

COMPARING STAFFING MODELS FOR FIRE BASED MOBILE  
URGENT MEDICAL SERVICES

by

Adrienne Jo O'Brien

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As members of the DNP Project Committee, we certify that we have read the DNP project prepared by Adrienne Jo O'Brien entitled "Staffing Models for Fire Based Mobile Urgent Medical Services" and recommend that it be accepted as fulfilling the DNP project requirement for the Degree of Doctor of Nursing Practice.



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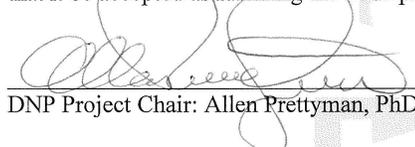
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Date: November 13, 2017

Final approval and acceptance of this DNP project is contingent upon the candidate's submission of the final copies of the DNP project to the Graduate College.

I hereby certify that I have read this DNP project prepared under my direction and recommend that it be accepted as fulfilling the DNP project requirement.



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Date: November 13, 2017

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SIGNED: Adrienne Jo O'Brien

## DEDICATION

This project is dedicated to the many people who have provided mentoring, support, love and encouragement throughout my continuing education. Abigail Merchant, Hanna Cordova and Bonnie Longacre have been a tremendous source of support and love for many years before my nursing education began, and have pulled me through the most difficult times. My mother, who is also a Nurse Practitioner, served as a mentor, role model, and gave unconditional love and support throughout this process. My grandmother also served as a role model and provided unconditional love and support from childhood, and I wouldn't be where I am today without her. Finally, my husband Joseph and two sons Aiden and Steve, have ensured my home is always full of laughter and love. My husband's support and dedication to me and our family has allowed me to achieve my goals as a FNP, and finally complete my DNP Project.

A very special thanks should be given to the Green Valley Fire District and their governing board. Additionally, Fire Chief Wunder, Division Chief Sayre and Battalion Chief Modrzejewski for their foresight in developing such an innovative program, and their continued support of the program in its infancy.

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## ABSTRACT

**Background:** Comparing Full-Time (FT) and Part-Time (PT) staffing models for a mobile integrated health (MIH) program established by a local Fire Department.

**Objective:** Determine if the program is sustainable and which staffing model is more effective at obtaining sustainability.

**Design:** Quality Improvement project with retrospective data review.

**Setting:** Green Valley Fire District in Green Valley, Arizona. A predominant retirement community.

**Target:** The residents of the Green Valley Fire District.

**Interventions:** Utilizing the RE-AIM framework, a retrospective review of the data collected by the previously implemented MIH Program in Green Valley was completed. The framework was utilized to review relevant data and determine if the program has achieved the expected outcomes, and maintained a sustainable and transferable MIH program.

**Measurement:** Decrease in emergency medical (EM) calls for service with the implementation of the MIH program. Comparing staffing models for consistency in services.

**Results:** The results showed a decline in EM calls for service with the MIH program, and more consistency in availability and patient services with the FT staffing model.

**Limitations:** The demographics of the community limit the generalizability and transferability of the data obtained from the project. Additional data should be collected and analyzed both retrospectively and for successive years to substantiate the benefits and continue to improve the effectiveness of the MIH program.

Conclusions: The program could be used as a model for other MIH programs, with adjustments made for the respective community. The value or sustainability of any MIH program cannot be limited to revenue solely. Other perspectives of value added service and cost savings must also be considered.

Significance: This study highlights the effectiveness of an MIH program in a small retirement community and shows the benefit of a FT staffing model versus a PT staffing model for consistency of patient care and daily program operations. There are also multiple aspects of value to an MIH program, some of which are difficult to conceptualize and measure based on historical models of healthcare delivery and Fire Department Services. Further review of these types of programs is needed to establish the overall benefits of MIH.

## CHAPTER 1 – INTRODUCTION

### Problem Description

The country is looking to find new ways to improve healthcare. The issue of improved access to healthcare affects all Americans, and is a common topic of discussion in the political arena. According to The White House Press Secretary (2017), some of the most common points discussed regarding medical care are decreasing costs, improving patient outcomes, increasing access to care and improving the continuity of patient care. The idealized direction under the current presidential administration is finding new and innovative ways to make these concepts into a working reality (The White House, 2017). One method for improvement would be utilizing alternative resources and integrating them into parts of the system that are already in place.

An example of this is the Mobile Integrated Health (MIH) concept. In various locations in the United States, there are programs developing that are using the current emergency medical services systems that are in place and expanding the services to utilize nurse practitioners and physician assistants as part of those services. The purpose of this integration is to address the gaps in care, increase access to care, improve continuity of care, improve patient outcomes and decrease costs (Beck et al., 2012).

The Emergency Medical Services (EMS) system has grown significantly over the past few years. The National Registry of Emergency Medical Technicians is the only nationally recognized certification for EMS providers. Their publicized historical data for all EMS providers starts in 2006 and indicates that at that time, they had 277,626 EMS providers encompassing First Responder to EMT-Paramedic (National Registry of Emergency Medical

Technicians [NREMT], 2007). The most recent data from NREMT (2017), indicates they currently have 359,669 EMS Providers. Additionally, per the Bureau of Labor Statistics (2015), EMS is projected to grow 24% over the next decade. This is a rapid rate in comparison to most other occupational fields. Even with the history of significant growth and the projected continued growth, EMS providers and systems have not been acknowledged as healthcare providers that can bill for services, unless it is in the event of transporting a patient to a hospital. They have also been limited to transporting their patients to a hospital, even if a lower level of care may be more appropriate. This is shown to be an ineffective and inappropriate method of treatment for patients. It is costly, often does not have beneficial patient outcomes and rarely improves continuity of care (Beck et al., 2012; Nejtek, Aryal, Talari, Wang, & O'Neill, 2017).

The costs for responding, treating and transporting a patient have also gradually increased with no indication that insurance companies are considering reimbursement for the services beyond those in a transport (Choi, Blumberg, & Williams, 2016). The EMS systems in the U.S. are pushing to find methods for reimbursement for their services, and mobile integrated health appears to be one of those methods (Choi, Blumberg, & Williams, 2016).

### **Local Problem Description**

One of the mobile integrated health programs that is currently in place is in Green Valley, Arizona. The Green Valley Fire District has implemented a unique program to address the gaps in patient care within their community with the goal to generate revenue to balance the increasing costs of EMS services that are not reimbursed.

The Green Valley Fire District (GVFD) is in Green Valley, Arizona. The GVFD (2015) is responsible for the fire and emergency medical services of their district, which covers

approximately 15 square miles. There are 74 employees at GVFD, including suppression and administrative personnel. The suppression personnel (firefighters) are mandated to be educated at the minimum level of an Emergency Medical Technician – Basic or Paramedic. (EMT-B/EMT-P). GVFD has 24-hour coverage of their district, with five fire stations, and a minimum of 3-4 firefighter/EMT's at each station on one engine. Each station also has a minimum of one EMT-P per shift, and per station. They respond to all calls for service, including medical calls.

The 2010 U.S. Census is the most recent information obtainable, showing Green Valley with a year-round population at that time of 21,391. The listed number of residents over the age of 65 was 72% (United States Census Bureau, n.d.) The geographic region within the district is primarily identified as a retirement community, with multiple age-restricted housing developments. From the months of November through May, the elderly population increases to approximately 30-35,000 residents per the Green Valley Community Coordinating Council, due to out of state residents residing there for the winter months (T. Ward, personal communication, June 16, 2016). Thus, the emergency medical responders are treating and transporting predominantly elderly patients, and often these are patients whose primary and specialty providers are from another state.

As of June 2017, GVFD does not carry a Certificate of Necessity (CON) with the State of Arizona to transport their own patients (Arizona Secretary of State, 2015: Green Valley Fire District [GVFD], 2015). Patient transports are contracted with American Medical Response (AMR). In the event of a medical call initiated through 911, at least one GVFD engine and one AMR transport unit will respond. The staff from GVFD and AMR will work collaboratively to determine the need for the patient's care. AMR and GVFD EMS providers have their respective

Medical Direction to determine on scene protocols or to provide additional medical direction on scene as needed. The EMS providers cannot act or treat independently of their Medical Direction in the State of Arizona (Arizona Secretary of State, 2015).

Until October 1, 2016, the State of Arizona required that EMS providers, responding to a patient request for care, had to transport the patient to definitive care (Emergency Department), or allow the patient/legal guardian to refuse transport if they were legally competent. EMS providers were not allowed to transport to facilities that are considered a lower level of care. These facilities include urgent cares, and primary or specialty care offices (Department of Health and Human Services [DHHS], 2016). Although the state law was amended in October of 2016, the Medical Director for individual EMS providers can still dictate and supersede the legislation, to have the patient transported to the ED. It is also mandatory that the EMS providers contact their Medical Director any time the patient is not going to the ED (Arizona State Legislature, 2017). The Operations Chief at the Green Valley Fire District, Joseph Kosiorowski, indicated since the law has changed the EMS providers in the Green Valley Fire District are still not utilizing the variable options for transport outside of the ED at the request of their Medical Direction (J. Kosiorowski, personal communication, May 8, 2017).

With limited options available to the EMS providers in GVFD, there was a noted number of non-critical patients that were transported to the emergency department when they were likely not good candidates as a patient for emergency care (Modrzejewski, 2010). The basis for determining if a patient was not likely a good candidate for transport was determined based on criteria for common treat and release illnesses/injuries seen in both ED and urgent care settings. These included, but were not limited to, mild respiratory symptoms, need for prescription

medication refills, simple sutures, health education, wound care, resources to preventive care, dermatological complaints, or need for basic lab work (Modrzejewski, 2010). The burden of transporting non-critical patients to an emergency department includes the cost of treatment in an emergency department, the cost of ambulance transportation to the emergency department, the cost of staffing, supplies, and vehicle maintenance for the EMS providers, and the lack of more appropriate levels of medical treatment for the patient (Modrzejewski, 2010).

### **Available Knowledge**

Recognizing that there was a need for alternative methods of treatment for the patients in the Green Valley community, the Green Valley Fire District began to investigate the possibility of a Nurse Practitioner working in conjunction with EMS providers, in the pre-hospital setting to decrease the number of non-critical patients being transported via ambulance to the emergency department, and to provide an additional value added service to their residents (Modrzejewski, 2010). GVFD considered the Nurse Practitioner role specifically, since a Nurse Practitioner can practice independently in the State of Arizona without Medical Direction from a physician (Arizona State Board of Nursing [ASBN], 2009). Employing a Nurse Practitioner was also a more economical approach for the Fire District, since they are generally salaried less than a physician (MidlevelU, 2013). As part of the investigation, GVFD conducted a survey with the residents, asking if this alternative response model would be favored and supported. The response was favorable for the program (Modrzejewski, 2010).

