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### Examining Patient Outcomes of Telemedicine in Rural Emergency Departments

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EXAMINING PATIENT OUTCOMES OF TELEMEDICINE  
IN RURAL EMERGENCY DEPARTMENTS

A Scholarly Project Submitted to the Graduate School  
in Partial Fulfillment of the Requirements  
for the Degree of  
Doctor of Nursing Practice

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Pittsburg, KS

December 2016

EXAMINING PATIENT OUTCOMES OF TELEMEDICINE  
IN RURAL EMERGENCY DEPARTMENTS

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# EXAMINING PATIENT OUTCOMES OF TELEMEDICINE IN RURAL EMERGENCY DEPARTMENTS

An Abstract of the Scholarly Project by  
Jessica Greig Dalton

Increasing shortages of primary care physicians has resulted in the use of family nurse practitioners for staffing of rural Emergency Departments (ED) throughout the United States. Although the majority of these Family Nurse Practitioners have not been formally trained in emergency medicine, they are placed in the role. The specific aim of this study is to examine if using telemedicine in the rural emergency department will improve patient outcomes, decrease transfers, and decrease mortality. This study's project design is a retrospective chart review of Emergency Department patients at Wilson Medical Center from April 2015 to April 2016 where telemedicine was utilized in the care of these patients. This project's results show that telemedicine utilized in a rural emergency department staffed by nurse practitioners is beneficial for patients. With the use of telemedicine, the patient's outcomes are considered positive when they are at least slightly improved upon disposition; additionally, transfer rates with the use of telemedicine are at a low percentage compared to patients being discharged home, and mortality rates are a minute 4%. These findings determine that telemedicine can be beneficial for rural emergency departments staffed by nurse practitioners potentially becoming a standard of care in the future.

## Table of Contents

CHAPTER I.....	1
DESCRIPTION OF THE CLINICAL PROBLEM .....	1
SIGNIFICANCE .....	3
SPECIFIC AIMS/PURPOSE.....	3
THEORETICAL FRAMEWORK .....	4
PROJECT QUESTIONS.....	5
DEFINITION OF KEY TERMS .....	6
LOGIC MODEL OF THE PROPOSED DNP PROJECT .....	7
SUMMARY .....	10
CHAPTER II.....	12
INTRODUCTION .....	12
LITERATURE REVIEW .....	12
Telemedicine and outcomes.....	12
Telemedicine and cost effectiveness.....	16
Telemedicine and perspectives .....	20
SUMMARY .....	22
CHAPTER III .....	25
INTRODUCTION .....	25
PROJECT DESIGN.....	25
SAMPLE/TARGET POPULATION .....	26
Sample/Target Population Recruitment.....	26
Inclusion and Exclusion Criteria.....	26
Protection of Human Subjects .....	27
PROCEDURES .....	27
IRB (Institutional Review Board) Approval.....	27
Mutual Agreement with Cooperating Agency.....	27
Timeline of Project Phases.....	28
Resources Needed .....	28
Market analysis .....	28
Eligible participants/organizations.....	28
Description of Study .....	28
Outcome Data .....	29
TREATMENT OF DATA/OUTCOMES/EVALUATION PLAN.....	29
Evaluation Measures .....	29
Tools/Instruments .....	29
Methods of Analysis .....	30
PLAN FOR SUSTAINABILITY.....	30
SUMMARY .....	31
REFERENCES .....	46
APPENDIX A.....	50
APPENDIX B .....	51
APPENDIX C .....	52

## LIST OF FIGURES

FIGURE.....	PAGE
1. Bell Curve for Patient's Outcomes.....	35

## **Chapter I**

### **Introduction**

#### **Description of the Clinical Problem**

Increasing shortages of primary care physicians has resulted in the use of family nurse practitioners for staffing of rural Emergency Departments (ED) throughout the United States. Although the majority of these Family Nurse Practitioners have not been formally trained in emergency medicine, they are placed in the role. According to Olsen (2015), “In the face of workforce shortages in emergency medicine, advanced practice providers (APPs) including nurse practitioners (NPs) and physician assistants (PAs) are being utilized to provide emergency care in rural hospitals. APPs without previous advanced practice emergency care experience are being employed in rural critical access hospital emergency care settings” (p. 203). Nurse practitioners have the stressful task of taking care of critical situations that present to the emergency departments that do not have immediate physician coverage. As stated, the majority of nurse practitioners have not had the specialized training for those critical situations. This common practice may be cause for concern and is the focus of this scholarly project.

For the purpose of this project, the American Telemedicine Association’s (ATA) definition of telemedicine will be utilized and is described as, “the use of medical information exchanged from one site to another via electronic communications to improve a

patient's clinical health status" (Dowling, 2015, p. 27). Telemedicine has been used for consultations with physicians or specialists in the emergency department that are staffed with nurse practitioners for many years. According to Wesson & Kupperschmidt (2013), "some form of telemedicine has been in use since the early 1900s, beginning with the use of 2-way radios and progressing to the use of interactive real-time technology" (p. 199). Telemedicine has become very popular in rural emergency departments. It has been proposed that telemedicine has been used to help decrease cost for the patient by decreasing unnecessary transfers, improving revenue for the facility by keeping them local, and improving outcomes and decreasing mortality.

The frequency of emergent situations that present to the small hospital ED staffed by Family Nurse Practitioners as the lone provider is high in rural areas of the United States. These emergent situations include patients presenting with respiratory distress and the ST elevation which accompanies myocardial infarction, as well as other life-threatening conditions. According to Ward, "Patients with classic clinical presentations of STEMI may be more likely to get sent directly for cardiac catheterization, bypassing the ED, whereas those with atypical presentations (e.g., without chest pain) continue to present to the ED. This shift in presenting characteristics seen by ED physicians may make timely identification of a patient with STEMI more challenging" (2015, p. 168). In rural emergency rooms, nurse practitioners are not specialized and they lack exposure to certain emergent conditions frequently enough to be well-rehearsed. If it is already challenging to make a timely identification of a patient with ST elevation myocardial infarction (STEMI), then it might take even longer for the lone provider that has not had enough exposure to hasten the process of diagnosing the STEMI.



## **Significance**

Since there is such a shortage of physicians, nurse practitioners have become the front line in the emergency departments of small rural hospitals. According to Levine & Goldschlag (2015), “By 2020, the number of Americans older than 65 is forecast to increase by a staggering 36%, while the physician supply will hardly keep up at 7%, according to a report published in 2010 by the Association of American Medical Colleges (AAMC) Center for Workforce Studies” (p. 36). The significance of the phenomena of the physician shortage is that nurse practitioners are the lone providers that have to manage every situation that comes through the doors due to the physician shortage. As previously stated, these emergent situations need fast assessment, diagnosing, and treatment to decrease the rate of mortality.

Due to the physician shortage, telemedicine has been utilized with increasing frequency in rural emergency departments to assist with consultations. Nurse practitioners can use telemedicine for cases they are not as familiar with, due to the lack of exposure or non-specialize training in emergency medicine, to get an expert opinion. Telemedicine is a resource that the nurse practitioners can readily utilize since the access to healthcare is limited in rural areas, especially for specialties.

## **Specific Aims/Purpose**

The specific aim of this study is to examine if using telemedicine in the rural emergency department will improve patient outcomes, decrease transfers, and decrease mortality. Providers strive to make patient outcomes positive. Nurse practitioners are utilized in rural emergency departments because of physician shortages. Nurse practitioners are competent providers, but are not necessarily trained specifically for the emergency

department making it difficult to be effectively prepared for some emergent conditions because of the lack of exposure or training. Telemedicine can be utilized to help improve patient outcomes by having an immediate consultation with a specialized physician that can give guidance on how to care for the patient. By improving patient outcomes and decreasing mortality, providers have done what they set out to do, give quality care. This study will help determine if telemedicine can improve patient outcomes, decrease mortality, and decrease transfer rates.

