

## The Use of Quantitative Protocols to Determine Quality of Care and Patient Outcomes in Time Sensitive Emergencies

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### Abstract

The goal of my research was to identify the use and importance of quantitative measures including door to EKG, door to CT, and door to last radiology during Time Sensitive Emergencies (TSE) in Emergency Departments and their effect on the efficiency and effectiveness of patient outcomes. This was completed through data collection and case studies from dedicated emergency personnel. Within the State of Idaho, a TSE protocol is referred to for patients presenting with a heart attack (STEMI), Stroke, and Trauma. A TSE Designated Center is a healthcare facility that has voluntarily applied for TSE designation, met and is in compliance with the designation criteria and standards of these rules, and that the TSE Council has designated as one or more of the trauma, stroke, and/or STEMI level certifications. A case study design was used to gain a more in-depth understanding of a complex issue through detailed contextual analysis of a limited number of TSE time studies resulting from one critical access hospital. This was initiated by contacting personnel who are familiar with TSE protocol and time study initiatives. Data was collected and analyzed. A survey was used to gauge employee knowledge of TSE protocols and initiatives. Data evaluation was completed by identifying common factors related to inefficiency as well as the perception of effectiveness from the perspective of frontline staff. Results indicate that hospitals that prioritize the use of quantitative measures have improved times and improved patient outcomes. There are few reports of the impact that quality control factors and quantitative protocols have on TSEs in the United States, specifically related to the efficiency of practice and patient outcomes. This study found that ED employees were knowledgeable and understood the importance of using TSE protocol, but actual behaviors showed room for improvement.

**Keywords:** Critical Access Hospital, Efficiency, Time Sensitive Emergency

### 1. Introduction

Steele Memorial Medical Center (SMMC) is a critical access hospital in Salmon Idaho. It is the most rural critical access hospital in the continental United States. It is a level four trauma center dedicated to treating all patients, including those presenting with symptoms of Time Sensitive Emergencies (TSE's). Within the State of Idaho, a Time Sensitive Emergency is referred to for a heart attack (STEMI), Stroke, and a Trauma. A TSE Designated Center is a healthcare facility that has met and is in compliance with the designation criteria and standards of these rules; holds one or more of the trauma, stroke and/or STEMI level certifications as designated by the TSE Council; and has voluntarily applied for TSE designation. A heart attack is referred to as a STEMI, which is a common name for ST-elevation myocardial infarction. This is a more precise definition for a type of heart attack that is caused by a prolonged period of blocked blood supply affecting a large area of the heart and has a substantial risk of death and disability, therefore, calling for a quick response. A stroke is an interruption of blood flow to the brain causing paralysis, slurred speech and/or altered brain function usually caused by a blockage in a blood vessel that carries blood to the brain (ischemic stroke) or by a blood vessel bursting (hemorrhagic). A trauma is the result of an act or event that damages,

harms, or hurts a human being resulting in intentional or unintentional damage to the body resulting from acute exposure to mechanical, thermal, electrical or chemical energy, or from absence of such essentials as heat or oxygen<sup>2</sup>. Rural medical providers are geographically and socially isolated with fewer resources and patients experience less access to specialists' providers. Rural medicine has undergone a cultural change in the past 20 years. Rural doctors still provide a wide variety of medical care; however, the shortage of family practice medical providers is significantly impacting rural areas as more patients seek treatment at the ED. Advances in medical technology allows rural providers to consult with specialists outside of the rural area virtually<sup>4</sup>. Rural medical facilities often have limited personnel which requires the providers present to be more independent and resourceful. Rural medical providers regularly perform specialists' skills such as surgery, emergency care, and hospitalist services and many serve their facility in a variety of roles such as emergency care as well as obstetrics and on call hours<sup>4</sup>.

