Fall 2020

IMPROVING DOOR TO TRANSFER TIMES FOR ST SEGMENT ELEVATION MYOCARDIAL INFARCTION IN SMALL EMERGENCY DEPARTMENTS: A QUALITY PERFORMANCE IMPROVEMENT PROJECT

Amber Ryals

IMPROVING DOOR TO TRANSFER TIMES FOR ST SEGMENT ELEVATION MYOCARDIAL INFARCTION IN SMALL EMERGENCY DEPARTMENTS: A QUALITY PERFORMANCE IMPROVEMENT PROJECT

by

Amber Ryals

A Doctoral Project
Submitted to the Graduate School,
the College of Nursing and Health Professions
and the School of Leadership and Advanced Nursing Practice
at The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Nursing Practice

Approved by:

Dr. Carolyn Coleman, Committee Chair
Dr. Cathy Hughes, Committee Member

December 2020

Published by the Graduate School

ABSTRACT

Heart disease is a leading cause of death in the United States (Centers for Disease Control [CDC], 2020). ST-elevation myocardial infarctions are around 38% of all coronary syndrome patients that present to the emergency department (Akbar et al., 2020). Smaller, outlying facilities can be at a disadvantage due to the lack of readily available specialties and services, such as a cardiac catheterization laboratory, which has the potential to cause a delay in inpatient care. With standardized cardiac protocols in place at many facilities, initial identification and treatment of myocardial infarctions are begun long before a patient enters a facility, often with a catheterization team waiting for the patient's arrival. Streamlining the initiation of protocols can better improve patient outcomes and transfer times for emergency rooms to a larger receiving facility for early percutaneous coronary interventions and reperfusion of the ischemic heart muscle. The goal of the quality improvement project was early identification by the emergency room providers and initiation of more efficient transfer to reduce transfer time. A secondary aspect provided information for better training for future staff members of the emergency department.

The population of the study included patients with a diagnosis of ST-segment myocardial infarction and over the age of 18. The setting was a small rural emergency department without a cardiac catheterization laboratory in the facility. A retrospective chart review was performed to evaluate the overall door to transfer times of patients diagnosed with ST-segment elevation myocardial infarctions. The results of the chart review revealed the patients were transferred to a higher level of care within a 60-minute time frame.

Overall, the facility was below standard times of transfers to a higher level of care for myocardial infarctions. An executive summary was given to the emergency department staff director and medical director of the findings. After the executive summary was provided, the director reported the consideration of future policy implementation.

ACKNOWLEDGMENTS

To Dr. Carolyn Coleman and Dr. Cathy Hughes – Thank you for your guidance and direction for this project. Your encouragement was greatly appreciated and without you both, my goals and project could not have been accomplished.

To Dr. Megan McNeil and Faculty – Thank you for your support of my project and for allowing me to complete the tasks in your facility.

DEDICATION

To my parents – Thank you for your constant love, support, and encouragement. You have always pushed me to follow my dreams and do the best I can while not forgetting God made it all possible. I love you both.

To my family and friends – Thanks for being my cheerleaders through this journey and helping me celebrate the milestones along the way.

To Diane and Miranda – You two have pushed and encouraged me more times than I can count. I am honored to have shared this journey with you both and look forward to our future endeavors.

Thank you, Jesus, for keeping me during this time of life and allowing me to complete the task.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

LIST OF ABBREVIATIONS

IRB	Institutional Review Board
DNP	Doctorate of Nursing Practice
STEMI	ST-Segment Elevation myocardial infarction
PCI	Percutaneous coronary intervention
RCR	Retrospective Chart Review
ED	Emergency Department
ERP	Emergency Room Provider
QoL	Quality of Life

CHAPTER I - INTRODUCTION

Many diagnoses of acute myocardial infarctions are identified in an emergency department (ED) by an emergency room provider (ERP) or in the field by emergency medical staff. Early recognition and activation of myocardial infarction could improve patient outcomes and decrease the mortality of the patient. If a patient presents with chest pain as a complaint, standard protocols are typically initiated by interdisciplinary staff and physicians. For facilities without interventional cardiology services, every minute before a transfer is crucial in improving patient outcomes (Kontos et al., 2010). Standard door to intervention goals are less than 60 minutes at most facilities with in house cardiac catheterization laboratory (Menees et al., 2013), while less than 120 minutes is standard for those patients that must transfer these patients to a higher level of care (Estevez-Loureiro et al., 2014). Decreasing the time spent preparing the patient for transfer from a small, rural facility is one of the changes that can be made. While some factors are beyond a facilities' control, such as availability and capability of the flight care team or ambulance services, there are ways, such as faster electrocardiogram or medication administration times, that can overall improve and decrease the time it takes to recognize and initiate the transfer of the patient.

Background

Most rural emergency departments do not have the capabilities of correcting an underlying condition that requires surgical intervention. Because of the lack of capabilities and specialties available, the patient must be immediately transferred to a facility with a cardiologist and cardiac catheterization laboratory available. If not transferred in a timely manner, patients will typically have negative outcomes for their

overall health. Once the heart muscle is damaged, reperfusion is necessary to attempt to repair the damage (Dunphy et al., 2019).

Significance

The patient should be transferred immediately for a more favorable outcome and to prevent cardiac muscle from becoming ischemic. The goal of treatment is to decrease the damage occurring to the heart muscle (Dunphy et al., 2019). This project analyzed the various ways emergency department providers can decrease the time to percutaneous coronary interventions to improve overall patient outcomes.

Problem Statement

Decreasing the time of door to patient transfer can greatly improve patient outcomes. The standard door to cardiac catheterization laboratory time for patients with acute myocardial infarction is 60 minutes. While the 60-minute window increases with a transfer to a 120-minute window, the window can present more delays of patient care. At most emergency departments, standard door to electrocardiogram time is 5 to 10 minutes for chest pain patients, with other standing orders for a chest x-ray, aspirin, cardiac enzymes, and large bore intravenous access as standard protocols (Kelly et al., 2017).

