Evaluation of a Nurse Practitioner Led Program on Decreasing Emergency Room Visits

EVALUATION OF A NURSE PRACTITIONER LED PROGRAM ON DECREASING EMERGENCY ROOM VISITS

by

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As members of the DNP Project Committee, we certify that we have read the DNP project prepared by Julia Anne Cyr entitled "Evaluation of the Impact of a Nurse Practitioner Homecare Program on Emergency Department Visits" and recommend that it be accepted as fulfilling the DNP project requirement for the Degree of Doctor of Nursing Practice.

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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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STATEMENT BY AUTHOR

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SIGNED: __Julia Anne Cyr_____

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DEDICATION

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ABSTRACT

Background: The overuse of the emergency department (ED) for non- critical patients has been associated with overcrowding and a rise in healthcare cost. Green Valley Fire Department (GVFD) has created a program, Fire-Based Urgent Medicals Service (FBUMS) with a nurse practitioner (NP). Patients can call 9-1-1 or the "NP hotline" and request to be seen by the NP instead of being immediately transported to the hospital via ambulance.

Purpose: The purpose of this project is to evaluate the impact of the nurse practitioner led FBUMS, on ED visits and ambulance transports.

Methods: A survey was mailed to all persons, age 18 and older, who were seen by the NP with FBUMS between February 2017 and March 2017. The survey asked about the reasons for contacting GVFD, the type of treatment received, and whether they went to ED after treatment.

Data analysis: Descriptive statistics including frequencies, percentages, means and standard deviations were used to analyze each of the answered survey questions in Microsoft Excel©.

Results: Surveys completed (n=42). The majority, 39 (92.9%) stated they did not receive care at the ED within 72 hours following their appointment with the NP, three (7.1%) stated they did. By dramatically decreasing transport to the hospital and associated ED treatment, it is estimated to have saved approximately $53,425 in ambulance costs and $54,210 in ED treatment for a total savings of $99,632.52.

Conclusion: A Fire-Based Urgent Medical Service led by a nurse practitioner decreased emergency room visits and ambulance transports.

INTRODUCTION

Background

Hospital emergency departments are constantly exploring ways to decrease the number of people seeking treatment for non-emergency problems (Soril, Leggett, Lorenzettia, Noseworthy, & Clement, 2015). Non-emergency ED visits are defined as visits for conditions that with a delay of several hours to days, the probability of an adverse outcome is not increased (Uscher-Pines, Pines, Kellermann, Gillen, & Mehrotra, 2013). According to the Centers for Disease Control and Prevention, in the U.S. there are about 130.4 million emergency department visits annually with only 9.3% of those visits resulting in hospital admission (2017). This discrepancy between ED visits and actual hospital admissions suggests that many patients may be effectively treated elsewhere, not in an emergency setting. The over-use of the emergency department not only potentially delays care for patients in emergent conditions but may also increase healthcare spending by provoking excessive testing and treatment and potentially weaken the patient-primary care provider connection (Uscher-Pines et al., 2013).

The overuse of the emergency department is thought to be due to access barriers that prevent patients from seeking care elsewhere such as urgent care clinics, primary care offices and retail clinics. In fact, a study conducted by Weinick, Burns, and Mehrotra (2010) found that anywhere between 13.7 and 27.1% of emergency department visits could be seen at retail clinics or urgent cares. Potential barriers that may impact when patients seek treatment in ED include long wait times for outpatient appointments, limited after-hours care at outpatient offices and transportation. One way to reduce barriers to health care access is to increases the number of primary care providers. For many years the number of nurse practitioners providing primary care

has been consistently increasing (AANP, 2017). The quality of care provided by nurse practitioners has been found to be comparable to physicians and in some cases with higher patient satisfaction (Kurtzman & Barrow, 2017). The Green Valley Fire Department has developed a program, "Fire Based Urgent Medical Service" (FBUMS), led by a nurse practitioner to help increase access to healthcare for people seeking non-emergent, urgent treatment and decrease ambulance usage and emergency department visits. This program provides healthcare services provided by a nurse practitioner in people's homes.

Local Problem

Rural health populations in particular face great challenges accessing healthcare. Rural communities represent 25% of the United States population yet less than 10% of primary care providers (PCP) practice in those communities (Baskin, Baker, Bryan, Young, & Powell-Young 2015). This shortage of PCP's makes the usage of the emergency department not only a more attractive alternative than waiting for an appointment at their primary care office but at times necessary- even for non-emergent situations. Green Valley, Arizona, with a population of only 21,391 persons, and the majority of which are older than the age of 65 (72%), falls into this "rural" health category (census.gov, 2010). A Green Valley Community study recently conducted showed that 20% of their residents called 9-1-1 in 2014, instead of waiting to see their doctor or going to urgent care (Behavior Research Center, Inc., 2014). Additionally, 86% of those 9-1-1 calls resulted in an ambulance transport to the hospital (Behavior Research Center, Inc., 2014). Their findings also showed that 32% of Green Valley residents don't have regular health care appointments (medical, dental or therapy), 5% of the residents indicated they don't drive and 33% stated they lack free transportation (Behavior Research Center, Inc., 2014). Most

importantly, the study indicated that there could have potentially been a 25% reduction in patient transports for non-critical conditions if advanced care provider, such as a nurse practitioner, were available to intercept those patients (Behavior Research Center, Inc., 2014).

