IMPROVING STEMI TRANSFER TIMES

A Scholarly Project

Submitted to the

Faculty of Liberty University

In partial fulfillment of

The requirements for the degree

Of Doctor of Nursing Practice

By

Beth Anne Geiger

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Scholarly Project Chair Approval:

Abigail Jean Newton, DNP. August, 2023.

ABSTRACT

Early identification and treatment for the patient experiencing an ST elevation myocardial infarction is imperative. The American Heart Association and the American College of Cardiology have provided national guidelines to standardize the expectation of care for these patients. When organizations are not equipped to perform a percutaneous coronary intervention, the patient requires transfer. Delay in patient transfer leads to increased morbidity and mortality and poor patient outcomes. For this reason, it is essential that non-PCI capable hospitals have a standard protocol that is followed to expedite treatment and transfer of the patient to a higher level of care. This project evaluated the impact that instituting a STEMI protocol had on transfer times. A retrospective analysis of previous transfer times was utilized to compare if the institution of a protocol was effective at improving the transfer process.

Keywords: STEMI, Myocardial Infarction, Transfer, Non-PCI Capable Hospital

Copyright Page

Dedication

This project is dedicated to my husband, Luke, and our son Gideon, for their support and patience during this process.

Acknowledgments

This project would not have been possible without the support and guidance of my chair Abigail Newton DNP and my preceptor Katherine Davis MSN.

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List of Abbreviations

Centers for Disease Control and Prevention (CDC)

ST Elevation Myocardial Infarction (STEMI)

American College of Cardiology (ACC)

American Heart Association (AHA)

Percutaneous Coronary Intervention (PCI)

Door-In-Door-Out (DIDO)

Acute Myocardial Infarction (AMI)

Myocardial Infarction (MI)

Centers for Medicare and Medicaid Services (CMS)

Electrocardiogram (ECG or EKG)

Society for Academic Emergency Medicine (SAEM)

Advanced Cardiac Life Support (ACLS)

Emergency Department (ED)

Doctor of Nursing Practice (DNP)

Advanced Practice Registered Nurse (APRN)

Institutional Review Board (IRB)

SECTION ONE: INTRODUCTION

The Centers for Disease Control and Prevention (CDC) have identified heart disease as the leading cause of death in the United States (CDC, 2022). Heart disease does not discriminate; it impacts women, men, and individuals from all ethnic backgrounds (CDC, 2022). Although many conditions fall under the umbrella of heart disease, this project aimed to improve outcomes for patients undergoing an ST elevation myocardial infarction (STEMI). Mortality for patients who experience a myocardial infarction continues to be high without prompt evaluation, identification, and treatment (Mechanic et al., 2022). It is for this reason that the American College of Cardiology (ACC) and the American Heart Association (AHA) have outlined clinical performance and quality measures to standardize the expectations of care for STEMI patients (American College of Cardiology (ACC), 2017).

The ACC and AHA have developed individualized measures for centers capable of performing percutaneous coronary intervention (PCI) and for hospitals without this capability. The facility where this writer conducted her scholarly project was not PCI-capable. The measure for hospitals that are not PCI-capable states, "Patients with acute STEMI (or its' equivalent) defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG, who are seen initially at a non-PCI-capable hospital, should be transferred to a PCI-capable hospital with a door-in-door-out (DIDO) time ≤30 minutes" (ACC, 2017, paragraph 2). Evidence has shown that patients who do not receive percutaneous coronary intervention within 90 minutes of acute myocardial infarction (AMI) have increased morbidity and mortality (Jneid et al., 2017). Therefore, meeting this quality measure is essential to improving patient outcomes. Additionally, achieving STEMI transfer times of ≤30 minutes was identified as a fiscal goal for the unit and was a priority to the organization.

Background

Acute myocardial infarction is one of the leading causes of death worldwide (Mechanic et al., 2022). Within the United States, someone has a myocardial infarction (MI) every 40 seconds (CDC, 2022). It has been estimated that 550,000 new onset and 200,000 repeat MIs occur in the United States annually (Cleveland Clinic, 2023). Of these individuals, 280,000 have experienced a STEMI (Cleveland Clinic, 2023). The rural hospital where this project was conducted was not a PCI-capable facility and therefore stabilized and transfered AMI patients. Per the ACC/AHA guidelines, patients who are not hemodynamically stable or who are unable to receive PCI within 120 minutes should receive a fibrinolytic (Gonzalez et al., 2020). Fibrinolytics must be administered within the first 3 to 6 hours of symptom onset and potentially up to 12 hours after symptoms begin (Gonzalez et al., 2020). The closest PCI center available to the hospital where the project was conducted is 16.7 miles or roughly 24 minutes by ground transport. Therefore, due to proximity, a transfer is preferred over a fibrinolytic medication; however, if the transfer has an anticipated delay of ≥60 minutes or if the patient is unstable for transfer, a fibrinolytic medication should be considered (Gonzalez et al., 2020). The emergency department had set a goal of achieving a door-in-door out time for STEMI patients of ≤30 minutes to align with the ACC/AHA guidelines.

Problem Statement

The mortality rate related to acute myocardial infarctions has been declining in recent years due to prompt treatment; however, with delays, mortality continues to be high (Mechanic et al., 2022). Between 5 to 10% of post-MI patients die within the first year and almost 50% of individuals will require readmission to the hospital (Mechanic et al., 2022). Not only are these statistics alarming for patient care and outcomes; additionally, the Centers for Medicare and

Medicaid Services (CMS) link quality to payment through the hospital readmission reduction program which monitors readmission rates for AMI patients (CMS, 2022). Therefore, this issue is pertinent not only to patient care and outcomes but also has financial impacts on the organization.

Purpose of the Project

The purpose of this project was to assess how the implementation of a STEMI protocol would impact the transfer time for patients who presented to the emergency department with a STEMI. The goal of this project was to standardize the workflow for STEMI patients to streamline the process and improve the time from door to transfer.

Clinical Question

In STEMI patients within the rural emergency department, how does a STEMI protocol, compared to no protocol affect the door-to-transfer time within 30 to 60 days?

SECTION TWO: LITERATURE REVIEW

Search Strategy

The literature review for this scholarly project was conducted using three databases. The first database utilized was CINAHL. The first search term applied was STEMI which resulted in 4,745 articles. The word “transfer” was added to the STEMI search which narrowed down the article selection to 188 items. The search was restricted to articles published between October 2018 and February 2023. Other modifiers included the limitation to articles that were published in English, had full text available, and were peer-reviewed. With these modifiers in place, CINAHL presented 23 articles for review.

The second database utilized for the literature review was Medline ProQuest. Terms such as “STEMI, STEMI Transfers, Door in Door Out Time” were utilized. The initial search resulted in 14, 951 results. The search was modified to include articles written between October 2018 and February 2023 that were peer-reviewed and published in English. This reduced the number of results to 135 articles. This writer then limited the search to include randomized controlled trials, systematic reviews, practice guidelines, observational studies, and meta-analyses. Medline ProQuest provided 67 articles with these modifiers in place.

The third database utilized was Google Scholar. The initial term searched was “improving STEMI transfer times”. This yielded 21,700 articles. The search was modified to include articles that had been written since 2019. This narrowed the number of articles to 10,400. The search was then modified to the most recent studies performed. 28 articles were chosen for review. After the removal of redundant articles and assessment of pertinence to the upcoming project, a total of 15 articles were reviewed in depth. Articles included focused on the identification of the STEMI patient, current best practices to improve STEMI patient outcomes, and the interfacility transfer process for STEMI patients from a non-PCI capable facility to a PCI capable hospital.