Additionally, a preliminary study was conducted in 2009 by one of the department Battalion Chiefs, Dan Modrzejewski (2010), prior to initiating the Nurse Practitioner program. This study involved a survey completed by the emergency medical responders in the district, for

each call they responded to over the course of four months, from October 1, 2009 to January 31, 2010. The survey asked if a Nurse Practitioner could have assumed care of the patient in the field instead of transporting the patient to the emergency department. Prior to implementing the survey, the emergency medical responders were given training on the common practices of a Nurse Practitioner in the Urgent Care setting, and an established treatment criterion was developed for review with the patient, if needed. The results of the study indicated there was a possibility of decreasing overall ambulance transports in the district by an average of 27.5% monthly (Modrzejewski, 2010).

The data collected from the community survey, and the preliminary study completed by Battalion Chief Modrzejewski (2009), was presented to the GVFD Board of Directors for review and approval to initiate the NP program. After approval from the board, the Fire Based Urgent Medical Services program was developed and launched. This model of a Mobile Integrated Health (MIH) program has been in operation since March 2015 (Green Valley Fire District, 2015).

The suppression employees of GVFD are trained in a paramilitary environment and format (GVFD, 2016). These methods are used to encourage camaraderie, trust and teamwork among them. It is also a vital aspect of having a respected and structured chain of command in the event of an emergency. These models are utilized due to the high stress and intensity of the calls for service, and the need for quick and accurate reactions (Rhodes, 2006). As a result, the employees of GVFD, like many other fire districts, are close knit and the respect is earned through time and trial with the employees. The Nurse Practitioner role was introduced as a dual administrative and suppression role. The administrative functions of developing, maintaining and

continuing the Fire Based Mobile Urgent Medical Services (FBUMS) program were to be blended with the quick and reactionary response of the suppression units. This was implemented without structured suppression training on the part of the NP, limiting the awareness of the common practices, procedures and culture of the suppression units and employees. Likewise, the suppression employees were not given a structured training and education on the procedures and culture of the NP's. Consequently, both parties required proactive communication to blend their individual roles into the best working relationship for both GVFD and the patients they serve.

The Nurse Practitioner(s) have worked in conjunction with the GVFD EMS providers to identify and treat appropriately triaged patients in the pre-hospital setting, instead of transporting them to the ED. Additionally, residents within the district could call an established and publicized appointment scheduling line and request to have the Nurse Practitioner respond to their location for a medical evaluation. The patients who contacted the appointment line were medically triaged when they called an on-duty NP, RN or Paramedic. When appropriate, the Nurse Practitioner would respond and treat the patient without activating the EMS system/response. Since the initiation of the program there have been two staffing models utilized for the NP's: 1) Full time staffing with one lead NP, and one per diem NP; 2) Part time staffing with four part-time NP's. The models varied with the intention of creating consistent patient care and increased availability of the NP's. There has not been an evaluation of the effectiveness of the staffing models since the program was initiated.

## **Review and Synthesis of Literature**

### **Access to Care**

Approximately two-thirds of the geriatric (elderly) community in the United States have multiple chronic medical conditions, and they make up 66% of the costs for the total healthcare budget in the U.S. (Centers for Disease Control and Prevention [CDC], 2013). Homebound elderly have been found to be the most vulnerable of the elderly population, with the least amount of access to healthcare. In 2011, there were approximately 922,000 homebound patients in the U.S. that had a disability or activity limitation. It is estimated that only 11.9% of homebound elderly receive primary care services in the home (Choi, Marti, Bruce, & Kunik, 2012; Ornstein et al., 2015). These patients are more likely to be hospitalized, have twice the number of chronic medical conditions than the same demographic that are not homebound, and they are more likely to suffer from depression and dementia (Ornstein et al., 2015).

The inability or difficulty for the patient to leave the home, and the lack of homebound services results in extended periods of time where patient conditions are not evaluated and monitored. Once their chronic conditions reach a point of exacerbation, they contact emergency medical services (EMS) and they are transported to the emergency department (Abrashkin et al., 2016). Choi et al. (2012), found that having access to a healthcare provider to discuss acute medical concerns, and having scheduled follow up, significantly decreases visits to the ED for the homebound population.

### **Costs of Emergency Care**

Medicare costs have increased significantly in the past decade for patients utilizing the emergency department. In 2003, the average cost per emergency department (ED) visit was

\$698. In 2012 that cost had increased to an average of \$1390. These costs do not include the use of emergency medical service systems and ambulance transports (Solberg et al., 2016).

Nationwide the average percentage of reimbursement for billed EMS treatment and transport are lower than reimbursement for billed treatment in the hospital. Medicare patients make up approximately 35% of EMS reimbursement nationwide (Solberg et al., 2016), and the number is significantly greater in the Green Valley Fire District where 72% of the population is age 65 or older as of 2010 (United States Census Bureau, n.d.) and predominantly insured through Medicare. One study by Tadros et al. (2012), indicated that identification of frequent EMS users within a certain area, followed by a collaborative intervention from a case manager and local social services, resulted in a significant reduction in the use of EMS services, and subsequently costs at 28% and 32% respectively. A second study by Rinke, Dietrich, Kodeck, & Westcoat (2012), that utilized the same approach of identification of frequent users and intervention by case management, showed a 79% decrease in transports to the ED, and a \$15,000 savings in a period of 12 weeks.

Wilcoxson (2016), evaluated a community based integrated health program where a paramedic and NP were paired and responded to calls for service to provide treatment, if necessary, and connect the patient to community resources. This decreased the call volume of the patients that contacted EMS frequently reduced the burden of cost for EMS, as well as the potential cost of inpatient care at the local hospital. In a similar study, it was found that EMS intervention to an appropriate level of care, instead of the ED, would decrease Medicare costs anywhere from \$283-560 million per year. That number would likely double if private insurance

companies also allowed for alternative treatment options (Alpert, Morganti, Margolis, Wasserman, & Kellerman, 2013).

Another study conducted in San Diego evaluated a program where high frequency users of the ED were identified and contacted by a case manager who assisted in finding alternative community and health resources for the patients. The high frequency users made up 11% of the total transports for the paramedics, which equated to \$6.4 million in charges, of which \$4.6 million were uncompensated (Tadros et al., 2012). Intervention with the case manager and utilization of the alternative resources led to a 37% decrease in EMS encounters, and a 32% decrease in EMS charges. During the study, one of the frequently utilized hospitals had a decrease in patient encounters of 28%, a decrease in ED charges of 12% and a decrease in admissions of 9% with a decrease of inpatient charges at 5% (Tadros et al.).

Finally, the average cost of one hour of Fire and Rescue Response was calculated by both the Smithfield Model and the Charles River Associates Model (2014). The listed average was \$776.47 for both models. These models included the average cost per hour of the vehicles utilized in the response, which was \$250 per hour as indicated as an average by the local Association of Fire Chiefs (Blake, Wiese, & Ip, 2014). They also list six personnel per response, and include the cost of an ambulance. The personnel costs include the salary of each individual in the response, uniform costs, retirement costs and holiday pay (Blake, Wiese, & Ip, 2014). These models have a different staffing and pay scale than GVFD, but they give an estimated cost per hour as a framework for determining those costs within GVFD.

## **Continuity and Quality of Care**

Nationwide, the elderly population makes up 12-21% of all ED visits, while they account for only 14% of the population (Karam, Radden, Berall, Cheng, & Gruneir, 2015). In the Green Valley area, the numbers are significantly higher based on the average age of the population and the basis that it is a retirement community. Karam et al. (2015) also noted 43.9% of their study population had at least one return visit to the ED within six months of the initial visit. At least 7.5% return three or more times within a three-month period, and over 80% have at least one unaddressed medical concern during the ED visit. During their study, it was noted that post ED discharge interventions that included an integrated model of care, with access to additional community resources, was the most beneficial to the patient, and decreased the return visits to the ED.

A second study indicated that an alternative method of treatment would be greatly beneficial among the elderly population, based on the lack of admission and even the lack of need for diagnostic testing on patients transported to the ED. Approximately 53% of elderly patients transported to the ED during the study were not admitted. Of these patients, 62.8% had normal vital signs upon arrival in the ED, and 18.9% did not have diagnostic testing during their course of treatment. The presenting problem of “injury” was more likely to be discharged, whereas “infection” was twice as likely to be admitted. Also 25.4% of the patients that received a CT were later discharged from the ED, and 30.1% were admitted. Some 70% of all CTs were of the head in this patient population. Establishing a protocol for alternative treatments of injury patients, that present with normal vital signs, and low probability of diagnostic testing would

provide a more appropriate level of care for these patients and avoid the costs of the ED (Burke, Rooks, Levy, Schwartz, & Ginde, 2015).

For the alternative treatment models that are available, the home care model has shown to have improved care coordination, higher performance, more availability and quality improvement over the standard medical clinic setting (Hing, Kurtzman, Lau, Taplin, & Bindman, 2017). The patients and families were more satisfied with in home care, and in the instances where the care was provided in a skilled nursing or assisted living facility, there was significant amount of time saved by personnel in the preparation and organization of the patient transport to, and return from an ED visit. Additionally, the plan of care was simplified and there was evidence of improved communication by the provider responding to the patient and interacting with the patient and staff (Dwyer, Craswell, Rossi, & Holzberger, 2017).

The models that have been studied for mobile integrated health have generally utilized a NP or PA as the healthcare provider. Multiple studies have shown the overall health of the patient, mortality risks, and quality of care do not differ between Physicians, PAs and NPs (McCleery, Christensen, Peterson, Humphrey, & Helfand, 2014). The use of PAs and NPs is also generally associated with less cost than physicians when considering salary, use of resources and overall effectiveness of care provided (Martin-Misener et al., 2017). Finally, a collaborative model of physicians and NPs was found to have the same quality of care and adherence to compliance measures as the physician only models (Virani et al., 2015). It was also noted that the physician's knowledge of the NP and their scope or skills, increased the likelihood that the Physician would refer a patient to an NP.

## **Mobile Integrated Healthcare**

Mobile integrated healthcare (MIH) is not a new concept, but it has been gathering increasing attention from EMS and healthcare providers, patients and politicians across the country. With varied types of programs and a lack of established guidelines or protocols nationwide, there have been fluctuations in the success of these programs. The common goals for MIH remains the same, even with varied needs in individual communities. Improved access and continuity of patient care, utilizing the most appropriate resources, and working collaboratively with the EMS systems that are already in place (Choi, Blumberg, & Williams, 2016).