## 1.2 Statement of the Problem

The primary circumstance that leads to a lack of efficiency and effectiveness of emergency departments (ED) is the frequent use of EDs as primary care facilities because of a limited access to general practitioners or triage resources. Limited staffing in emergency rooms causes an influx of patients who are not considered critical to create a back log for physicians. This increases patient wait time and decreases the quality of care provided in an efficient manner<sup>1</sup>. Frequent flyers in the ED are patients who are seen by providers upwards of 3-4 times in a twelve-month period. Many of these individuals are in the emergency room for symptoms that are considered non-urgent including a lack of knowledge regarding their symptoms or addicts looking for prescription medications. Some of the most notable cases of misinformation are those who are diagnosed with a chronic disease, such as diabetes or asthma, and may not have been properly informed or don't understand how to manage their symptoms on their own. This causes them to search for immediate relief from the fear they are faced with due to their health complications. This fear often stems from a lack of access to primary care providers or an inconsistent history of annual wellness exams. Trends in ED misuse show that women are approximately 9% more likely than men to misuse the ED. This trend also applies to those individuals between the ages of 55-64 and those of a middle-class socioeconomic status<sup>1</sup>.

## 2. Methodology

### 2.1 Introduction

Countless patients in rural America suffer from TSE, but little research has been done on the use of quantitative methods of managerial decision making in these medical emergencies. This research took place over the course of five months. Provider survey data was collected in October 2019 and patient record data was collected for patients treated in 2018 and 2019. Research data resulted was consistently reliable and valid. This was ensured by taking steps to keep ethical and consistent research practices and patient anonymity as high as possible. This study has a moderate level of generalizability due to the limitations of region, access, and TSE regulations.

### 2.2 Research Design

The research is designed as a quantitative case study. This design was chosen due to limited access to isolated rural healthcare facilities. A single healthcare facility was the ideal environment to complete this research. The dependent variables included knowledge, attitudes, and beliefs of rural medical employees in regard to patient treatment during TSE. The independent variables include the quantitative goals specifically, time from door to EKG, door to CT or door to last radiology set by the healthcare facility in treatment protocol for patients experiencing TSE.

#### 2.2.1 participants

The survey participants were chosen from employees of SMMC. The TSE information was collected from patient case audits over the course of two years, 2018 to 2019, who had presented to the ED with symptoms of a STEMI, stroke, or a trauma at a level which activated the TSE protocol. A total of 20 staff members from SMMC were targeted as this composed approximately 50% of the department's collective staff. The employee participants (n=13) were volunteers from the ED front line staff including nurses and emergency services technicians, laboratory technicians, and radiology technicians. These departments were selected due to their direct involvement and treatment of TSE

patients. The staff in these departments have the most hands-on experience with TSE patients, and therefore should have the more accurate and prevalent knowledge and understanding of TSE quantitative measures. The majority of volunteers ( $n=12$ ) have over five years of experience in a healthcare setting with further technical education qualifying them for their positions.

#### *2.2.2 research question*

The research question measured was; how do quantitative protocols determine quality of care and patient outcomes during Time Sensitive Emergencies?

#### *2.2.3 research instrument*

The research instrument used was an electronic survey consisting of 22 questions. For this study, questions included in the survey were regarding the knowledge, attitudes, and behaviors of the participating respondents. This reflected the front-line employees' perceptions of the use of TSE protocols at SMMC. The survey included open ended questions, Likert questions and multiple-choice questions. Eligible participants were required to agree to a statement of consent. The consent form informing participants of their rights before, during and after completing their individual survey was signed by all 13 volunteers prior to participation. Three questions collected demographic information, including department, education, and years of experience. The next section of questions measured general knowledge regarding TSE's and implementation of TSE protocol at the healthcare facility and within the state of Idaho. The final section of questions measured participants specific knowledge about quantitative goals and time metrics within SMMC. These questions were formulated from information from the Idaho Department of Health and Welfare as well as TSE goals set by SMMC.

#### *2.2.4 data collection*

Firstly, TSE patient data was collected from the manager of the ED from 2018 and 2019 to the date of the study. Secondly, using this data, an online survey was created to measure front line employees view of the effectiveness of TSE protocol. This survey was then distributed via an email hyperlink. An introductory email was sent to the managers of the ED, Laboratory, and Radiology with a request to share the survey link with their respective employees in the middle of October. Data collection spanned a three-and-a-half-week period.

#### *2.2.5 data analysis*

Data evaluation was done by compiling TSE data into a common format as a method of data cleaning. Outlying patient data were disregarded to avoid inaccurate results. This patient treatment data was analyzed to identify trends that emerged over time as well as the pattern of patient outcomes based on admits, transfers, discharges, and mortality. Data was analyzed using SPSS Statistics to determine frequencies, percentage and open coded relationships between the questions, responses and how each participant responded.