Critical Appraisal

The articles that were chosen to be incorporated within the literature review met the inclusion criteria of terms including, “STEMI, STEMI transfer, improving STEMI transfer times, or STEMI door-in-door-out time”. All articles reviewed were peer-reviewed. Each article was categorized using Melnyk levels of evidence (Melnyk & Fineout-Overholt, 2015). One level 1 systematic review and meta-analysis was incorporated (Melnyk & Fineout-Overholt, 2015). One level 2 randomized controlled trial was reviewed (Melnyk & Fineout-Overholt, 2015). Two

level 3 controlled trials were examined (Melnyk & Fineout-Overholt, 2015). 10 of the 15 articles would be categorized as level 4 (Melnyk & Fineout-Overholt, 2015). The level 4 evidence was comprised primarily of retrospective cohort studies that aimed to examine how to improve their facilities' transfer times for STEMI patients. For this reason, the level 4 studies were very relevant to this project.

The strengths of the literature included being peer-reviewed. Limitations for retrospective cohort studies include the possibility of bias and confounding. Additionally, many of the studies were performed at a single facility with no comparison group. However, the evidence substantiating the need for an efficient process to recognize and streamline the transfer process for STEMI patients was overwhelming. A table of evidence is provided (Appendix A).

Synthesis

The articles for this synthesis focused on STEMI symptoms, best practices, national guidelines, and improving transfer from a non-PCI-capable facility to a PCI location. The primary aim of acute STEMI management was identified as the restoration of coronary blood flow as quickly as possible (Ali et al., 2020). All the articles identified STEMI as a medical emergency that required prompt identification, evaluation, and treatment (Abuzeyad et al., 2022; Alexander et al., 2021; Ali et al., 2020; Alves et al., 2021; Dakota et al., 2020; Forsyth et al., 2020; Garcia et al., 2022; Latip et al., 2021; Podlesnikar et al., 2019, & Shi et al., 2018). Many of the articles acknowledged that patient survival and outcomes are dependent on reducing the time from occlusion to reperfusion (Abuzeyad et al., 2022; Alexander et al., 2021; Ali et al., 2020; Dakota et al., 2020; Forsyth et al., 2020; Garcia et al., 2022; Latip et al., 2021; Podlesnikar et al., 2019, & Shi et al., 2018). Prompt identification requires an understanding of common traits that are seen among STEMI patients. The most common presenting symptom was chest pain (Ali et

al., 2020 & Abuzeyad et al., 2022). Additional potential symptoms included shortness of breath, weakness, and dizziness (Ali et al., 2020 & Abuzeyad et al., 2022).

Furthermore, other traits have been identified among STEMI patients. These characteristics included being male gender, having dyslipidemia, diabetes mellitus, or hypertension (Ali et al., 2020, Abuzeyad et al., 2022, Jollis et al., 2022). Smoking and genetic factors were also noted to play a contributing role (Ali et al., 2020, Abuzeyad et al., 2022, Jollis et al., 2022). Smoking was the most common risk factor in younger patients, defined as < 45 years old; this age group constituted one-fourth of the STEMI population (Alexander et al., 2021).

Once a patient has been identified as being at risk for an acute coronary event, they must be promptly evaluated. Both The American College of Cardiology (ACC) and the American Heart Association (AHA) recommend acquiring an electrocardiogram (EKG) within 10 minutes of arrival to the emergency department for a patient suspected of having a STEMI (Abuzeyad et al., 2022). Rapid diagnosis and transfer to a primary percutaneous coronary intervention center have been associated with both a reduction in ischemia time and improved patient outcomes (Dakota et al., 2020 & Saban et al., 2019). Issues that impeded the transfer of a patient from a non-PCI-capable hospital to a PCI facility were found to be multifactorial (Abuzeyad et al., 2022 & Shi et al., 2018). However, one of the largest contributing factors in one study was a delay from the initial EKG to transfer activation by the emergency department (Garcia et al., 2022). Other contributing factors included not having a clear process or protocol, a lack of communication, and a lack of resources between involved institutions (Abuzeyad et al., 2022; Ali et al., 2020; Dakota et al., 2020; Forsyth et al., 2020; Garcia et al., 2022).

Additional associated factors that contributed to delayed reperfusion included a late presentation by the patient to the hospital, interhospital transfer times, and prolonged door-to-balloon inflation times at the PCI facility (Ali et al., 2020 & Jollis et al., 2022). One study noted that they had a significant difference in time to balloon inflation dependent on the time of the day and the day of the week; with delayed balloon inflation noted during evening hours and on weekends (Ali et al., 2020).

The literature established that STEMI patients who are transferred have delays in reaching PCI (Abuzeyad et al., 2022; Ali et al., 2020; Dakota et al., 2020; Forsyth et al., 2020; Garcia et al., 2022; Latip et al., 2021, Shi et al., 2018, Toledano et al., 2023, & Ward et al., 2020). One study found that transferred patients experienced an average of 162% longer delay from symptom onset to door arrival and a 98% longer delay from onset to balloon inflation (Forsyth et al., 2020). Another study reported that the median time from symptom onset to PCI was 148 minutes for patients who presented to a PCI-capable facility versus 240 minutes for a patient who required inter-facility transfer (Jollis et al., 2022). The evidence certainly confirmed that the management of ST-elevation myocardial infarction is time sensitive and patient outcomes are dependent on prompt reperfusion (Alves et al., 2021, Biswas, S., 2020, Oliveira et al., 2022, & Zhang et al., 2020). Additionally, the literature established that with interprofessional collaboration, clear communication, and teamwork, STEMI transfer times can meet national guidelines (Abuzeyad et al., 2022; Ali et al., 2020; Dakota et al., 2020; Forsyth et al., 2020; Garcia et al., 2022; Latip et al., 2021, & Shi et al., 2018).

Conceptual Framework

The conceptual framework utilized for this project was the Iowa Model Revised (Iowa Model Collaborative, 2017). The first step in the Iowa Model is to identify a triggering issue or

an opportunity for improvement. The issue identified was STEMI transfer times from the rural ED to a PCI-capable facility. The next step of the Iowa Model is to state the question or purpose. The clinical question was developed as follows: In STEMI patients within the rural emergency department, how does a STEMI protocol, compared to no protocol affect the door-to-transfer time within 30 to 60 days?

The next step of the Iowa Model challenges the user to identify if this topic is a priority. This was a relevant issue as there are national benchmarks for door-in-door-out time for STEMI patients who require transfer. Additionally, the facility identified STEMI transfers as an area in which they were striving to make improvements. The next step in the Iowa Model encourages the user to form a team. The team was composed of this writer, my chair, the manager of acute care services, the director of physicians of the emergency department, and the manager of the cardiac catheterization lab. The next step of the Iowa Model instructs the user to assemble a literature review, which was provided above. Sufficient evidence has been reviewed to support the development of a localized protocol for this hospital emergency department. Permission was granted to use and reproduce the Iowa Model (Appendix G).

Theoretical Framework

The theoretical framework underpinning this project stems from Watson's Theory of Caring. The Theory of Human Caring was developed between 1975 and 1979 (Watson Caring Science Institute, 2022). This theory was formed from four major concepts which include human beings, health, environment, and nursing (Nursing Theory, 2020). Jean Watson, the author of the theory, gave definitions for each of the four components. The human being, she described as being a valued individual (Nursing Theory, 2020). Health was acknowledged to be more than

just physical but also incorporated mental, social, and general daily functioning (Nursing Theory, 2020).