The costs associated with emergency department use and ambulance rides are extensive, especially in a rural community like Green Valley. Green Valley Fire Department contracts a private ambulance company, American Medical Response of Maricopa (AMR), who bills independently for their transports. An ambulance ride with an AMR ambulance can cost patients anywhere from $1273.75-$ 1369.88 per ride from Green Valley to Tucson, where many receive treatment at Banner University Medical Center (azdhs.gov, 2015). In addition to the ambulance transport, the emergency department also comes with a high cost. A study conducted by Solberg et al., (2016) found that in 2012 the average cost of an emergency department visit was $1390. Given these numbers, each patient transported to the emergency department can expect to pay anywhere between $2,663.75-$2,759.88 for their care.

To help alleviate the high cost associated with non-acute ambulance transports and emergency department visits, as well as create a more accessible health care system, Green Valley Fire Department created a program utilizing a nurse practitioner to provide healthcare for people with non-critical issues and treat them at home. Green Valley residents in need of non-emergent, urgent, treatment can request to be seen by a nurse practitioner via a 911 call or through their “NP Hotline” number to schedule an appointment with the on-staff nurse practitioner. The nurse practitioner, along with paramedics if needed, will go directly to the patient and provide the treatment. Patients are evaluated and treated for issues such as back pain, dental infection, dehydration/ hydration therapy, dermatology (burns, abscesses, infection,

wounds), respiratory infections, urinary tract infections, laceration repair, medication reconciliation, minor orthopedic injuries; in home services available include portable X-rays and phlebotomy.

Purpose

This project evaluated the impact of the Fire Based Urgent Care Service, led by a nurse practitioner, on emergency department visits and ambulance rides. Data were collected from people who sought care and received treatment from the nurse practitioner, working for the Green Valley Fire Department. The data collected were used to determine if the people needed emergency department treatment with 72 hours after receiving care from the nurse practitioner.

Stakeholders play an invaluable role in project implementation as their vested interest in the program is needed to ensure the program will be given a fair test (Polit &Beck, 2012). Stakeholder's involvement helps to guide projects as they offer greater insight into the depth and scope of the problem at hand (Polit & Beck, 2012). In this project, Green Valley Fire Department is a key stakeholder, and will also be an active participant in this project. As a city fire department, serving more than 35,000 constituents, the well-being of the community's population has always been of the utmost importance. While Green Valley Fire Department has always provided services to those in emergent situations, the nurse practitioner led program offers Green Valley Fire Department yet another way to better connect with the needs of its community. Nurse practitioners are also a vital stakeholder in this project. Without a nurse practitioner, who can provide safe, cost-effective and quality care independently, the Fire Base Urgent Medical Service would not be possible. Finally, and perhaps most importantly, the community of Green Valley will be an important stakeholder for this project. As the people who

will be receiving treatment, their willingness to participate, their experiences throughout the project, as well as their feedback from the surveys will provide invaluable insight into the problem of non-emergent ED visits and will be crucial for the success of the overall project.

Specific Aims

Specific aims are to determine if the Green Valley Fire Department nurse practitioner led program: 1.) Reduce emergency room treatment; 2) Reduce ambulance transportation; and 3) The reasons some people treated by the nurse practitioner later needed emergency room treatment.

FRAMEWORK AND SYNTHESIS OF EVIDENCE

Theoretical Framework

The theoretical framework that will guide my project is the Theory of Total Quality Management (TQM) also referred to as Continuous Quality Improvement (CQI). These two terms will be used interchangeably throughout this discussion. The Theory of Total Quality Management emphasizes the importance of continuous improvement in healthcare to better meet the customers' needs (Grol, Bosch, Hulscher, Eccles, & Wensing, 2007). This is often a multidisciplinary process as inadequate performance isn't seen as an individual problem but a system failure (Grol et al., 2007). The major components of this framework are organizational culture, identifying the leaders and creating a team (Grol et al., 2007). Moreover, the TQM model is important in guiding this project as it will help to identify the patients' needs and how the organization can better meet those needs to prevent an emergency department visit.

The Theory of Total Quality Management was chosen for this project as this framework has been shown to support the development of high-quality primary health care systems

(Matthews et al., 2014). Although research with the use of CQI or TQM studies in outpatient facilities is limited due its use and implementation primarily being in hospital settings, there are a few examples. For instance, an observational study conducted by Matthews and colleagues (2014) found that at the health center level, Type 2 diabetes care was greatly improved through the commitment to using CQI long term. The reasoning found was that the use of this model encouraged regular patient attendance (with use of a patient reminder system) and an improved recording system that created better coordination of patient care in the complex patient/provider environment (Matthews et al., 2014). Additionally, another CQI implementation was found greatly beneficial by Yu and colleagues (2014). Yu et al. (2014) evaluated the role of a CQI initiative that focused on improving peritoneal dialysis clinical outcomes. Their findings showed that after the initiation of a CQI process, peritonitis rates vastly declined and patient survival rates were significantly higher (Yu et al., 2014). Furthermore, the CQI model has been shown to achieve goals in the outpatient setting including the reduction of no- show appointment rates at a mental health facility (Pellegrin, Carek, & Edwards 1995), patient satisfaction improvement with visits (Piccirillo, 1996), continuity of care improvement with providers (Kibbe, Bentz, & McLaughin, 1993) and even in an internal medicine clinic that was able to achieve improvement in numerous daily work functions (Shortell, Bennett, & Byck, 1998; Young, Ward, and McCarthy, 1994). With its high success rates in multidisciplinary care, the TQM framework serves as an excellent fit for this project.

