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“Evaluating Acute Chest Pain Management in the ED: A Focus on ECG Timing and Process Efficiency”

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Doctor of Nursing Practice Project

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Abstract

Acute chest pain is a leading cause of Emergency Department (ED) visits, where rapid electrocardiogram (ECG) administration is critical for diagnosing ST-Elevation Myocardial Infarction (STEMI) or Acute Coronary Syndrome (ACS). At Emory Saint Joseph's Hospital (ESJH), adherence to the American Heart Association (AHA) 10-minute ECG guideline was evaluated through a retrospective review of patient charts and a structured survey capturing nurse feedback. Compliance rates showed variability: 62.5% in Q1, 100% in Q2, 80% in Q3, and 100% in Q4. Nurse feedback identified barriers such as limited technician availability (52%), restricted booth access (44%), and registration delays (20%). These findings highlight the need for operational improvements and targeted education to enhance guideline adherence. Consistent ECG timeliness is vital for improving outcomes and reducing complications in high-risk ACS patients.

Keywords: Acute chest pain, Emergency Department (ED), electrocardiogram (ECG), American Heart Association (AHA), acute coronary syndrome (ACS), guideline adherence, STEMI (ST-Elevation Myocardial Infarction), nurse feedback, diagnostic timeliness, operational inefficiencies

Component 1: ***Problem Identification, Conceptual/Theoretical Framework and Review of the Literature, Project Design and Methods***

Background & Significance

Description of the Problem

Chest pain ranks the second most common chief complaint in the Emergency Department (ED) representing over 5% of all cases (Cairns & Kang, 2022). It is a prevalent and potentially life-threatening symptom that frequently leads to ED visits, requiring prompt assessment and intervention to prevent adverse events (Gulati et al., 2021). Ideally, when patients present with acute chest pain, an electrocardiogram (ECG) should be acquired and interpreted within 10 minutes of arrival to a medical facility, as this is critical for identifying and triaging patients with Acute Coronary Syndrome (ACS). In cases of ST-segment elevation myocardial infarction (STEMI), immediate reperfusion therapy, including primary percutaneous coronary intervention (PCI) or fibrinolysis, is indicated to restore blood flow and minimize myocardial damage (Elendu et al., 2023). However, the main problem lies in the variability of the time it takes to perform an initial ECG for these patients, which can delay crucial diagnosis and intervention, ultimately impacting their prognosis (Yiadom et al., 2017).

Delays in obtaining an ECG, particularly when it exceeds the American Heart Association (AHA) recommended 10-minute window guideline for patients with suspected ACS, have been shown to significantly increase morbidity and mortality rates due to delayed interventions, such as reperfusion therapy for STEMI (Lee et al., 2019). Prompt and accurate assessment of chest pain in emergency settings is essential, as delays in diagnosing and treating ACS can result in irreversible cardiac damage or death (Amsterdam et al., 2014).

Population Affected

The affected population includes adult patients (age ≥18) presenting to Emory Saint Joseph's Hospital (ESJH) ED in Atlanta, Georgia. This diverse demographic encompasses various sociodemographic backgrounds, socioeconomic statuses, and levels of health literacy. Although this project does not directly focus on social determinants of health (SDOH), it is important to acknowledge that individuals from marginalized communities may face delays in care due to barriers such as limited healthcare access, resource constraints, and longer wait times, all of which can impact the timeliness of ECG completion and diagnostic accuracy.

This project's primary focus is on the general adult population; however, future research should explore how SDOH, including socioeconomic status, race, and geographic location, affect access to timely cardiac care. Investigating these disparities could yield valuable insights into how addressing barriers related to healthcare access and resource allocation may improve ECG completion rates and overall outcomes for at-risk populations.