Survey data was exported from Qualtrics and coded separately for each survey question. Each question responses were analyzed to measure participant knowledge, attitudes, and behaviors. Each question fell into a different category of statistical (nominal, ordinal and interval/ratio) analysis which would then be used to find the mean, median and mode, or combination, for each question. The statistical reporting system was used to find similarities and differences for each question and then would complete a report of the data.

### 3. Data

#### 3.1 Sample Demographics

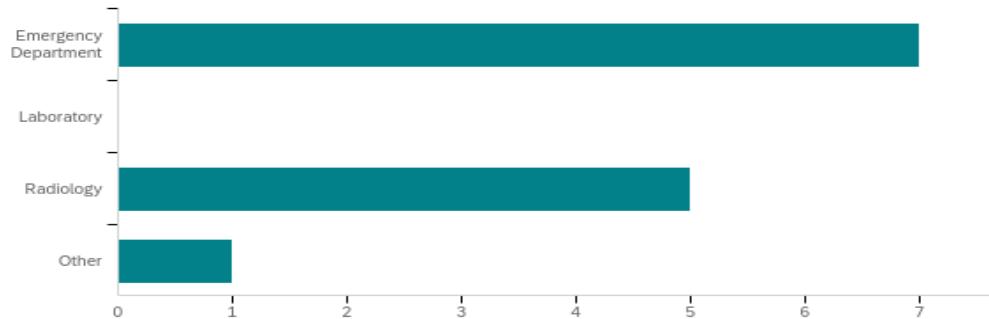


Figure 1. What department do you work in?

For this study 13 employee volunteers completed the survey. Many participants were ED employees 53.85% (n=7). The remaining participants were Radiology Department Employees 38.47% (n=5) and 7.69% (n=1) were from another department who regularly interacted with the ED. There was no employee participation from the Laboratory.

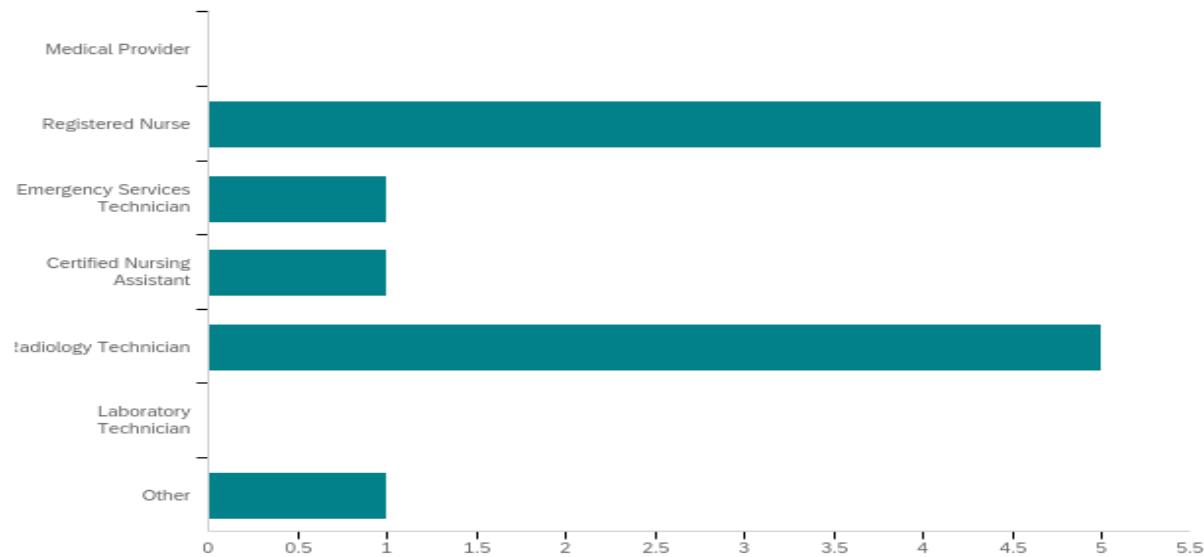


Figure 2. What is your position at your health care facility?

Of those participants, Registered Nurses and Radiology Technicians each comprised 38.46% (n=5) of the participants. The remaining participants were Emergency Services Technicians 7.69% (n=1), Certified Nursing Assistants 7.69% (n=1) or Other 7.69% (n=1).