Environment addressed the concept that nursing has succeeded in transmitting caring from generation to generation as it is a fundamental part of the profession (Nursing Theory, 2020). Lastly, she described nursing as a holistic occupation that is essential to the practice of caring (Nursing Theory, 2020). Watson further developed ten "carative factors" to help incorporate caring into medicine (Watson Caring Science Institute, 2022, paragraph 10). Within these factors are ideas such as "being present, sensitive, and allowing others to express their feelings both positive and negative" (Watson Caring Science Institute, 2022, paragraph 10). Factors such as these were incorporated into education sessions with the staff. The utilization of Watson's approach helped to encourage the staff to feel involved and supported them to contribute to the project in a meaningful way.

The development of a protocol to streamline the care of the STEMI patient was intended to encourage prompt identification, evaluation, and transfer. These goals are underlined by care for the patient's immediate needs and future well-being.

Summary

The American College of Cardiology and the American Heart Association have outlined clinical performance and quality measures to standardize the expectations of care for STEMI patients (American College of Cardiology (ACC), 2017). Patients complaining of symptoms that are consistent with an acute coronary syndrome, such as chest pain, should have an EKG within 10 minutes of arrival to the emergency department (Abuzeyad et al., 2022). If STEMI identification has occurred, transfer activation should occur immediately (Garcia et al., 2022).

The specific expectations for the non-PCI capable hospital recommend that a STEMI patient be identified, evaluated, and transferred with a door-in-door-out time of ≤30 minutes (ACC, 2017).

A lack of immediate transfer activation, not having a clear process or protocol, a lack of communication, and a lack of resources between involved institutions were all found to contribute to a delay in patient transfer (Abuzeyad et al., 2022; Ali et al., 2020; Dakota et al., 2020; Forsyth et al., 2020; Garcia et al., 2022). Patient outcomes are dependent on reducing the time from occlusion to reperfusion (Abuzeyad et al., 2022; Alexander et al., 2021; Ali et al., 2020; Dakota et al., 2020; Forsyth et al., 2020; Garcia et al., 2022; Latip et al., 2021; Podlesnikar et al., 2019, & Shi et al., 2018). The purpose of this project was to assess how the implementation of a STEMI protocol would impact the transfer time for patients who present to the emergency department with a STEMI.

SECTION THREE: METHODOLOGY

Design

This project was an evidence-based practice project utilizing the Iowa Model (Iowa Model Collaborative, 2017). The Iowa Model was developed to help guide nurses to use evidence to improve the quality of care that patients receive (White et al., 2021). The project design was non-experimental and focused on quality improvement based on national guidelines. The project provided a quantitative analysis with a focus on how the implementation of a STEMI protocol impacted the door-to-transfer time in the rural emergency department setting. Comparison data was obtained through retrospective chart analysis.

Measurable Outcomes

Areas of interest included:

1. The time of the patient's arrival.
2. The time the EKG was performed.
3. The time from STEMI recognition to transfer.
4. The Door-in-Door-out Time.

Setting

The project was done in an emergency department of a rural community emergency department in Pennsylvania. The population in this town was observed to be 2,833 in 2020 (Data USA, 2020). Of this population, 2.67k reported as Caucasian, 95 as African American, and 29 as Hispanic (Data USA, 2020). The most reported employment groups of people living in this region were office and administrative support, material moving occupations, and production occupations (Data USA, 2020). The patient-to-clinician ratio in the county was stated to be 1,049 to 1 (Data USA, 2020). 10.8% of the population was reported to be uninsured; this data is relevant as lack of insurance coverage has negative impacts on health (Healthy People 2030 n.d.). Uninsured adults are less likely to seek care for preventive services such as diabetes, cancer, and cardiovascular disease (Healthy People, 2030).

The rural community hospital is part of a healthcare system that includes five institutions. One of the five institutions is PCI capable. The organization's mission is to "work with the communities to help each person attain optimal, life-long health, and well-being" (Guthrie, 2023, paragraph 2). The system focuses on "providing integrated, clinically advanced services that prevent, diagnose, and treat disease" (Guthrie, 2023, paragraph 2). One of the fiscal goals for the rural emergency department was to obtain door-in-door-out times of ≤30 minutes to align with

the ACC/AHA guidelines. As such, this project aligns with national guidelines, institutional goals, and the system's mission. A copy of the project site letter of support is provided in Appendix D.

Population

The patient population for this project consisted of STEMI patients presenting to the rural community hospital in Pennsylvania. This emergency department's typical census for patients ranges from 20 to 30 patients daily. The acuity of the presenting patients varies. The sampling procedure was convenience as patients included in the study were dependent on STEMI patients presenting to the facility. The sampling group included patients who had presented with the diagnostic criteria consistent with a STEMI. Per the Society for Academic Emergency Medicine (SAEM), "a STEMI is present if there are >1-2 mm of ST elevation in two contiguous leads on the ECG or a new left bundle branch block with a clinical picture consistent with ischemic chest pain" (SAEM, 2022, paragraph 3). Exclusion criteria included any patient < 18 years of age.

Ethical Considerations

This scholarly project was designed to protect human subjects. No personal demographic information from patients was collected during this project. The DNP project team, which was comprised of both this student and the project chair, completed research ethics training to ensure the protection of human subjects. A copy of this writer's Collaborative Institutional Training Initiative (CITI) certificate is available for review in Appendix C. Additionally, this project was submitted to and approved by the Liberty University Institutional Review Board (IRB) and the healthcare institutions' IRB. Copies of both IRB documentation are available for review in Appendix B. The integration of the Christian worldview into this project was attained by incorporating patience and compassion with staff as they learned a new protocol.

Data Collection

Data for this project was acquired through the cardiovascular data analyst supervisor who oversees and monitors the organization's STEMI statistics. Data included in the collection contained the patient's time of arrival, time of EKG, and time of transfer.

Tools

The tool for this project was the initiation of a STEMI protocol within the rural emergency department in Pennsylvania. The STEMI alert protocol was adapted from the guidelines from the American Heart Association for the recognition and treatment of acute coronary syndrome which may be found in Appendix E (Advanced Cardiac Life Support, 2023). A workflow for the care of the STEMI patient was utilized for staff education and is available in Appendix F.

Intervention

The intervention was the institution of a STEMI protocol within the rural emergency department in Pennsylvania. The project addressed the department’s annual fiscal goal of achieving STEMI transfer times of less than or equal to 30 minutes to align with the AHA/ACC guidelines (AHA, 2022). The project was approved by the manager of acute care services who oversees the unit. It also was discussed with the director of the emergency department physicians and the manager of the cardiac catheterization lab.

The first and second steps of the protocol ensured that the timely acquisition and interpretation of an EKG was made the priority. The American Heart Association identified “accurate risk stratification and diagnostic testing as two time-dependent therapies that have a large impact on STEMI patients’ morbidity and mortality” (AHA, 2021, paragraph 17). The AHA recognized that the EKG is the first diagnostic test that should be performed for a patient

who presents to the emergency department with chest pain or angina-equivalent symptoms (AHA, 2021). National guidelines from the ACC and AHA outline the 12-lead EKG procurement and interpretation should occur within 10 minutes of arrival to the emergency department (AHA, 2021).

If a STEMI has been identified, the third and fourth steps of the protocol were to call a STEMI alert to notify all staff to streamline care for the patient. The fifth and sixth steps focused on the initiation of the transfer. The AHA established that STEMI-referring hospitals should have a primary plan for the timely and efficient transfer of patients presenting with a suspected STEMI (AHA, 2021). "The diagnosis of STEMI should lead to an immediate activation of the transfer protocol. The STEMI referring hospital should have an algorithm to follow that describes the step-by-step procedure for the care of the patient and the initiation of transport" (AHA, 2021, Paragraph 34). The seventh step initiated the completion of the transfer paperwork.