Epidemiology

According to Benjamin et al. (2018), approximately every 40 seconds, someone in the United States experiences a myocardial infarction (MI), with an estimated annual incidence of 605,000 new attacks and 200,000 recurrent ones, of which 170,000 are unaccounted for (Benjamin et al., 2018). Prompt diagnosis and management of ACS, facilitated by timely ECGs, are crucial in reducing adverse outcomes such as death, heart failure, and recurrent ischemic events (Lee et al., 2019). The AHA recommends emergent catheterization and PCI for STEMI, with a door-to-procedure start time of less than 90 minutes, with the first step in this evaluation is performing an ECG within 10 minutes (Gulati et al., 2021).

State of General Knowledge

Research consistently supports the importance of adhering to the AHA guideline of administering an ECG within 10 minutes of a patient's arrival with chest pain, as it improves patient outcomes in emergency settings (Gulati et al., 2021). Hospitals implementing this protocol have reported significant improvements in managing acute chest pain, along with reductions in morbidity and mortality related to ACS (Gulati et al., 2021). By ensuring rapid ECGs, the AHA guideline facilitates early diagnosis and timely intervention, ultimately reducing complications and lowering mortality rates (Lin et al., 2023).

Organizational/Local Knowledge of the Problem

At ESJH ED, there is considerable variability in the time taken to perform an ECG for patients presenting with chest pain, leading to inconsistent care delivery. Baseline data from the first quarter of 2023 showed that only 62% of chest pain patients received an ECG within the AHA recommended 10-minute window, well below the hospital's goal of achieving a 90% compliance rate. This delay in ECG acquisition has contributed to prolonged diagnosis and treatment, including delays in administering thrombolytics or performing PCI. Such delays are associated with worse outcomes, including longer hospital stays and higher rates of complications.

Figure 1 outlines the ESJH triage protocol for acute chest pain, which aligns closely with the AHA's established guidelines. These guidelines emphasize prompt ECG administration within the first 10 minutes of patient arrival as a critical step in the early identification and treatment of STEMI and ACS (Yiadom et al., 2017). The ESJH protocol incorporates early ECG screening criteria to identify high-risk individuals and ensure timely interventions, echoing recommendations from the literature emphasizing the importance of minimizing delays during intake and triage processes (Yiadom et al., 2017; Gulati et al., 2021).

Challenges such as delays during registration and triage, however, often hinder the ability to meet this benchmark. Optimizing screening processes is essential to reducing diagnostic delays for ACS patients and improving overall care delivery (Lin et al., 2023). Consistent adherence to the AHA's 10-minute ECG guideline has been shown to enhance the timely diagnosis and management of ACS, including MI, by reducing door-to-treatment times, improving survival rates, and decreasing long-term complications (Lin et al., 2023). Achieving this standard at ESJH requires addressing factors such as ED volume, workflow inefficiencies, resource limitations, and staff training. By emphasizing the immediate identification of at-risk patients and prioritizing the administration of ECGs within the 10-minute window, the ESJH protocol seeks to ensure patients receive prompt and standardized care, facilitating early intervention and reducing risks associated with delayed diagnosis and treatment.

Significance

This project holds significance for the local practice at ESJH, as it seeks to identify gaps in achieving the AHA-recommended 10-minute ECG window for patients presenting with acute chest pain. By evaluating current local practices, this project will provide insights into workflow insufficiencies, staff training needs, and procedural gaps that may contribute to delays in ECG administration. This project will provide essential insights for driving practice changes within the ED, helping to ensure more consistent and timely care for chest pain patients. Although this project will not directly implement an intervention, it serves as a crucial evaluation to guide future improvements aimed at enhancing patient safety and outcomes by reducing delays in critical diagnostics. By targeting areas for optimization, it has the potential to create a more time efficient ED environment that better aligns with time sensitive guidelines, ultimately improving the quality of care. Moreover, this approach encourages a broader model for quality improvement, offering a

framework that other departments and institutions can adopt to systematically address delays in critical diagnostics and foster an outward looking approach to patient-centered care.

Purpose Statement

The purpose of this DNP scholarly project is to evaluate the impact of adherence to the AHA guideline, which mandates ECG administration within 10 minutes of arrival for adult patients presenting with acute chest pain in the ED. This evaluation will be conducted through a twofold approach: (1) retrospective chart reviews to analyze ECG times and associated outcomes, and (2) obtaining nurse feedback to assess the perceptions and barriers to ECG acquisition within the ESJH ED.