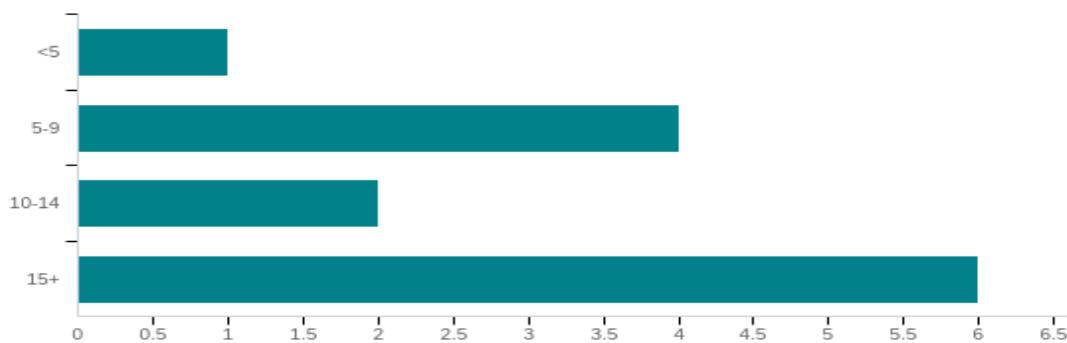


Figure 3. Years of experience in health care?

The highest number of the participants in this study had 15+ years of healthcare experience 46.15% (n=6). The second most prominent experience response was between 5-9 years which consisted of 30.77% (n=4). Of the remaining participants, 15.38% (n=2) had between 10-14 years of experience, and 7.69% (n=1) had less than 5 years of experience.

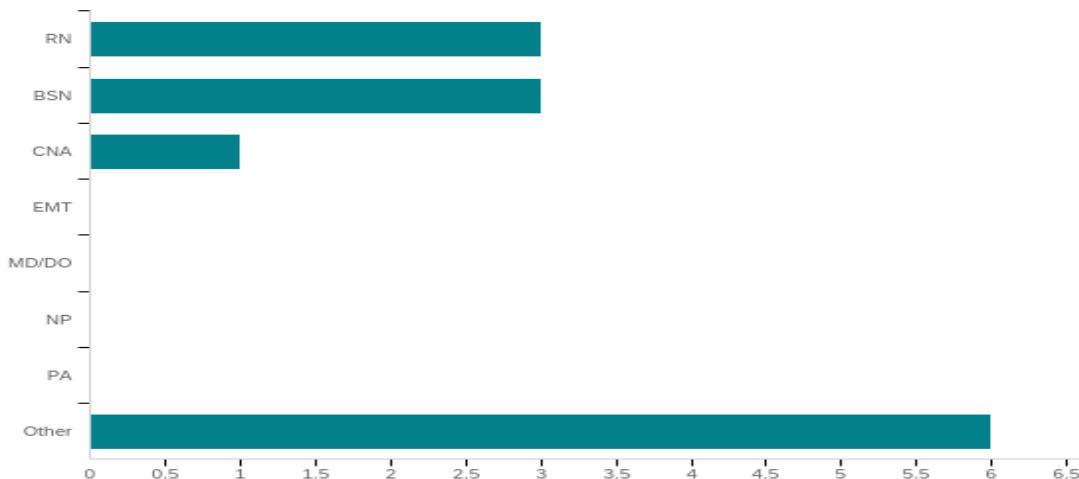


Figure 4. What is your highest level of education?

In regard to participants highest level of education, 46.15% (n=6) responded with Other, 23.08% (n=3) BSN, 23.08% (n=3) RN, and 7.69% (n=1) CNA.