The model of MIH is based on the theory that the EMS systems, which are already in place, are providing care and accessing patients on a 24-hour basis, every day. By augmenting this system, and adding additional alternative resources, the patient becomes the focus of the care. This is done by bringing the healthcare to the patient when appropriate, and avoiding the historical patterns of costly ambulance transport to the emergency department. Each community has a unique population that must be considered when implementing an MIH program. There must also be available resources working in conjunction with the MIH providers to effectively treat the patient, maintain quality outcomes, and create sustainability of the MIH program. Some of the resources listed include NPs or PAs, EMS Providers, social workers and community resource personnel (Beck et al., 2012).

One study by Nejtcek et al. (2017) demonstrated that a successfully implemented MIH program decreased ambulance transports and emergency department and hospital admissions. This works to reduce the costs for the patient, insurance companies, hospitals and EMS systems. In this study, the patients who utilized EMS/ED services most frequently, had improved

healthcare outcomes and a notable increase in access to care based on the 24-hour availability of MIH services.

### **RE-AIM Framework**

According to Virginia Polytechnic Institute and State University (2016), also known as Virginia Tech (VT), the RE-AIM framework is commonly used to identify facilitators and barriers of a research intervention. The purpose is to determine if the intervention is transferable to other populations or locations. The major components of the RE-AIM framework are based on the name: Reach, Efficacy, Adoption, Implementation and Maintenance. This framework provides a consistent method for evaluation of interventions that is generalizable in various types of settings.

The Reach of the project includes the identified target population and additional demographic information ranging from age and gender to income, ethnicity, health and education. The number of participants that were involved in the intervention versus the number of known subjects within the target population, and their representativeness of the target population will provide valuable data on the reach of the intervention (McGoey, Root, Bruner, & Law, 2015; VT, 2016; Wozniak et al., 2012).

The Efficacy of the study evaluates the positive or negative impact of the study on quality of life and clearly identified outcomes. These can be both objective and subjective measures depending on the goals identified. There is often a theory-based model, which the measures are derived from, and attrition rates should be noted (if relevant) (McGoey et al., 2015; VT, 2016; Wozniak et al., 2012).

Adoption consists of the description and delivery methods of the intervention, the total number of participants and their proportion to the population. The representativeness of the settings and interventions. Finally, if there is an inclusion and exclusion criteria or randomization, it should be noted in the adoption (McGoey et al., 2015; VT, 2016; Wozniak et al., 2012).

Implementation includes the actual use of the intervention, duration of use, adaptations to the intervention or protocols on individual levels, consistency in delivery of the intervention, the time and cost of the intervention. The generalizability of the study is also addressed, and barriers or adaptations to overcome barriers are noted to increase generalizability or explain how it is lacking (McGoey et al., 2015; VT, 2016; Wozniak et al., 2012).

Maintenance is the follow up immediately, or a specified time after the completion of the intervention. The included information is the significant findings and measured outcomes. The level of maintained interventions, and the cost of maintaining the interventions (McGoey et al., 2015; VT, 2016; Wozniak et al., 2012).

### **Context**

Contextual factors can influence various aspects of an intervention. These factors should be identified and evaluated to aid in understanding the influences surrounding the program, and provide a complete account of the intervention. The contextual elements can influence the generalizability and transferability of the intervention if they are not identified and addressed appropriately and thoroughly. The intervention and the context cannot always be considered separately, and are often interwoven. However, appropriate reporting of known contextual

factors remains essential in a complete evaluation of any intervention (Howarth, Devers, Moore, O'Çathain, & Dixon-Woods, 2016).

Important contextual elements that may influence the effects of this intervention include unfamiliarity with the area and local resources, workload constraints due to driving time, multiple administrative duties for one individual, and a complicated patient demographic. The experience qualifications for hiring of NPs within the FBUMS program were flexible. This led to staffed NPs with varied backgrounds and experience in providing healthcare to the target population. The limited community awareness of the availability and capability of the FBUMS program are also contextual factors to be considered.

### **Resource Utilization**

Local resources become a vital part of the healthcare system after a visit with a healthcare provider, and the high-risk patients often benefit the most from access to these resources (Karam et al., 2015; Tadros et al., 2012; Wilcoxson, 2016). Knowledge of the available resources, methods of contacting and communicating with the resources and understanding the protocol for their involvement are required for successful transition of the patient. While this knowledge can be learned, it takes time and multiple interactions to develop rapport and trust between the healthcare provider and the resources (Blacklock et al., 2015). For the GVFD FBUMS program having multiple duties for one Full-Time NP, and/or the use of several Part-Time NPs, it may be difficult to quickly and effectively know what the available resources are and to transition patients to them appropriately.

## **Workload Constraints**

Driving time and administrative tasks for the NP also impact their availability for patient care, and the extent of patient care. The distance from the office of the NP to one end of the district is approximately 10 miles with a 15-minute drive time. The drive from the south end of the district to the north end is approximately 12 miles, and a 10-minute drive time if utilizing the north-south interstate that runs through the district. Finally, driving from the east to the west side of the district is nine and a half miles, and averages a 20-minute drive time. As the patient visits are based on urgent medical concerns and EMS activation, there is not a set route to align patient visits based on proximity to the next patient. This has the potential to create a significant amount of time that the NP is driving to and from patient visits, and diminishes the time available for additional patient encounters. In addition, the NP is responsible for all aspects of the patient visit, which includes gathering patient consent, insurance information, demographic data, history, physical exam, diagnostic testing orders, prescription orders, resource allocation, discharge summaries and complete documentation of the patient encounter. In most medical facilities, there are at least two other staff members that assist with these aspects of the patient encounter. To ensure the NP is compliant with the basic standards of medical care, they are responsible for obtaining and correctly documenting these items. Inventory, quality improvement/assurance, and equipment maintenance are also the responsibility of the Full Time or lead Part Time NP. Each administrative task that cannot be delegated by the NP further hinders the availability of the NP for additional patient encounters.

## **The Geriatric Patient**

The medical evaluation and treatment of geriatric patients differs greatly from that of other patients (Besdine, 2016). According to Besdine (2016), a significant difference is the average number of diagnosable medical conditions. The elderly have an average of six diagnosable medical conditions. Major medical conditions lead to individual organ system disease, which adversely affects other organs and results in multiple organ system diseases.

The treatment for these medical conditions is generally multiple prescription medications or polypharmacy, which increases the risk of side effects, adverse events and drug interactions (Patterson et al., 2014; Romskaug et al., 2017). Polypharmacy is most commonly defined as the consumption of four or more medications concurrently. The combination of age related physiological changes of multiple organ systems and polypharmacy can limit the ability of the patient to metabolize medications. This further complicates the common risks associated with polypharmacy (Patterson et al., 2014).

Cognitive decline can make it difficult for a healthcare provider to obtain an accurate medical, social and family history, medication reconciliation, and known compliance to medication consumption and/or healthcare treatment (Besdine, 2016). This functional decline makes it difficult for the patient to get to medical appointments, diagnostic testing, follow up and the pharmacy for prescribed medications. Several factors can contribute to the patient's limitations. These include but are not limited to visual impairment, inability to self-transport, lack of necessary ambulatory aides/medical equipment, and multiple healthcare providers in multiple locations. Additionally, the patient may have a medical power of attorney that is to be involved in their medical care, or an advanced directive that limits the type of care the patient is

willing to receive (Besdine, 2016; Conroy & Turpin, 2016). These are just some of the complex factors involved in treating geriatric patients, but they present additional consideration for the NP when providing and coordinating clinical care in the predominantly elderly demographic of the GVFD.

### **Varied Clinical Experience and Background**

There are various specialty clinical practice options available to the NP in Arizona (ASBN, 2009). With these options, there is often varied backgrounds, skills, experience and comfort levels with each individual provider. Of the four part-time NPs, the background experience varied from emergency department, urgent care, acute care, inpatient and family practice. Each background lends both advantages and disadvantages to the effectiveness of a MIH program. The strengths and weaknesses of the individuals and their background or experience also influences the MIH program and can change the consistency of care dependent on the provider.

### **Community Awareness**

Finally, community awareness of the availability of the program and the scope of practice of the NP is an additional factor to consider. Most Fire Districts do not have a background in marketing, or a strategy for disseminating non-emergent information. Historically, this has not been necessary since the Fire and EMS systems have been in operation for several decades, and the method for activating these systems has been universal in the United States since the 9-1-1 system was designated in 1968 (National Emergency Number Association [NENA], 2014). With the launch of a new and little-known program such as MIH, the local fire district is responsible for notifying their residents of the availability and capability of the program. The efforts of the

marketing and dissemination of information directly influences the level of awareness within the community and affects the success of any MIH program (Nitsch, 2013).

Each of these contextual factors should be considered when evaluating the overall barriers and facilitators of the intervention. These factors are considered to better understand this specific intervention, and to allow for adjustments in the intervention and/or the context of future program designs (Blacklock et al., 2016).

### **Rationale**

The RE-AIM Framework is designed to evaluate the performance of a program on various levels, to identify facilitators and barriers of translation (VT, 2016). Since the FBUMS program has been in operation utilizing two different staffing models at different times, the RE-AIM framework was applied to identify the barriers and facilitators of each staffing model. The information gleaned from the RE-AIM framework was compared between the two staffing models, and assisted to identify which parts of each staffing model can be used for successful translation into a similar MIH program. It will also aid in improving the existing staffing model within FBUMS to help achieve the intended goals and outcomes as desired.

Using the RE-AIM Framework, the staffing models of the FBUMS program in GVFD were evaluated and compared for reach, adoption, implementation, effectiveness, and maintenance. The two staffing models reviewed were: 1) Full time staffing with one lead NP, and one per diem NP; and, 2) Part time staffing with four part-time NP's. The timeframes for comparison were the months of January-April 2016 and January-April 2017. These months are being compared because the individual staffing models were utilized consistently within each timeframe.