Clinical Questions

A diverse set of clinical questions were formulated to guide this project and assess the impact of the AHA guideline for ECG administration within 10 minutes of arrival in the ED. The first question addresses the measurable impact of adherence to the AHA guideline on patient outcomes. Specifically, how does meeting the 10-minute ECG guideline affect clinical outcomes within the ED? This question will be explored through retrospective chart reviews and run charts to track ECG times, allowing for an analysis of trends that reveal the effects of timely ECG administration on patient outcomes.

The second question delves into the experiences and insights of ED nurses regarding the implementation of the AHA guideline. What feedback can ED nursing staff provide about the effectiveness and challenges associated with the 10-minute ECG guideline, and how can this feedback inform future practice improvements? This question will be addressed through a survey of nursing staff, capturing their perspectives on daily protocol challenges, perceived barriers to adherence, and suggestions for enhancement. Insights gathered will help refine the protocol to foster more consistent adherence and improve patient care outcomes across the ED.

Project Aims: Evaluation and Feedback

The aim of this project is to analyze existing patient data, specifically focusing on completion times, patient demographics, and clinical outcomes, to identify the operational barriers preventing consistent compliance with the AHA guideline. By examining these data points, the project seeks to recognize patterns and areas for improvement within the triage process to enhance timely ECG administration and overall patient outcomes.

The second aim of this project is to gather feedback from ED nurses at ESJH ED through a structured survey to evaluate their experiences with the current chest pain triage protocol. This includes identifying perceived barriers to meeting the AHA guideline for ECG completion within 10 minutes, assessing familiarity with hospital-specific protocols, and understanding operational challenges such as staffing and resource availability. The insights gained from the nursing survey aim to guide strategies for enhancing workflow efficiency and promoting consistent adherence to established protocols.

Assumptions and Limitations

For the purpose of this project, it can be assumed that healthcare providers in the ED will adhere to the AHA guideline for timely ECG administration utilizing a chest pain triage protocol at ESJH ED. It is also presumed that data extracted from the hospital's Electronic Hospital Record (EHR) will be accurate and complete for evaluating adherence to the 10-minute ECG window. Another assumption is that the necessary resources, such as ECG machines, adequately trained personnel, and sufficient staffing levels, will be available consistently to meet the guideline requirements. Additionally, it is assumed that the current infrastructure of the ED can support the protocol without requiring major modifications and that patients will report their symptoms accurately, enabling timely intervention.

Several factors may limit the project's success. Variations in patient acuity and presenting symptoms may impact the time to ECG and overall effectiveness. Staffing levels, ED crowding, and the availability of necessary resources, can influence the ability to adhere to the guideline consistently. External factors, such as seasonal variations in patient volume and unexpected surges in ED visits, could also influence the project's results. Furthermore, throughput and satisfaction scores may be impacted by other factors, such as patient expectations and external healthcare policies.

Conceptual Framework

This project aligns with the Institute of Medicine's (IOM) Six Aims for improving healthcare quality by ensuring timely, appropriate, and equitable care for patients presenting to the ED with acute chest pain (Bau et al., 2019). Specifically, it focuses on adherence to the AHA guideline for ECG administration within 10 minutes of arrival, a critical step for the early diagnosis and management of ACS to improve patient outcomes. By minimizing delays in diagnosing ACS, the project aims to enhance safety and reduce the risk of adverse cardiac events.

Effectiveness is supported by evidence-based protocols aligned with national guidelines, enabling healthcare providers to systematically assess and intervene for chest pain patients appropriately. The project's commitment to patient-centeredness ensures that all patients, regardless of background, receive timely assessment and treatment. Timeliness is a core focus, as the project evaluates adherence to the 10-minute ECG benchmark and identifies operational barriers, such as staffing, ED volume, and workflow inefficiencies, that may impact performance.