#### 4. Findings

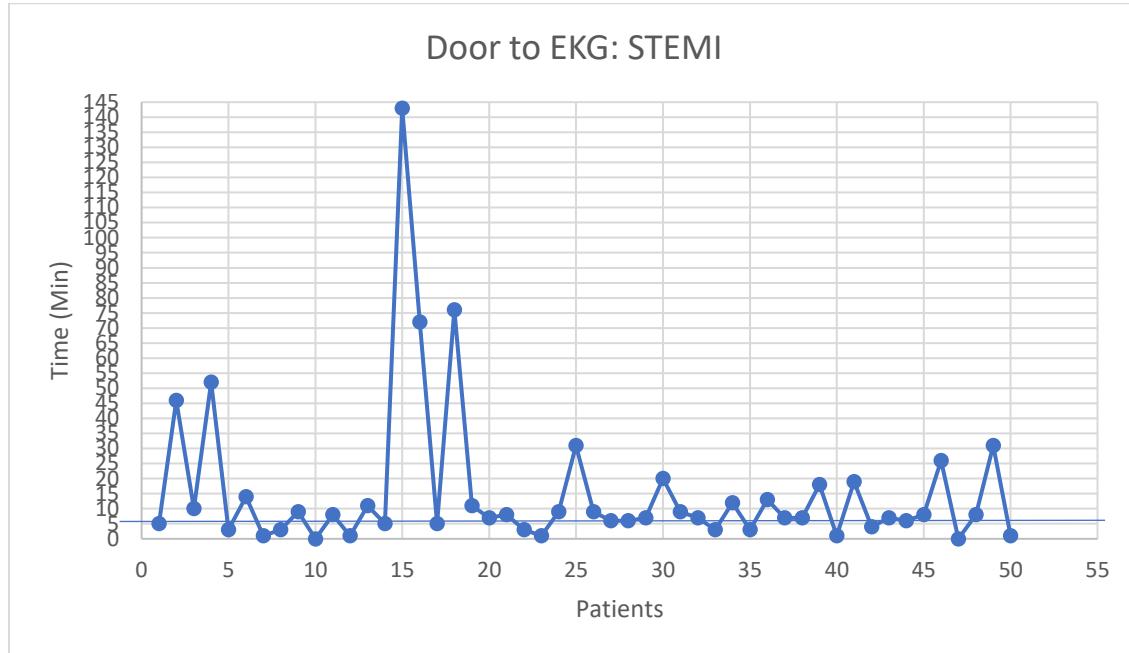


Figure 5. Door to EKG: STEMI

There are 4 identified metrics for STEMI patients. These include door to EKG in less than 45 minutes, door to Troponin in less than 30 minutes, door to TNKase in less than 30 minutes, and door to transfer in under 90 minutes. Of the n=50 EKG's administered 68.00% (n=34) were administered in under 10 minutes.

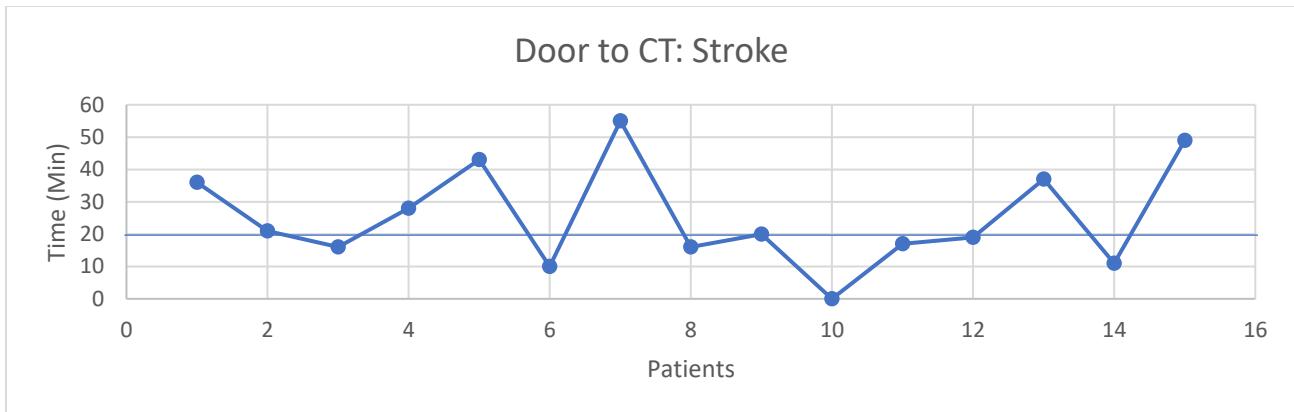


Figure 6. Doors to CT: Stroke

There were three metrics identified for Stroke Patients; Door to CT in under 20 minutes, Door to TPA in under 45 minutes, and Door to transfer in under 90 minutes. Of the 15 stroke cases audited 53.33% (n=8) of patients were taken to CT in less than 20 minutes. The remaining 46.66% (n=7) of patients were in CT within 55 minutes.