### **Theoretical Framework**

The theoretical framework that is the basis of this project is the nursing process discipline theory. This theory was designed by Ida Jean Orlando. The major dimensions of the model explain that a nurse's role is to find out what the patient's immediate needs are and meet those needs. However, the patient's needs may not be what they appear to be. Nurses have to use their own perceptions, thoughts and feeling to explore the patient to find out what his/her needs are. This process helps the nurse find out the nature of the patient's distress and provides the help he/she needs. The concepts of this theory include: function of professional nursing, presenting behavior, immediate reaction, nursing process discipline, and improvement.

In an effort to link Orlando's nursing process discipline theory, the described concepts of presenting behavior, immediate reaction, nursing process discipline, and improvement will be utilized. The function of professional nursing is to supply the help a patient needs for his/her needs to be met. If the patient has an immediate need for help, which typically happens in the emergency department setting, the nurse discovers that

need and meets it. Presenting behavior is described as the “chief complaint” in the common lingo of an Emergency Department. If the chief complaint is life threatening, telemedicine would be utilized. Immediate reaction is the patient’s immediate reaction to the situation that is going on. The nursing process discipline is the framework for processing the immediate concern and the process of meeting the patient’s needs. Nursing process discipline is where the provider would assess, diagnosis, and treat the patient using a systematic process, the nursing process. The typical process starts with the provider assessing the immediate need and then seeking consultation through telemedicine to produce positive results. The use of the nursing process will lead to the final concept of improvement. Improvement is described as the process of the FNP utilizing telemedicine for consultation in situations where guidance is needed to bring a positive patient outcome. Positive patient outcomes are described as situations with decreased mortality and decreased transfers.

Through the use of the Orlando theory, the nurse practitioner in the rural emergency department would be able to identify the immediate danger of the patient’s chief complaint. Once the immediate danger is recognized as a life threatening situation, telemedicine would then be consulted. The physician on the other end of the telemedicine system, along with the nurse practitioner, would use the nursing process or another form of a systematic approach to determine the immediate danger of the situation to meet the patient’s needs and hope to improve the patient outcome, along with decreasing unnecessary transfers.

### **Project Questions**

The following research questions to be asked for this project are:

- ☐ Does utilizing telemedicine in a rural emergency department that is staffed with a nurse practitioner improve patient outcomes?
- ☐ Does utilizing telemedicine in a rural emergency department that is staffed with a nurse practitioner decrease patient mortality?
- ☐ Does utilizing telemedicine in a rural emergency department that is staffed with a nurse practitioner decrease transfers to a tertiary facility?

### **Definition of Key Terms**

For the purpose of this project, the following definitions are provided to assist with clarification.

- ☐ Advanced practice providers- a provider that is not a physician. This includes nurse practitioners and physician assistants.
- ☐ Emergency department/room- a part of the hospital that provides immediate treatment for acute conditions and trauma.
- ☐ Emergent conditions- any condition that is life threatening. Examples: respiratory distress, acute myocardial infarction, trauma, etc.
- ☐ Family nurse practitioner- licensed advanced practice registered nurse that are educated and trained to assess, diagnose, and treat acute and chronic conditions of patients of all ages.
- ☐ Physician Assistant- educated and trained to assess, diagnose and treat acute and chronic conditions under the supervision of physicians.
- ☐ Physician- a person that is trained and licensed to practice medicine. A doctor of medicine or osteopathy. Trained to assess, diagnose, and treat acute and chronic conditions.

- Rural emergency department/room- an emergency room that is located in a smaller city that is miles away from a major city where resources are readily available compared to the “rural” facilities.
- Telemedicine- “the use of medical information exchanged from one site to another via electronic communications to improve a patient’s clinical health status” (American Telemedicine Association (ATA), Dowling, 2015, p. 27).

### **Logic Model of the Proposed DNP Project**

The inputs in the logic model for this study would be the nurse practitioners, physicians, time, Irene Ransom Bradley School of Nursing, and this DNP student. The outputs are divided into activities and participation. Activities would be the chart review of the current charts to select participants and to extract data, and interviews with the emergency medical services and the medical helicopter regarding transfers. Another activity would be obtaining consents for participation from the patients. The consent would entail their participation with the study.

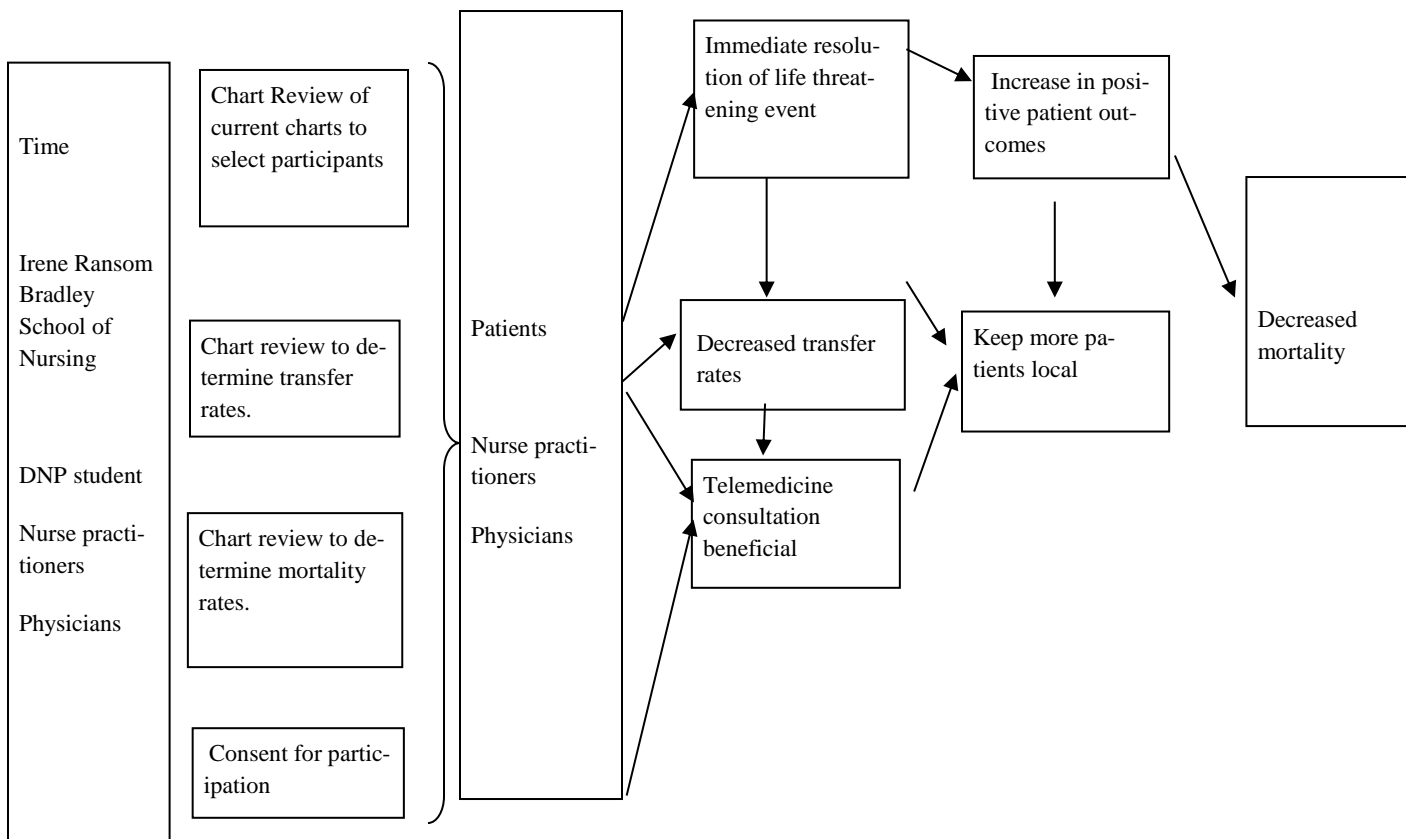
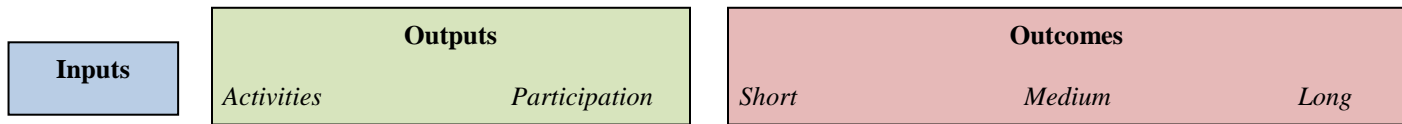
The outcomes of this model are divided into short, medium, and long term goals. Short term goals include; immediate resolution of the life threatening condition, a decrease in transfer rates and discovering if telemedicine consultation is beneficial. Medium goals consist of an increase in positive patient outcomes and keeping more patients local by decreasing transfers. The long term goal is to decrease mortality.