Efficiency is addressed by optimizing ED resources to streamline processes, reduce bottlenecks, and enable prompt care for chest pain patients. The project also emphasizes equity,

ensuring that all patients, regardless of sociodemographic factors, receive equal access to timely care. Through retrospective chart reviews and feedback from healthcare providers via a survey, the project will gather data on ECG times, evaluate adherence to the guideline, and identify areas for improvement to consistently meet the AHA's standards.

Conceptual Definitions

Conceptual Definitions

1. **Safety**: In this project, safety refers to minimizing the risk of harm to patients presenting with acute chest pain by ensuring that ECGs are performed promptly, thereby facilitating early diagnosis and intervention. The goal is to avoid adverse outcomes that could arise from delayed recognition and treatment of acute coronary syndromes, such as myocardial infarction (Hughes, 2018).
2. **Effectiveness**: Effectiveness in this context means the application of evidence-based guidelines to ensure the optimal assessment and management of patients with acute chest pain. By adhering to the American Heart Association's 10-minute ECG guideline, the project aims to enhance patient outcomes by ensuring the early identification of conditions like STEMI, which require rapid intervention (Gulati et al., 2021).
3. **Patient-Centeredness**: Patient-centeredness is defined as providing care that is respectful of, and responsive to, individual patient preferences, needs, and values. This project aims to ensure that all patients presenting with chest pain, regardless of their demographic or social background, receive timely diagnostic care and appropriate treatment that considers their specific circumstances (Hughes, 2018).
4. **Timeliness**: Timeliness in this project focuses on reducing delays in the delivery of critical diagnostic services, specifically by performing an ECG within 10 minutes of a patient's arrival to the ED. Meeting this benchmark is crucial for diagnosing and

managing ACS early, which can significantly reduce morbidity and mortality (Krumholz et al., 2008; Gulati et al., 2021).

5. **Efficiency**: Efficiency refers to the optimal use of emergency department resources, such as ECG technicians, equipment, and triage protocols to reduce bottlenecks and enhance the speed and accuracy of care delivery. The project seeks to streamline processes and eliminate unnecessary steps that could delay the timely assessment of patients presenting with chest pain (McHugh et al., 2010).
6. **Equity**: Equity is ensuring that every patient presenting with acute chest pain receives timely and appropriate care, regardless of sociodemographic factors such as race, gender, age, or socioeconomic status. This project specifically aims to identify and address barriers that may lead to inequities in the timeliness of ECG administration, thereby promoting equal access to high-quality emergency care (Braveman, 2003).

Literature Review and Synthesis

Researchers have comprehensively investigated the importance of timely ECG acquisition for patients presenting with symptoms of ACS, with particular emphasis on achieving the AHA's recommendation of an ECG within 10 minutes upon arrival to the ED (Gulati et al., 2021). This prompt diagnostic intervention is crucial for initiating rapid, life-saving treatments, enhancing outcomes, and reducing mortality for ACS patients (Gulati et al., 2021). In a prospective historical cohort study, Yiadom et al. (2017) assessed missed case rates (MCR) for STEMI patients across multiple EDs, identifying variability in ECG acquisition times as a substantial factor influencing patient outcomes. The study demonstrated that the best-performing EDs achieved low MCRs by consistently meeting the 10-minute ECG benchmark, significantly reducing diagnostic delays and the myocardial ischemia time, a crucial factor in patient prognosis. By proposing MCR as a key performance metric, Yiadom et al. (2017) highlighted

that tracking this metric enables hospitals to identify and target performance improvements in ECG acquisition, leading to enhanced quality in ACS care. This research aligns closely with the objectives of broader STEMI screening protocols, emphasizing that accurate and timely ECG screenings are integral to reducing missed diagnoses and improving the speed and quality of care, which directly supports this project's focus on refining diagnostic speed to reduce missed or delayed ACS care (Yiadom et al., 2017).