The RE-AIM Framework will be utilized as follows:

1. Reach- Did the intervention reach the intended target population of residents within Green Valley? Are the patients that were treated within the FBUMS program a representative sample of the community?
2. Efficacy- Were the initial goals of the program met? Did the method of delivery decrease costs for the Fire District, patients and insurers?
3. Adoption- Has the intervention been adopted by the residents of Green Valley? What was the level of penetration into the target population? Was the sample representative of the general population for purposes of transferability?
4. Implementation- Was the intervention being implemented as intended? Were changes made to the program, when appropriate, to better suit the intended outcomes? Was the intervention used consistently? What barriers and facilitators were identified in the implementation of the intervention? Can the intervention be generalized for use in other MIH programs?
5. Maintenance- Was the intervention sustainable in a cost-effective way? What were the significant findings and how do they compare to the goals and desired outcomes of the intervention? Was the intended delivery of the intervention maintained through the specified timeframes?

Once the staffing models were evaluated, the findings were compared to establish the facilitators and barriers of each model with the goal of creating a MIH model that can be translated and utilized by others, and improve the current FBUMS program within GVFD.

### **Specific Aims**

The primary purpose of this project is to compare staffing models for a Nurse Practitioner (NP) led mobile urgent medical services program developed by the Green Valley Fire District in Green Valley, Arizona. The program was developed to reduce the number of non-critical patients being transported via ambulance to the emergency department within the district. However, it has been continually revised in an attempt to create an effective and sustainable program that has value added service for the community. Since the start of the program, there has not been an official evaluation of the effectiveness of the program or the various staffing models utilized. The staffing models were evaluated using the RE-AIM framework, to determine the facilitators and barriers of each model. This information can potentially aid in the creation of a MIH model that can be translated and utilized by others, and improve the current FBUMS program within GVFD.

## **CHAPTER 2 – METHODS**

### **Intervention**

In March of 2015, the first NP unit was initiated with one full time NP. The structure of the program was heavily dependent on the NP, the individual level of comfort for patient care, and the availability in scheduling. The program was launched and advertised to the residents through multiple outlets including local Home Owner's Associations (HOA), volunteer organizations, and specialty groups in the area. The program had many variables in types of service based on the knowledge and experience of the NP. The availability of service was also varied, based on the needs of the individual NP. Eventually the first NP resigned without a steady or consistent timeframe of service in the district. For that reason, the initial phase of the FBUMS program is not being evaluated for this project.

In January of 2016, four part-time NP's started their employment with GVFD. As previously mentioned, each NP came from a varied background in training and experience. The available schedule of the NP's was varied by days, times, and number of shifts per month. There was 50 hours per week available for the NPs to work. With these changes in place, the program was reintroduced to the suppression employees and to the residents of Green Valley.

The primary goal for the suppression employees remained minimizing the number of transports of non-critical patients to the ED. Based on their knowledge and experience, the suppression employees would call the on-duty NP to inquire if the NP could take disposition of the patient. This was after it was determined the patient was stable enough to refuse transport to the ED, and the Medical Director had given permission for the patient to refuse. The NP would respond to the patient's home, or speak to the EMS providers on scene to determine if the patient

was manageable from the perspective of the individual NP. This was based on the individual's scope of practice and level of comfort for accepting treatment of the patient. If the patient was accepted by the NP, the usual progression of a typical clinic visit would ensue. The patient was evaluated and treated at their home, or wherever they were initially seen by EMS providers. Once care was completed, the NP released the patient to self-care, or a higher level of care as indicated. The appropriate documentation was completed and filed for billing with a third-party billing company. The billing company was responsible for the dissemination and collection of the appropriate bills for the care provided by the NP.

The alternative method for initiating a patient encounter was through an established and publicized hotline created by GVFD. During operating hours, and some after hours, the patients were triaged by either Division Chief Katherine Sayre, BSN, or Battalion Chief Dan Modrzejewski, EMT-P. The hotline also had a voicemail service for missed calls, which would be returned at the next most appropriate opportunity. Once appropriately triaged, the patient was added to a schedule for the NP based on their availability. As with the calls from the EMS Providers, the NP would respond to the home or requested location of the patient and provide the necessary care, followed by documentation and submission for billing.

This staffing model continued until October of 2016. During that time, there were periods of gaps in coverage of the schedule, and varied days or hours of availability on the schedule. During that same timeframe, the patient encounters generated through the suppression employees and the appointment line gradually declined. A multitude of factors contributed to this decline, but the overall impact was less revenue generation, and decreased chance of sustainability.

In an effort to revive the program, provide greater consistency of services and availability, GVFD decided to hire one full time NP, and keep 2-3 per diem NP's for extra coverage. In October of 2016, one full time NP was hired for a 40-hour per week work schedule. Only one per diem NP opted to remain on the staffing roster, with an average of two eight-hour shifts per month. The schedule was set for the on-duty NP to be available Monday through Friday 0800-1600. The initial responsibilities of the full-time NP were to continue patient care as needed and as called upon. Additionally, the NP was to ensure the structure and integrity of the program continued through the previously implemented quality assurance and improvement measures, and continue developing plans for growth and progression of the program. Prior to this change in staffing, the lead part-time NP was responsible for quality assurance and improvement measures.

As the busy season began in January 2017, the full-time NP had been in operation with a consistent schedule for approximately three months. The suppression employees were aware of the scheduled availability of the NP, and the program was again advertised to the residents through multiple outlets including local Home Owner's Associations (HOA), volunteer organizations, and specialty groups in the area.

At this time, the program is still operating with one full time NP, and one per diem NP. The per diem NP is utilized on an average of two shifts per month, to maintain his or her skill set and knowledge in the FBUMS setting. The program and staffing models had not been officially evaluated for their effectiveness since the inception of the program.

## **Study of the Intervention**

The RE-AIM Framework has been chosen to study and compare the two interventions, or staffing models. The RE-AIM Framework was chosen to determine the facilitators and barriers of the interventions, and compare the relevant and available data collected during the use of each staffing model (McGoey et al, 2015). The goal is to translate the project findings into a sustainable model for the GVFD FBUMS program and potentially other MIH programs. Appendix A shows the breakdown of the RE-AIM Framework as it applies to this intervention.

### **Reach**

The target population for either intervention, or staffing models, are the patients treated by an FBUMS NP that reside in the boundaries of GVFD. The number of patients treated was compared to the estimated population in the district to determine penetration. In order to evaluate the representativeness of the sample population to the target population, the zip code and age was recorded for the sample of patients from both interventions. These were compared to the known demographics of the target population.

### **Efficacy**

There are several factors to be evaluated for the efficacy of the interventions. To address the initial goal of the FBUMS program, the number of patients seen per staffing model and the number of transported patients were evaluated to determine if the transports decreased by 25% as predicted. The number of patients transported to a hospital by GVFD EMS during the working hours of the NP was compared to the number of patients seen by the NP on those same dates to determine if there was a significant impact on the number of EMS transports when the NP was in service. In addition, the methods of program delivery were compared to identify which resulted

in the most patient encounters, and help to determine if one method is more effective over another. The EMS initiated encounters for the NP were compared to the encounters initiated by the appointment line to determine the efficacy of the program delivery models. The number of encounters where the NP responded and determined the patient needed transportation to the hospital or a higher level of care was also recorded and considered. This information helps to determine whether the interventions improve the access and availability of healthcare to the target population. Finally, to determine if the treatments rendered by the NP were less expensive than being treated in an emergency department, the billing codes used by the NP were compared to the common billing codes for similar services in the ED. The ED cost comparison was chosen because the prior option for treatment within GVFD for an urgent or non-critical medical concern was transport to a hospital and treatment in an ED.

### **Adoption**

The FBUMS program was designed to deliver in home urgent medical services to the residents of GVFD through a NP that is employed by the district. The staffing models included four part-time NPs with varied schedules, available days and hours. The other option utilized for the program was one full time NP with a set schedule of available days and hours, and one per diem NP scheduled on days the full-time NP was unavailable.

The first method of delivery was EMS based calls where the suppression personnel on scene triaged the patient and determined an NP could potentially assume care of the patient. The patient also had to consent to treatment from the NP, and a medical refusal had to be accepted by the suppression personnel medical director. The other method was a published appointment line triaged by a paramedic, RN or the NP when the patient called. If appropriate, the patient was

then scheduled for an appointment with the NP and treated accordingly. The data on the number of encounters initiated by each method of delivery, during the working hours of the NP, would indicate the level of adoption by the EMS providers of GVFD and the residents of Green Valley respectively.

The participants that were included in the evaluation are the residents of GVFD treated by the FBUMS NP during the two study periods. The age and area of residence were compared to the general population within the district for representativeness. The number of repeat patients versus new patients was unable to be determined due to the de-identification process. This information was going to be evaluated to obtain a more accurate level of penetration. The number of patient contacts missed or declined by the NP was noted as possible patient encounters, and the number of patients transported to a higher level of care by the NP was noted to determine appropriate adoption of the program and to demonstrate the level of understanding of the capabilities and scope of the NP. This data has been recorded by the FBUMS administrators and NPs daily, and was reviewed after data collection.

A more detailed set of data was collected to evaluate the representativeness of the sample population. Due to the unique demographics of the population, this data was collected as part of the contextual factors influencing the intervention. The data included age and insurance status. Gender was a planned data point; however, it was removed in the de-identification process. This data was previously collected separately from the Electronic Health Records (EHR) as part of the monitoring of the patient encounters for the program.

Finally, the patient encounters that were excluded from the data collection are patients seen outside of GVFD boundaries, privately contracted patients, and GVFD employees or their families.

### **Implementation**

To determine the use of the intervention, the number of patients that were treated based on an EMS initiated calls was compared to the number of patients treated that were initiated based on the appointment line. The percentage of each was calculated for the timeframe of each study.

The timeframe evaluated was January-April 2016 and January-April 2017. These timeframes were picked due to the high call volume within GVFD, and the consistent use of the staffing models during those times.

The adaptations that were made during implementation of the program were discussed and evaluated as indicated. One of the adaptations was the method of triage. The procedure for triage was adjusted during the program from the RN and Paramedic model to the NP model. Originally, the difference in the NP accepting versus declining encounters based on the triage system was going to be evaluated, however this information was not available in the data collected. Any additional adaptations were discussed as they presented during the quality improvement project.

The consistency of delivery between full-time and part-time staffing models was evaluated based on the number of shifts and hours worked, consistency in scheduled days, and the effect of vacation and sick time utilized in both periods.

The cost was determined by looking at the positions of full-time with benefits versus part time with additional available hours, and how frequently those hours were utilized. The equipment, vehicle, mileage and inventory costs were assessed based on the monthly report generated by the Division Chief.

The generalizability of the program was addressed based on the previously recorded demographics of the sample population, the square mileage of the district, the structure of the fire district and the governing board, the varied population size depending on time of year, the rural location of the department, and any private contracting for services in the FBUMS program.