Prior to initiating the changes outlined in the performance improvement plan, the emergency department being evaluated had a door to electrocardiogram time of 13-14 minutes per the emergency department director. To quickly identify a patient with an ST-segment myocardial infarction, an electrocardiogram must be done in less than 10 minutes. Decreasing the time from door to electrocardiogram has improved the overall patient care times of medications administered, initiation of transfers, and the arrival of the patient to a higher level of care.

PICOT

Will decreasing the time of identification of ST-segment elevation myocardial infarctions (STEMIs) and implementation by an interdisciplinary team of standard emergency room protocols for patients decrease the overall time taken to initiate a transfer to a facility with percutaneous coronary intervention capabilities (PCI) compared to national standards? This project assessed the time of each protocol and the implementation of the protocol by the staff. Without changing the protocols already in effect at the facility, the time of the protocols can be decreased for better probable outcomes for each patient. The goal for rural emergency departments is to decrease the overall time spent initiating treatment and transfer for patients with ST-elevated myocardial infarctions. The project evaluated the overall performance of emergency room staff and staffing needs for the department. The evaluation also provided indications for the training of future staff members.

Needs Assessment

A discussion was had with an emergency department director concerning the number of patients seen in the emergency department for chest pain and those that were diagnosed with ST-segment elevation myocardial infarctions. The information leads to a need to evaluate department performance. A small 14-bed emergency department without in-house cardiology and PCI capabilities had to transfer each patient that was diagnosed with a STEMI. The patients that were diagnosed and transferred due to a myocardial infarction have the initiation times of each protocol that was implemented. The director recognized the need to reduce the amount of time taken to transfer a patient in need of a cardiac catheterization laboratory procedure and possible percutaneous coronary

interventions; meaning a difference in the quality of life for a patient or even in some cases, life or death. The more cardiac muscle that is weakened by the myocardial infarction, the more secondary diagnoses can occur later in the patient's lifetime (Dunphy et al., 2019). The department manager, as well as the emergency medical director at this facility, are attempting to decrease transfer time for patients from the initial encounter in the emergency department as a performance improvement goal for the department. The closest facilities with PCI capabilities are 22 minutes by ground to the east or 37 minutes by ground to the west, while flight care teams take around 12 minutes to the larger facility to the west. The transfers are initiated by the emergency room physician and must be referred through a call center that is operated by the facility's overseeing organization. Currently, once the transfer is initiated, a centralized call center arranges transport of the patient to the larger facility based on bed availability and physician acceptance. Once the patient is transported to the closest accepting facility and taken to a cardiac catheterization laboratory for the possible intervention, the vessels causing the myocardial infarction can be repaired, allowing for reperfusion to occur.

The national standards of time for transferring a patient diagnosed with ST-segment elevation myocardial infarction are 90 minutes from door to percutaneous coronary intervention (Comelli et al., 2011). The national standard time for obtaining an electrocardiogram is less than 10 minutes of the patient's arrival. Standards also suggest medications should be administered upon immediate recognition of the myocardial infarction.

Synthesis of Evidence

Decreasing the time it takes for a patient to receive a higher level of care and receive fibrinolytic or percutaneous coronary interventions can reduce the amount of cardiac tissue that becomes ischemic. The decrease in intervention time should provide better outcomes for patients, and in turn, a lower mortality rate. While there are more than two treatment options, this project evaluates percutaneous coronary interventions and reduction of the door to balloon times overall. This project looks at transfers for percutaneous coronary interventions and overall door to balloon times on transfers, while the articles examined and reviewed reflect this. While treating with PCI is not the only treatment option, percutaneous coronary intervention is becoming a higher level of care for patients with STEMIs.

Search

The article database used for the first search was Medline with the keywords *ST-segment elevation myocardial infarction* or *STEMI* with the results of 17,553 articles that were further refined with the keywords *cath lab*, which yielded 65 articles. Of these 6 articles met the criteria and provided the appropriate information for this project. A second search used the article database of CINAHL and yielded 6,327 articles using the keywords *ST-segment elevation myocardial infarction* or *STEMI*; when second key words *cath lab* were added, the number of articles was reduced to 15, with six of the articles being relevant. Google Scholar search was also used with the key phrase of *door to balloon times*. The search for *door to balloon time* resulted in 93,600 articles that were further narrowed to 3,960 articles by adding *STEMI transfers* and the years 2010 through 2020 to the search. Also, using Google Scholar, 189,000 articles were resulted using the

keyword *STEMI* which was narrowed to 36,700 when adjusting the search to 2016 and newer.

The authors overall agree that decreasing the time to catheterization labs and percutaneous coronary interventions vastly improve a patient's outcome. Decreasing the time from patient presentation until the patient is in the cardiac catheterization laboratory decreases patient mortality rates and improves the quality of life (QoL) (Yoong Fu et al., 2019). The methods of many myocardial infarction transfers with treatment may vary per article; however, the articles used to reiterate the quicker the patient receives treatment from a higher level of care, the better the outcome for each patient.

Percutaneous Coronary Intervention

Estevez-Loureiro et al. (2014) reported that longer delays to primary percutaneous coronary interventions can highly lessen the benefits of this therapy. Estevez-Loureiro et al. (2014) also states that percutaneous coronary intervention is the preferred standard of treatment of ST-elevation of myocardial infarctions when the intervention can be performed rapidly by qualified physicians. Also suggested by this study is that there should be no added time delays of transfers by stopping in the second emergency department on arrival to the facility with PCI capabilities (Estevez-Loureiro et al., 2014).

Swanson et al. (2010) noted that primary PCIs are becoming the most common choice for the treatment of STEMI patients. Swanson et al. also states that PCI decreases 30-day mortality rate, stroke, and reinfarction of the heart tissue when compared to thrombolysis. The author also suggests that small reductions in various admission processes can reduce the door to balloon time for patients in need of cardiac catheterization (Swanson et al., 2010).

