p> <p>Further times spent in preparation for the home visit and education</p> <p>The pilot study involved others working in their full-time role, the authors have since implemented community paramedicine providers with resources and communication to the pharmacist</p> <p>Continued funding is difficult due to</p>	L G qu

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					<p>the minimal insurance of the patients enrolled in the study</p> <p>The area of the home visits, clients often had address changes and where not necessarily home when providers went into the home</p>	
10	Ziaecian & Fonarow (2015)	Non evidence-based study	n/a	<p>5.7 million Americans have a diagnosis of heart failure</p> <p>Goal for healthcare systems per CMS initiatives is to decrease 30-day hospital readmissions for patients with heart failure diagnosis</p> <p>Among Medicare patients between 2008 and 2010 64% of HF patients had readmissions, 35.8% died in the year after their admission</p> <p>Highest readmission rate day is day # 3</p> <p>17-35% of patients' readmissions are secondary to heart failure, 53-62% of readmissions are secondary to non-heart failure causes</p> <p>Prediction models had poor identification or potential readmissions when using administrative data</p>		L H q

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				<p>Hospitals in area without large amount of resources had an increased incidence of readmission rates</p> <p>Strategies for early follow up at home have demonstrated a decrease in hospital readmissions in heart failure patients</p>		
11	Bennett, Yuen, & Merrell (2017)	Pre and post comparison	<p>N = 193 participants 68 enrollees and 125 comparisons</p> <p>Abbeville county South Carolina</p>	<p>Cost benefit analysis cost per visit: \$205.78 Average inpatient cost per day: \$1,531 Average ED visit cost \$449 Average EMS 911 activation cost \$312</p> <p>Post marginal benefit estimated to be upwards of \$18,198 greater than a 20% return investment</p>	<p>Not a true comparison group was available</p> <p>Smaller sample size</p>	L G q
12	Choi, Blumberg, & Williams (2016)	Non evidenced based	n/a	<p>Community paramedicine or mobile integrated health care to describe a new community-based model of health care, that has been implemented in the emergency medical services (EMS) systems.</p> <p>The focus of these programs allows for healthcare to occur in the community, home or outpatient setting which avoids unnecessary ED visits as well as readmissions. Initially these programs were designed for very rural settings, where there was minimal access to healthcare as well as the very underserved populations who do not have access to healthcare or providers.</p> <p>MedStar, a MIH program in Texas, implemented readmission program for patients with congestive heart failure (CHF) diagnosis and designed the program in</p>		L H q

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				<p>conjunction with cardiology and implemented the readmission program.</p> <p>MedStar program had a readmission rate of 16.3% compared to the National median of 23% in 2013. Financially \$30,343 in Medicare charge avoidance was achieved as well as an avoidance of \$7,620 per person from October of 2013 to February of 2015. A MIH program in Nova Scotia demonstrated a 23% reduction of ED recidivism between 2002 and 2003. Further programs began to develop, Nevada implemented MIH programs which devolved a focus on alternative transportation, direct telephone lines to nurses, and community paramedicine programs in the home</p>		
13	Staffan, Swayze, & Zavadsky (2017)	Non evidenced based	n/a	<p>MIH outcomes and measures identify program structure</p> <p>EMS is rapidly growing in the Medicare part B arena</p> <p>MIH toolkit identifies outcomes, measures and goals as a guideline for community paramedicine interventions</p> <p>MIH toolkit identifies Nurse triage intervention guidelines</p>		L G q
14	Lang, Spaite, Oliver, Gotschall, Swor, Dawson, & Hunt (2012)	Non-Evidenced based	n/a	<p>The Federal Interagency Committee on EMS (FICEMS) and the National EMS Advisory Council (NEMSIC) developed a model to guide in the development of a model for EMS agencies to develop, implement, and evaluate EMS systems.</p>	<p>This model does not measure patient outcomes.</p>	L H q