The potential barriers of the program that limited implementation will be discussed later in the project. These include, but are not limited to the new concept of the program, FD versus NP background/culture, current billing practices, insurance contracts, payment delay, background/experience of individual NPs, and time constraints.

The potential facilitators of the program that assisted in implementation will be discussed throughout the project. These include, but are not limited to, GV Board of Directors and community support, a program model that was easily adaptable, NP capability of independent practice, nationwide MIH movement, and positive community feedback of the program with patient satisfaction surveys.

### **Maintenance**

The significant findings of this quality improvement project reviewed the penetration of the target population to determine if there is a need for additional measures to increase the knowledge or awareness of the FBUMS program. The benefits or detriments of the full-time versus part time staffing models were reviewed for indications of the model most likely to

remain sustainable. Determining there were cost savings based on decreased ambulance transports with the FBUMS program and staffing models. The costs of both staffing models were also compared with the actual revenue generated with each model.

The measured outcomes were evaluated to determine if the program successfully decreased ambulance transports, decreased costs to the varied stakeholders, and improved access to care. The outcomes that were not measured, but potentially could be measured in future projects are improved quality of care, improved continuity of care, and improved patient outcomes.

To determine the level of maintained interventions the availability of the NP based on days and hours worked, the number of patient encounters (911 and Appointment), and the cost versus revenue were evaluated for both staffing models.

Cost of maintained interventions included the cost of one full-time employee with benefits, and one per diem employee salary during the specified timeframe. This was compared to the cost of four part-time employees without benefits and their salary over the specified timeframe. The cost of equipment, vehicle maintenance, and inventory was also be compared for both timeframes.

### **Measures**

The RE-AIM Framework is designed to evaluate the performance of a program on various levels, to identify facilitators and barriers of translation (VT, 2016). Since the FBUMS program has been in operation utilizing two different staffing models, the RE-AIM framework was applied to identify the barriers and facilitators of each staffing model. The measured outcomes extracted from the RE-AIM framework was then compared between the two staffing

models, and assisted to identify which parts of each staffing model can be used for successful translation into a similar MIH program. It will also aid in improving the existing staffing model within FBUMS to help achieve the intended goals and outcomes as desired.

The RE-AIM framework combines factors that influence internal and external validity, to evaluate elements of a program beyond just the efficacy. The framework addresses and integrates multiple aspects of a program to determine the context under which the program is found to be both internally and externally valid (McGoey et al, 2015). This increases the reliability of the intervention, by defining the specific criteria that the intervention was implemented and evaluated with. Future interventions can be modeled after the original intervention, and adapted in the areas needed, to suit the multiple variables in the new setting (VT, 2016).

### **Analysis**

To determine the multifactorial influences of the NP program and whether there is an overall decline in the EM call volume and which staffing model provided more consistent and impactful results several data points were collected, reviewed and compiled.

In an effort to strengthen the correlation between decreased EM call volume and the presence of an NP on certain shifts, the data should be reviewed prior to the implementation of the MIH program and continue to be monitored under a consistent staffing model for another two years. As this DNP project concludes with some influential data promoting the continued and future use of MIH programs in the EMS settings, the Principal Investigator (PI) plans to remain involved in leading efforts to create and sustain optimal performance measures in this and other MIH programs. The author will request that the appropriate contacts within the GVFD release the same data that has been reviewed and analyzed for this project, for the next two years and the

previous two years prior to the implementation of the MIH program. The information from this project, and the future data analysis will be utilized to provide feedback to the GVFD and any other interested parties with MIH health programs in place or considering development of their own MIH program. The MIH programs are a newer concept in the nation, with limited data available to guide current or future programs. The information obtained from this quality improvement project will be some of the first data reviewed and released on a sustained MIH program working within an EMS system. This QI project will aid in identifying areas for growth and development of a MIH programs in the nation, and hopefully be the start of evidence-based care to patients in the pre-hospital EMS setting that may not need an emergency department visit but have historically had that as the only option for medical assessment and treatment. The outcome of the QI project was determining if the FT or PT staffing models of this MIH program could be sustainable, transferable, and provide the patient with greater continuity of care. Additionally, the project was attempting to determine which staffing model would be more likely to achieve those outcomes. Reviewing the number of appointments in comparison to the number of EM calls when the NP was working, to see if there was the expected 25% decline in EM calls, and reviewing the FT versus PT schedule to determine if there was more coverage and consistency in coverage in one model over the other for improved continuity of care for the patients. An overall review of the program with both models to determine if the model is transferable to other populations or EMS districts/departments, and a review of costs sustained by the PT versus FT model, versus revenue in each respective model. To assess for the effect of time on the outcome of the intervention, information was retrospectively reviewed and measured from previously reported data over a four-month timeframe from each staffing model. The four-

month timeframe chosen was January through April of 2016 when the PT staffing model was utilized, and January through April of 2017 when the FT staffing model was utilized. The data was not altered in any manner, and was reviewed as it had been recorded. The first set of data consisted of partially de-identified patient appointments manually entered into an encounter spreadsheet by the NPs responsible for the patient. The second set of data, from the same timeframes, consisted of partially de-identified patient encounters from EMS/911 calls that were manually entered into an electronic health record by suppression personnel in the Green Valley Fire District. The dates and times analyzed from the EMS encounters were matched up with the dates and times an NP was working. All additional patient encounters were not recorded, except the overall number of calls for that timeframe to compare 2016 and 2017.

### **Ethical Considerations**

The goal of this Quality Improvement Project is to compare the FT and PT staffing models of a Mobile Integrated Health program that is operating in conjunction with a pre-existing fire district. The comparison should help to reveal which staffing model is more likely to be successful, sustainable and transferable to future MIH programs. The data was collected retrospectively for these comparisons. As such, the subjects were not asked to participate in an intervention, which would affect the quality of their health or the care they received. However, the data collected for this project has the potential to improve current and future mobile integrated healthcare and emergency medical services regarding both patient outcomes and cost savings.

Additionally, when evaluating the level of benefit versus burden, the data collected retrospectively can provide valuable information about the various components of a MIH

program and potentially be used for translational research and applied to future MIH programs. All this information was collected without interfering with patient care, or disrupting the patient after the completion of their care since it is based on previously collected data.

Patient privacy is paramount in providing healthcare, data collection, and publication of findings. To maintain the patient privacy during this QI project, the patient information was partially de-identified to exclude the patient name, address, city and medical record number. The names of healthcare providers whose data was reviewed for the project also remained anonymous.

Since this project is attempting to create evidence-based standards of care for MIH programs, and evaluating what staffing models would be the best fit for MIH practice initiation or improvement, it did not need to be considered research for the purposes of an Institutional Research Board (IRB). Review of Quality Improvement (QI) project was conducted by the University of Arizona College of Nursing Committee Chair and two co-chairpersons in addition to submittal to the University of Arizona IRB for review and approval as a QI project. The Fire Chief of the Green Valley Fire District was also advised of the QI project and necessary data collection involved. The Fire Chief also granted and signed a letter of approval for this QI project.

## CHAPTER 3 – RESULTS

### Results

An analysis of the data following the RE-AIM framework revealed the following.

Reach - Did the intervention reach the intended target population of residents within Green Valley? Both the part-time and full-time staffing models reached the intended target population based on the zip codes listed in the encounter forms, and the average age of the patients. The part-time staffing model (PT) provided care to 149 patients from January through April of 2016. The full-time staffing model (FT) provided care to 186 patients from January through April of 2017. See monthly breakdown in Figure 1. The average age of patients for the PT was 66, and the FT was 70. Only one patient encounter was out of the area of the target population with the PT, and five encounters were out of the area for the FT. Based on the demographics and physical location of the community, both staffing models were serving a representative sample of the community.

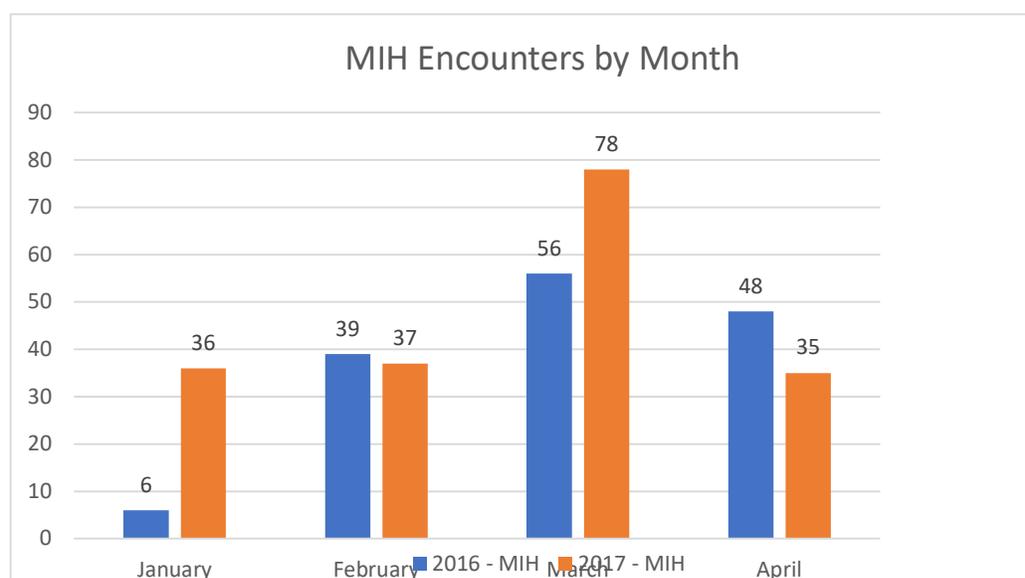


FIGURE 1. MIH Encounters by Month

Efficacy - One of the primary initial goals in developing the FBUMS program was to decrease the number of non-critical patient transports within the Green Valley Fire District. To determine if there was an impact on the number of transports, the overall number of emergency medical (EM) calls completed by the suppression personnel of the fire district for the timeframe being evaluated, was compared to the number of EM calls completed by the suppression personnel when a Nurse Practitioner was working. For 2016 the total number of EM calls within the specified timeframe was 1,369, 570 (42%) were completed while the NP was working. In 2017 the total number of EM calls within the specified timeframe was 1,731, 575 (33%) of which were completed when the NP was working (Figure 2). Even though there was a 26% increase in EM call volume, there was a 9% decrease in the number of EM calls completed by the suppression personnel while the NP was working. In addition, the number of calls completed by the individual NP (Figure 1) compared to the total EM calls completed by the suppression employees (Figure 3) while the NP was working was evaluated. In 2016, the PT NP's took 21% of the call volume, and in 2017 the FT NP took 24% of the call volume (Figure 4). While the numbers cannot be directly correlated to the NP program, there is some evidence to show the program has been effective in decreasing the number of patients seen by the GVFD suppression personnel. The decreased percentage is consistent with a positive impact from the MIH program. The actual number of transports were not delineated from these numbers, as that information was not available in the data set provided.