The suggestion of using reperfusion therapies while awaiting transfer to help improve the outcomes of a PCI is made by Kamona et al. (2018). Kamona et al. (2018) states that optimal reperfusion therapies, such as percutaneous coronary interventions and thrombolytic therapy, will reduce morbidity and mortality rates of patients diagnosed with ST-segment elevation myocardial infarction. Kamona et al. (2018) also states that patients with STEMI should be transferred to a PCI capable facility as soon as possible to reduce the mortality rate.

Peterson et al. (2011) attempts to predict and summarize the factors that can hinder lower door to balloon times and suggests pre-hospital delays, such as transfers, emergency medical services, have the largest role in the longer door to balloon times. Streamlining the inadequacies could help reduce some of the delaying factors for the patient to receive reperfusion therapy (Peterson et al., 2011). While some delays cannot be predicted, such as lack of transportation availability, those delays that can be corrected could be streamlined.

Reduction of Door to Balloon Times

Yoong Fu et al. (2019) performed a study and discovered that a timely door-to-balloon transfer time decreases the overall mortality rate of the STEMI patient population. White et al. (2012) suggests using a helicopter when feasible to decrease door to balloon times for improved patient outcomes. With data showing decreased time from door to balloon is improving worldwide, the overall hospital mortality rate is remaining the same (Menees et al., 2013). Menees and his co-authors (2013) do not have a suggestion to improve hospital mortality rates except to continue to improve the door to balloon times.

With various studies, Kontos et al. (2010) presents a solution of having a centralized page for the cardiac catheterization laboratory team and physician be put into place. However, this suggestion is not feasible for every facility. Rokos et al. (2010) suggests optimizing the electrocardiogram interpretation as quickly as possible to help reduce door to balloon times. The suggestion made by Rokos et al. (2010) is one suggestion and change in standardized care that should be feasible in any facility whether a small outlying area or a large facility with in-house percutaneous coronary intervention capabilities.

Evidence Based Practice Theory

Faye Abdellah's Theory (Raingruber, 2017) combines disease-centered and patient-centered nursing. Abdellah suggested that problems can be overt or covert but still require nursing skills that include observation, applying knowledge, using resources, and completing nursing procedures (Raingruber, 2017). With the nursing skills needed, there is also a patient-centered approach used that includes identifying relevant data, considering similar situations experienced and identifying a therapeutic plan (Raingruber, 2017). A theory such as Abdellah's can be used to evaluate how to care for a patient diagnosed with myocardial infarction and the nursing staff's response to the plan of care for the patient (Raingruber, 2017).

DNP Essentials

The doctoral nursing practice essentials that are used with the project include Essential I: scientific underpinnings for practice. The underpinnings for practice include using knowledge to quickly and effectively diagnose and treat patients having a myocardial infarction and to further streamline the current policy in place (Zaccagnini &

White, 2017). Essential II, which is organizational and systems leadership for quality improvement and systems thinking, helped to utilize new care delivery models that were still feasible to the current organizational perspective (Zaccagnini & White, 2017). Adjusting an already in place policy and improving the patient flow further improved the patient outcome and overall goal of the project which was to decrease the time of transfer for a patient experiencing an ST-segment elevation myocardial infarction. Essential VI, interprofessional collaboration for improving patient and population health outcomes was the main essential needed (Zaccagnini & White, 2017). The DNP essentials require teamwork from all aspects of the staff to ensure the patient is appropriately cared for in a timely manner.

Goals, Objectives, and Expected Outcomes

The primary goal for this project was to decrease the time it takes the healthcare team to initiate protocols for chest pains and recognition of ST-segment elevation myocardial infarction from the initial time the patient presents to the emergency department. Reducing the time between orders received and the completion of an order of medications given, IV access obtained, and electrocardiogram performed can decrease the time the patient is ready for transport which further reduces the time needed to receive the intervention. Another goal was to decrease the time for initiation of protocols by the emergency room nurse and physician.

The goals also include improving staff education for future emergency department staff, as well as improving the overall recognition and treatment of STEMI patients. With the evaluation of the retrospective chart review, the director will be able to assess current practices and policies. An executive summary will be presented to the facility emergency

directors who will evaluate the goals for possible future staff training and changes in the facility policies.

Summary

Improving a patient's quality of life post-STEMI begins when the myocardial infarction is occurring and the few short hours after the event. An evaluation of the interdisciplinary team is the beginning of quality improvement for the emergency department. Streamlining the implementation process of the emergency department's standing protocols will be the initial step in the process of this project in order to obtain quality improvement and improved patient outcomes.

CHAPTER II – METHODOLOGY

Methods for retrospective chart review include a tracking tool for a quality improvement project concerning the implementation of protocols the facility has in place for ST-elevation myocardial infarctions. The methods also evaluated the treatment team's response to the recognition of patients who present to the emergency department with a complaint of chest pain. The initiation of transfer of the patient within 25 minutes of patient presentation to the emergency room has been evaluated. Unless contraindicated, patients received the standard emergency room protocol of being administered 325mg aspirin, a form of nitroglycerin, and be given supplemental oxygen. Other medications, such as intravenous heparin, beta-blockers, and clopidogrel are ordered by the emergency room physician after initiation of patient transfer and consultation with the accepting cardiologist. The initiation of protocols by emergency room staff should occur within 10-15 minutes of arrival to the department. By decreasing the time spent performing care prior to initiation of the protocols being implemented, the receiving facilities have less delay on patients' arrival and are able to take the patient to the cardiac catheterization laboratory faster. The retrospective chart review included all patients over the age of 18 years old, regardless of race or gender. The RCR analyzed the time that an electrocardiogram (EKG or ECG) was performed, a diagnosis was made, medications were given, and the transfer was initiated to better improve times for future patients and staff education.

With current COVID-19 changes, the hospital has added additional protocols and responses, including testing each patient intended to be transferred for COVID-19. The facility is capable of performing a rapid test on patients that are admitted or transferred.

When initiating facility transfer for a STEMI patient, results are not necessary prior to transport in order to prevent a delay in inpatient care. A phone call to the receiving facility with the results can better prepare to receive the patient in appropriate personal protective equipment.