Expanding on the relationship between rapid ECG acquisition and improved outcomes, Lin et al. (2021) conducted a retrospective cohort study in Taiwan that evaluated the effectiveness of adhering to the 10-minute door-to-ECG target. The study revealed that faster ECG times led to quicker treatment interventions, particularly among patients with higher scores on the heart-broken index, a triage score developed to assess ACS symptoms quickly. However, Lin et al. (2021) found that certain atypical presentations of ACS, such as dizziness, nausea, abdominal pain, and cough, were associated with delays in ECG acquisition, underscoring the importance of refined triage systems to promptly identify and prioritize ACS cases that may not present with classic symptoms. This insight suggests that more adaptable triage criteria, sensitive to atypical symptoms, are needed to avoid delays and improve outcomes, which is a crucial consideration for this project that aims to implement and evaluate protocols that minimize diagnostic delays through refined triage processes for various ACS presentations (Lin et al., 2021).

Zègre-Hemsey et al. (2011) explored gender disparities in ECG timeliness, particularly within rural community hospitals, finding that only forty-one percent of patients presenting with chest pain, met the 10-minute ECG target. Women experienced longer average times to ECG than men, likely due to atypical symptom presentations, which were less likely to be prioritized in the triage process. The study emphasized that gender-specific triage protocols could mitigate

these delays, enhancing diagnostic and treatment timelines for women. Such findings underline the importance of triage adjustments to address demographic disparities in ACS management, supporting efforts to ensure equitable diagnostic timeliness. In the context of this project, this study highlights the necessity of incorporating gender considerations into the ED's triage protocols to address delays associated with non-classic presentations in female patients and, consequently, improve outcomes for all ACS patients (Zègre-Hemsey et al., 2011).

Jacobs et al. (2021) provided a policy evaluation of the Mission: Lifeline initiative, aimed at optimizing regional ACS care through standardized protocols and streamlined processes. This initiative underscored the importance of consistent and timely ECG acquisition as a foundational step to achieving reduced door-to-balloon times, which is a key predictor for STEMI survival. The analysis highlighted success of strategies such as, prehospital ECG transmission and activation of the catheterization lab before hospital arrival, led to faster treatment initiation and decreased variability in ACS care. Jacobs et al. (2021) advocated for adopting system-wide protocols to ensure consistency in ECG timeliness across diverse healthcare settings. For this project, these findings advocate for the implementation of a unified set of ECG timing standards across EDs, ensuring timely intervention regardless of hospital size or geographic location (Jacobs et al., 2021).

Collectively, these findings reinforce the importance of timely ECG acquisition as a critical initial diagnostic step in ACS care. Evidence consistently demonstrates that standardizing protocols, addressing demographic disparities, and streamlining triage are instrumental in enabling EDs to meet the 10-minute ECG benchmark, thereby reducing mortality and improving ACS care quality across hospital settings. This body of research provides a solid framework for refining ED protocols to enhance ECG acquisition times, advocating for initiatives that pursue equitable, high-quality ACS management. However, notable gaps persist in the literature,

particularly in addressing gender and racial disparities in ECG timeliness and ensuring consistent standards in rural and smaller hospital settings. This project draws from these studies to implement targeted triage improvements and expand ECG timing protocols that are sensitive to the needs of diverse patient populations, striving to meet the 10-minute benchmark consistently across all care environments.

Setting/Population

The population for this project consists of adult patients, aged 18 and older, who present with chest pain. The setting of the study is Emory Saint Joseph's Hospital, a well-known STEMI receiving center and Level I Emergency Cardiac Care Center. This location is particularly suited for the study, as it operates in a high-volume, high-acuity care environment, making it ideal for evaluating advanced triage protocols and their impact on patient outcomes.

Inclusion/Exclusion Criteria

The inclusion criteria for this study are adult patients (18 years or older) who presented directly to the ED with chest pain or suspected STEMI within the designated study timeframe. This approach ensures a comprehensive view of the patient demographic managed for acute chest pain, from mild to severe cases, within the ED setting. The exclusion criteria eliminate patients under 18 years of age, as pediatric cases require different triage protocols. Additionally, patients arriving via EMS or transfers from other facilities are excluded, as these cases may follow different pathways and timelines for ECG administration. Patients presenting with conditions unrelated to chest pain or cardiac issues, as well as those outside the specified study quarters, are also excluded to maintain a clear focus on the target population.