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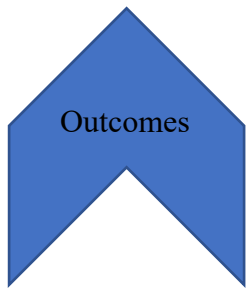
				<p>FICEMS and NIMSEC recommend that after design and implementation follow up with quality improvement and evaluations are important for program growth and development.</p> <p>Pilot testing is important in the implementation stage to obtain information for program evaluation</p>		
15	Redflash Group Medtronic Philanthropy (2014)	Non evidence based	n/a	<p>MIH program evaluation is necessary to ensure that MIH programs are delivering patient centered care. In it important the MIH programs have performance markers that are met, and program evaluation is important to ensure the implementations are appropriate and that patients are receiving the patient centered care the program was intended for.</p> <p>Factors that should be evaluated are operations, healthcare quality and total cost of care.</p> <p>Calculation of cost savings is important for survival of the program as well as growth and expansion of the program</p> <p>Evaluation of the MIH program should be utilized in Triple Aim in accordance with the recommendations of the Institute for Healthcare Improvement.</p> <p>The Three Aims:</p> <ol style="list-style-type: none"> 1. Better Healthcare: improvement in safety, effectiveness and patient centered care. This should be done in appropriate time with equity and effectiveness. 		L G q

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				<p>2. Better Health: improvement in the population’s overall health.</p> <p>3. Lower costs: the total per-capita cost of healthcare should decrease, and performance measures should be intended to focus on cost savings</p>		
16	Ranganathan (2016)	Non evidenced based	n/a	<p>Evaluation of a MIH program in is important as it demonstrates importance and value for the stakeholders.</p> <p>Program evaluation should focus on program impact in relations to patient health outcomes, patient satisfaction, and financial cost of the program and cost savings.</p> <p>Evaluation incorporates both qualitative and quantitative data</p>		L G q
17	Saunders, Evans, & Joshi (2005)	Non evidenced based	n/a	<p>Process evaluation is necessary to look into the structure of the program, identify strengths, weaknesses, and if interventions were implemented.</p> <p>Process evaluations are important to determine if the program implementation went was planned as well as to identify challenges and successes.</p> <p>Process evaluation not only assists in understanding the implementation, but also allows the evaluator to determine the health promotion program was successful</p>		L G q

Appendix B

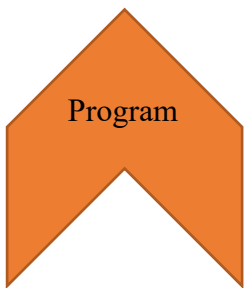
Theoretical Framework



Outcomes

- What is the impact of the program on participants, both intentional and non-intentional?
- What are changes in participant skill sets, behaviors, and dispositions relevant to the program characteristics?
- In what ways do participant and program characteristics contribute to program short-term and long-term outcomes and impact?

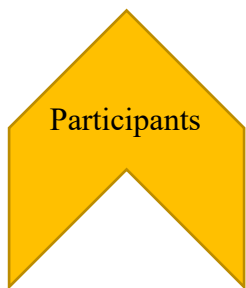
- Reduction in readmission rates and readmission costs
- Improvement in home visits, discharge education and follow up in effort to reduce hospital readmissions
- Short term: reduce 30- day readmission rates
- Long term: improvement in health status and reduction of health care costs



Program

- What are the relevant characteristics of the program?
- To what extent is fidelity of implementation maintained?
- How satisfied are participants with their program experience?
- How do stakeholders interact with the program?
- What evidenced-based practices and challenges can be identified within the program?

- Improvement of health status at time of discharge
- Patient home visits to address inpatient needs at home
- Evaluation of the program for potential expansion and improvement to better address patient needs and reduce health care costs
- Patient education and home intervention teaching regarding diet, home safety, and medication management



Participants

- What are the relevant background characteristics of the participants?
- To what extent do participants meet program criteria?
- To what extent can a comparison group be identified?

- Patient records
- Program participants
 - Care managers
 - Care providers
 - Providers making the MI diagnosis

(Adapted from Research and Evaluation)

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Appendix C

Data Collection Sheet

Patient	Date	Diagnosis heart failure	history of heart failure	age	Gender	Reasons for visit	Intervention done	Intervention coded	Education done	Education coded	Outcome treated not transported	Outcome treated a transport

- Key for all except Intervention coded and education coded:
yes=1
no=2

Key for Intervention coded:
IV medication = 1
Breathing treatment =2
Activities of Daily Living = 3
Safety evaluation = 4
Need for transport to hospital = 5
Medication box schedule fill =6
wound care = 7
other = 8

Key for education coded:
Medication education =1
nutrition education =2
discharge education =3
safety education =4
Disease process education = 5
outpatient resource education = 6
symptom education = 7
other = 8

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Appendix D

Gantt Chart