The eighth step focused on ensuring the provider placed orders for the STEMI patient in accordance with ACC/AHA guidelines. The ninth through fifteenth steps of the protocol outlined patient care procedures per the most recent update from the Advanced Cardiac Life Support (ACLS) acute coronary syndrome algorithm (ACLS, 2023). The sixteenth and seventeenth steps of the process ensured the nurse reviewed all transfer paperwork, called a nurse-to-nurse report, and provided bedside handoff to EMS for continuity of care. The last step defined the unit goal of achieving the transfer of the patient in less than or equal to 30 minutes per ACC and AHA guidelines.

Timeline

Determined if there was a pre-existing STEMI protocol by February 26th, 2023.

Created a Vocera Network STEMI alert by March 10th, 2023.

Finalized the STEMI protocol by March 30th, 2023.

Finalized the STEMI workflow by March 30th, 2023.

Finalized the Vocera Network by April 30th, 2023.

Obtained Liberty University IRB approval by May 9th, 2023.

Obtained organization IRB approval by May 25th, 2023.

Implemented the project on June 8th, 2023.

Collected data from June 8th, 2023, to August 18th, 2023.

Data analysis and comparison completed by August 27th, 2023.

Complete the project defense by September 18, 2023.

Post project to scholar's crossing by October 13th, 2023.

Feasibility Analysis

The STEMI protocol was developed from the ACLS guidelines for acute coronary syndrome. The interprofessional collaboration that was required for the implementation included administration, physicians, nursing, unit clerks, pharmacy, radiology, and laboratory. The only equipment necessary to implement the project was a Vocera network. The institution already possessed the equipment; therefore, the information technology department was able to build the STEMI network with no further purchasing required.

Data Analysis

The data analysis for this project consisted of a pre- and post-implementation time comparison.

Door-In-Door-Out Times

Door-in-door-out times were reviewed before the initiation of the project for a period of 5 months to acquire baseline data. The same measurements were reviewed post-implementation to assess for change via comparison of the means.

Door to EKG

As a secondary measurement of interest, the time from arrival to EKG procurement was reviewed before the initiation of the project for a period of 5 months. The same measurement was reviewed post-implementation to assess for improvement via the means.

STEMI Recognition to Transfer Time.

As a tertiary measure of interest, the time from STEMI recognition to the time the patient was transferred was evaluated. The same measurement was reviewed post-implementation to assess for improvement via the means.

SECTION FOUR: RESULTS

Descriptive Statistics

Retrospective chart data was reviewed from January 1, 2023, through May 31, 2023, to obtain baseline data before the implementation of the project. The emergency department treated seven STEMI patients during that time frame which would average just above one patient per month. The time from the arrival of the patient to acquiring the EKG was reviewed: The mean was 7.3 minutes. The shortest time was – 3 minutes, indicating that the staff completed the EKG before the patient had registration completed. The longest time was 22 minutes. The department

was able to meet the target of obtaining an EKG in ≤ 10 minutes 86% of the time. The Door-In-Door-Out times were also reviewed. The mean was 36 minutes. The shortest time was 25 minutes. The longest time was 56 minutes. The department was able to meet the target of obtaining Door-In-Door-Out times of ≤ 30 minutes 43 % of the time. Lastly, the time from STEMI recognition to the time of transfer was reviewed. The average time from recognition to transfer was 31.571 minutes. The longest was 53 minutes. The shortest was 23 minutes.

Measurable Outcome 1:

The first outcome that was examined post-implementation of the STEMI protocol was the door-in-door-out time measuring the time from the patient's arrival to the patient's transfer. The first STEMI patient who presented post-protocol initiation had a door-in-door-out time of 52 minutes.

Measurable Outcome 2:

The second outcome examined post-implementation was the door to EKG time measuring the time from the patient's arrival to the time the EKG was obtained. The first STEMI patient who presented post-protocol initiation had a door-to-EKG time of 32 minutes.

Measurable Outcome 3:

The third outcome examined post-implementation was the time from STEMI recognition to the time of transfer. The first patient who presented post-protocol initiation had a STEMI recognition to STEMI transfer time of 9 minutes.

SECTION FIVE: DISCUSSION

The constructed protocol was implemented on June 8th, 2023. Written educational materials were supplied to the staff along with a trifold which was placed in the staff lounge and a binder containing a printed laminated workflow and the printed standard work procedure for STEMI patients. Verbal education sessions were also provided. A laminated guide for accessing the STEMI box out of the Omnicell was placed in the medication room. The vocera network was tested and functioned appropriately. Education within the emergency department, laboratory, and radiology groups was provided. The protocol incorporated multiple departments and several different job categories to standardize the care that the STEMI patient received. It is essential to understand that to improve the transfer process, all the team members must work together to facilitate identification, evaluation, and an appropriate disposition for this important patient population. While the proportion of STEMI patients that arrived at this facility is not overwhelming, it is a low-volume, high-risk group that requires urgent treatment.

The implementation of a STEMI protocol provided the staff with a standard workflow to follow when presented with a patient having an ST elevation MI. Accurate identification and classification by nursing upon the arrival of the STEMI patient is paramount to expediting treatment as a delay in recognition of a STEMI patient directly correlates with delayed reperfusion and increased rates of morbidity and mortality. Before the implementation of the STEMI protocol, the staff identified the patient at risk for STEMI and obtained an EKG in ≤ 10 minutes 86% of the time. However, door-in-door-out times of ≤ 30 minutes were only achieved 43 % of the time.

Post-implementation of the protocol, there was a low volume of STEMI patients to examine. During the data collection phase of this project, only one STEMI patient presented for evaluation. That patient had a door-to-EKG time of 32 minutes and a door-in-door-out time of 52

minutes. Further information was requested upon review of this information to try to ascertain if repeat education was necessary or what factors impacted this patient's timely evaluation. The CV data analyst reported that this patient had an atypical presentation. On arrival, the patient was found to be in SVT with a heart rate between 200-215 beats per minute. The patient required stabilization measures. Multiple attempts were required to convert this rhythm. Upon successful conversion, an EKG was acquired. STEMI was identified 43 minutes after arrival. Once STEMI was identified, the patient was transferred from the facility 9 minutes later. Due to this patient's presentation, a delay in identification was unavoidable. Before the implementation of the STEMI protocol, the unit had an average STEMI recognition to transfer time of 31.571 minutes. Post-implementation the time from identification of STEMI to transfer occurred in 9 minutes.

Implication for Practice

This STEMI protocol was established to take evidence and apply it into practice to facilitate improved patient-centered care. Literature has identified that the transfer of STEMI patients from non-PCI capable hospitals to PCI-capable hospitals is a challenge to healthcare within the United States. The Doctor of Nursing Practice (DNP) degree was designed to help mitigate challenges within healthcare (Moran et al., 2020). The utilization of evidence-based practice is the very essence of a practice doctorate. "DNP Essential VIII: Advanced Nursing Practice" outlines the responsibility of the DNP to "Demonstrate advanced levels of clinical judgment, systems thinking, and accountability in designing, delivering, and evaluating evidence-based care to improve patient outcomes" (AACN, 2006, p. 17). This STEMI project certainly aligned with this essential and provided the advanced practice registered nurse (APRN) the ability to "teach and support nurses to achieve excellence in nursing practice" (AACN, 2006, p. 17).

It must be noted that this quality improvement project does have several limitations. The first noted limitation of the project is the time constraint due to deadlines which may have impacted the sample size. The second limitation recognized is the small sample size which restricted the ability to apply any inferential statistics. The third limitation recognized in this project included that it was performed at a single facility with no comparison group. Further studies aimed at evaluating patient outcomes with mortality and morbidity post-implementation of STEMI protocols in rural emergency department settings should be undertaken to better identify how a protocol may impact patients' long-term outcomes.

Sustainability

This protocol is very sustainable. It requires no financial resources; however, it will require continued education and reinforcement and further updating in the presence of new national guidelines.