Population and Sample

The setting was a small 14-bed emergency room in coastal county in a southern state. The facility is the only emergency department in the county. The nearest capable facilities are 16.2 miles to the east and 29.9 miles to the west. The average number of patients seen per day is 60 to 65 patients, which was lower in the month of April most likely due to COVID-19. The acuity of the patients can vary from day to day but ranges from mild injuries and illnesses to critically ill patients that require an immediate higher level of care. This facility is associated with a large healthcare organization out of a state to the west and attempts to keep the patients in the network when transfers are needed. The facility focused on in this quality improvement project does not have a cardiac catheterization laboratory and only one cardiologist on call, but this physician does not perform interventions on patients.

The population of the county is 47,632 (U.S. Census Bureau, 2019). Mississippi ranks near the top due to death from heart disease and diabetes (Mississippi State Department of Health [MSDH], 2019). The emergency department staff consists of one physician per day and night, one mid-level provider throughout the busiest times of the day, 3 day or night shift nurses, and 3 mid-shift nurses. The staffing also consists of one patient care technician from 7:00 am until 11:30 pm split into various shifts. Registration

clerks are also actively involved with patients and have the initial contact with the patient and are able to register the patient in a timely manner.

The sample size includes each patient diagnosed with an ST-elevation myocardial infarction. Exclusion criteria is any patient under the age of 18 years old within April 2020 to June 2020 time frame of which this process was assessed. The convenience sample is a total of 27 patients diagnosed in the emergency department with STEMI.

Procedure and Intervention

The retrospective chart review for performance improvement plan evaluates the response of the emergency department staff of patients who present with chest pain. The registration staff placed an initial complaint in the patient's chart. If a patient specified chest pain as (1) a main complaint, (2) a call to the department charge nurse to notify of a chest pain complaint was made in order to ensure prompt assessment by the physician. At this time, a staff member brought the patient to an available room with (3) a cardiac monitor. To decrease time, the patient was placed on a cardiac monitor immediately and had an electrocardiogram performed within 10 minutes on arrival to the emergency department. (4) A patient care technician (PCT) or a secondary nurse will be able to obtain this EKG and attach the patient to the monitor. The primary nurse interviewed the patient and (5) asked questions related to medical history, allergies, and history of present illness in order to triage the patient appropriately. The secondary nurse (6) will obtain intravenous access and (7) blood specimens at this time. The patient care technician presented the physician with the EKG and (8) the physician determined if the patient is having an active myocardial infarction and initiated a transfer to a larger facility. (9) The patient was administered medications that are appropriate in the protocol, such as aspirin,

and (10) the initiation of transfer began. The physician also collaborated with the accepting cardiologist regarding what medications the patient should receive.

A retrospective chart review using the author designed a data sheet (see Appendix A) included the total time of the patient is in the emergency department, door to EKG time, door to transfer initiation. The form is author-designed and will evaluate the time of the actions of the emergency department staff. Each patient will have a form assigned with de-identified data and will look at the time for each protocol that was implemented. The times of the emergency room response was evaluated after the project time frame with the department director and medical director. Once reviewed with the directors, the staff will be informed of the evaluation of how to improve performance.

Quality Performance Improvement Plan

An improvement plan for the facility was created per the request of the department director. The plan includes a retrospective chart review to determine where any possible delays are in inpatient care. Once the delays are determined, a plan was formed to correct the delays. The plan included beginning the triage process of chest pain patients within 3 minutes of their arrival to the emergency department. A way to lessen time from door to triage is to have a call placed to the charge registered nurse by the registration clerk when the patient states he or she has chest pain. The call triggered a nurse or patient care technician to bring the patient to an open room and begin the triage process. The patient care tech or secondary nurse obtained an electrocardiogram and a full set of vital signs. The placing of the patient on the monitor, triage process, and electrocardiogram should occur within ten minutes of the patient's arrival to the emergency department. If the department is full or busy, the triage nurse should bring the

patient into the triage room and perform the electrocardiogram there along with triaging the patient to prevent any delays in care. Overall, an electrocardiogram was obtained within an average of 8 minutes, and the patient was placed on the cardiac monitor in the room within the same time frame. The quick obtaining of an electrocardiogram assisted to improve the early identification of ST-elevation for the patient. Medications were also administered by nursing staff within 12 minutes of the patient's arrival to the department. The improvement plan allowed an emergency department physician to identify and diagnose the ST-elevation and begin initiation of transfer of the patient within 15-18 minutes.

While some variables concerning transfer that the sending facility could not control and that included availability of emergency medical services or flight care to transfer the patient to the receiving facility. Weather, COVID-19, and bed availability at an accepting facility are also variables that could not be controlled. For COVID-19 concerns, rapid COVID testing was available within the small emergency department but took up to 30 minutes for testing results. The patients are tested, if possible, for admission or transfer whether or not he or she is symptomatic.

Statistical Analysis

All patient data was de-identified during this retrospective chart review for the quality improvement project and used an author-designed form to evaluate the times of protocol initiation. Door to triage, electrocardiogram, medications, and transfer times were evaluated and compared to the previous information gathered. Once the data is evaluated, the information was presented to the medical and department directors for

their re-evaluation of the department and prior standing protocols and staffing needs for future implications.

Mean scores were used to evaluate the times gathered for the data. The shortest amount of time as well as the longest amount of time were used. The mean times of all the charted reviewed gave a suggested time and show any needs for improvement with the department and patient care.

Ethical Considerations

The ethical considerations did not include patient information; based on the design of the project, no names, ages, or other identifying factors will be involved. The project evaluated the total time of patients in the emergency department, the time is taken to obtain an electrocardiogram and identify the ST-elevation, time is taken to administer medications, and the time taken to initiate the transfer. The ethical considerations of patients are needed and were addressed by the de-identification of data. An Institutional Review Board (IRB-20-343) approval from The University of Southern Mississippi and a letter of support from the emergency department director was received. The information gathered was password protected and any printed information will be shredded and appropriately disposed of.