Concepts

Although this project primarily focuses on the sixth principle, understanding all six of the basic principles of the TQM model is important as they influence and interact with the program's

evaluation. The first step is to determine the current state of knowledge about a given issue (Shortell et al., 1998). This was done by Green Valley Fire Department as they determined what exactly patients are needing when calling for emergency help and their awareness of what warrants emergency assistance. Understanding those needs and determining what can be done is the second step; the development of an action plan (Shortell et al., 1998). An example of this was done by O'Connor and colleagues (1996) who implemented a CQI program to improve outcomes with patients who have diabetes mellitus (DM) attending primary care at two clinics in the Midwest. Given the wide need for improved DM care, O'Connor et al. (1996) developed an action plan to better address those needs. They were able to determine an action plan by conducting a meeting with personnel from the primary cares and Minnesota Department of Health (all nurses, physicians, and managers) where all were encouraged to present their idea on how to address those needs (O'Connor et al., 2014). The third step is the application of the intervention on the given issue (Shortell et al., 1998). In continuing with the previously given example, O'Connor et al. (1996) and the team of clinicians were able to come up with a computerized method to audit their care following the initial meeting (O'Connor et al., 1996). For Green Valley Fire Department, this was done by creating the Fire-Based Urgent Care Services with a nurse practitioner. The fourth step requires the undertaking of clinical re-engineering, a process that may go beyond improving current procedures and redefine them (Shortell et al., 1998). O'Connor and colleagues were able to take the results of the audit and review the process of care which led to a modified care system (1996). For Green Valley Fire Department, this is re-working how the department initially responded to all calls, whether they be emergent or just urgent. The fifth step is the actual implementation of the intervention

(Shortell et al., 1998). For Green Valley Fire Department, this was the application of treatment given by a nurse practitioner and paramedic team. The sixth and final step, the outcomes of the program need to be assessed (Shortell et al., 1998). This needs to be done to determine if the program is effective and outweighs the costs associated with the implementation. Going back to the example with Minnesota Department of Health and Midwest clinics, they found their results of patient audit and process of care led to an improved care system that was more effective for all patients enrolled at the clinic (O'Connor et al., 1996). As previously mentioned, this project is primarily focused on this sixth step, as it is assessing the NP programs effectiveness in diverting unnecessary ED visits and ambulance rides. With so many successful implementations of the TQM/CQI framework, incorporating these concepts in the project's intervention can increase the success and sustainability of the NP program.

Synthesis of Evidence

The literature indicates that there's excessive overuse of emergency departments for non-emergent conditions. Many of these non-emergent ED visits and oftentimes, readmissions, are due to conditions that can be effectively treated in the primary care setting (Fraino, 2015). Factors associated with frequent readmissions of the ED include; lack of access to services upon discharge, ongoing or untreated chronic conditions, lack of understanding treatment of follow up plan and even lack of transportation (Fraino, 2015). With evidence suggesting that NPs provide cost-effective and quality care, it seems reasonable to propose that making this care even more accessible (i.e., home care services with a fire department) will also reduce overall healthcare costs.

To gain a better understanding of the impact the nurse practitioner role has had in preventing emergency department visits as well as creating a more cost-effective alternative to medical treatment from a health care provider, several literature searches were conducted using PubMed and Cumulative Index of Nursing and Allied Health Literature (CINAHL). The following keywords were used: nurse practitioner, homecare, hospice, palliative care, cost-effectiveness. Related terms such as Advanced Practice Registered Nurse (APRN), home visit, ambulatory care and long-term care were also used to find relevant articles. Inclusion criteria for the articles included: English language and human species. A date range was left off to increase the spectrum of articles found as data was limited. Eleven articles were retained that applied to the project's purpose.

NP Health Care Outcomes: Safety

There is a great amount of evidence that supports the role of nurse practitioners in healthcare services. Their role has proven to not only be a cost-effective alternative to primary care physicians but also an equivalent, and at times better, in terms of quality of care. Kurtzman and Barrow (2017) compared the quality of care and practice patterns of physician assistants (PAs), nurse practitioners and primary care physicians (MDs) in community health centers. Their findings showed that in 7 of the 9 outcomes studied, there was no statistical difference in NP or PA care compared to MD (Kurtzman & Barrow, 2017). In fact, in the remaining outcomes, NP patients were actually more likely to give health education and counseling (such as smoking cessation counseling) than patients seen by the MDs (Kurtzman & Barrow, 2017). In a randomized control trial, Mundinger et al. (2000) also compared the patient health outcomes in patients seen by a nurse practitioner compared to a medical doctor in a primary care setting.