The assumptions are that telemedicine will be beneficial to both the patient and the facility. Using telemedicine will hopefully decrease transfer rates, decrease mortality, and improve patient outcomes. Another assumption would be that agencies that need to

provide approval will grant such approval. Those agencies are Pittsburg State University IRB, and the Irene Ransom Bradley School of Nursing. The external factor that will be the most challenging will be technology itself. If the technology does not work due to electricity or if integration of lab or x-rays don't happen, it could affect the outcomes. Charting also is another external factor that could be detrimental because if it is not sufficient, pulling data for the study could be cumbersome. Weather is also an external factor that could inhibit transfers to a facility that delivers higher level of care. The full logic model for the telemedicine study is shown in Figure 1.

## Project: Telemedicine Logic Model

**Goal:** To utilize telemedicine in a rural emergency room to decrease transfer rates, decrease mortality, and improve patient outcomes.



### Assumption

Telemedicine will decrease transfer rates.  
 Telemedicine will improve patient outcomes.  
 Approval will be granted by Pitt State IRB & School of Nursing.  
 Telemedicine will decrease mortality.

### External Factors

Technology will not be up to par for integration of labs and xrays.  
 Electricity for use of equipment.  
 Charting will not be sufficient to be able to pull data for study.  
 Weather inhibiting transfer to a higher level of care facility.

## Summary

The increasing shortages of physicians has increased the use of nurse practitioners in the rural emergency departments that have not been trained in emergency medicine. In addition, the average nurse practitioner working in a rural emergency department has not received any type of “residency” experience for specialization in this area. This can be a serious problem for critical patients that are taken to rural emergency rooms because the nurse practitioners are not specialized and lack of exposure to critical situations. That being said, telemedicine is a way that nurse practitioners can have immediate consultation with a trained physician or specialist. If nurse practitioners have the ability to have immediate consultation with a physician or specialist, it will improve patient outcomes and decrease mortality.

In the past, consultation could be cumbersome. A phone consultation takes time to call, discuss the situation, and then find a plan, and then possibly call a different physician and go through the same procedure again, all while the physician doesn’t ever see the patient and just has to take the nurse practitioner’s assessment. With telemedicine, having a physician assess a patient is as easy as a push of a button. Literally, the nurse practitioner pushes a button that signals the receiving facility in a distant location to answer and appear on a television screen to be able to assess the patient and communicate with the nurse practitioner right at the patient’s bedside. The cameras that are used can zoom in to be able to assess the most intricate details. This assists the assessments by having two sets of eyes on the patient, to be able to assess, diagnose, and treat the patient to improve the outcome.



It has been proposed that telemedicine has been used to help decrease cost for the patient by decreasing unnecessary transfers, improving revenue for the facility by keeping them local, improving outcomes, and decreasing mortality. This study is to help determine if telemedicine actually accomplishes all of these. If telemedicine achieves these goals, it is beneficial to be utilized in all rural emergency rooms for patient and facility and should be considered a standard of care.

## **Chapter II**

### **Integrated Review of the Literature**

#### **Introduction**

As stated, telemedicine has become very popular in rural emergency departments. It has been proposed that telemedicine has been used to help decrease costs for the patient by decreasing unnecessary transfers, improving revenue for the facility by keeping the patient local, and improving outcomes and decreasing mortality. These positive outcomes can be met by assisting the nurse practitioner with a means of consulting specialists through the use of telemedicine.

This chapter will cover the literature review portion of this paper. Several articles have been published regarding telemedicine and the specific aspects and benefits of telemedicine. A thorough review of the literature provides the basis for this study.

#### **Literature Review**

**Telemedicine and outcomes.** Telemedicine has been shown to decrease mortality, decrease in hospital stays, and decrease unnecessary costs. As a provider, the overall goal is to improve patient outcomes. Telemedicine is one method that can be utilized to improve these outcomes. According to Wesson & Kupperschmidt, “Telemedicine has the potential to eliminate unnecessary cost and poor patient outcomes incurred when patient

transfers to urban centers are delayed” (2013, p. 199). When using telemedicine for consultation, the critical patient is identified earlier and transfer is initiated faster, which in turn improves patient outcomes. With telemedicine in place, the nurse practitioner is able to have questions answered and is given immediate feedback by the consultant. For example, the consultant can give advice or recommendations on early fluid resuscitation, airway management, or other life-saving interventions.

As mentioned previously, as a result of the shortage of physicians, rural emergency departments are usually staffed with a nurse practitioner that is not specifically trained in emergency medicine. In rural emergency departments or rural facilities in general, there is also a lack of specialized physicians. Using telemedicine, consultations can be done with physicians that are trained in emergency medicine and that are also specialized in a wide variety of areas.

Telemedicine can improve access to physicians and services that are usually not available in the rural community. According to Dowling, “benefits of telemedicine include reduced costs, improved access to physicians and services, improved continuity of care, and the potential for reduced travel costs and time off work” (2015, p. 27). With this technology, patients can have improved outcomes because of the increase in access to physicians or specialists.

An article by Dharmar et al., discussed medication errors in the emergency department. The study was done on children showing that telemedicine decreased the amount of physician related medication errors. Dharmar et al. concluded that, “Pediatric critical care telemedicine consultations were associated with a significantly reduced risk

of physician-related emergency department medication errors among seriously ill and injured children in rural emergency departments” (2013, p. 1090). Telemedicine showed that it decreased medication errors thus improving patient outcomes. Studies on this topic suggested that the dosing errors in children were due to the environment of the emergency department being chaotic and the lack of training and knowledge of the provider in calculating the dose of the medication to be given. Since most rural emergency departments are staffed with nurse practitioners that are not trained specifically in emergency medicine, telemedicine has become a lifesaver regarding consultation on difficult or critical cases, especially pediatrics. Use of telemedicine improves the patient’s outcome. “Our finding of lower physician-related emergency department medication errors among patients who received telemedicine consultations could be attributed to the specialized training and higher level of experience among the consulting physicians in treating children, which is consistent with other studies evaluating the impact of physician training and experience on patient outcomes” (Dharmar et al., 2013, p. 1094).

In addition, telemedicine helps with management of diseases in long term care setting. According to Levine & Goldschlag, “Telemedicine has been shown to facilitate management of symptoms, diet, body mass index, and blood pressure and glucose levels in people with diabetes” (2015, p. 36). Management of chronic diseases by telemedicine improves overall health and makes positive patient outcomes, especially since elderly are majority of the patient population in emergency department visits. Levine & Goldschlag further state, “With respect to management of chronic diseases such as congestive heart

failure, stroke, and chronic obstructive pulmonary disease, telemedicine has proven to increase the quality of long-term monitoring and decrease or prevent complications” (2015, p. 36).

Telemedicine can also be utilized to benefit special populations like the elderly, this issue was discussed by Levine & Goldschlag (2015). “By 2020, the number of Americans older than 65 is forecast to increase by a staggering 36%, while the physician supply will hardly keep up at 7%” (Levine & Goldschlag, 2015, p. 36). Due to the significant decrease in the physician supply, telemedicine has become an increasing trend to ensure patients to have access to physicians and specialists to improve patient outcomes.

Emergency departments have multitudes of critical situations. One situation that an article discussed was stroke. According to Handschu et al., “telemedicine is a promising technology that can help to get modern stroke care to more patients. Our data suggest that remote video examination of stroke patients is feasible even in the acute care situation at the emergency room and provides valid clinical information comparable to bedside testing” (2003, p. 2846). Telemedicine is like having another set of eyes on the patient. This is beneficial because one provider might not catch something that another provider does. Being able to visualize the patient by utilizing telemedicine can improve patient outcomes by having two providers assess, diagnose, plan, and treat. Two providers being able to consult and discuss a patient’s case, especially if one of those providers is a specially trained physician, can only improve patient outcomes.