Dissemination Plan

The results will be disseminated on Scholars Crossing through Liberty University. Additionally, this writer would like to tailor the protocol for the other hospitals within the organization and have a system-wide emergency department STEMI protocol. Lastly, this writer will investigate publication in a professional journal.

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Appendix A. Article Critique and Leveling Matrix

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Abuzeyad et al., (2022). Inter-facility transfer for patients with stemi in bahrain: Characteristics and timings. *Journal of Emergency Medicine, Trauma & Acute Care*, *2022*(4), 1–9. https://doi.org/10.5339/jemtac.2022.25	This study aimed to examine the inter-facility transfer of STEMI patients from a non-PCI-capable facility to a PCI-capable facility while simultaneously analyzing certain characteristics and timings between the involved institutions.	STEMI patients between January 01, 2018, and December 31, 2019, were included with a total of 141 patients studied.	This was a retrospective observational study on the inter-facility transfer of STEMI patients. Electronic medical records were reviewed to gather data. Data collected included door-to-ECG time, door-in-door-out (DIDO), and door-to-balloon time (DTBT).	Of the patients, only 47 were brought by EMS; the others arrived by private vehicle. Mean door-to-ECG and DIDO times were 8 minutes and 32.5 minutes. 112 patients underwent PCI with a DTBT of 90 minutes.	Level 4: Retrospective cohort study.	The study was a single-center study. It was also retrospective with a potential for confounding and possible bias. There was no comparison group	Yes. The study did state some limitations. However, the information that was documented regarding the evaluation of the STEMI patient in a non-PCI capable hospital and transfer processes could be used to improve practices.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Alexander et al., (2021). Acute st-elevation myocardial infarction in the young compared with older patients in the tamil nadu stemi program. *Heart, Lung & Circulation.*, *30*(12), 1876–1882. https://doi.org/10.1016/j.hlc.2021.04.013	This study aimed to compare the differences in clinical presentation, risk factors, and outcomes of young patients (<45 y/o) versus older patients (> 45 y/o) with acute STEMI.	A total of 2,420 patients were enrolled in the pre-implementation and post-implementation quality of care study.	Quality of care study named the TN-STEMI program.	A total of 591 patients were <45 y/o. 92.5% of the young STEMI patients were male. Females had worse outcomes than males. Smoking was the most common risk factor in < 45 y/o. In > 45 y/o patients, risk factors included diabetes mellitus and high blood pressure.	Level 4: Cohort quality of care study.	In this study, females sought medical attention much later than males did. These factors may have contributed to inferior outcomes in females.	Yes. The first step to treating a STEMI is STEMI identification. Education regarding different presentations among various age groups and genders should be emphasized at the point of care for early recognition.

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Ali, F. A., Altahoo, H., & Lynch, M. (2020). Clinical review: Management of patients with acute st-elevation myocardial infarction. *Heart Views: The Official Journal of the Gulf Heart Association, 21*(4), 256-262. https://doi.org/10.4103/	This study aimed to assess the quality of practice provided to STEMI patients within a specified time frame and identify possible areas for improvement.	277 STEMI patients were included in the study.	A clinical review of STEMI patients was performed using the National Institute for Health and Care Excellence guidelines alongside the American Heart Association guidelines.	During hospital business hours the median door-to-balloon time was 62 minutes. Door-to-balloon time not meeting the guidelines occurred outside of business hours.	Level 4: This is a retrospective, standards-based clinical review.	The main limitation of this study was the lack of complete information for some patients, especially symptom onset time for patients referred from other hospitals.	Yes. This study was able to detect a difference in performance based on the time of day and day of the week. While this study may only be specific to that organization, the findings should encourage other facilities to examine if this is a trend in their entity.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Alves, M., Prada, L., Costa, J., Ferreira, J. J., Pinto, F. J., & Caldeira, D. (2021). Effect of oxygen supply on mortality in acute st-elevation myocardial infarction: Systematic review and meta-analysis. *European Journal of Emergency Medicine: Official Journal of the European Society for Emergency Medicine, 28*(1), 11-18. https://doi.org/10.1097/MEJ.0000000000000764	This study aimed to evaluate the clinical effect of high-flow oxygen therapy in patients with STEMI.	The total amount of patients in the sample totaled 7703.	Randomized controlled trials (RCTs) were reviewed to evaluate the use of high-flow oxygen (6 L/min or higher) in comparison with room air or lower oxygen supply in STEMI patients.	High oxygen supply may be associated with a decrease in short-term mortality in STEMI patients, but the collective data did not substantiate a change in practice.	Level 1: Systematic review & meta-analysis	There was a risk of bias in the individual studies and low confidence in pooled data, mainly due to the exclusive inclusion of open-label trials.	No. While this study is level 1 and has a thorough review of the literature, further trials are required to substantiate a change in practice.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Biswas, S. (2020). *Incidence and predictors of unplanned hospital readmission after percutaneous coronary intervention*. Journal of Clinical Medicine. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7600497/	The purpose of this study was to examine the incidence of, and risk factors for, unplanned hospital readmissions within 30 days following PCI.	Data was prospectively collected for 28,488 patients undergoing PCI between 2013 and 2019. 3,059 of the patients had unplanned hospital readmission within 30 days of PCI, and 1,848 patients (60.4%) were readmitted for primarily cardiac findings.	Prospective data collection and retrospective analysis of readmission.	Predictors of re-admission post-PCI were female sex, having ≥1 admission in the 12 months before PCI, acute coronary syndrome presentation, having any in-hospital complication, and being discharged on an oral anticoagulant.	Level 4: Observational Cohort Study	The study was unable to account for all possible factors associated with readmission following PCI such as frailty and comorbidities. Classification of readmission as planned or unplanned and cardiac or non-cardiac was dependent on coding quality by participating hospitals.	Yes, the study showed that improved in-hospital education on cardiac symptoms such as early STEMI identification and treatment is effective in reducing 30-day readmission rates for AMI.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Dakota et al., (2020). "Door-in to door-out" delay in patients with acute st-segment elevation myocardial infarction transferred for primary percutaneous coronary intervention in a metropolitan stemi network of a developing country. *The International Journal of Angiology: Official Publication of the International College of Angiology, Inc, 29*(1), 27-32. https://doi.org/10.1055/s-0039-3401046	This study aimed to evaluate the door-in-to-door-out (DIDO) delays at the initial hospitals evaluating STEMI patients.	1076 STEMI Patients between October 2014 and April 2019.	The study analyzed the DIDO times of STEMI patients who were transferred via ground ambulance to a PCI-capable facility.	The median DIDO time was 180 minutes. DIDO time showed a positive correlation with total ischemia. Women patients were shown to have longer DIDO times > 120 minutes.	Level 4: Retrospective cohort study.	The time it took to transport was not evaluated in this study and may have impacted the delay to reperfusion.	Yes. While this study took place at one facility, it can be used to identify possible causes of delay of transfer for the STEMI patient from the initial evaluating hospital to the PCI-capable hospital.

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Forsyth, R., Sun, Z.H., Reid, C., & Moorin, R. (2020). Inter-hospital transfers and door-to-balloon times for stemi: A single center cohort study. *Journal of Geriatric Cardiology.*, *17*(6). https://doi.org/10.11909/j.issn.1671-5411.2020.06.0	This study aimed to assess the impact of transfers on performance measures for patients diagnosed with ST-segment elevation myocardial infarction (STEMI).	All patients presenting with symptoms suggestive of ACS and admitted for PCI were studied over 7 months. A total of 87 patients were included in the study.	Patients were divided into two groups of direct presentations or transfers from a secondary non-PCI capable hospital. Time of symptom onset, time to the first hospital, PCI-capable hospital arrival, and balloon inflation were assessed.	Transferred patients had significant delays in symptom-onset to arrival at the PCI-capable hospital. Symptom-onset to balloon inflation and first hospital arrival to balloon inflation times were also delayed.	Level 4: Cohort Study	The study was performed at a single center.	Yes. The need for efficient processes to streamline transfer and avoid any unnecessary delays is crucial to reducing system delays in the treatment of ACS (Forsyth et al., 2020).