These patients had recently been treated in an emergency department or urgent care and their findings showed no significant differences in patients' health status at six-month or one-year follow-ups (Mundinger et al., 2000). Further, it was noted that patients with hypertension who were seen by the NP had significantly lower diastolic values than those seen by the MD's (82 vs 85 Hg) (Mundinger et al., 2000). Dierick-van Daele, Metsemakers, Derckx, Spreeuwenberg and Vrijhoef (2009) also conducted a randomized control trial that evaluated the process and patient outcomes between care provided by a nurse practitioner and by a physician for patients with common complaints at the first point of contact in primary care. Their findings also showed that nurse practitioners provided comparable care with no statistically significant differences found in patients' health outcomes, medical resource use and clinical guideline compliance (Dierick-van Daele et al., 2009).

NP Health Care Outcomes: Long-Term Care and Home Health Care Outcomes

There is also evidence suggesting that nurse practitioners can provide quality care outside of primary care services or hospital settings such as long-term care facilities and home health. McAiney et al. (2008) examined the practice model of NPs working in a long-term care (LTC) home and its influence on staff confidence, preventing hospital admissions and assistance in early hospital discharge. Their study found that NPs in LTC homes have a positive impact not only on positive patient outcomes but also on improving staff confidence (McAiney et al., 2008). Similarly, Kennedy and colleagues (2015) in a qualitative evaluation found the NPs role provided a *unique contribution* with *fluid role boundaries* in a multi-professional palliative care context. Nurse practitioners have also been found to reduce adverse health outcomes for patients receiving their care through an in-home health consultation program (HCP). Imhof et al. (2012)

conducted a randomized control trial to evaluate the effects of NPs in the HCP on quality of life, health indicators (such as falls and acute events) and healthcare resource use compared to standard care. They found a significant difference in self-reported acute events for the NP group (n=116 vs n=168) falls (n=74 vs n=101), complications from falls (63.1% vs 78.7%) and hospitalizations (n=47 vs n= 68) compared to standard care (Imhof et al., 2013). Finally, Miller and colleagues (2016) conducted a retrospective cohort study to evaluate how receipt and timing of nursing home palliative care consultations (primarily done by nurse practitioners) are associated with end-of-life care transitions and acute care use. Their findings showed that residents with palliative care consultations, that were primarily done by nurse practitioners, had improved end-of-life care by reduced acute care use and potentially burdensome transitions (Miller et al., 2016).

NP Health Care Outcomes: Financial

Aside from the exceptional healthcare one can receive from a nurse practitioner, the cost-savings is one of the most notable potential benefits. For instance, Martin-Misener and colleagues (2015) conducted a systematic review that assessed the cost-effectiveness of NPs in primary and specialized ambulatory care. Their findings showed that NPs in primary and specialized ambulatory care have equivalent and at times better patient outcomes than physicians and are potentially cost-saving (Martin-Misener et al., 2015). Dierick-van Daele et al. (2010) also did an economic evaluation of nurse practitioners compared to general practitioners in treating common conditions. They also found that consultations with NPs were more cost-effective than for the general practitioner. They attribute the cost differences to differences in salary (Dierick-van Daele et al., 2010).

Although this literature review showed clinical strengths and positive patient outcomes with nurse practitioner care, it has revealed a lack of studies that show a direct benefit to patients receiving NP homecare in lieu of being taken directly to Emergency Department via ambulance. Additionally, many of the research findings compared NPs effectiveness to physician assistants. However, there are different practice limitations for each field and this program (and this project) is specifically pertaining to the role/effect of NPs in homecare treatments. Furthermore, four of the studies (Dierick-van Daele et al., 2009; Dierick-van Daele et al., 2010; Ismail et al., 2013; Martin-Misener et al., 2015) found were conducted in the United Kingdom (UK). Although their findings were consistent with the studies done in the United States, the healthcare system and utilization of NPs is vastly different in UK. Such a significant gap in the literature demonstrates an urgent need for future research so health care providers can provide better quality and cost-effective care at the homes of the patients.

METHODS

A nonexperimental quantitative descriptive design was used to assess the survey results from people that used the Green Valley Fire Departments nurse practitioner led, Fire-Based Urgent Medical Service.

Ethical Considerations

Prior to the initiation of the project, Institutional Review Board (IRB) approval from the College of Nursing at the University of Arizona was obtained (See Appendix C). This approval ensured that all appropriate steps and measures were in place to protect the participants, minimize risks and safeguard privacy (Polit & Beck, 2012). To ensure the protection of

participant's safety the ethical principles of respect for persons, beneficence, and justice were followed.

Respect for Persons

Participants were respected as individuals who are capable of making their own decisions and controlling their actions (Polit & Beck, 2012). Participants were given the choice to participate in the project of own their free will and were not pressured or coerced into participating. Participants read a letter about the project before completing the survey which included implied consent language (See Appendix B).

Beneficence

Beneficence requires that human research only is done to benefit the specific population and to minimize harm (Polit & Beck, 2012). The completion of the survey was completely voluntary, no participants were forced or coerced into completing the survey.

Justice

Justice refers to the participants right to fair treatment and privacy. This also means that participants should be selected based on study requirements, not a vulnerability (Polit & Beck, 2012). The project ensured the confidentiality of their survey responses was maintained as Green Valley Fire Department addressed all surveys and removed any identifying information prior to my receipt. Participants were only asked to disclose their name if they wanted to consent to receiving a $5 gift card in return.

Setting

The project took place in Southern Arizona at Green Valley Fire Department located in Green Valley, Arizona.