There is an article that was reviewed that was from the world’s largest telemedicine study. It showed that telemedicine decreased mortality. According to Kidholm et al.,

“Critically assessing the existent Whole System Demonstrator studies shows that, although applied telemedicine technology appears to have a major effect on decreasing mortality, this major beneficial effect is confounded by other less-positive results” (2014, p. 48). Decreasing mortality is the major goal in healthcare. Providers strive to improve patient outcomes and decrease mortality.

**Telemedicine and cost effectiveness.** The initial implementation of telemedicine is expensive. A telemedicine system requires hardware, software, and other communication commodities to function. However, grants are available to help implement telemedicine in rural communities. According to Wesson & Kupperschmidt, “These grant funds allow hospitals to either purchase or lease equipment or install equipment and to operate and evaluate the telehealth systems” (2013, p. 200). These grants require quantitative studies on outcomes that measure the quality of care, the use of technology, if patient outcomes were improved and the extent which the cost of service that was delivered was affected in terms of efficiency and effectiveness of care. Wesson & Kupperschmidt discussed the findings of cost effectiveness from their study, “there was a dramatic decrease in hospital cost. Posttelemedicine, the total cost was \$1126683 when compared with the pretelemedicine cost of \$7632624, which represented a significant cost savings of \$6505941” (2013, p. 201). Overall, the cost initially would be expensive, but the cost effectiveness would be better in the long run. According to Spooner & Gotlieb, “CMS limits reimbursement by Medicare for telemedicine services to beneficiaries who are treated in rural health practice shortage areas. The CMS has not formally defined telemedicine for the Medicaid program, and federal Medicaid law does not recognize telemedicine as a

distinct service, but reimbursement is available at a state's option as a cost-effective alternative to traditional care" (2004, p. 639). Since a majority of patients are on Medicare and Medicaid, this could be an issue regarding cost effectiveness. However, this article goes on to state, "There is little solid research examining how reimbursement for physician telemedicine services has developed in real-world settings" (2004, p. 641). More research needs to be done regarding cost effectiveness and telemedicine.

To contradict the above article regarding reimbursement and not recognizing telemedicine as a distinct service, Levine & Goldschlag state, "On April 30, 2015, United Healthcare expanded coverage options for virtual physician visits, giving patients enrolled in self-funded employer health plans secure access to a physician via mobile phone, tablet, or computer 24 hours a day" (2015, p. 38). United Healthcare is the largest insurer. Levine & Goldschlag continue to say that, "Other insurers such as BlueCross BlueShield, Wellpoint, and Oscar also have adopted telemedicine coverage" (2015, p. 38). With insurance companies getting on board with reimbursement for using telemedicine, this will help telemedicine become a cost effective way to deliver healthcare.

Transferring patients is also another part of the equation when it comes to being cost effective. If a patient is transferred to a tertiary facility, the hospital loses the revenue of that hospital stay. Also, the patient is accruing costs of the transfer and the other facility in patient stay, which could be higher due to it being a bigger hospital. All in all, patient and facility lose money when transferring is occurring. According to Handschu et al., "In general, transferring patients is expensive, laborious, time consuming, and risky for the patient" (2003, p. 2842). With telemedicine consultation, they are able to give recommendations if transferring is necessary or if the rural hospital is able to handle such a

case. This can decrease unnecessary transfers and keep patients closer to home, decrease transfer costs, and increase revenue for the hospital due to admission of the patient in their facility.

Kidholm et al. (2014) discussed cost effectiveness. The authors reported that, “Both scenarios show a reduction in the costs per patients using telehealth by 7–8%, but the costs remained higher than in the control group. The authors calculated the incremental costs per gained quality-adjusted life-year to be £92,000 and concluded that telehealth is not cost effective when used as an add-on to standard patient support and treatment” (Kidholm et al., 2014, p. 46). This shows that telemedicine is not cost effective, however, this is not pertaining to the emergency department where it can be life-saving. It also showed that cost was reduced, just not as low as the ones that did not receive telemedicine consultation. However, this also doesn’t include patient outcomes with the cost effectiveness. The increased cost, while not ideal, does potentially improve patient outcomes. In regards to improving outcomes and decreasing fatalities, the increase cost could be considered negligible.

Patient costs are also included in travel time; telemedicine can decrease those costs by increasing access to healthcare. Patients from rural communities tend to have to travel many miles to be able to see a specialist. One of the benefits to telemedicine is the decrease in travel time and access to healthcare. According to Allen et al., “The benefits of telehealth for patients include reduced travel and more timely service, with health outcomes at least equal to traditional face-to-face consultations” (2013, p. 1133). Time is as valuable as money. Telemedicine could help decrease time used for traveling and decrease cost that it takes to travel to another facility that could be hour or so away from a



rural community. Decreasing costs by using telemedicine and patient outcomes are at least equal to traditional face to face consultations, this is considered a positive outcome.

According to Loh et al., “There is often a high capital cost that should reduce with time as the technology becomes more accessible and affordable. Furthermore, the reduction in travel time for rural and remote patients may justify additional costs for some patients” (2013, p. 829). For an example, if a patient needed to travel to the city to see a specialist, it could be at least a 5 hour journey or more. Time would be needed for at least an hour to see the specialist, driving to and from facility, meals, refueling. If the patient took a family member they would have to be off work, arrange for childcare or picking up from school. To help offset costs, “The patient may be able to claim travel assistance from the State or Commonwealth Governments, but this is an additional cost” (Loh et al., 2013, p. 829). Depending on the additional cost, it might not be worth it for the patient. It is imperative to take these costs into consideration when thinking about sending patients to specialists. Telemedicine could help reduce these costs by making access to specialists readily available by being closer to home.

Another article that was based in Australia, showed that implementing telemedicine decreased travel time for patients and was beneficial due to cost savings for the patient. There was a cancer center that was servicing other rural areas in Australia that was at least 900km away. With the use of telemedicine, it decreased the patient travel time and kept them from accruing costs due to travel. According to Sabesan et al., “savings as a result of a reduction in patient travel to Townsville can be used to make this model of care self-sustainable” (2014, p. 205). This shows that telemedicine is cost effective for patients that are in a rural setting, especially ones that seek specialty care.

**Telemedicine and perspectives.** Perspectives regarding telemedicine makes a difference when trying to see if telemedicine is beneficial. If a provider does not like telemedicine, they are more likely not going to utilize it, even if consultation is needed and would produce improved patient outcomes. Providers have a hard time with change and technology. Some might not feel comfortable using it due to lack of knowledge regarding the technology that it takes to use telemedicine. Others might not use it because they are used to having the phone consultation with an actual local physician and would prefer that method. Either way, finding out a provider and patient perspective on telemedicine would be beneficial to know prior to implementing telemedicine in their facility. According to Shah et al., “Participants and family members stated that the telemedicine visit resulted in a thorough evaluation. Providers and one family member noted that the structure of the telemedicine program increased overall provider efficiency” (2013, p. 573). However, there was a negative perspective regarding telemedicine, “Some thought that in-person care would be ideal and would have preferred that the physician be present in person” (Shah et al., 2013, p. 573). Providers discussed that they felt that telemedicine gave superior care when compared to telephone only consultation, however, it was noted that telemedicine was more time consuming than consulting by the telephone. Shah et al. continue to state that, “stakeholders find the convenience and speed of telemedicine-enhanced emergency care to be highly desirable. Providers felt that telemedicine-enhanced emergency care provided enough data, enhanced diagnostic certainty, and overall, improved care, even though they felt in-person visits to be superior” (2013, p. 575).