Summary

The quality improvement project is not to change the standing protocols of the emergency department, but to improve the recognition of a patient experiencing a STEMI. With the overall improvement potential, the transfer time of patients to a receiving facility will be shorter and improve the patient outcomes. By using the

retrospective chart review, areas that need improvement will be identified and be adjusted for future interdisciplinary staff in the facility.

CHAPTER III - RESULTS

With a retrospective chart review, there were 4,701 total patients that presented to the emergency department in April 2020 through June 2020. The average number of patients were fewer than previous months likely due to COVID-19. This emergency department reported a decrease of overall patients for April when compared to the first quarter of the year with some steady increasing of numbers over May 2020 and June of 2020. Of the 170 patients presenting with chest pain, 27 of the patients were diagnosed as an ST-segment elevation myocardial infarction. All of the patients diagnosed with ST-segment elevation myocardial infarction were transferred to a facility with percutaneous coronary intervention capabilities and a higher level of care with cardiology in house.

Evaluation of the patients' stay in the emergency department revealed an average time of 46 minutes for the length of stay. The door to transfer time compared to a national benchmark was under the average times with minimal delays. Door to intervention time for patients that present to an emergency department in a facility with a cardiac catheterization laboratory should be around 90 minutes or less per national guidelines (Comelli et al., 2011). The door to transfer time for the facility is far below national standards by 44 minutes.

The retrospective chart review revealed a meantime for the door to triage of the facility to be 4 minutes with the ranges going from 1 minute to 12 minutes. While there is no national guideline for the door to triage time, most emergency departments attempt to triage a chest pain complaint within 10 minutes of arrival. The evaluated time of triage varied due to different means of arrival, such as personal vehicles and ambulance.

According to the chart reviews, most patients began receiving medications within a 7 to 24-minute time frame with a mean of 11 minutes. In one case evaluated, no medications were given due to patients taking medications prior to their arrival to the emergency department. Another factor that presented was patients' allergies to aspirin or other medications administered. While there are various suggested medications for an ST-segment elevation myocardial infarction, the chart review was to evaluate the time of initial medication, regardless of which medication was administered.

The door to electrocardiogram average time was 8 minutes from arrival. The emergency department's goal is to have an electrocardiogram on each patient that complains of chest pain within 10 minutes of arrival. The average time was 2 minutes below the goal. Occasional outliers for the 10-minute window occurred but no more than 6 patients with electrocardiogram times over that window.

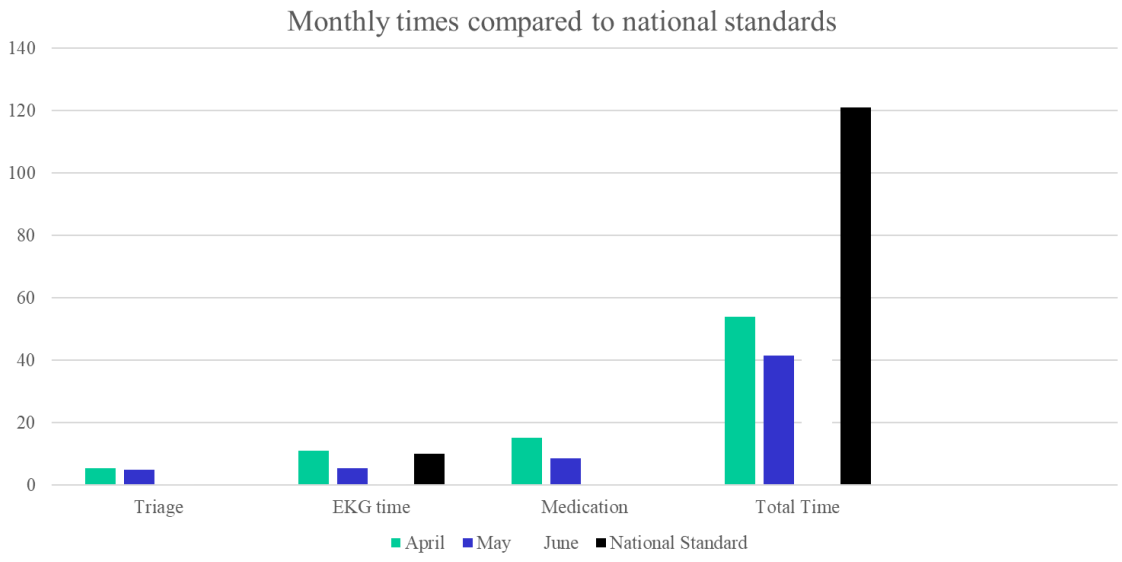

Figure 1. Monthly Comparisons to National Standards

Summary

The overall times in the emergency department were below national standards of transfer from the facility. While the transfers to balloon time cannot be evaluated due to departure from the small emergency department, the times of the patient leaving the facility allowed for adequate time to be evaluated at a larger facility within the 90-minute suggested time frame. Even with adequate transfer times, there are areas of improvement that could be made. Evaluation of the delays revealed that most of the delays came from transportation availability. The evaluation would indicate the emergency department staff are up to the standards of care for an ST-segment elevation myocardial infarction with some small areas of improvement needed.

CHAPTER IV - DISCUSSION

The areas that showed the need for improvement were medication administration, as well as a transfer out of the facility. The average times for electrocardiograms were well below the 10-minute window that is the policy of the facility. The retrospective chart review indicated a below standard time of 44 minutes. While the emergency department's times were acceptable per standards, the emergency department director would like to improve the overall transfer times and patient outcomes.

After evaluating the times in the emergency department, there were areas discovered that could be improved. The plan focused on improving the current processes of the emergency department and not adjusting any current policies. The improvement plan included the necessary precautions for COVID-19 as well as any issues that may arise if the patient is COVID positive.