Methods

A process map was developed to visualize the workflow for managing "walk-in" patients presenting with chest pain at ESJH ED **(Appendix A)**. This map captures the sequence of steps

from patient arrival to ECG completion and serves as a tool to identify potential inefficiencies or delays in the triage workflow. The process begins with the patient's arrival, followed by immediate ECG acquisition, which is a critical step for identifying potential STEMI cases. After the ECG is completed, the ED physician evaluates the patient's history alongside the ECG results to determine whether STEMI is suspected. If STEMI is identified, a STEMI alert is activated to mobilize necessary resources for urgent intervention. In cases of uncertainty, the ECG is sent to the on-call Cardiologist, and an interventional cardiologist is contacted for further evaluation. Once STEMI is confirmed, the Transfer Center activates the Cath Lab team, facilitating rapid patient transfer to the Cath Lab, especially during regular hours. This map serves as a visual guide to the time-sensitive care protocols, such as the AHA's 10-minute ECG guideline, and highlights areas where delays might arise, enabling targeted evaluations and interventions to improve efficiency and outcomes.

In addition to the process map, feedback from 33 nurses was gathered through a SurveyMonkey questionnaire **(Appendix B)**. This survey was designed to assess the efficiency of the current triage protocol, nurses' familiarity with ECG guidelines, and barriers encountered during the triage process. It included multiple-choice and open-ended questions and collected demographic information such as years of experience and shift patterns **(Appendix B).** The survey aimed to identify specific challenges and workflow inefficiencies that impede timely ECG completion, including technician availability, access to ECG booths, and delays in recognizing atypical ACS presentations. The nurse survey provided valuable insights into current practices and barriers to meeting the 10-minute ECG guideline at ESJH ED. It was instrumental in identifying areas where adjustments could enhance protocol effectiveness, such as improved resource allocation and targeted staff education.

The data collected includes key STEMI receiving center achievement measures, such as the time to ECG, overall length of stay, detailed diagnostic demographics, comprehensive medical history, race and sex demographics, facility arrival time, and confirmation of diagnoses such as STEMI. For STEMI patients, the first contact to reperfusion therapy time is also collected when applicable. This data is sourced from the patients' EHR and is entered into the American Heart Association's Get with the Guidelines (GWTG-CAD) IQVIA Registry Platform (STEMI Registry) (*Get With The Guidelines-Coronary Artery Disease [GWTG-CAD] IQVIA Registry*, n.d.). The registry ensures robust data collection and validation by offering real-time data checks, performance tracking, and benchmarking across various metrics. A data collection sheet is developed to systematically record the time from patient arrival to ECG completion, with times plotted on a run chart to track performance against the target of completing an ECG within 10 minutes of arrival, as detailed in **Appendix D.** Collection tools, such as EHR, run charts, and the GWTG-CAD registry, are essential for gathering reliable data, which is critical to achieving this project's objectives. Data analysis is conducted using statistical software, with support from the GWTG-CAD IQVIA registry platform, to evaluate trends, correlations, and benchmark performance. The analysis focuses on identifying patterns in the collected data, such as demographic characteristics, diagnostic outcomes, and delays in ECG completion. For patients who do not meet the 10-minute ECG benchmark, their symptoms, age, gender, and final diagnosis are analyzed to uncover recurring themes and barriers. These insights help to identify the underlying reasons for delays in ECG completion. Based on the analysis, targeted interventions are developed to address identified barriers to meeting the 10-minute ECG benchmark. Interventions may include increasing technician availability, optimizing booth scheduling, and enhancing staff training. The effectiveness of these interventions is continuously monitored by assessing their impact on ECG times and overall patient outcomes. By refining

these strategies, the project aims to improve adherence to the AHA guidelines and enhance the quality of care for patients presenting with chest pain.