An article that was reviewed showed the nurses perceptions in the intensive care unit that utilized telemedicine. According to Mullen-Fortino et al., “nurses experienced

with ICU telemedicine generally supported use of the technology. The majority thought that ICU telemedicine improves survival in the ICU, although fewer thought that telemedicine decreases medical errors or improves the satisfaction of patients' families" (2012, p. 28). The article goes on to say that nurses would prefer to know the physician that was being consulted via telemedicine. This could be a reason for staff not to utilize the telemedicine as much. Not having a rapport with the physician prior to utilizing them for consultation can make it difficult for staff to consider their recommendations and trust their judgement. However, utilizing telemedicine "may improve survival and prevent ICU complications by allowing direct continuous monitoring of critically ill patients by trained intensivists, especially at night. Telemedicine also allows rapid contact with a critical care expert when an in-house physician is not immediately available" (Mullen-Fortino et al., 2012, p. 29). Rural emergency departments usually do not have in-house physicians. In rural emergency department settings, physicians have a 30-minute call back time to be able to reach the facility. Sometimes this could be devastating for the patient because time is of the essence when dealing with critical situations.

According to Sabesan et al., "These studies show that patients can experience effective doctor-patient communication through technology based consultations and that the patients can establish closer relationships with specialists. Patients from a range of ethnic and cultural backgrounds have been able to build effective rapport with specialists through telehealth" (2013, p. 102). Telemedicine is a technology that can produce the same type of relationships as face to face consults can. This information shows that it is

accepted from patients that telemedicine can be as effective in communication as in person consults and can be utilized in specialties. Being able to effectively communicate while using this technology is vital in being able to make it successful.

Telemedicine has been used in pediatrics infrequently. However, one article that was reviewed showed that communication with pediatric patient's parents were strengthened by the use of telemedicine. "The few studies cited here seem to indicate that telemedicine has important implications for accessing pediatric subspecialty services, determining future health care workforce requirements and their distribution, improving communications with parents of sick and chronically ill children, and extending the boundaries of the medical home" (Spooner & Gotlieb, 2004, p. 642). This article showed many benefits from utilizing telemedicine, however, it showed that communication was improved with parents of the chronically ill pediatrics.

According to Dowling, "Many of us have seen our staff, our patients, their families, and the staff of transport services needlessly burdened by an issue that could have been handled remotely by telemedicine—conferencing with the caregivers at the facility" (2015, p. 27). Having telemedicine to consult helps decrease the need for unnecessary transfers. This article talks about a long term care facility, however, it could help decrease unnecessary transfers in the emergency department setting as well. Telemedicine also can help decrease the emergency department visits in this population.

## **Summary**

Telemedicine "is the use of medical information exchanged from one site to another via electronic communications for the health and education of the patient or

healthcare provider and for the purpose of improving patient care, treatment, and services” (Nelson & Staggers 2014, p. 126). The use of telemedicine has been shown through this literature review that it is beneficial in multitude of ways. “According to the American Health Information Management Association, benefits of telemedicine include reduced costs, improved access to physicians and services, improved continuity of care, and the potential for reduced travel costs and time off work” (Dowling 2015, p. 27). These are some of the benefits that have been discussed in this chapter.

The review of literature showed a lot of articles that made good points regarding telemedicine and how it can improve patient outcomes, decrease transfer rates, decrease mortality, and be cost effective. Cost effectiveness is the only part of telemedicine that can still be a challenge. Telemedicine might not be exactly cost effective, but when tied to patient outcomes, it might be cost effective enough to benefit the patient. Also, none of these articles really touched base on the cost effectiveness for the facility. Only one article talked about the initial implementation of telemedicine is expensive, but it didn’t go into detail regarding if the facility would increase their revenue by providing telemedicine to their patients. Decreasing transfers would be one way the facility would increase revenue at their facility, because they would keep the patient in their hospital compared to transferring to a tertiary facility.

After the review of literature, it has been shown that telemedicine is beneficial and should be implemented in rural emergency departments where nurse practitioners are utilized as the lone provider. The articles reviewed show that nurse practitioners are being used more in the emergency department due to the physician shortages. Telemedicine helps bridge the gap of physician and specialist shortages. There are many benefits that

have been discussed in regards to telemedicine. However, for this chapter it is imperative to focus on how telemedicine can decrease mortality, decrease transfer rates, and improve patient outcomes.

## **Chapter III**

### **Methods**

#### **Introduction**

This study was designed to determine if utilization of telemedicine is beneficial to patients in a rural Emergency Department that is staffed with nurse practitioners. Benefits for this study include improvement of patient outcomes, decrease in mortality, and decrease in unnecessary transfers. This chapter will cover the methodology, selection and protection of subjects, instrumentation, data collection, and analysis of data for this study.

#### **Project Design**

This author will conduct a feasibility study to determine if telemedicine would be practical to be utilized in an Emergency Department in a rural, critical access hospital. The study will also examine if telemedicine would improve patient outcomes, decrease mortality, and decrease unnecessary transfers. This study's project design is a retrospective chart review of Emergency Department patients at Wilson Medical Center from April 2015 to April 2016 where telemedicine was utilized in the care of these patients. The rationale for using this design is to examine the possible benefits of telemedicine which has already been established at the start of the study. At this point in time, the data are available, but need to be collected in a systematic manner; no follow-up of these patients is necessary. Another rationale for using a retrospective study is that a retrospective

study typically requires less time to complete and is better for analyzing multiple outcomes. In view of the fact that this study has multiple outcomes to analyze, as well as a small sample size, this author determined that a retrospective study would be the best design. This researcher hopes to be able to review at least 50 charts that meet the inclusion criteria. Another aim of the study will be to determine if transfer rates are decreased in patients who are treated with the benefit of telemedicine.

### **Sample/Target Population**

The target population for this study will be all Emergency Department patients at Wilson Medical Center in Neodesha, Kansas. Currently, Wilson Medical Center utilizes telemedicine was utilized in the care of all patients where it is warranted. Some of the warranted diagnoses that telemedicine is utilized on are patients with chest pain, sepsis, respiratory distress, and trauma. The decision to implement telemedicine was based on the fact that this critical access Emergency Department relies on staffing by family nurse practitioners with physician support by phone call. All ages and diagnoses of patients will be considered in this study.

**Sample/Target Population Recruitment.** Subjects will be selected by a retrospective chart review. All patients that were seen in the rural emergency department at Wilson Medical Center in Neodesha, Kansas by a nurse practitioner where telemedicine was utilized will be recruited. The timeframe will be from April 2015 to April 2016.

**Inclusion and Exclusion Criteria.** The inclusion criteria for this project will be any patient that is evaluated and treated by a nurse practitioner at Wilson Medical Center's Emergency Department where telemedicine has been utilized. Exclusion criteria for this project would include telemedicine utilized for inpatients but not as an Emergency



Department patient. No inclusion or exclusion criteria will be determined as a result of the diagnosis, demographics of the patients, or disposition of the patient.

**Protection of Human Subjects.** The Institutional Review Board (IRB) of Pittsburg State University and the Irene Ransom Bradley School of Nursing will approve this study based on their requirements before data collection is initiated. This study will meet the requirements for exempted IRB status due to the fact that there is no harm to human subjects. To protect the human participants, no identifiable demographic information will be needed for this study and also no risk has been identified for the human participants. Benefits of participation would be to determine if utilizing telemedicine will improve outcomes, decrease mortality, and be cost effective for all involved.

### **Procedures**

**IRB (Institutional Review Board) Approval.** IRB approval will be sought from Pittsburg State University beginning with the approval of Irene Ransom Bradley School of Nursing. After approval from the School of Nursing, the request moves to the Institutional Review Board (IRB) of Pittsburg State University, the Committee for the Protection of Human Research Subjects (CPHRS), which is chaired by Mr. Brian Peery and is located in the Graduate and Continuing Studies Office.

**Mutual Agreement with Cooperating Agency.** Approval will be also obtained from Wilson Medical Center in Neodesha, Kansas to do a retrospective chart audit from April 2015 to April 2016 on all patients that were seen in the Emergency Department where telemedicine was utilized. Also, approval from Avera, the telemedicine company, would need to be obtained. The approval letter was obtained from both facilities via email (Appendix A).

**Timeline of Project Phases.** Data collection will start in September 2016. After data is collected it will be evaluated and results will be finalized by October 2016. Completion of the scholarly project along with final edits will be finished by November 2016.

**Resources Needed.** The technology needs for this project are telemedicine and all technology that pertains to operation of telemedicine. Personnel resources would be the committee for guidance, the cooperating agency staff for access to charts, and the telemedicine staff for consult information. There are no fiscal resources needed for this project.