One improvement suggested will be a medication box with a lock. One of the delays listed was medication administration. Per facility policy, the medications must be verified by a pharmacist and pulled from the medication system used; however, verification by a pharmacist can cause some delays. A medication box would include standard medications that are administered for ST-segment elevation myocardial infarctions and will be verified by two registered nurses and still be scanned into the electronic medical record. The medications should be aspirin, a beta-blocker, nitroglycerin sublingual, nitroglycerin infusion, antiplatelet, and heparin. Other items in the box could include tubing for the infusion, syringes, and needles to draw up medications. A medication box could decrease the time for medication administration to be less than 12 minutes from the door to initial medication administration to the patient.

Another improvement that could be made would be increasing staffing. Increased staffing would assist in performing the electrocardiogram within a shorter amount of time. The addition of a patient care technician for 24 hours instead of 16 could improve these times. A patient care technician can also place the patient on the cardiac monitor in the room while the registered nurses give medications, obtain intravenous access, and call report to the receiving facility.

By triaging a patient complaining of chest pain in an exam room, instead of the triage room, could reduce the door to electrocardiogram time by 4-5 minutes. A second nurse or patient care technician will be able to obtain the EKG while the primary nurse continues to triage the patient and get a full set of vital signs. The patient should be placed on supplemental oxygen and medications are to be administered within 10-12 minutes of arrival to the emergency department. The ED physician is expected to assess the patient and initiate the emergent transfer of the patient within 12-15 minutes of arrival. Expected outcomes are to have the patient to the receiving facility's cardiac catheterization lab within 40 minutes of transfer initiation. Expedited transfers should cause the patient to have a door to receiving facility time of around 45 minutes and able to be in the catheterization laboratory within another 15-20 minutes of arrival to the second facility.

Implications of Future Practice

Of the retrospective chart review, there are some things discovered that were not included in the original phase of this study. One area of further study could be the evaluation of transportation services. Various delays from emergency medical services could be from lack of staffing and available ambulances or the ambulances and teams

being busy with non-emergent calls. Also, for some ST-segment elevation myocardial infarctions that are transported into a facility without a cardiac catheterization laboratory by emergency medical services, and evaluation of paramedic knowledge and capability should occur.

Some implications of future practice could also include evaluating a standard of medications in a particular order to be given. While some medications are contraindicated in different areas of the infarctions occurring in the heart, there could be an algorithm created along with a policy for these medications to be given to prevent further delay. Also, evaluation of heparin bolus or infusion and nitroglycerin tablet or infusion could be made since medication orders currently varies by physician.

Intravenous access is also a necessary measure for myocardial infarction. During the retrospective chart review, it was discovered that there was no marking in the electronic medical record that time stamped when the intravenous access was placed. While the access was charted, the time was not always accurately timed. A suggestion of a single “click” in the chart to appropriately time stamp the intravenous access could be created, similar to the timestamp of the electrocardiogram in the medical record.

COVID-19 presents a new issue with transfers for patients. COVID-19 testing can cause delays in transports or certain facilities not accepting the patient if positive. A higher mortality or morbidity rate could also be evaluated for the patients who test positive for COVID-19 with ST-segment elevation myocardial infarctions. A patient being positive for the virus should not change initial emergency department care but could change protocols for catheterization laboratory care.

Summary

In conclusion, the initial phase of this project evaluated the various times of the emergency department's response to a patient with ST-segment elevation myocardial infarctions and the transfer of these patients to a higher level of care. Other areas could be investigated for future changes in the emergency department. Overall, the facility's times are below the national standard which seems to indicate the staff is efficient in the care of the patient. The decreased time of the door to electrocardiogram for quick identification of myocardial infarction is the priority of the staff in the emergency department. A physician correctly diagnosing and initiating transfer for STEMI patients is vital for decreased morbidity for the patients. With some unexpected delays occurring, there are other areas that should be evaluated concerning the transfers of critical patients from the small facility.

APPENDIX A - Author Designed Data Collection Tool

Arrival Date/Time	Diagnoses	Door_Provide	Door_Tria	Door_E	Door_1s	ED Time in mins
04/24/2020 2304	Bradycardia; Fatigue; Heart block AV second degree (STEMI)	30	12	15	15	55
04/29/2020 1155	SOB (shortness of breath); CHF (congestive heart failure); Myocardial infarction of anterior wall (STEMI)	22	9	12	18	62
04/09/2020 0851	Acute ST elevation myocardial infarction (STEMI); Complete heart block	10	1	9	12	47
04/17/2020 0416	Acute ST elevation myocardial infarction (STEMI)	25	1	10	11	60
04/23/2020 0302	Chest pain; Acute ST elevation myocardial infarction (STEMI)	20	5	13	15	65
04/05/2020 1722	Chest pain; Acute ST elevation myocardial infarction (STEMI)	15	1	11	20	59
04/29/2020 0114	Elevated troponin; Acute ST elevation myocardial infarction (STEMI)	10	3	8	24	58
05/26/2020 0306	Acute ST elevation myocardial infarction (STEMI)	12	5	4	10	21
05/03/2020 1938	Chest pain; STEMI (ST elevation myocardial infarction); Acute ST elevation myocardial infarction (STEMI) involving right cor	15	9	10	10	50
05/26/2020 0806	Chest pain; Pain; Atrial fibrillation with RVR; Acute ST elevation myocardial infarction (STEMI)	9	7	6	12	35
05/29/2020 1118	Precordial chest pain; Acute ST elevation myocardial infarction (STEMI)	10	6	8	10	39
05/13/2020 2216	Cardiac arrest; ST elevation myocardial infarction (STEMI), unspecified artery	11	1	5	8	49
05/18/2020 1712	Chest pain; Acute ST elevation myocardial infarction (STEMI), initial episode of care	14	6	8	11	56
05/21/2020 0030	Chest pain; Acute ST elevation myocardial infarction (STEMI)	12	3	3	6	44
05/14/2020 1551	Acute ST elevation myocardial infarction (STEMI); Bradycardia; Acute hyperkalemia; Persistent severe sinus bradycardia	9	1	4	10	46
05/16/2020 0649	Chest pain; ST elevation myocardial infarction (STEMI), unspecified artery; Bradycardia	12	4	8		31
06/26/2020 1457	Acute ST elevation myocardial infarction (STEMI)	11	3	10	11	46
06/22/2020 0401	Chest pain; Acute ST elevation myocardial infarction (STEMI); Hyperbilirubinemia; Non-intractable vomiting with nausea, u	10	1	8	12	43
06/27/2020 1556	Chest pain; Acute ST elevation myocardial infarction (STEMI)	8	2	10	9	38
06/04/2020 1445	Acute ST elevation myocardial infarction (STEMI)	5	5	11	13	41
06/28/2020 1228	Acute ST elevation myocardial infarction (STEMI)	17	6	7	9	42
06/12/2020 2134	Acute ST elevation myocardial infarction (STEMI); Hyperkalemia; Chest pain, unspecified type	11	1	5	12	48
05/30/2020 0426	Chest pain; Acute ST elevation myocardial infarction (STEMI)	12	3	5	7	40
04/08/2020 0727	Acute ST elevation myocardial infarction (STEMI); Chest pain; Acute inferior myocardial infarction	10	7	11	12	35
04/30/2020 2336	Tachycardia; Acute ST elevation myocardial infarction (STEMI)	9	5	8	10	45
06/23/2020 2025	Acute ST elevation myocardial infarction (STEMI)	13	4	9	11	41
05/30/2020 2025	Encounter for central line placement; Chest pain; Acute ST elevation myocardial infarction (STEMI)	5	1	7	9	46