Participants

A total of 102 people, age 18 and older, who were seen by the nurse practitioner working for the Fire-Based Urgent Medical Services between February 2017 and March 2017 were mailed a survey. The goal of 40% return rate was set for the survey. Mailed surveys typically achieve less than 50% response rate (Polit & Beck, 2012).

Survey Development

The questions in the survey were written at the 5th grade reading level. The survey was reviewed and approved by three content experts.

Data Collection

Survey distribution and data collection occurred between September 8, 2017, and October 16, 2017. The survey, along with a cover letter, was initially distributed to all people (n=102) that received treatment from Green Valley Fire Departments Fire-Based Urgent Medical Service led by a nurse practitioner between February 1-March 31, 2017. The people were asked to complete the 9-question survey that asked demographic questions, the reason for seeking NP care and if they went to the emergency department after receiving treatment (Appendix A). The surveys were addressed and mailed by Green Valley Fire Department to protect the identity of the participants. Two weeks after the surveys had been mailed out, on September 27th, a postcard reminder, addressed by Green Valley Fire Department, was sent to all participants. All participants received the reminder even if they have completed the survey as the surveys were not identifiable. Additionally, in an effort to further increase the response rate, participants were given an option on the survey to consent to the release of their name and address to receive a $5.00 gift card for completing the survey. Once the participants completed the surveys they were

asked to mail them in a pre-addressed, pre-stamped envelope to Green Valley Fire Department. Green Valley Fire Department reviewed the surveys and mailed out gift cards to those who had consented to them. At the completion of data collection, a total of 42 participants voluntarily completed the surveys. The participants implied consent by completing and returning the survey, this was stated in the cover letter (Appendix B). The surveys were collected and contained in a sealed box until retrieved by me.

RESULTS

Using Microsoft Excel® descriptive statistics including frequencies, percentages, means and standard deviations were used to examine the results from the survey questions.

Sample

A total of n=48 participants responded for a return rate of 47% to the survey, four surveys were "return to sender" and one was sent back stating the person had passed away. Of the returned surveys, one did not specify gender, one did not specify age, three did not specify how they contacted the Green Valley Fire Department, three did not specify whether or not they went to the emergency department 72hours after treatment, and two did not specify why they did go to the emergency department resulting in (n=6) incomplete surveys. The incomplete surveys were discarded to prevent nonresponse bias (Polit & Beck, 2012). The sociodemographic details are in Table 1. Note the mean age for participants was >75 years. This is aligned with Green Valley's demographics as approximately 72% of the population is over the age of 65 years according to the United States Census Bureau (census.gov, 2010).

TABLE 1. *Sociodemographic Characteristics of Participants and Treatment Details* (n=42)

Sociodemographic Characteristics		
Age	Mean (±SD)	75.28 years (13.55)
	Range	27-92 years
Gender	Female	32 (68.1%)
	Male	15 (31.9%)

Addressing Specific Aims #1 and #2

To answer this aim, participants were asked if they had sought care after 72 following treatment from the nurse practitioner. Most people indicated they did not need to go to the ED, thus not needing ambulance transport, following treatment, suggesting they received adequate care at from the nurse practitioner. See Table 2 for more details.

TABLE 2. *Participants Who Sought ED Treatment* (n=42)

Participants who sought ED treatment 72 hours later			
ED visit 72 hours after	Yes	3	7.14%
	No	39	92.90%

Addressing Specific Aim #3

The reasons participants who stated they did receive care in the emergency department following treatment from the nurse practitioner are presented in Table 3. Please note, the majority of the participants who stated they did receive care in the ED following treatment, contacted Green Valley Fire Department through 911 and one was unsure of which time she had needed transportation to the hospital.

TABLE 3. *Details of Participants Who Went to the Emergency Department* (n=3)

Participant	Age and Gender	Method of Contact	Reason	Treatment	Written Response
1	83 F	NP Hotline	Prior use	Other	"I was taken to Banner Hospital by ambulance-same day. Diagnosis: Listeria"
2	91 F	9-1-1	Transportation issue	UTI, URI, Other	"The fire department has taken me to the G.V. Hospital emergency room so many times I cannot remember "why" or date mentioned above. I'm grateful for all their assistance"
3	86 F	9-1-1	Transportation issue, Recommendation from friend/family	Other	"Bowel Obstruction"

When looking at the characteristics of the reasons participants utilized the program and the treatment provided, 78.6% had contacted Green Valley Fire Department requesting Fire-Based Urgent Medical Service through the NP Hotline (n=33). The leading reasons people contacted Fire-Based Urgent Medical Service was an inability to get in with their primary care provider and that they had been recommended to use the service by family/friend. See Table 4 for more details.

TABLE 4. *Contact Details of Participants*

Contact Details of Participants		
How Participants requested to be seen by FBUMS	**Frequency**	**Percentage**
Called 9-1-1	4	9.60%
Called NP Hotline	33	78.60%
Banner	5	11.90%
Reason for contacting GVFD/9-1-1		
Does not have a PCP	4	9.50%
Not able to get appointment with PCP	13	14.30%
Transportation or mobility issue	6	14.30%
Used FBUMs in the past	8	19.05%
Was recommended by a friend/family	15	35.70%
Banner Referral	4	9.50%

See Table 5 for treatment/services provided to the patients. Note the leading treatments/services were indicated for upper respiratory infection (URI) or "earache, cough, cold/respiratory infection" as listed on the survey, and "other" with both at 17 (40.5%).