**Market analysis.** This study could show how telemedicine for a facility improves outcomes and decreases mortality. If this study reveals that telemedicine is beneficial for the facility and patient, by improving outcomes and decreasing mortality, then telemedicine could be marketed to other rural emergency departments. This study could also be a beginning in making evidence-based guidelines regarding the use of telemedicine in rural emergency department where nurse practitioners are the lone providers.

**Eligible participants/organizations.** This author will conduct a meeting with the cooperating agency to propose how this study will benefit the patient by the utilization of telemedicine in the Emergency Department.

**Description of Study.** Any patient that went to the emergency department at Wilson Medical Center in Neodesha, Kansas where telemedicine was utilized will be identified with a retrospective chart review from April 2015 to April 2016. There will be no exclusion regarding diagnosis or demographic information. The retrospective chart audit

will determine how many patients were transferred and their condition on discharge. Demographic information does not need to be used to collect this data. Charts will be kept confidential via secured electronic medical records.

**Outcome Data.** The outcome data that will be collected is transfer rates, death rates, and improvement in condition. All this data will help give a clear understanding if telemedicine is beneficial for rural emergency departments that utilize nurse practitioners as lone providers.

### **Treatment of Data/Outcomes/Evaluation Plan**

**Evaluation Measures.** To evaluate the data linked to the objectives, data will be collected via a retrospective chart review on all emergency department patients at Wilson Medical Center from April 2015 to April 2016 where telemedicine was utilized. Data that will be collected will be the condition of the patient upon discharge, death rates, and transfer rates.

**Tools/Instruments.** A short four item questionnaire (Appendix B) will be utilized to extract data from medical records. The questionnaire was developed by this author along with committee member, Greg Belcher. A Likert-type scale will determine if a patient had any improvement in their condition upon discharge or transfer. The components of the Likert-type scale are “Very poor”, “poor”, “no change”, “slight improvement”, or “back to their normal”. Analysis will be based on numerical scores assigned by the data collector with 5 being the highest or best and 1 being the lowest or poorest rating. To determine the condition of the patient if not properly recorded in the medical record, a rubric will be utilized to distinguish each category on the Likert-type scale (Appendix C).

Other variables like death and transfer rates will be measured with a “yes” or “no” answer from the questionnaire that is being utilized to extract data.

**Methods of Analysis.** With the help of a statistician, data will be entered into the computer and then analyzed using Excel program. Data will be analyzed and percentages and frequencies will determine how telemedicine impacts outcomes, mortality, and transfer rates. The higher the percentage will determine if telemedicine is beneficial in the rural Emergency departments where nurse practitioners are being utilized.

### **Plan for Sustainability**

Increasing shortages of physicians has increased the use of nurse practitioners that have not been specialized to emergency medicine in the rural emergency departments. According to Olsen, “In the face of workforce shortages in emergency medicine, advanced practice providers (APPs) including nurse practitioners (NPs) and physician assistants (PAs) are being utilized to provide emergency care in rural hospitals. APPs without previous advanced practice emergency care experience are being employed in rural critical access hospital emergency care settings” (2015, p. 203). Nurse practitioners have the stressful job of taking care of critical situations that present to the emergency department without immediate physician coverage. Most nurse practitioners have not had the specialized training for those critical situations. This can be a serious problem for critical patients that are taken to rural emergency rooms due to the lack of experience because the nurse practitioners are not specialized or lack exposure to critical situations.

Telemedicine has been used for many years for consultations with physicians or specialists in emergency rooms that are staffed with nurse practitioners. According to Wesson & Kupperschmidt, “some form of telemedicine has been in use since the early

1900s, beginning with the use of 2-way radios and progressing to the use of interactive real-time technology” (2013, p. 199). Telemedicine has become very popular in rural emergency rooms. It has been proposed that telemedicine has been used to decrease unnecessary transfers, improve outcomes, and decrease mortality.

### **Summary**

This author will conduct a feasibility study to determine if telemedicine would be practical to be utilized in a rural emergency room. The study will examine if it will improve patient outcomes, decrease mortality, and decrease unnecessary transfers. A retrospective chart review of the charts at Wilson Medical Center emergency department, located in Neodesha, Kansas, from April 2015 to April 2016 for every patient where telemedicine was utilized will be performed to obtain a sample size. Patients of all ages and situations that involved the use of telemedicine in the emergency room will be included. Exclusion criteria will be if telemedicine was used for consultation on patients that were not actively emergency room patients or if patients were seen by a physician instead of a nurse practitioner.

It has been shown that telemedicine is beneficial and should be implemented in rural emergency departments where nurse practitioners are utilized as the lone provider. Telemedicine “is the use of medical information exchanged from one site to another via electronic communications for the health and education of the patient or healthcare provider and for the purpose of improving patient care, treatment, and services” (Nelson & Staggers 2014, p. 126). The use of telemedicine has been shown that it is beneficial in multitude of ways. “According to the American Health Information Management Association, benefits of telemedicine include reduced costs, improved access to physicians and

services, improved continuity of care, and the potential for reduced travel costs and time off work” (Dowling 2015, p. 27).

It has been proposed that telemedicine has been used to help decrease cost for the patient by decreasing unnecessary transfers, improving revenue for the facility by keeping them local, improving outcomes, and decreasing mortality. This study will help determine if telemedicine actually accomplishes some of these goals. If telemedicine achieves these goals, it will be proven that it is beneficial to utilize telemedicine in all rural emergency departments both for the patients and for the facility, and should be considered a standard of care.

## **Chapter IV**

### **Evaluation Results**

#### **Evaluation Results**

The increasing shortage of primary care physicians has resulted in the use of family nurse practitioners for staffing of rural emergency departments throughout the United States. Although majority of these family nurse practitioners have not been formally trained in emergency medicine, they are placed in the role. The specific aim of this study was to examine if using telemedicine in the rural emergency department staffed with family nurse practitioners would impact patient outcomes, transfers, and mortality. The following research question that was proposed for this project is: does utilizing telemedicine in rural emergency departments that is staffed with a nurse practitioner improve patient outcomes, decrease mortality, and decrease transfers to a tertiary facility?

#### **Description of Sample/Population**

The sample population was fifty charts of Wilson Medical Center in Neodesha, Kansas emergency department patients that were seen by a nurse practitioner from April 2015 to April 2016. Demographic data was not obtained for this study. The length of time to collect the data was approximately a week from start to finish. Data were collected by Avera Health on all patients where telemedicine was utilized from April 2015 to April

2016. The data were then filtered down to fifty charts which were randomly selected. After the fifty charts were selected, data was extracted from the electronic medical record by the utilization of the questionnaire (Appendix B).

### **Description of Key Terms/Variables**

Telemedicine is defined as “the use of medical information exchanged form one site to another via electronic communications to improve a patient’s clinical health status” (Dowling, 2015, p. 27). For many years, telemedicine has been used for consultations with physicians or specialists in the emergency department that are staffed with nurse practitioners. The use of telemedicine has been proposed to impact patient outcomes, transfer rates, and mortality.

**Independent Variable.** The independent variable of this project was telemedicine. Telemedicine was utilized on all patients in this project.

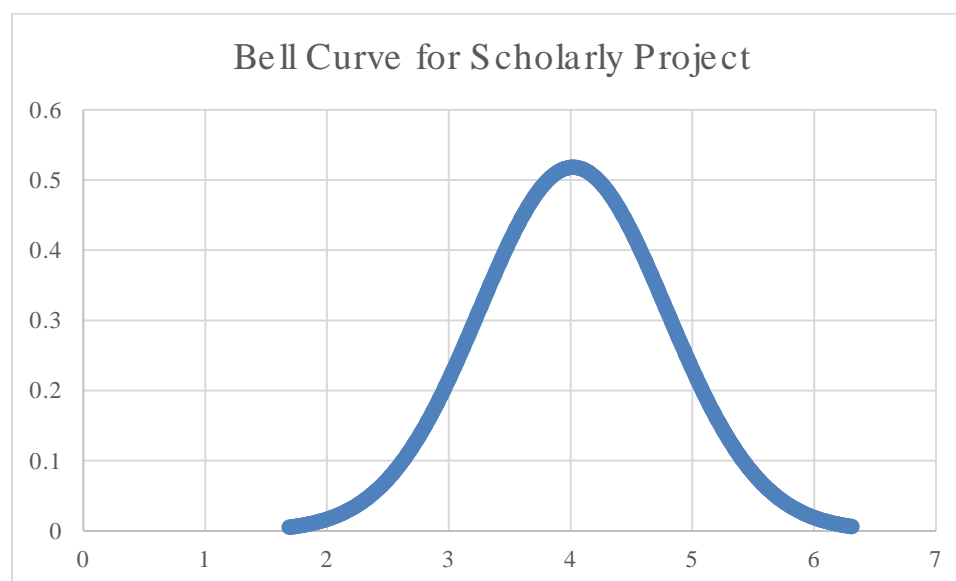
**Dependent Variables.** The dependent variables of this project are transfer rates, mortality rates, and patient outcomes.