APPENDIX B –IRB Approval Letter

Office *of*
Research Integrity

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

118 COLLEGE DRIVE #5125 • HATTIESBURG, MS | 601.266.6576 | USM.EDU/ORI

NOTICE OF INSTITUTIONAL REVIEW BOARD ACTION

The project below has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services regulations (45 CFR Part 46), and University Policy to ensure:

- The risks to subjects are minimized and reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered involving risks to subjects must be reported immediately. Problems should be reported to ORI via the Incident template on Cayuse IRB.
- The period of approval is twelve months. An application for renewal must be submitted for projects exceeding twelve months.
- Face-to-Face data collection may not commence without prior approval from the Vice President for Researches Office.

PROTOCOL NUMBER: IRB-20-343
PROJECT TITLE: IMPROVING DOOR TO TRANSFER TIME FOR ST-SEGMENT ELEVATION MYOCARDIAL INFARCTION IN SMALL EMERGENCY DEPARTMENT – A QUALITY PERFORMANCE IMPROVEMENT PROJECT
SCHOOL/PROGRAM: School of LANP, Leadership & Advanced Nursing
RESEARCHER(S): Amber Ryals, Carolyn Coleman

IRB COMMITTEE ACTION: Approved
CATEGORY: Expedited
5. Research involving materials (data, documents, records, or specimens) that have been collected, or will be collected solely for nonresearch purposes (such as medical treatment or diagnosis).

PERIOD OF APPROVAL: September 14, 2020

Donald Sacco Jr.

Donald Sacco, Ph.D.
Institutional Review Board Chairperson

APPENDIX C – Executive Summary

The following are the STEMI results and proposed improvements for the emergency department. It was found that prior to streamlining the process, the average EKG times were 13 minutes from the times the patients arrived. The average transfer time was over 60 minutes for the patient to leave the department. The times showed areas of needed improvement. The areas corrected included communication between the staff and registration as well as physicians were improved.

After correcting the communication gaps, the overall patient transfer times improved to an average length of stay of 44 minutes for STEMI patients. The EKG times improved from 13 minutes to an average of 8 minutes.

Further suggestions for improvement include adding an extra patient care technician or registered nurse. Also, creating a medication box that includes standard medications given to myocardial infarctions could be added. The box should have a lock and will be replaced after each patient. A sheet inside the box will help to track medications and supplies used from the box.

Included in this summary are the overall number of patients that presented with a chief complaint of chest pain as well as diagnosed with STEMI. Also included is a chart that identifies the time improvements after the quality performance improvement plan was implemented.

Table A1.

Monthly Patient Census

	April	May	June
Total Patients	1448	1610	1643
Chest Pain	61	52	57
STEMIs	9	11	7

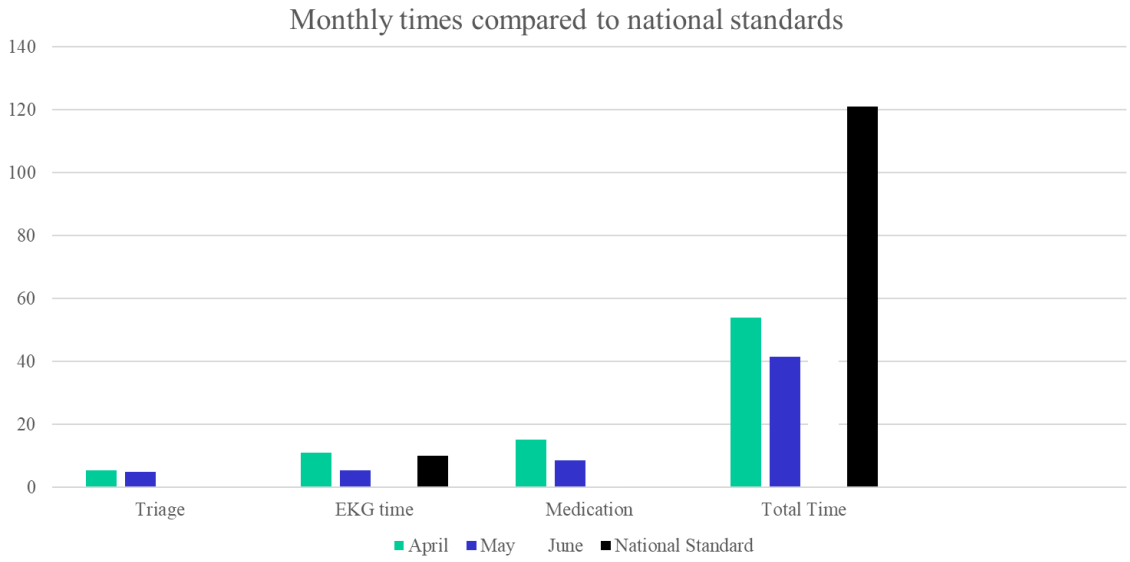

Figure A1. *Monthly Comparisons to National Standards*

Thank you for your assistance and support of this project. I look forward to new challenges with the team.