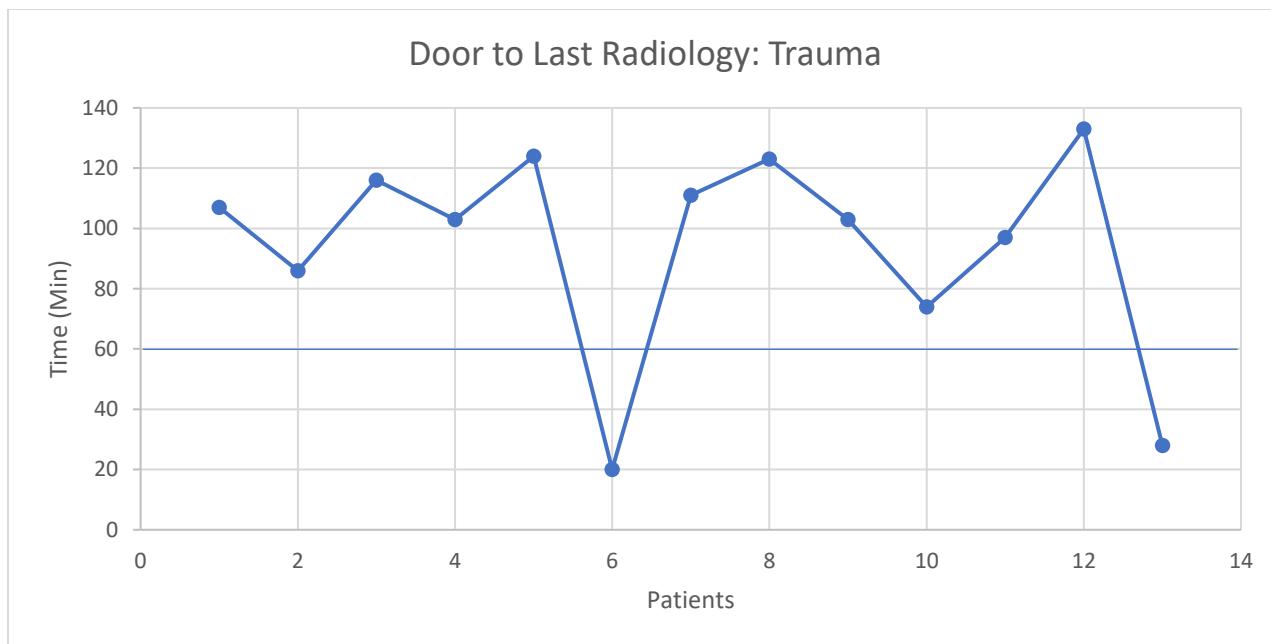


Figure 7. Door to Last Radiology: Trauma

There are 4 quantitative metrics identified for trauma patients. These include door to CT read, door to last lab resulted, door to last radiology all under 60 minutes, and door to admit/transfer in under 180 minutes. There was n=13 trauma patients in 2018. No data was collected in 2019. There were 13 patients who received radiology at SMMC. Of those; 15.38% (n=2) occurred in less than 60 minutes. The remaining 84.62% (n=11) occurred outside this time frame.

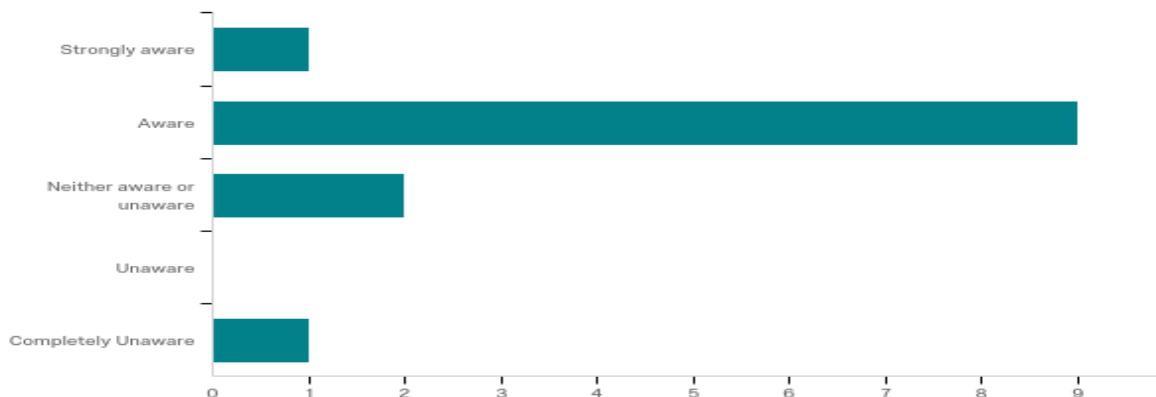


Figure 8. How aware are you of your facilities quality metric measurements?