TABLE 5. *Treatment/Service Provided to Participants*

Treatment provided to participants			
Treatment/Service provided	Back/joint pain	1	2.38%
	Bone, joint or muscle injury	1	2.38%
	URI	17	40.48%
	Asthma/COPD	1	2.38%
	Medication Refill	2	4.76%
	UTI	5	11.90%
	Dehydration/Hydration therapy	1	2.38%
	Dental infection	0	0
	Cut/Trauma injury	2	4.76%
	Portable Labs/ X-rays	1	2.38%
	Other	17	40.48%

Finally, the details of participants satisfaction are in Table 6. Please note these questions were asked using a Likert scale of one to 10 (10 meaning "strongly agree" they are satisfied) with the care provided by FBUMS, and the likelihood they would recommend FBUMS to other people (with 10 meaning "very likely" to recommend).

TABLE 6. *Satisfaction Details of Participants* (n=42)

Satisfaction with Treatment received	Mean (SD)	9.60 (1.17)
Likely to recommend GVFD FBUMs		9.60 (1.19)

DISCUSSION

The project evaluated a largely understudied area regarding the use of a nurse practitioner led fire department program to treat people in their home. The results indicate that the use of a fire department a nurse practitioner led fire department program decreases emergency department treatment and ambulance transportation.

Relationship of Results to Other Evidence

As shown in the results, the mean age for participants was > 75 years. Green Valley, Arizona is largely a retirement community, with 72% of its population over the age of 65 years (census.gov, 2010). This may help explain barriers to access identified in the survey such as transportation, mobility issue, and ability to be seen by a primary care provider. These findings were similar to a study conducted by Fiztpatrick, Powe, Cooper, Ives and Robbins (2004) that found the perceived barriers to health care access in a population with the mean age of 76 years to be transportation, older age, female gender, lack of doctor's responsiveness to patients concerns, low income and medical bills.

Most importantly, the results also showed that 92.9% of the participants (n=39) were able to receive suitable treatment at home provided by the nurse practitioner and avoided an unnecessary emergency department visit. The results correlate with the findings in the literature that nurse practitioners provide high quality care in outpatient environments. The results also dovetail with McAiney and colleagues (2008) findings who found that a practice model with nurse practitioners prevented hospital admission and improved early hospital discharge. Imhof et al.'s (2012) research also showed that nurse practitioners in a home health consultation program reduced hospitalizations.

Furthermore, these findings fit together with prior studies that show nurse practitioners provide quality care, comparable to physicians and in some cases better than physicians, as well as deploying nurse practitioners in the outpatient environment potentially decreases healthcare costs (Dierick-van Daele et al., 2010). This data is also significant because more people are receiving care from a nurse practitioner in outpatient environments, not a physician that they would likely be treated by in the hospital emergency department. Kurtzman and Barnow (2017) compared the quality of care practice patterns of nurse practitioners, physician assistants and primary care physicians in health centers. Their findings found no significant differences in nurse practitioner or physician assistants care compared to the physician in seven out of nine outcomes. In the remaining two outcomes, nurse practitioner patients were more likely to receive recommended smoking cessation counseling and more health education services than patients seeing the physician. Mundinger et al., (2000) also compared outcomes from patients randomly assigned to nurse practitioner's or physicians for primary care follow-up and ongoing care after an emergency department visit or urgent care visit. Their findings showed no significant

differences in patients' health status between the nurse practitioners and physician patients but did find that in patients with hypertension cared for by nurse practitioners had lower diastolic values (Mundinger et al., 2015).

Strengths and Weaknesses

Strengths

The survey was effectively created and vetted by nursing experts. A strong collaboration was developed between the project leader and the Green Valley Fire Department allowing for the development of a system to effectively and efficiently distribute the survey via the U.S. postal service. The surveys were returned via the U.S. postal service and via a collaborative process saved in a secure location without incident until collected for data analysis. Most importantly, the data gained from this project shows home treatment provided by a nurse practitioner working for a fire department reduced unnecessary emergency department visits.

Weaknesses

The surveys response rate goal of 40% was met. However, the final sample size (n=42) was not robust. This is despite sending a follow-up postcard reminder and offering an incentive gift card. Many people only reside in Green Valley during the winter months and travel to cooler areas of the county during the summer months. This may have impacted the response rate as the surveys were sent to the address of where treatment was given, which may not be their primary residence during the time of the survey was mailed. Furthermore, Green Valley's population demographics regarding age affect the generalizability of findings. As previously discussed, the mean age in this project was > 75 years. It is certainly possible findings would differ in a younger age demographic. As indicated in the results 19.05% of participants (n= 8) stated they

had used Green Valley Fire Department nurse practitioner program in the past (See Table 4). It is possible they had been seen by the nurse practitioner more than once in the specified time period and may not have known which treatment to discuss in the survey. The time of treatment being asked about was approximately 7-8 months prior to the survey distribution. Such a long length of time could have impacted the participant's recollection of the events preceding and succeeding their treatment.

The impact of nurse practitioners working with fire departments to reduce unnecessary emergency department visits and ambulance rides, although increasingly prevalent throughout the U.S, has not been thoroughly studied. Due to the limited research in this area, the results found in this project cannot be compared to other studies.