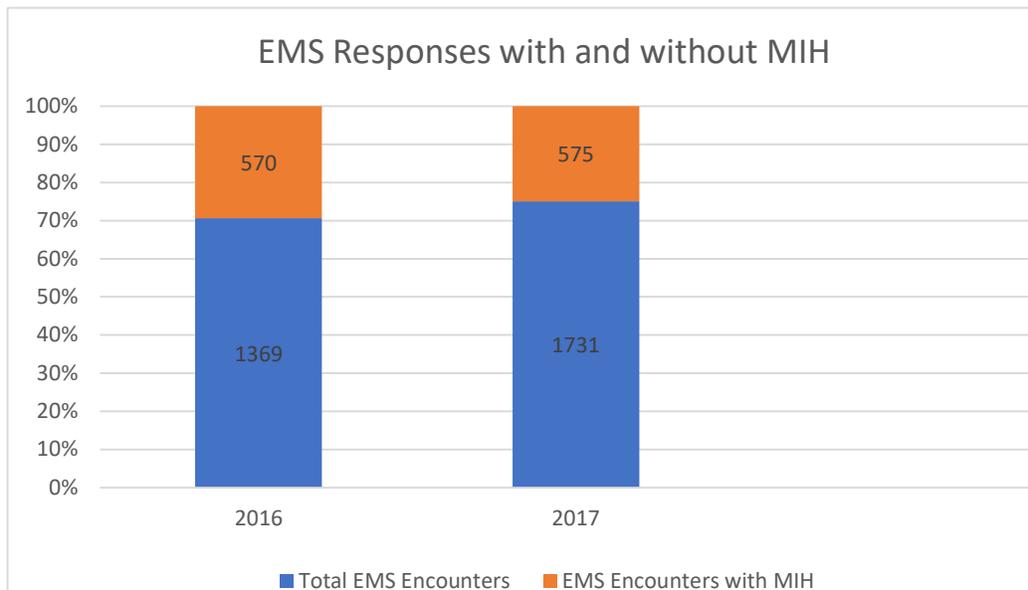


FIGURE 2. EMS Responses With and Without MIH

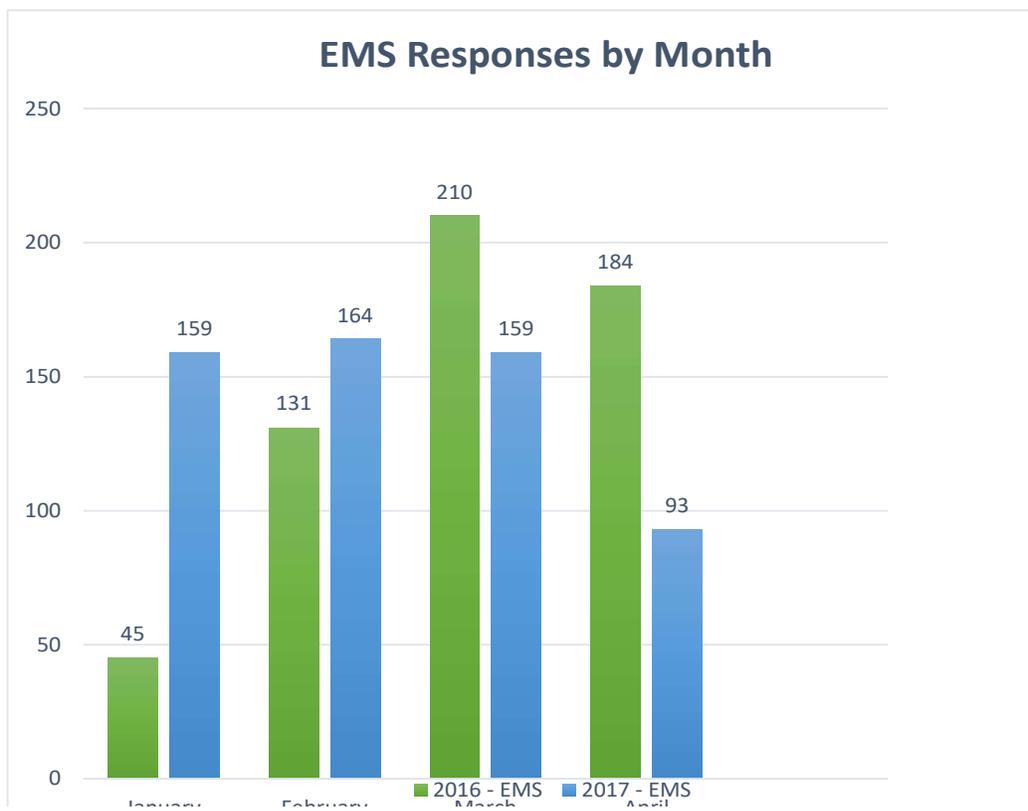
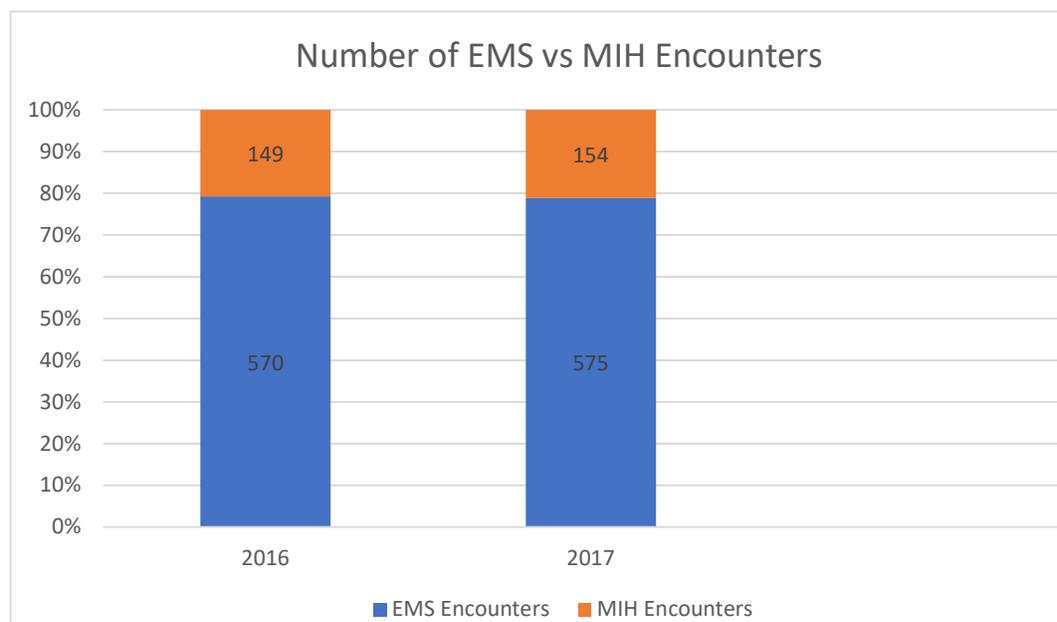


FIGURE 3. EMS Responses by Month



*FIGURE 4.* Number of EMS vs MIH Encounters

The budget for four PT NP's over the identified timeframe was approximately \$32,500 and equipment costs over the same period of time was \$8,250. The total revenue generated during that time was \$4,726.37. The budget for one FT NP over the identified timeframe was approximately \$38,622 and the equipment costs remained the same. The total revenue generated during that time was \$5,866.11. With salary and benefits, the FT NP was approximately \$4982.26 more costly than the four PT NPs over the specified timeframe. However, with the FT and PT NPs taking 21-24% of the EM call volume, the cost savings for utilizing one person in one vehicle should be compared to the cost of staffing and sending one fire engine and one ambulance to each of the EM calls.

As previously mentioned, the average cost of one hour of Fire and Rescue Response was calculated by both the Smithfield Model and the Charles River Associates Model (2014). The listed average was \$776 for both models, and this included the average cost per hour of the

vehicles utilized in the response, as well as personnel. To make a more accurate reflection of the response to calls within GVFD, the personnel was lowered to minimum approved staffing for the FD of one Captain, one Engineer and one Firefighter. The hourly salary and benefit breakdown for these three personnel, based on the Smithfield and Charles River Associates Model, would total \$136.63. The cost for an ambulance should also be excluded since GVFD ambulances are contracted with a private company who bills independently. The average cost of the Fire Engine should be included at \$250 per hour, with a total hourly cost per response of \$386.63. With each EM call averaging 50 minutes, per the call data provided by GVFD, the average cost per call would be approximately \$322.19.