When asked how aware employee survey participants were of their facilities quality metric measurements. The majority, 69.23% (n=9), responded that they were aware, 7.69% (n=1) were strongly aware, 15.38% (n=2) were neither aware or unaware, and 7.69% (n=1) were completely unaware.

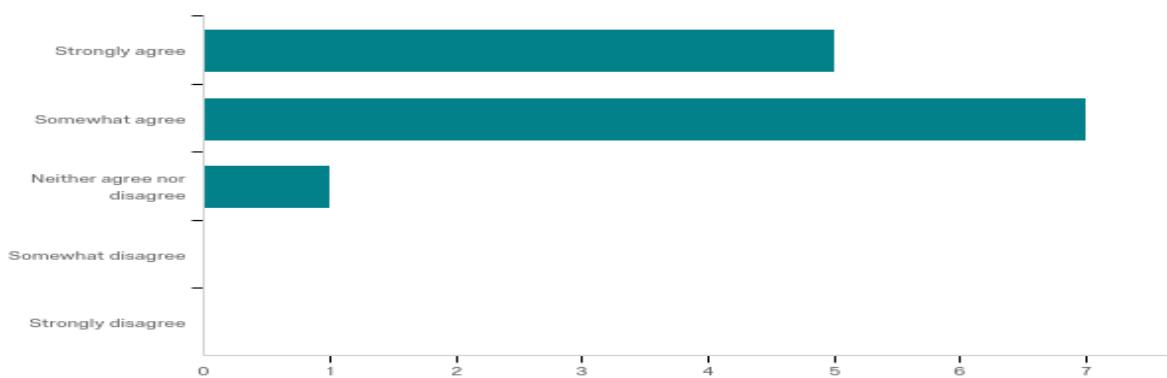


Figure 9. Do you agree that quality metrics impact patient outcomes?

When employee survey participants were asked if they agreed that quality metrics impacted patient outcomes 53.85% (n=7) somewhat agreed, 38.46% (n=5) strongly agreed, and 7.69% (n=1) neither agreed nor disagreed.

## 5. Discussion

It is important to note that when healthcare facility employees treat TSE patients, the main objective is to provide the best possible care to the patient to increase their odds of survival, regardless of all other factors including TSE time metrics. Many hospitals do not have a dedicated team of medical staff for their emergency rooms. Rather, providers cycle through the ED, many of whom are often younger and less experienced. This causes there to be a lack of communication between providers, disarray amongst the staff who are not comfortable or as familiar working together and a lower quality of care being provided in emergent situations<sup>3</sup>.

However, knowledge of time metrics is important to improving patient outcomes which was apparent in this study. This knowledge is applicable to any TSE designated center, such as SMMC, but could benefit hospitals around the country to provide more comprehensive and effective care. A TSE Designated Center is a healthcare facility that has met and is in compliance with the designation criteria and standards of these rules; holds one or more of the trauma, stroke and/or STEMI level certifications as designated by the TSE Council; and has voluntarily applied for TSE designation.<sup>2</sup>. This designation could be expanded outside the state of Idaho which could increase data collection regarding behaviors during TSE's, if more studies were conducted.

The lower than expected behavior results may be characteristic of rural medicine due to staffing limitations. SMMC staffs the ED with one provider, one nurse, and one emergency services technician. With limited staffing in emergency rooms an influx of patients who are not considered critical causes a back log for physicians. This increases patient wait time and decreases the quality of care provided to them in an efficient manner<sup>1</sup>. Rural medical providers are geographically and socially isolated with fewer resources and patients experience less access to specialists' providers. They are often limited in personnel which requires them to be more independent and resourceful. Rural medical providers regularly perform specialists' skills such as surgery, emergency care, and hospitalist services and many serve their facility in a variety of roles such as emergency care as well as obstetrics and on call hours<sup>4</sup>.