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Garcia et al., (2022). *Deploying a novel custom mobile application for stemi activation and transfer in a large healthcare system to improve cross-team workflow. Stemicathaid implementation project*. American Heart Journal. https://www.sciencedirect.com/science/article/pii/S0002870322001326	The report aimed to describe a new process that was implemented to improve the STEMI workflow for inter-hospital STEMI transfers.	More than 250 people were trained and included in the implementation of the new process, including ED Physicians and nurses. User-specific training was provided along with a review of the roles and responsibilities of each team member. The team will provide feedback after each STEMI case to assess for functionality issues.	STEMIcathAID mobile application. Staff will continue to follow their current STEMI protocol and additionally trial a new mobile app for 4 to 6 weeks to assess for improvement in inter-hospital transfer quality of care for STEMI patients.	The study showed that a STEMI care application can be safely deployed into the clinical workflow without interrupting the ongoing clinical process.	Level 4: Cohort Study	Still being evaluated for efficacy. Lack of EMS and EMR involvement.	No. This study demonstrates how one can utilize teamwork and intra-professional collaboration to standardize workflow, which is pertinent information to this writer. However, the results of the pilot regarding the impact on the quality of care for STEMI patients are not yet available.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Jollis, J. G., Granger, C. B., Zègre-Hemsey, J. K., Henry, T. D., Goyal, A., Tamis-Holland, J. E., Roettig, M. L., Ali, M. J., French, W. J., Poudel, R., Zhao, J., Stone, R. H., & Jacobs, A. K. (2022). Treatment time and in-hospital mortality among patients with st-segment elevation myocardial infarction, 2018-2021. *JAMA: Journal of the American Medical Association*, *328*(20), 2033–2040. https://doi.org/10.1001/jama.2022.20149	The purpose of this study was to describe the process measures and outcomes for a cohort of patients presenting with STEMI.	Information was reviewed for a total of 114, 871 patients with STEMI treated at 648 different hospitals in the Get with The Guidelines–coronary artery disease registry.	The method was a cross-sectional study of a STEMI-based registry between 2018 and 2021. Information reviewed included treatment times, in-hospital mortality, and adherence to system goals (≤90 minutes to PCI, and ≤120 minutes if patients require transfer to a PCI-capable hospital).	The median time from symptom onset to PCI was 148 minutes for patients presenting to PCI-capable hospitals by EMS, 195 minutes for patients who arrived by private vehicle, and 240 minutes for patients transferred from another hospital.	Level 4: Cross-Sectional Cohort Study	The first limitation listed was that the registry was developed from self-reported patient data. The second limitation is that there was 8% of the data missing.	Yes. This study of patients with STEMI included in a US national registry provides information on changes in processes and outcomes between 2018 and 2021 (Jollis et al., 2022).

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Latip, M. N., Jumat, L., & Li Ling Chaw. (2021). Impact of data feedback implementation for improving door-in-door-out time in patients presenting with st elevation myocardial infarction to emergency department. *Brunei International Medical Journal (BIMJ)*, *17*, 102–108.	This study aimed to evaluate the effect of implementing monthly departmental data feedback on reducing door-in-door-out (DIDO) transfer time.	A total of 59 STEMI patients were enrolled.	A 2-phase quantitative interventional study was performed at the emergency department. Data was first extracted from the electronic health care records for the first 6 months, and then monthly data feedback regarding DIDO time was introduced for the next 6 months. DIDO time difference was compared between these 2 phases.	The median DIDO time before monthly feedback was put into effect was 40 minutes. After the rollout of feedback was employed, DIDO time improved to 39 minutes.	Level 3: Controlled trial (quantitative interventional study).	The study was relatively small, and data was only collected for 6 months.	Yes. This study is relevant for review as it provides suggestions for improving DIDO times for STEMI patients in a rural ED. Education and reinforcement for staff regarding the importance of timely evaluation and transfer of the STEMI patient can improve patient outcomes.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Oliveira, C. C., Afonso, M., Braga, C., Costa, J., & Marques, J. (2022). *Impact of door in-door out time on total ischemia time and clinical outcomes in patients with st-elevation myocardial infarction*. Revista Portuguesa de Cardiologia. https://www.sciencedirect.com/science/article/pii/S0870255122004036	The purpose of this study was to examine the door-in-door-out times of hospitals that transfer patients with STEMI to PCI-capable centers and to assess the impact that total ischemia time for the patient has on clinical outcomes.	523 patients with STEMI who required transfer from a non-PCI hospital to a PCI center between 2013-2017.	Retrospective Analysis	The median door-in-door-out time was 82 minutes. Only 7 patients were transferred in ≤30 min. Observed in-hospital mortality was higher among patients with DIDO times >60 min vs. ≤60 min	Level 4: Retrospective analysis of a cohort	Limitations listed included that due to the study being retrospective, it was not possible to ensure that the number of omitted cases in the statistical analysis of some variables was low.	Yes. This study confirmed that shorter DIDO times are associated with shorter reperfusion delays, lower adjusted in-hospital mortality, and longer survival times.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Podlesnikar et al., (2019). Effect of early metoprolol during st-segment elevation myocardial infarction on left ventricular strain: Feature-tracking cardiovascular magnetic resonance substudy from the metocard-cnic trial. *JACC.Cardiovascular Imaging, 12*(7), 1188-1198. https://doi.org/10.1016/j.jcmg.2018.07.019	The study aimed to evaluate the impact that IV metoprolol has on left ventricular strain during STEMI using feature tracking and cardiovascular magnetic resonance (CMR).	197 Patients with an acute anterior STEMI were enrolled in the METOCARD-CNIC trial (100 patients received IV metoprolol before primary PCI and 97 patients were used as control).	Left ventricular global strain was measured with CMR at 1 week and 6 months post and compared between randomized groups.	Patients who received early intravenous metoprolol had a marked decrease in LV strain compared with the control patients at 1 week and 6 months after STEMI.	Level 2: Randomized controlled trial	Feature-tracking is a new technique to assess LV strain with CMR.	Yes. This study shows that early administration of metoprolol before primary PCI reduces the incidence of both short- and long-term severe LV systolic dysfunction for STEMI patients. Which translates to improved patient outcomes.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Shi, O., Khan, A. M., Rezai, M. R., Jackevicius, C. A., Cox, J., Atzema, C. L., Ko, D. T., Stukel, T. A., Lambert, L. J., Natarajan, M. K., Zheng, Z., & Tu, J. V. (2018). Factors associated with door-in to door-out delays among st-segment elevation myocardial infarction (stemi) patients transferred for primary percutaneous coronary intervention: A population-based cohort study in Ontario, Canada. *BMC Cardiovascular Disorders*, *18*(1), 1–9. https://doi.org/10.1186/s12872-018-0940-z	The study aimed to identify modifiable factors to improve door-in-door-out (DIDO) times and assess the impact of DIDO times on 30-day mortality.	966 STEMI patients being transferred from a non-PCI-capable facility to a PCI facility.	A population-based, retrospective cohort study of 966 STEMI patients transferred for primary PCI in Ontario in 2012.	The median DIDO time was 55 min. Patients with timely ECGs were more likely to meet the guidelines for DIDO times. Those with DIDO times > 90 min had higher 30-day mortality rates.	Level 4: Retrospective cohort study.	Information on key time intervals was determined through chart review and times could not be validated.	Yes. This study can be used to identify possible causes of delay of transfer for the STEMI patient from the initial evaluating hospital to the PCI-capable hospital.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Ward, M. J., Vogus, T. J., Bonnet, K., Moser, K., Schlundt, D., & Kripalani, S. (2020). *Breaking down walls: A qualitative evaluation of perceived emergency department delays for patients transferred with st-elevation myocardial infarction – bmc emergency medicine*. BioMed Central. https://bmcemergmed.biomedcentral.com/articles/10.1186/s12873-020-00355-6	The purpose of this study was to analyze the underlying cause of delay for the STEMI patient being transferred from the emergency department.	Three emergency departments that routinely transfer STEMI patients. 43 ED staff were interviewed (Physicians, Nurses, and ancillary staff).	Semi-Structured Interviews.	3 major themes were identified that contribute to the delay of transfer for the STEMI patient. The first was processes, the second was communication and the third was resources.	Level 6: Qualitative Study	One limitation the study acknowledged was a qualitative approach conducted at three unaffiliated medical centers may not be generalizable as the study was trying to capture the issues within the transfer processes in one region.	Yes. Although the study is a Level 6, it identified that standardized processes, such as a STEMI protocol, help to reduce uncertainty and can mobilize resources. Communication between facilities can reduce delays and expedite care.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Zhang, Y., Yu, B., Han, Y., et al. (2019). Protocol of the china st-segment elevation myocardial infarction (stemi) care project (cscap): A 10-year project to improve quality of care by building up a regional stemi care network. *BMJ Open*, 9: e026362. doi:10.1136/ bmjopen-2018-026362	The purpose of this study was to show how implementing regional STEMI care networks can improve the reperfusion treatment rate, shorten the total duration of myocardial ischemia, and decrease mortality.	All patients who met the definition of myocardial infarction and the Chinese STEMI diagnosis and treatment guidelines were enrolled. The study contained three phases. During phase one, 4,191 patients were enrolled. During phase two, 20,799 patients were enrolled. During phase three, 30 hospitalized patients from non-PCI and PCI facilities will be enrolled.	The study was a prospective, multicenter registry study. A STEMI protocol was introduced in combination with a circular enrollment–evaluation–feedback–improvement method being implemented.	Phase 1 focused on the in-hospital process optimization of primary percutaneous coronary intervention. Phase 2 focused on the PPCI hospital-based regional STEMI care network construction together with EMS and adjacent non-PPCI hospitals, while phase 3 focused on the whole-city STEMI care network construction.	Level 3: Controlled Trial	The study limitations listed included that hospitals were not randomly selected in this study.	Yes. The study has many workflow diagrams that give a visual representation of how the improve the STEMI workflow process. This was an in-depth study that examined how to improve cardiac outcomes for patients at the hospital, regional, and city levels.