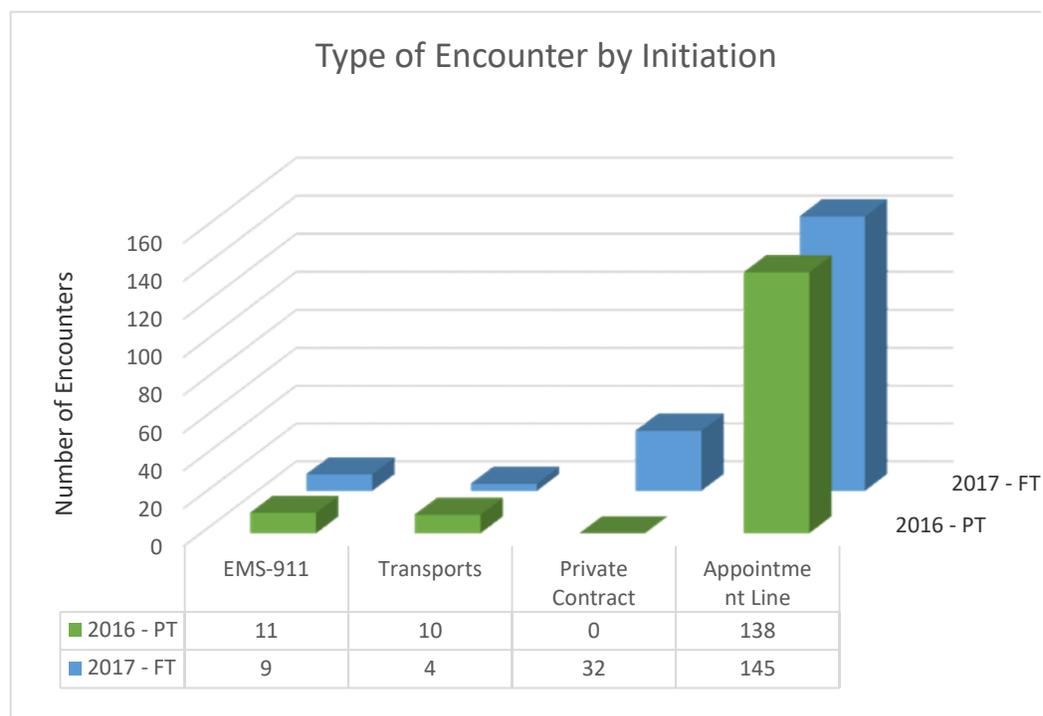
Based on the number of hours worked, the salary provided, and the average daily equipment costs, the PT NPs cost approximately \$52.80 per hour to operate and the FT NPs cost approximately \$63.50 per hour to operate. These numbers do not include any of the revenue generated from the NP billing, and it should be noted that per the data provided by GVFD, each NP visit was an average of 60 minutes. While the revenue generated by the NP billing for services does not directly offset the costs of the salary and equipment, the cost savings on the side of suppression personnel is impacted tremendously. Again, there is not a guarantee that each patient seen by the MIH program would have ultimately utilized the GVFD EM system, but if they had there would have been an average additional cost in suppression personnel of \$103,455 for the specified timeframe in 2016 and \$104,310 in 2017. These estimates are based on the number of non-911 initiated patient appointments for the specified timeframe each year, and they do not include the privately contracted appointments or employee appointments since those would not have been generated through the 911 system.

Finally, the CPT codes used by the FT and PT NPs were 99341-99349 for the basic visit. Any additional medications given, diagnostic testing or procedures performed were submitted with additional CPT codes and the corresponding additional billing. The secondary CPT codes were not noted on the encounter forms where the data was collected.

The correlating maximum charges allowed by the Centers for Medicare and Medicaid (2017) for 99341-99349 are \$60.12 to \$242.39. In 2016 the average bill was \$373.09 and the average reimbursement rate was \$52.22. The average billed amount in 2017 was \$205.21, and the average reimbursement rate was \$40.82. It should be noted that there were multiple missing data points in both years. When comparing the average billed and reimbursed rate for the services provided by the MIH program, to the average bill nationally for an emergency department visit, there is a significant difference. Solberg et al., (2016) indicated that in 2012 the average cost per emergency department visit was \$1390. That is a 73% increase from the highest average bill of the MIH program to the average emergency department bill, and at least \$1000 in savings on average. The patient and the insurance company both benefit from these savings, as well as the medical system as a whole.

Adoption - The number of encounters or appointments that were generated by the appointment line indicates the program was well adopted by the residents of Green Valley. During the specified timeframe in 2016, there was a total of 149 encounters, 11 were initiated by the 911 system, and 17 were employees of the fire district. In 2017, there were a total of 186 encounters, nine were initiated by the 911 system, 23 were employees of the fire district, and 32 were privately contracted appointments (Figure 5). These numbers indicate that 81% of the appointments in 2016 and 78% in 2017, were generated by the residents, showing they had

adopted use of the program. Based on the 12-21% national average of elderly patients utilizing the emergency department, the MIH program numbers were evaluated to determine the level of penetration into the community that did need emergency medical services. Another factor to be considered, according to Burke et al., (2015), 53% of the elderly patients taken to the ED were not admitted. When evaluating the number of EM calls while the NPs were working and comparing them to the number of NP/MIH appointments, it was noted that in 2016, the PT NP's took 21% of the call volume, and in 2017, the FT NP took 24% of the call volume. The number of patients that could find alternative methods of transport were not available for comparison. Additionally, it should be noted that during the specified timeframes, 10 patients in 2016 and four patients in 2017 had to be transported to the hospital after being evaluated by an NP. Finally, as mentioned previously, the average age of patient in the 2016 timeframe was 66 and 2017 was 70. Based on the United States Census Bureau (n.d.) findings in 2010, the Green Valley area has an average population of 65 and above. Based on the average age of patients seen, and the percentage of call volume performed by the MIH program, the appropriate level of penetration of the population was achieved by both staffing models.



*FIGURE 5.* Type of Encounter by Initiation

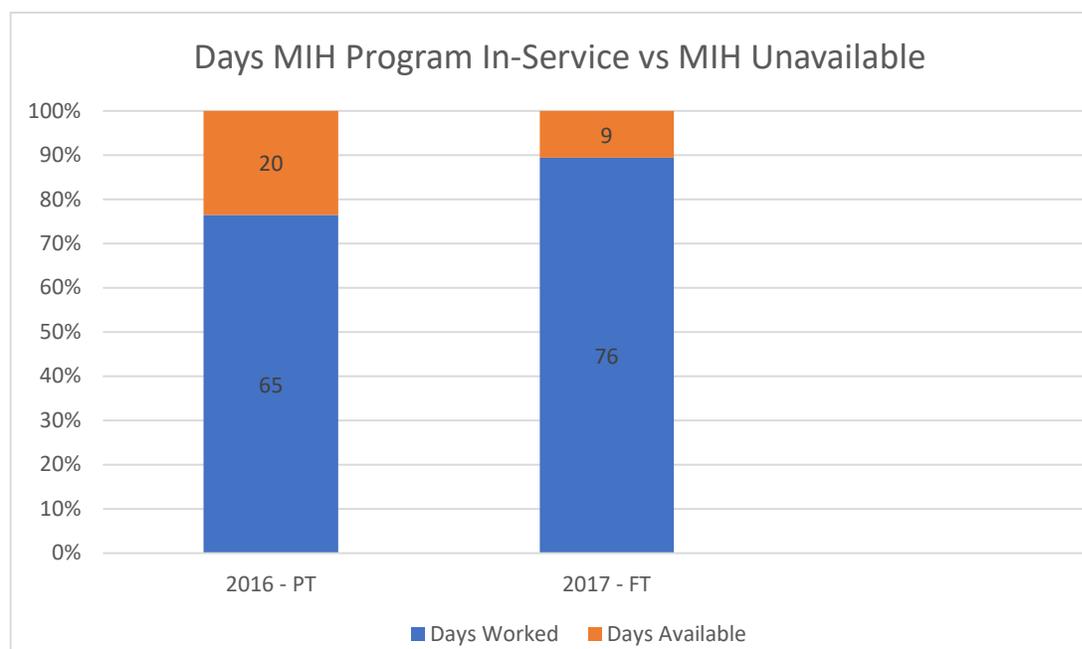
The population targeted by the MIH program is not representative of the general population based on age, for purposes of transferability to the general population. Since 72% of the population are 65 or older in Green Valley, and only 14% of the national population is 65 or older (Karam et al., 2015). Additionally, in 2017, there were only two self-pay or sliding fee patients seen, one patient was publicly insured, and all other patients had some form of private insurance and/or Medicare. In 2016, there were no self-pay or sliding fee patients, one publicly insured patient, and all other patients had some form of private insurance and/or Medicare. Per the most recent data from the CDC (2016), 10.4% of the general population under the age of 65 is uninsured, and 26.3% are covered by public insurance.

Another discrepancy between the population from this QI project and the general population was behavioral health complaints. Based on a review of the patient complaints and

actual diagnosis categories, there were a limited number of behavioral health (BH) complaints. In 2016, there were two BH complaints, and one of them was listed as a secondary diagnosis. In 2017, there was only one BH complaint. For EMS, this is an unusually low number of BH complaints. Recent studies have indicated that 10-12% of emergency medical service calls and the subsequent emergency department visits are due to behavioral health and/or substance abuse complaints (American Psychiatric Association, 2016; Norman, Mello, & Choi, 2016), but up to 45% of all patients presenting to the emergency department have an undiagnosed mental illness (Zun, 2016).

Implementation - The program was implemented to intervene for the non-critical patients that did not need transport to an emergency department. The initial concept was for the suppression employees to call the MIH program and have them respond and treat the patient on scene. As the program progressed, the number of 911 or suppression-based appointments were very limited. In 2016, 7.4% of the appointments were 911 initiated, and only 4.8% in 2017. These low numbers contributed to the development of an established appointment line where the patient could bypass the 911 system and schedule an appointment directly with the MIH program. Apart from the employees and the privately contracted appointments described above, the addition of the appointment line led to the remainder of the appointment volume from the residents in the community. This method also appears to have assisted in achieving the intended outcome by lowering the number of encounters for the suppression personnel when the NP was working. The intervention was not used consistently under the PT staffing model, since the days worked were inconsistent, and the number of missed encounters for the specified timeframe under the PT model was 24, and only 10 with the FT model. Also, with the PT model only 76%

of the days available to work were covered. Under the FT model 89% of the days were covered (Figure 6). This led to discrepancy in availability and care for the patients, as any needed follow up or future scheduling of appointments was inconsistent. A brief overview of the data compared between the FT and PT staffing models (Figures 1-6 as listed previously), can be seen in Table 1.



*FIGURE 6.* Days MIH Program In-Service vs MIH Unavailable

TABLE 1. *Full-Time and Part-Time Data for Comparison*

	<b>Part Time</b>	<b>Full Time</b>
<b>Penetration</b>	149	186
<b>Representativeness Age (Average)</b>	66.29	70.56
<b>Representativeness Zip Code</b>	1 out of area	5 out of area
<b>Decrease in EM Responses</b>	570 of 1369 or 42%	575 of 1731 or 33%
<b>Number of NP Appointments</b>	149	186
<b>Initiated through 911</b>	11 or 7.4%	9 or 4.8%
<b>Initiated Through Appointment Line</b>	138 (17 Employees)	145 (23 Employees)
<b>Private Contract Appointments</b>	0	32
<b>Transport After NP Assessment</b>	10	4
<b>CPT Codes</b>	99342-99349	99342-99349
<b>Repeat Patients</b>	Unable to obtain d/t data	Unable to obtain d/t data
<b>Missed Encounters</b>	24	10
<b>Declined Encounters</b>		
<b>Gender</b>	Unable to obtain d/t data	
<b>Insurance Status</b>	31 W/O insurance	0 W/O insurance
<b>Declined Encounters</b>	Unable to obtain d/t data	Unable to obtain d/t data
<b># Shifts Worked</b>	65 of 121 or 54% (76% M-F)	76 of 120 or 63% (89% M-F)
<b># Hours Worked</b>	650	608
<b>Vacation/Training/Sick Time</b>	Not Applicable	7 Days
<b>Salary Costs</b>	\$32,500	\$38,622
<b>Equipment Costs</b>	\$8,250	\$8,250
<b>Revenue</b>	\$4,726.37	\$5,866.11

The identified barriers when implementing the program were limited 911 initiated appointments, inconsistent scheduling, delayed revenue with medical billing, and varied comfort or experience levels for individual NPs. The facilitators were identified as alternative method for initiating appointments, changing staffing models for consistency in patient care and NP availability, and private contracts for additional revenue sources.