A decrease in non-emergent patients will also increase the efficiency of treatment of TSE patients. The rippling effects of these arguably unnecessary visits include ED overcrowding, longer wait times, and patient, as well as provider, dissatisfaction. This in turn causes highly trained and skilled healthcare providers to occupy their time with less urgent cases, causes them to be forced to provide lower quality and less timely care to those in emergent situations. Around the world healthcare professionals are searching for solutions to this issue. Some of the solutions posed include- providing more (or better) educational materials to parents, using telephonic triage, and increasing copays for nonurgent ED visits<sup>5</sup>.

## **5.1 Limitations of the Study**

Due to SMMC being the most remote critical access hospital in the continental US, external factors must be considered as a limitation to the TSE protocol data. These include weather related transport hurdles, lack of appropriate resources, and the time taken to reach the ED from the back country. Lack of representation from the Laboratory is a survey participant limitation because the laboratory employees play an integral role in the treatment of TSE patients as well as their understanding of quality metrics that are important to the efficient treatment of these patients. Another limitation is the lack of trauma data from 2019. Having data results from only 2018 causes the conclusions that are made to be less accurate. SMMC is unique as it has the TSE certification despite its small size which lends itself to the final limitation which was the size of the survey participant pool.

## **5.2 Recommendations for Future Research**

When conducting future research on TSE in rural health settings, it would be beneficial for the research to:

- 1.) Use a larger and more representative sample of employee participants.
- 2.) Expand research to facilities with higher level TSE certifications.
- 3.) Expand on trauma data to create more comprehensive data trends.

## **5.3 Recommendations for Health Educators/Practitioners/Administrators**

- 1.) By developing programs or disseminating information across healthcare facilities that specifically target knowledge and understanding of TSE quality metric goals, employees can better understand the steps that must be taken to put forth their best effort to achieve these goals and improve patient treatment.
- 2.) The implementation of initiative programs will encourage employees to achieve the developed time metric goals and track their performance overtime. This will increase extrinsic motivation of employees.
- 3.) Maintaining accessible records of TSE performance allows management and employees to keep themselves accountable. Audit cases creates a learning opportunity to improve performance in the future.

## **5.4 Summary**

There is an undeniable inefficiency in the treatment of ED patients due to the frequent use of EDs as primary care facilities and a limited patient access to general practitioners or triage resources. This is especially problematic in rural healthcare facilities in their efforts to treat patients with TSE. Countless patients in rural America suffer from TSE, but little research has been done on the use of quantitative protocols in these medical emergencies. The purpose of this study was to identify the use and importance of quantitative measures during TSE throughout critical access healthcare facilities with level four trauma certification and their effect on the efficiency and effectiveness of patient outcomes. To conduct the study on The Use of Quantitative Methods on Managerial Decision Making in TSE, a convenience sample was recruited from SMMC. This study was completed through survey data collection and case studies from dedicated emergency personnel. Knowledge and behaviors of employees dedicated to treating TSE's in rural Idaho indicate a strong understanding on the importance of quality metrics in treating TSE's however, situational factors decrease performance in meeting TSE goals.

## **6. Conclusion**

Upon reviewing the data from the study, the following conclusions were made:

- 1.) Employees of SMMC were aware and knowledgeable of the quality metric goals their facility had in place. According to the study the majority, 69.23% (n=9), responded that they were aware, 7.69% (n=1) were strongly aware, 15.38% (n=2) were neither aware or unaware, and 7.69% (n=1) were completely unaware.
- 2.) This knowledge is not reflected in the behavior of employees based on patient case studies. Of the five Stroke patients who were transferred 20% (n=1) were transferred in under 90 minutes. The remaining 80% (n=4)

were transferred outside of the target time period. Of the 52 STEMI patients transferred, 9.62% (n=5) were transferred in under 90 minutes. The remaining 90.38% (n=47) occurred outside of that time frame. Finally, all 13 trauma patients were admitted or transferred. For 46.15% (n=6) of patients this occurred in less than 180 minutes. The remaining 53.85% (n=7) patients were admitted or transferred in greater than 180 minutes.

## 7. Acknowledgements

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