Implications for Clinical Practice

The nurse practitioner program saved money for the people that received treatment and community health system. Cost savings were seen for Green Valley Fire Department as fewer resources were used. A nurse practitioner visit did not require the personnel costs associated with ambulance transportation, such as salary of each individual in response, uniform, holiday pay and retirement costs (Blake, Wiese & Ip, 2014). As calculated by The Smithfield Model and the Charles Rivers Associates model (2014), the average cost of a one hour of Fire and Rescue Response was $776. Both of these models included that average cost per hour of the vehicles utilized in the response ($250 per hour for fire apparatus and/or ambulance) (Blake, Wiese & Ip, 2014). However, the cost of the ambulance should be excluded as they are privately contracted through American Medical Response, as previously discussed, bringing the cost to $526. Although these models may have different staffing and pay scale than the Green Valley Fire

Department they do give an estimated cost per hour estimate the Green Valley Fire Department is likely to resemble. This is significantly higher compared to the data provided by the Green Valley Fire Department in which the nurse practitioner costs, including equipment, approximately $63 per hour to operate. These numbers do not include any revenue generated from the nurse practitioner billing. With such a significant difference in cost from using the Fire and Rescue Response compared to the nurse practitioner, Green Valley Fire Department potentially saved $18,473 for the 39 patients that saw the NP and didn't need transport to the ED (Table 7).

TABLE 7. *Potential Cost Savings to Green Valley Fire Department*

Price details		
	Per person	**N=39**
Fire and Rescue Response	$526	$20,532
NP visit	$63	$2,476
Total potential cost saving	**$462**	**$18,473**

People seen by the nurse practitioner also potentially had significant cost savings. As previously discussed, an ambulance transport from Green Valley to Tucson, where many patients receive care at Banner University Medical Center, can cost anywhere $1273.75-$ 1369.88 per ride (azdhs.gov, 2015). If all 39 patients were to be transported to Tucson for treatment instead of receiving treatment at home by the NP that would have a total additional cost of $49,676.25-$53,425.32 in the ambulance rides alone. Additionally, by receiving the treatment at home, patients were able to avoid the high cost of an emergency room visit. Utilizing the average cost of an ED visit previously mentioned by Solberg et al., (2016) of $1390 per visit, if all 39 did receive care in the ED instead of receiving treatment from the NP with FBUMS, that would have cost an approximately an additional $54,210 is ED care alone (Table 8 for pricing details). These

prices are significantly different than the cost of the NP visit with FBUMS. In data provided by GVFD, the average billed amount in 2017 by GVFD for treatment provided by the NP with FBUMS was $205.2.

TABLE 8. *Potential Cost Savings to Patients*

Price details		
	Per person	**N=39**
Average cost of ED visit	$1390	$54,210
Average cost of Ambulance ride from green valley to Tucson with ALS/BLS per patient (31miles)	$15.80/ mile (31 miles) + with ALS $880.08 or with BLS $783.95 = $1273.75- $1369.88	$49,676.25- $53,425.32
Average Cost of NP treatment with FBUMS	$205.20	$8,002.80
Total potential cost saving	**$2,4583.55-$2,554.68**	**$95,883.45- $99,632.52**

The overuse of the emergency department is a problem that needs repair. The growing profession of nurse practitioners may be one of the key variables in fixing the problem. The information obtained from this project shows that home treatment with a fire department nurse practitioner led program can prevent unnecessary emergency department visits. Furthermore, the findings of this project draw attention to the need for further studies on this content. Future projects and interventions should aim to evaluate the impact nurse practitioners have with fire departments in urban settings with a more diverse patient demographic.

Plan for Dissemination of Results

The results of this project will be disseminated to the sponsors of this project, Green Valley Fire Department. A presentation will be held for the fire department with the board of director's present. The information obtained in this project will further provide Green Valley Fire Department ways to improve their NP Program and continue to decrease healthcare cost. The project leader also will identify a scholarly journal(s) in which to disseminate the findings to a larger audience.

Conclusion

The main result from this project is that seeing the nurse practitioner avoided the need for emergency department care and ambulance transportation. This project showed that after receiving treatment at home from the nurse practitioner, 92.9% of the participants (n=39) did not require emergency room treatment. Green Valley, Arizona is not the only city in the United States with an aging population in need of more accessible healthcare, it is very likely a model like Green Valley Fire Departments Fire-Based Urgent Medicals Services will work successfully elsewhere.

Accessible, quality healthcare has never been more urgent. Comprehending how we, as a society, can deliver a more cost-effective and obtainable method of treatment is essential. The dissemination of the information gained from project will better equip and prepare Fire Departments throughout the nation with information they need to help them decide to develop a program utilizing a nurse practitioner. The results show that a nurse practitioner led program supported by a fire department is cost effective and can also help minimize the overuse of hospital emergency departments and ambulance transports.

APPENDIX A:

SURVEY

THE UNIVERSITY OF ARIZONA College of Nursing

Green Valley Fire District (GVFD)
Nurse Practitioner Urgent Medical Services - Questionnaire

You have been asked to complete this questionnaire because you received health care from the GVFD Fire-Based Urgent Medical Service. Please answer the questions based on the healthcare you received from the GVFD Fire-Based Urgent Medical Service during the time-period from February 2017 to March 2017. Return the completed survey in the postage paid return envelope.