This model could provide a basic framework to be generalized for use in other MIH programs. Noting that having consistent personnel on a full-time basis, with the appropriate comfort and experience level would be highly recommended. Utilizing alternative methods for scheduling appointments outside of the 911 system, or private contracts as another method of penetration and revenue generation is also likely necessary in an MIH program. Identifying the appropriate outside resources for the MIH program, and the patients will also aid in continuity of care, and appropriate levels of care. Finally, understanding that the revenue generated through insurance and private contract billing will likely not sustain the program alone. Limiting the success of the program to the dollar amount in revenue is ignoring some major beneficial impacts on other aspects of healthcare and EMS. Some of the additional items that require evaluation is the potential decline in suppression personnel calls for service, the decreased number of patient transports and/or emergency department visits, which decrease the cost of individual patient care, and the ease of access to a healthcare provider for individuals that are home bound, have limited transportation options, or have extended periods of time they are required to wait to see their primary care provider. Some of these are cost saving measures which should be evaluated retrospectively once the program is already in place, for actual amounts. Some aspects are just a value-added service to a community, and more consistency in care for patients, which cannot be translated into a dollar amount.

Maintenance - As mentioned above, when evaluating the cost savings, the revenue and the value-added service to a community the program does appear sustainable and cost-effective. The goal of reducing non-critical patient transports could not be clearly delineated based on the data collected. However, the decline in overall EM calls when the NP was working, versus an

overall increase in EM calls over the same timeframe indicates that there was some success in lowering EM patient encounters for suppression personnel. While the program did not continue with the original intended plan of delivery through the 911 system, the barriers were overcome by changing the staffing model and the methods of access to care, while continuing to incorporate the original model. For this quality improvement project, the methods of delivering care with each staffing model was consistent, but the access to care progressed as needed to provide more access to the NPs.

## **CHAPTER 4 – DISCUSSION**

### **Interpretation**

Interpretations of this QI project includes the probable correlation between implementing an MIH program and decreasing the volume of EM calls and/or transports for non-critical patients. The availability of the MIH provider to complete an entire plan of care for the patient, including follow up as needed without the limitations of required follow up as seen in a primary care office. While the salary for an advanced practice provider becomes the focal point of many budgetary concerns within EMS agencies, there is some evidence to show that the cost saving within the agency, and the potential for revenue through patient insurance billing, offsets and can exceed the monetary value of the provider salary. This QI project may impact the future of MIH programs, the potential for growth in the MIH industry, the perspective of costs for these programs, and the expectation for future patient care in the EM industry.

### **Limitations**

As previously discussed the specific demographics of the population regarding age and insurance status makes the generalizability and transferability limited. Additionally, the number of behavioral health complaints is also minimal in this community. However, these items do not eliminate the possibility of transferability. They are factors to be considered in advance, when creating MIH programs in varied locations throughout the country.

Other limitations of the study include data entry that was adjusted periodically throughout the timeframes reviewed. There were four different providers inputting the data as well, with some entries left blank. Finally, the background and expertise of the providers varied the approach to individual patient care, and willingness to accept certain patients/healthcare

conditions presenting. This variation potentially changed the number of patients that could have been treated within the MIH program.

Finally, while the program was in place since March 2015, the initial timeframe evaluated was when the four providers were newly hired into this practice. All had previous advanced practice experience, but this field was new to them all. This also may have attributed to less patient encounters in the preliminary phase.

### **Summary**

This QI project key findings include notable benefits to the implementation of a MIH in a pre-existing EMS system. The ease of access to care, decrease in the number of non-critical patient transports to emergency departments, and lower costs associated with MIH care can be attained with initiation of a MIH program. The benefits found with a FT versus PT staffing model include consistency in the delivery and scope of care, and the increased availability of the MIH provider for patient care. One notable strength of the QI project was determining the unseen cost savings for an EMS agency. This cost savings comes through utilization of a minimally staffed MIH unit, that has the capability of assessing, treating, and following up with a patient while billing for services, instead of repeated EMS contacts, with a fully staffed fire engine and ambulance, which occasionally concludes without a full assessment, treatment and follow up plan in place.

### **Conclusions**

This QI project was useful in determining if the current MIH program is sustainable when looking at all points of data, not just the financial points of the actual program. It lends

credibility to the model of MIH, and the ability of other EMS agencies to consider initiating a similar model with evidence to support the need and the cost saving measures.

As mentioned before, a further retrospective review of EM encounters for similar timeframes should be completed to lend support to the decline in EM encounters when the MIH unit was in service. At a minimum, data from the next two years should also be evaluated to determine the consistency in use of the MIH program, especially under the same staffing model currently utilized. It may also aid in identifying other relevant influencing or contextual factors.

Finally, comparing data with other established MIH programs to provide additional supporting data for the use of MIH programs and their impact in various communities would allow for more generalizable and transferable models of MIH programs.

If MIH programs can establish a basic framework that is proven to be effective and transferable, then the movement for additional government and financial support can be driven through appropriate channels to secure more funding and resources for these types of programs.

## CHAPTER 5 – OTHER INFORMATION

### Operational Definitions

Certificate of Necessity (CON) – A certificate that is issued to an ambulance service by the department and that describes the following: (a) Service area; (b) Level of service; (c) Type of service; (d) Hours of operation; (e) Effective date; (f) Expiration date; (g) Legal name and address of the ambulance service; (h) Any limiting or special provisions the Director prescribes.

Current Procedural Terminology (CPT) – CPT codes are the United States' standard for how medical professionals document and report medical, surgical, radiology, laboratory, anesthesiology, and evaluation and management (E/M) services.

Emergency Medical Technician Basic (EMT-B) – A person who has been trained in an emergency medical technician program certified by the director or in an equivalent training program and who is certified by the director as qualified to render services based on the permitted treatment and medication protocols established in the State of Arizona, and by the individual Medical Direction.

Emergency Medical Technician (Paramedic-P) – means a person who has been trained in a paramedic program certified by the director or in an equivalent training program and who is certified by the director to render services based on the permitted treatment and medication protocols established in the State of Arizona, and by the individual Medical Direction.

Emergency Medical Services (EMS) – Those services required following an accident or an emergency medical situation: (a) For on-site emergency medical care; (b) For the transportation of the sick or injured by a licensed ground or air ambulance; (c) In the use of emergency communications media; (d) In the use of emergency receiving facilities; (e) In

administering initial care and preliminary treatment procedures by emergency medical care technicians.

Fire Based Urgent Medical Services (FBUMS) – Utilizing a Family Nurse Practitioners (FNP) to provide medical treatment to GVFD residents with a non-emergent medical concern.

Generalizability – The extension of research findings and conclusions from a study conducted on a sample population to the population at large.

Geriatric – Age 65 or older.

Green Valley Fire District (GVFD) – Green Valley Fire District provides fire protection and emergency services to a suburban and rural area of more than 35,000 constituents. GVFD serves a 45-square mile area and operates out of four stations covering both residential and commercial areas. The District is governed by five publicly elected officials, and funded by the taxpayers of the community it serves.

Medical Direction – Supervision of emergency medical care technicians by a base hospital medical director, administrative medical director or basic life support medical director. For the purposes of this paragraph, “administrative medical director” means a physician who is licensed and who provides direction within the emergency medical services and trauma system.

Mobile Integrated Health (MIH) – A mobile health care unit providing patient care outside of the traditional patient settings, and collaborating with multiple resources to provide high quality, cost effective patient centered care.

Non-Critical Patient – A patient who is alert and oriented, has stable vital signs, and is able to wait 24-hours or less for medical treatment.

Nurse Practitioner (NP) – Registered nurses who are prepared through advanced education and clinical training to provide a wide range of preventive and acute healthcare services to individuals of all ages.

Penetration – The amount a program is utilized within the intended target population.

Registered Nurse (RN) – A nurse who has a diploma, has passed a national licensing exam, and meets all the standards required by the state.

Representativeness – A study sample that accurately reflects the surrounding population.

Sample Population – A subset of evaluated subjects that is representative of the surrounding population.

Scope of Practice – The procedures, actions, and processes that a healthcare practitioner is permitted to undertake in keeping with the terms of their professional license.

Specialty Clinical Practice – Clinical practice within one or more population foci, consistent with the individual education and certification of the healthcare provider.

Stakeholders – Persons or organizations with interest in the quality improvement project, and that may be affected by the outcomes.

Suppression Personnel – Employees that are divided into three platoons of firefighters working a 3-on/4-off shift schedule. The Operations Division provides emergency and non-emergency services, 24-hours a day, 365 days a year.

Target Population – The residents of the Green Valley Fire District.

Transferability – A process performed by readers of research. Readers note the specifics of the research situation and compare them to the specifics of an environment or situation with which they are familiar.

Triage – The assignment of degrees of urgency to wounds or illnesses to decide the order and level of care needed for appropriate medical treatment of a patient.

APPENDIX A: BREAKDOWN OF THE RE-AIM FRAMEWORK

## BREAKDOWN OF THE RE-AIM FRAMEWORK

Items Assessed	Full Time	Part Time
<p style="text-align: center;">REACH</p> Penetration = # Pts seen/Actual Population Representativeness= Age & Zip Code of Pts/Population		
<p style="text-align: center;">EFFICACY</p> Decrease Transports 25%= # Pts seen/ # Pts Transported while NP in service # Pt Encounters FT vs PT # Pt Encounters EMS vs Appt # Pt Encounters with NP response resulting in transport CPT Codes for NP Pt Encounters vs ED CPT Codes		
<p style="text-align: center;">ADOPTION</p> Repeat Pts vs New Pts # Pt Encounters Missed # Pt Encounters Declined PTA Pt Age, Gender, Insurance Status		
<p style="text-align: center;">IMPLEMENT/MAINTAIN</p> # Pt Encounters Accepted vs Declined Through Triage Models # Shifts Worked #Hours Worked Consistency in Scheduled Days Vacation & Sick Time Utilized Salary Costs Equipment Costs		

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