### **Analyses of Project Questions/Hypotheses**

This project included three questions. Each question was answered individually in order to be thorough and complete. The first question of this project included, “how does utilizing telemedicine in a rural emergency department that is staffed with a nurse practitioner impact patient outcomes?” This question was answered by using descriptive statistics, mean and standard deviation. Patient condition upon discharge was obtained by a Likert-type scale, “very poor,” “poor,” “no change,” “slight improvement,” or “back to their normal.”. Using numerical data, each category was coded; “1” was “very poor”, “2” “poor” and so forth, until “5” which includes being the best at “back to their normal”.



This numerical data was entered into an Excel program and the statistical formula was applied to find the mean and standard deviation of the data. The mean of the data collected for patient outcome revealed a score of 4.02 and a standard deviation was 0.77 was obtained. These findings reveal that patient outcomes would be considered as “slight improvement” with the use of telemedicine. This finding reveals a positive outcome. The standard deviation was low decreasing the variability of the results.



*Figure 1: Bell curve for patient's outcomes*

The second question of this project was, “how does utilizing telemedicine in a rural emergency department that is staffed with a nurse practitioner impact patient mortality?” This answer was determined by the use of descriptive statistics percentages and frequencies. Data was obtained by a “yes” or “no” answer on the questionnaire (Appendix B) that was utilized to extract data from the patient’s charts. Using numerical data, “yes” was coded as a “1” and a “no” as a “2.” Then the numerical data was entered into Excel program and the statistical formula was applied to find the frequency and percentages. The percentage of mortality was 4% for patients treated through the use of telemedicine;

and, indicating 96% of patients treated through the use of telemedicine survived during this treatment period.

The third and final question of this project included, “how does utilizing telemedicine in a rural emergency department that is staffed with a nurse practitioner impact transfer rates to a tertiary facility?” This answer was determined by the use of descriptive statistics percentages and frequencies. Data was obtained by a “yes” or “no” answer on the questionnaire (Appendix B) that was utilized to extract data from the patient’s charts. Using numerical data, “yes” was coded as a “1” and a “no” as a “2.” Then the numerical data was entered into Excel program and the statistical formula was applied to find the frequency and percentages. The data analysis revealed the percentage of transfers out of Wilson County Medical Center during this time period was 30%. Patients that were discharged to their own homes were calculated to be 50% of the total patients; 16% of the patients were admitted to the Acute Care facility and 4% to the mortuary. These results show that with telemedicine the percentage of transfers were less than that of discharge home.

### **Summary**

The purpose of this project was to determine if telemedicine impacts patient outcomes, transfer rates, and mortality rates. This project’s results show that telemedicine utilized in a rural emergency department staffed by nurse practitioners is beneficial for patients. With the use of telemedicine, the patient’s outcomes are considered positive when they are at least slightly improved upon disposition; additionally, transfer rates with the use of telemedicine are at a low percentage compared to patients being discharged home, and mortality rates are a minute 4%. These findings determine that telemedicine

can be beneficial for rural emergency departments staffed by nurse practitioners potentially becoming a standard of care in the future.

## **Chapter V**

### **Discussion**

#### **Discussion**

The specific purpose for this project was to determine if using telemedicine in the rural emergency department staffed by nurse practitioners will impact patient outcomes, transfer rates, and mortality rates. Since there is such a shortage of physicians, nurse practitioners have become the front line in the emergency departments of small rural hospitals.

#### **Relationships to Outcomes to Research**

Nurse practitioners are competent providers, but are not necessarily specifically trained for the emergency department, making it difficult to be effectively prepared for some emergent conditions because of the lack of exposure or training. Due to the physician shortage, telemedicine has been utilized with increasing frequency in rural emergency departments staffed by nurse practitioners to assist with consultations.

Patient outcomes were positive when telemedicine was utilized in a rural emergency department staffed by nurse practitioners. This project revealed a mean result of 4.02, which is considered slightly improved upon disposition of patient. A positive outcome is a mean of 3.5 to 5. These results correlate with previous research that telemedi-

cine, “may improve survival and prevent ICU complications by allowing direct continuous monitoring of critically ill patients by trained intensivists, especially at night. Telemedicine also allows rapid contact with critical care expert when an in-house physician is not immediately available” (Mullen-Fortino et al., 2012, p.29).

Transfer rates for patients that was seen in the rural emergency department staffed by nurse practitioners are at a low percentage of 30% compared to 50% of patients being discharged home. This project determined that transfer rates are lower with the use of telemedicine. Handschu et al. (2003) stated “In general, transferring patients is expensive, laborious, time consuming, and risky for the patient” (p. 2842). This research correlates with the project findings that the lower percentage of transfers is overall better for the patient, improving outcomes.

Mortality rates for a patient that was seen in the rural Wilson Medical Center Emergency Department staffed by nurse practitioners was at a low percentage of 4%. This project determined that mortality is low with the use of telemedicine. During the literature review of this project, Kidholm et al. (2014) discussed how telemedicine technology has major effect on decreasing mortality. The results of this project validate what was found in the review of the literature involving previous research studies conducted on telemedicine.

This author speculates that the research and project results match because utilizing telemedicine in a rural emergency department staffed by nurse practitioners is overall beneficial for the patient. Telemedicine, through the results of research, has been shown to have multitude of benefits with very few concerns. Some of the concerns include ex-

pense and the perceptions of telemedicine being impersonal. These concerns are overshadowed by the significant amount of benefits telemedicine has, especially improvement of patient outcomes and decreased mortality.

### **Observations**

General observations that were noted during this project include the fact that telemedicine is utilized frequently by the nurse practitioners in the emergency department at Wilson Medical Center in Neodesha, Kansas, and telemedicine was also utilized by the physicians working in this facility. While obtaining the data from the patient's charts, some were excluded due to the fact that a physician saw the patient in the emergency department rather than the care being provided exclusively by a nurse practitioner. Four of the charts that were evaluated while obtaining the fifty charts for data extraction were charts where the provider was a physician, and were therefore taken out of the sample.

Another observation that was made while obtaining the data included the variety of different diagnosis. For this project, the diagnosis was not needed for data collection, and was not recorded. However, a simple glance revealed that diagnoses were in a broad spectrum of Emergency Medicine, ranging from trauma to gastrointestinal bleeding.

The study instruments that were utilized were sufficient for this project. The questionnaire (Appendix B) was an easy tool to extract data that was needed to determine the project outcomes. When determining the condition of the patient, the rubric (Appendix C) that was utilized to determine the condition, if the condition was not properly documented, was adequate. The rubric was only needed for a handful of patient charts due to proper documentation of the condition at discharge by the nurse practitioner. These study

instruments performed to this author's full expectations and this author was pleased with the results.

The project results are reassuring to this author because it was determined that telemedicine utilized in a rural emergency department staffed by nurse practitioners is beneficial for the patient. These benefits are improved patient outcomes, decreased transfer rates, and decreased mortality. Since these results show telemedicine to be beneficial, there is potential that telemedicine can be a standard of care in a rural emergency department that is staffed by nurse practitioners.