1. Gender:
   ❑ Female ❑ Male

2. Age in years: _____

3. Select how you requested healthcare with the GVFD Fire-Based Urgent Medical Service:
   ❑ Called the GVFD Urgent Medical Service Hotline Number
   ❑ Called 9-1-1

4. Why did you contact GVFD Fire-Based Urgent Medical Service for healthcare?
   ❑ I do not have a Primary Care Provider
   ❑ I was not able to schedule an appointment with my Primary Care Provider
   ❑ I was not able to leave my home due to transportation or mobility issues
   ❑ I used GVFD Fire-Based Urgent Medical Service before
   ❑ GVFD Fire-Based Urgent Medical Service was recommended by a friend or family member

5. What treatment/service did the Fire-Based Urgent Medical Service provide? (select all that apply)

❑ Back pain or joint pain
❑ Bone, joint or muscle injury
❑ Earache, cough, cold/ Respiratory infection
❑ Asthma/ COPD
❑ Medication refill
❑ Urinary tract infection
❑ Dehydration/ Hydration therapy
❑ Dental infection
❑ Cut or trauma injury
❑ Portable labs and X-Rays
❑ Other:

6. Within 72 hours (3 days) after your appointment with the Fire-Based Urgent Medical Service, did you receive care at an Emergency Department?
   ❑ No ❑ Yes – If yes please explain why in box below:

7. I was satisfied with the healthcare provided by the GVFD Fire-Based Urgent Medical Service.

   Circle a number:
   Strongly disagree 1 2 3 4 5 6 7 8 9 10 Strongly agree

8. How likely are you to recommend the Fire-Based Urgent Medical Service to other people?

   Circle a number
   Not likely 1 2 3 4 5 6 7 8 9 10 Very likely

Thank you for Completing the Questionnaire

THE UNIVERSITY OF ARIZONA
College of Nursing

Thank you for taking the time to complete this questionnaire. If you would like to receive a $5.00 gift card as a thank you for your time, please complete the below information and sign as indicated.

First Name: _____

Last Name: _____

Street Address _____

City, State, ZIP _____

Signature: **X** _____

APPENDIX B:

LETTER OF INTENT

THE UNIVERSITY OF ARIZONA
College of Nursing

August 2017

Hello,

My name is Julia Cyr, I am a doctoral student at the University of Arizona in the Family Nurse Practitioner program. I am working with Green Valley Fire Department (GVFD) on a project to help them improve the healthcare services provided to the Green Valley community. Green Valley Fire Department created the Fire Based Urgent Medical Services (FBUMS), a program utilizing a Family Nurse Practitioner in an effort to treat patients at home and help reduce Emergency Room visits. The goal of the project is to determine if the Fire Based Urgent Medical Services program has helped reduce Emergency Room visits.

The enclosed questionnaire will take less than 5 minutes to complete and will help provide valuable information to determine how well the FBUMS program is working. The survey will also help Green Valley Fire Department identify areas to improve the healthcare provided by the program. This questionnaire is voluntary and entirely confidential.

As a thank you for your time, I would like to give you a $5 gift card. If you would like to receive the $5 gift card, please complete the last page of the questionnaire. Return the completed questionnaire in the pre-addressed and pre-paid envelope.

The information you provide will help improve the healthcare in the Green Valley community.

Thank you,
Julia Cyr BSN, DNP-FNP student
juliacyr@email.arizona.edu

APPENDIX C:

IRB APPROVAL

Research
Office for Research & Discovery

Human Subjects Protection Program

1618 E. Helen St.
P.O.Box 245137
Tucson, AZ 85724-5137
Tel: (520) 626-6721
http://rgw.arizona.edu/compliance/home

Date:	August 25, 2017
Principal Investigator:	Julia Anne Cyr
Protocol Number:	1708748828
Protocol Title:	Evaluation of a Nurse Practitioner Homecare Program on Emergency Room Visits
Determination:	Human Subjects Review not Required

The project listed above does not require oversight by the University of Arizona because the project does not meet the definition of 'research' and/or 'human subject'.

- **Not Research as defined by 45 CFR 46.102(d)**: As presented, the activities described above do not meet the definition of research as cited in the regulations issued by the U.S. Department of Health and Human Services which state that "research means a systematic investigation, including research development, testing and evaluation, designed to contribute to generalizable knowledge".
- **Not Human Subjects Research as defined by 45 CFR 46.102(f)**: As presented, the activities described above do not meet the definition of research involving human subjects as cited in the regulations issued by the U.S. Department of Health and Human Services which state that "human subject means a living individual about whom an investigator (whether professional or student) conducting research obtains data through intervention ***or*** interaction with the individual, or identifiable private information".

Note: Modifications to projects not requiring human subjects review that change the nature of the project should be submitted to the Human Subjects Protection Program (HSPP) for a new determination (e.g. addition of research with children, specimen collection, participant observation, prospective collection of data when the study was previously retrospective in nature, and broadening the scope or nature of the research question). Please contact the HSPP to consult on whether the proposed changes need further review.

The University of Arizona maintains a Federalwide Assurance with the Office for Human Research Protections (FWA #00004218).

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