Appendix B. IRB Approval Documentation

[External] IRB-FY22-23-1506 - Initial: Non-Human Subjects Research

do-not-reply@cayuse.com <do-not-reply@cayuse.com>
Mon 5/8/2023 11:15 AM
[redacted]

Some people who received this message don't often get email from do-not-reply@cayuse.com. Learn why this is important

[EXTERNAL EMAIL: Do not click any links or open attachments unless you know the sender and trust the content.]

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

May 8, 2023

Beth Geiger
Abigail Newton

Re: IRB Application - IRB-FY22-23-1506 Improving STEMI Transfer Times

Dear Beth Geiger and Abigail Newton,

The Liberty University Institutional Review Board (IRB) has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds that your study does not meet the definition of human subjects research. This means you may begin your project with the data safeguarding methods mentioned in your IRB application.

Decision: No Human Subjects Research

Explanation: Your project is not considered human subjects research because evidence-based practice projects are considered quality improvement activities, which are not "designed to develop or contribute to generalizable knowledge" according to 45 CFR 46.102(l).

Please note that this decision only applies to your current application. Any modifications to your protocol must be reported to the Liberty University IRB for verification of continued non-human subjects research status. You may report these changes by completing a modification submission through your Cayuse IRB account.

Also, although you are welcome to use our recruitment and consent templates, you are not required to do so. **If you choose to use our documents, please replace the word *research* with the word *project* throughout both documents.**

If you have any questions about this determination or need assistance in determining whether possible modifications to your protocol would change your application's status, please email us at irb@liberty.edu.

Sincerely,

G. Michele Baker, PhD, CIP
Administrative Chair
Research Ethics Office

GUTHRIE

Vicky Hickey, BS, CCRP
Research & Education Manager
[redacted]

May 25, 2023

Beth Geiger RN
[redacted]

Your quality improvement (QI) project ***Improving STEMI Transfer Times*** does **not** require IRB review by the Institutional Review Board of The Guthrie Clinic. This project is not human subjects research. The Liberty Institutional Review Board also determined that the project is not human subjects research.

The project is being completed for your FNP/DNP through Liberty University and is conducted as QI only and not research as you attest below. The project aims to provide a focus on how the implementation of a STEMI protocol will impact the door-to-transfer time in the rural emergency department setting at Guthrie Robert Packer Hospital-Towanda.

Title of QI project:
Improving STEMI Transfer Times

If all of the below are checked and apply to your project, the project is QI that does not meet OHRP's definition of "research" and need not be submitted to the IRB.

☒	The project evaluates* current standard practices or current standard of care.
☒	Knowledge sought directly benefits the process/program/system being evaluated.
☒	The project is unique to the institution, department, class, etc., and it is unlikely that knowledge from the outcome of the project would be of interest or benefit to other institutions, departments, classes, etc. other than as a means for evaluation of their programs (i.e., the project is not "universally applicable" or "generalizable").
☒	Intend only to share the results of the evaluation with those individuals associated with the process/program/system. If the results of the initiative will be shared outside of this group (via conference, publication, etc.), it will be as its role as a QI project, not research.

*Evaluation may include data analysis and/or interaction with individuals

Attestation:
I attest that this proposed project meets the criteria as checked above. I hereby certify that any changes to the proposal that will meet the definition of research will be submitted to the IRB before the changes are implemented.

[redacted]

Please contact me at (570) 887-4882 or Vicky.Hickey@guthrie.org if you have any questions.

Sincerely,

[redacted]

Vicky Hickey, BS, CCRP

Appendix C: CITI Certificate

Appendix D: Project Site Letter of Support

[External] RBI premission

Davis, Katherine [redacted]
Wed 5/3/2023 2:01 PM
To: Geiger, Beth Anne [redacted]

[EXTERNAL EMAIL: Do not click any links or open attachments unless you know the sender and trust the content.]

5/3/23

Katherine Davis
Manager of Acute Care Services
[redacted]

Dear Beth Geiger,

After careful review of your research proposal entitled "Improving STEMI Transfer Times", I have decided to grant you permission to conduct your study at the Guthrie Robert Packer Hospital Towanda Campus Emergency Department.
Requested data for review includes the time of STEMI patients' arrival, the time of EKG, and the time of discharge/transfer. The requested data will not include any identifying patient information.
This study is considered a quality improvement project based on national guidelines.

Sincerely,
Katherine Davis MSN
Manager of Acute Care Services
Guthrie Robert Packer Hospital Towanda Campus

Katherine Davis MSN, RN
Acute Services, Manager
[redacted]

Appendix E: STEMI Alert Standard Work Procedure

STEMI Alert Standard Work Procedure

STEP	WHO	IMPORTANT STEP (WHAT)	TIME (WHEN)	KEY POINTS (HOW)	REASONS FOR KEY POINTS (WHY)
1	Nurse or Designee	Obtain the ECG	In < 10 minutes of arrival to the emergency department.	Complete EKG and give directly to provider. If questions regarding how to complete EKG, refer to standard work EKG procedure.	Per ACC/AHA guidelines. The prompt identification of a cardiac issue is imperative to streamlining appropriate care.
2	Provider	Interprets EKG	In < 10 minutes of arrival to the emergency department.	Physician will interpret and write interpretation on EKG.	Per ACC/AHA guidelines.
3	Provider	Call STEMI Alert	On recognition	Provider will notify the ED unit clerk to call a STEMI alert.	Clear collaboration among the team members will help to improve patient care.