### **Evaluation of Theoretical Framework**

The theoretical framework, Nursing Process Discipline Theory, states the role of the nurse is to determine and meet the patient's immediate needs for help. Telemedicine aids in the identifying of critical factors in the patient's care. With telemedicine aiding the nurse practitioner in the emergency setting, the immediate needs of the patient can be met in a timely fashion due to immediate expert consultation. The project results support this theoretical framework by improved patient outcomes. Improved patient outcomes were noted as a mean of 4.02, showing slight improvement upon discharge; this shows support for the theoretical framework by meeting the patient's immediate needs in a timely fashion making for positive patient outcomes.

Other variables not included in the study would be access to high speed internet for appropriate communication speed in telemedicine, as well as the nurse practitioner's level of experience and competence with various emergency situations that he/she may come into contact with. Those locations with better access to or faster speeds of internet

for the purpose of telemedicine will see better results than those locations with limited access, whether due to a general lack of access or limited access due to other similar factors. The more experienced a nurse practitioner is with a given situation, the more positive any outcomes will be.

### **Evaluation of Logic Model**

The results show that telemedicine is beneficial. The assumption of the logic model was that telemedicine would impact patient outcomes, decrease transfer rates, and decrease mortality. The project results did demonstrate a relationship between these concepts, as expected. Results showed that telemedicine does improve patient outcomes with a positive outcome mean of 4.02. The results of the project correlate with previous studies performed.

### **Limitations**

The biggest limitation of this project was that the sample size was relatively small. From April 2015 to April 2016, telemedicine was utilized in a total of 229 cases where patients were seen in the emergency department of Wilson Medical Center in Neodesha, Kansas. Only fifty of those patient's charts were randomly selected due to limited time for data collection. This author believes that there is no sampling bias because inclusion and exclusion criteria was minimal. The only exclusion for this project was that the patient had to be seen by a nurse practitioner and not a physician while being an emergency department patient. Inclusion criteria was all patients, no demographics were needed regarding race, sex, age, or diagnosis.

The instruments used for the project were adequate. A limitation that could be considered regarding the instruments would be the documentation done by the nurse



practitioner was not specific in determining the condition of the patient at discharge, making this researcher use the rubric (Appendix C), potentially creating a bias on how the condition is viewed. However, there were less than five patients' charts where the rubric had to be utilized. No adaptation was made to the study instruments. There were no fiscal resources regarding this project.

Avera, the telemedicine company, caused some time restraints regarding data collection because of the time it took to produce the data of all the patients seen in the Wilson Medical Center in Neodesha, Kansas emergency department where telemedicine was utilized. However, this author does not consider this a limitation to the study.

### **Implications for Future Projects and/or Research**

For future research on telemedicine use in rural emergency departments staffed by nurse practitioners, cost effectiveness for the patient and the facility needs to be further explored. There is limited research on cost effectiveness and telemedicine, especially for the facility. This research could benefit facilities and potentially encourage them to implement telemedicine in rural emergency departments due to telemedicine being both cost effective and beneficial for the patient. Future research regarding a specific diagnosis with a control group and an experimental group with telemedicine being the variable. This research could determine the impact that telemedicine has on patient outcomes for that specific diagnosis, positive or negative. Other future research could also include personal perceptions of patients, families, providers, and healthcare staff regarding telemedicine.

To improve the design for this project, this author could implement a control group by using or not using telemedicine regarding a specific critical situation in a rural

emergency department that is staffed by nurse practitioners. For example, chest pain patients that were seen in a rural emergency department staffed by nurse practitioners would be the specific patient population. A control group would be where the specific patient population, chest pain patients, did not have telemedicine utilized and the control group would be the same patient population but telemedicine was initiated.

### **Implications for Practice/Health Policy/Education**

The results of this project determine that telemedicine is beneficial for patients seen in rural emergency department staffed by nurse practitioners. Patient outcomes were positive at a mean of 4.02 showing slightly improved outcomes upon discharge, making for a positive patient outcome. Transfer rates were at a low percentage at 30% compared to 50% of patient being discharged home, and mortality rates were 4%. These results demonstrate that utilization of telemedicine in a rural emergency department staffed by nurse practitioners is beneficial and potentially a standard of care. Suggested changes for nursing practice could include the implementation of telemedicine in rural emergency departments staffed by nurse practitioners for immediate expert consultation. Implementation of telemedicine could potentially be a standard of care if research demonstrates that the utilization of telemedicine is life-saving.

Implementation of telemedicine could be a practice change for nurse practitioners that work in rural emergency departments. This change in practice could be an improvement to quality care since it has been shown that telemedicine improves patient outcomes when utilized. Telemedicine is being utilized more in all different fields of nursing. Nurs-

ing education needs to include knowledge regarding telemedicine, as a method of delivering care, to nurses and nurse practitioners. The more the nurse is familiar with telemedicine, the potential of increase in utilization of this method.

## **Conclusion**

Increasing physicians shortages have left family nurse practitioners as the lone provider in most rural emergency departments. Since family nurse practitioners are not specifically trained in emergency medicine, it makes it difficult to be effectively prepared for some emergent conditions. Telemedicine is a method that can be utilized to help improve patient outcomes by having an immediate consultation with a specialized physician that can give guidance on how to care for the patient. This project's aim was to determine if utilizing telemedicine in the rural emergency department will impact patient outcomes, transfer rates, and mortality rates. This project determined that telemedicine improves patient outcomes, decreases transfer rates, and decreases mortality. These findings have contributed to nursing knowledge and practice by demonstrating that telemedicine is an effective way for expert consultation to improve healthcare by positive patient outcomes. Utilizing telemedicine has been proven to be beneficial for the patient and should be considered a standard of care for rural emergency departments staffed with nurse practitioners.

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## APPENDIX

**Appendix A**  
**Email of Approval for Data Collection**

Hello,

I would like data on all ER patients that was seen using telemedicine to find out transfer rates, condition at discharge or transfer, and mortality rates!! I will keep all information confidential under a password protection that will only be used by myself!! No demographics are needed. I am not looking at age, sex, race, or anything that can tie a patient to the information!!! Thank you!!

Jessica Dalton

*Jessica,*

*I have spoken with our Analyst and we could get rough data for you prior to the implementation of our new software. We will not be able to provide #2 for you as that will have to be from the patient record at your facility. We are not always on the entire patient stay so cannot really provide the subjective data of the patient condition on discharge. It may simply be easier for us to provide the list of encounters, dates and times and have your pull those records locally to abstract your data. Let me know what direction you would like us to proceed.*

*Have a great weekend,*

**Mary Adams, RN**

*Avera eCARE Account Executive*

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**Appendix B**  
**Questionnaire on How to Collect Data**

TRACKING NUMBER \_\_\_\_\_

1. Did the patient transfer?

☐ YES

☐ NO

2. What was the condition at discharge?

☐ Very poor

☐ Poor

☐ No change

☐ Slight improvement

☐ Back to their normal

3. Did the patient pass away?

☐ YES

☐ NO

4. What was the disposition of patient at discharge?

☐ Home

☐ Transfer

☐ Other (Please specify) \_\_\_\_\_

**Appendix C**  
**Rubric for Determining Condition of Patient**

Very Poor	Needs artificial assistance to breath (ventilator)	Needs assistance with medications to maintain blood pressure (IV drips)	Receives Cardiopulmonary Resuscitation (CPR)
Poor	Needs assistance to breath (bipap, increase in oxygen or initiation of oxygen)	Vital signs are below normal values (bp less than 100/60 or greater than 160/90, HR less than 60 greater than 100, oxygen sats are less than 95%, RR is less than 16 or greater than 24) and needs interventions to maintain or improve vital signs (IV medications for BP, HR, oxygen initiation or titration)	Documentation of poor condition by provider.
No Change	Vital signs have not changed even with interventions.	No resolution of chief complaint prior to discharge.	Documentation of no change/improvement by provider.
Slight Improvement	Vital signs improved from baseline on arrival without continued intervention to improve (one time dose of medications).	Improvement of chief complaint but not resolved.	Documentation of slight improvement or resolving condition by provider.
Back to Their Normal	Vital signs are normal for them without assistance (bp >100/60 <160/90, HR 60-100, RR 16-24, oxygen sat 95% or greater)	Able to breath without assistance or use of oxygen, unless previously on oxygen prior to ER visit then same amount of L/min used.	Documentation of improvement by provider or back to baseline for patient.