Amber Ryals, BSN, RN, DNP Candidate

REFERENCES

Akbar, H., Foth, C., Kahloon, R.A., & Mountfort, S. (2020). Acute myocardial infarction ST elevation (STEMI). *Stat Pearls.* https://www.ncbi.nlm.nih.gov/books/NBK532281/

Centers for Disease Control and Prevention (CDC). (2020). *Heart disease*. CDC.gov. https://www.cdc.gov/heartdisease/index.htm

Comelli, I., Vignali, L., Rolli, A., Lippi, G., & Cervellin, G. (2011). Achievement of a median door-to-balloon time of less than 90 minutes by implementation of organizational changes in the 'emergency department to cath lab' pathway: a 5-year analysis. *Journal of Evaluation in Clinical Practic, 18*(2012), 788-792. https://doi:10.1111/j.1365-2753.2011.01673.x

Dunphy, L. M. H., Winland-Brown, J. E., Porter, B. O., & Thomas, D. J. (2019). *Primary care: the art and science of advanced practice nursing*. F.A. Davis Company.

Estévez-Loureiro, R., López-Sainz, A., Pérez de Prado, A., Cuellas, C., Calviño Santos, R., Alonso-Orcajo, N., Salgado Fernández, J., Vázquez-Rodríguez, J. M., López-Benito, M., & Fernández-Vázquez, F. (2014). Timely reperfusion for ST-segment elevation myocardial infarction: Effect of direct transfer to primary angioplasty on time delays and clinical outcomes. *World Journal of Cardiology, 6*(6), 424–433. https://doi.org/10.4330/wjc.v6.i6.424

Kamona, A., Cunningham, S., Addison, B., Rushworth, G.F., Call, A., Bloe, C., Innes, A., Bond, R.R., Peace, A., & Leslie, S.J. (2018). Comparing ST-segment elevation myocardial infarction care between patients residing in central and

remote locations: a retrospective case series. *Rural and Remote Health, 18*, 4618. https://doi.org/10.22605/RRH4618

Kelly, C. R., Kirtane, A. J., Stant, J., Stone, G. W., Minutello, R. M., Wong, S. C., Manuzon, H., Gerow-Smith, R., Kelley, N., & Rabbani, L. E. (2017). An updated protocol for evaluating chest pain and managing acute coronary syndromes. *Critical Pathways in Cardiology, 16*(1), 7–14. https://doi.org/10.1097/HPC.0000000000000098

Kontos, M.C., Kurz, M.C., Roberts, C.S., Joyner, S.E., Kreisa, L., Ornato, J.P., & Vetrovec, G.W. (2010) Emergency physician- initiated cath lab activation reduces door to balloon times in ST-segment elevation myocardial infarction patients. *The American Journal of Emergency Medicine, 29*, 868-874. https://doi.org/10.1016/j.ajem.2010.03.025

Menees, D.S., Peterson, E.D., Wang, Y., Curtis, J.P, Messenger, J.C., Rumsfeld, J.C., & Gurm, H.S. (2013) Door-to-balloon time and mortality rates among patients undergoing primary PCI. *The New England Journal of Medicine. 369*, 901-909. https://doi: 10.1056/NEJMoa1208200

Mississippi State Department of Health (MSDH). (2019). *Health equity in Mississippi*. MS.gov. https://msdh.ms.gov/msdhsite/_static/44,0,236.html

Peterson, M.C., Syndergaard, T., Bowler, J., & Doxey, R. (2011) A systematic review of factors predicting door to balloon time in ST-segment elevation myocardial infarction treated with percutaneous intervention. *International Journal of Cardiology,157*, 2012, 8-23. https://doi.org/10.1016/j.ijcard.2011.06.042

Raingruber, B. (2017). *Contemporary health promotion in nursing practice*. Jones and Bartlett Learning.

Rokos, I. C., French, W. J., Mattu, A., Nichol, G., Farkouh, M. E., Reiffel, J., & Stone, G. W. (2010). Appropriate cardiac cath lab activation: optimizing electrocardiogram interpretation and clinical decision-making for acute ST-elevation myocardial infarction. *American Heart Journal*, *160*(6), 995–1003.e10038. https://doi.org/10.1016/j.ahj.2010.08.011

Swanson, N., Nunn, C., Holmes, S., & Devlin, G. (2010) Door to balloon times: streamlining admission for primary percutaneous coronary intervention. *The New Zealand Medical Journal*, *123*(1309), 18-25. http://www.nzma.org.nz/journal/123-1309/3986

U.S. Census Bureau. (2019). *Quick facts. Hancock County, Mississippi.* https://www.census.gov/quickfacts/hancockcountymississippi

White, J., Howard, R., Goldsmith, R., Harrison, N., Johanson, S., Webster, M., Stewart, J., Ormiston, J., & Ruygrok, P. (2012) Safety and feasibility of patient transfer by helicopter for primary percutaneous coronary intervention. *The New Zealand Medical Journal.125*, 47-59. 125. No 1362. ISSN 1175 8716. http://www.nzma.org.nz/journal/125-1362/5350/

Yoong Foo, C., Andrianopoulos, A., Brennan, A., Ajani, A., Reid, C.M., Duffy, S.J., Clark, D.J., Reidpath, D.D., & Chaiyakunapruk, N. (2019) Re-examining the effect of door-to-balloon delay on STEMI outcomes in the Belgrade area coronary care units. *Scientific Reports*, 9, 19978, 84-96. https://doi.org/10.1038/s41598-019-56353-7

Zaccagnini, M.E. & White, K.W. (2017). *The Doctor of nursing practice essentials: A new model for advanced practice nursing.* Jones and Bartlett Learning.