4	ED Clerk	Call STEMI alert via vocera	When directed by provider	The clerk will push the round button on vocera and announce "ED Urgent broadcast, STEMI alert now"	The broadcast will alert all ED staff as well as radiology and lab to help streamline the care the patient requires.
5	ED Clerk	Contact the pulse transfer center.	Immediately after STEMI alert has been called.	The clerk will call the transfer center to notify of STEMI.	The initiation of transfer as quickly as possible after STEMI identification is crucial to avoiding delays.
6	ED Clerk	Notify EMS	Immediately after notifying the transfer center of the patient.	Call Guthrie EMS to notify of STEMI.	The initiation of transfer as quickly as possible after STEMI identification is crucial to avoiding delays.
7	ED Clerk	Begin filling out transfer paperwork	After completing steps 4, 5 and 6.	Begin filling out a transfer packet.	This will ensure that the required forms are ready when the patient

					is able to be transferred.
8	Provider	Place Orders in EPIC	When Appropriate	The provider will place all orders into EPIC for diagnostic testing and medications.	It is best practice for the provider to place orders.
9	Nurse or Designee	Place Patient on cardiac monitoring	As soon as possible and continuously while in department.	The nurse or designee with attach the 3 or 5-lead cardiac monitoring for continuous cardiac monitoring while in department. Right Upper Chest: white lead, Left Upper Chest: black lead, Left Lower Chest: Red	Continuous monitoring is necessary to monitor the status of the patient and ensure that the patient is not decompensating.

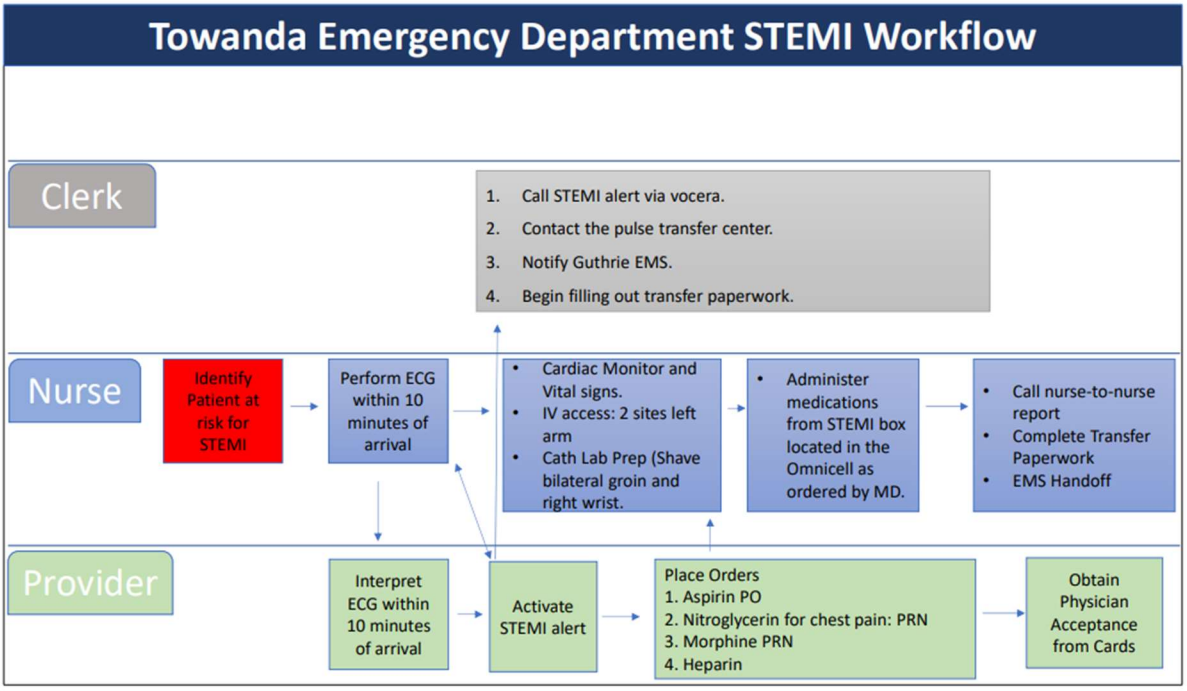
				Lead, Right Lower Chest, Green lead. Mid-chest: Brown Lead	
10	Nurse or Designee	Assess the patient's vital signs.	Every 15 minutes or more frequently per nursing judgment.	The blood pressure should be set to cycle at least every 15 minutes or more frequently as per nursing judgement.	Routine monitoring of vitals will indicate if there is a change in the patient status.
11	Nurse or Designee	Obtain IV access. 2 Sites, preferably in the left arm.	As Able	Start IV access as able.	Obtaining IV access in the left arm is preferable as the right arm may be used for PCI. However, if necessary, use the right arm. However, getting IV access should not delay the transfer.

12	Nurse or Designee or phlebotomist	Draw Labs	As Able	All labs should be drawn and sent for analysis.	Underlying pathology can be identified through laboratory diagnostics and serial troponins are required for cardiac patients. However, do not delay the transfer for lab work.
13	Radiology Technician	Portable Chest X-Ray	As Able	Obtain a 1 view portable chest x-ray as able.	Per ACC/AHA Guidelines. However, do not delay the transfer to obtain x-ray.
14	Nurse or Designee	Prepare Patient for the cardiac catheterization lab by shaving both sides of the groin and the right wrist.	Prior to Transfer as able	An electric razor is located in the trauma room on the counter and blades are in the storeroom. Shave the patients right wrist and	This will help to improve door to balloon times for the patient if the patient is ready to undergo PCI on arrival to RPH.

				bilateral groin if able.	
15	Nurse	Administer medications per MD order: 1. Aspirin PO 2.Nitroglycerin for chest pain: PRN 3. Morphine PRN 4. Fibrinolytics (Heparin) as indicated	When ordered	A STEMI box is located in the Omnicell. This box has all medications the patient should require prior to transfer.	Per ACC/AHA Guidelines.
16	Nurse	Review Transfer Paperwork for completeness	Prior to Transfer	Review transfer paperwork.	The nurse is responsible for ensuring that EMTALA forms are filled to completion.
17	Nurse	Call report to the receiving facility	Prior to patient arrival at destination	Call nurse to nurse report.	To ensure continuity of care.

18	Nurse	Give hand off to EMS	Prior to transfer	Give bedside report to EMS staff prior to the patient being transferred.	Clear communication improves patient care.
19	**Unit**	**Achieve goal of door-in-door-out time**	**< 30 minutes**	**Complete transfer from time of arrival to time of discharge in less than 30 minutes.**	**Per ACC/AHA Guidelines.**

Appendix F: STEMI Alert Workflow



Appendix G: Permission to use Iowa Model

[External] Permission to Use The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care

Kimberly Jordan - University of Iowa Hospitals and Clinics <survey-bounce@survey.uiowa.edu>
Mon 1/16/2023 12:27 PM
To: Geiger, Beth Anne [redacted]

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Iowa Model - 2015.pdf

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Reference: Iowa Model Collaborative. (2017). Iowa model of evidence-based practice: Revisions and validation. *Worldviews on Evidence-Based Nursing, 14(3), 175-182. doi:10.1111/wvn.12223*

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