Analysis Plan (Resources)

The analysis plan for this project involves using both Excel and the GWTG-CAD IQVIA Registry to evaluate the effectiveness of the triage protocol in meeting AHA guidelines, particularly the 10-minute ECG benchmark. Data, including patient demographics, diagnostic outcomes, and time to ECG, is first recorded in Excel to facilitate organization and preliminary analysis. Excel is used to create run charts that track the percentage of patients receiving an ECG within 10 minutes of arrival over time, offering a visual representation of performance trends. This data is subsequently entered into the GWTG-CAD IQVIA Registry, which provides strong data collection capabilities and real-time checks for data accuracy and completeness (*Get With The Guidelines-Coronary Artery Disease [GWTG-CAD] IQVIA Registry*, n.d.). Within this registry, the analysis software SAS is utilized for advanced statistical processing. SAS allows for in-depth analysis of key performance metrics, including benchmarking hospital adherence to AHA guidelines against similar facilities based on hospital size, region, and other criteria. This benchmarking process helps contextualize ESJH's performance within a broader framework.

The integration of SAS within the GWTG-CAD IQVIA Registry enables detailed analysis of trends, correlations, and performance metrics, including time to ECG and length of stay. SAS's ability to process large datasets allows for the identification of patterns related to patient demographics, clinical outcomes, and system-related delays, which may contribute to deviations from the 10-minute ECG goal. For instance, analysis may reveal underlying factors like ED congestion or staffing limitations that affect adherence to the benchmark. This combined use of Excel and SAS within the registry facilitates a comprehensive analysis that informs targeted interventions, such as optimizing ECG technician availability or booth scheduling. The

project team monitors these interventions by tracking their impact on ECG times and patient outcomes, using real-time and actionable insights provided by the registry to guide continuous quality improvement efforts.

Key Stakeholders

Key stakeholders involved in the project include the ESJH ED nurses, ED unit director, and cath lab team, who are directly responsible for patient care and have provided essential insights and feedback throughout the project. Their involvement has been crucial in evaluating current practices, identifying barriers to achieving the 10-minute ECG benchmark, and suggesting practical improvements that can be made within the existing workflow. Healthcare institutions including Emory Healthcare and educational institutions including Emory University have also been key stakeholders.

Ethical Considerations

This project was designed as a quality improvement initiative, utilizing the hospital's EHR system and the GWTG-CAD IQVIA Registry platform, and did not involve direct patient interaction. Consequently, informed consent was not required, as no new data was collected directly from patients. In line with ethical standards, the project adhered to strict data privacy and security measures to ensure patient confidentiality. All patient information was anonymized, and the analysis was conducted without identifiable patient data, in compliance with HIPAA and hospital policies governing patient privacy and data use. Given the nature of the project as a quality improvement initiative aimed at assessing and improving clinical processes, IRB approval was not required and therefore exempt. The project's emphasis on patient anonymity and adherence to ethical principles underscores its commitment to respecting the rights and privacy of all individuals involved.

Dissemination Plan

The dissemination of the project's findings and progress will occur through several strategic avenues, ensuring that all stakeholders are well-informed, and that the broader medical community can benefit from the results. Regular updates will be provided to both clinical and administrative teams. These updates will include periodic briefings to keep all involved parties informed about the project's status, including any challenges faced and preliminary findings. The goal is to maintain transparency and ensure continuous engagement with key stakeholders throughout the course of the project. These briefings will also provide an opportunity for addressing any emerging issues and making real-time adjustments based on feedback.

Upon completion of the project, the presentation of findings will be organized through departmental meetings. These presentations will provide a detailed overview of the project's outcomes, focusing on data-driven insights related to the triage protocol for chest pain patients and the adherence to the AHA guideline. These sessions will encourage open discussion, allowing clinical teams to engage with the findings and provide feedback for further improvements. The inclusion of the clinical and administrative staff in these discussions ensures that the findings are translated into actionable steps that align with the hospital's goals for improving patient care.

The project results will be disseminated through publication and conference presentations. Manuscripts detailing the project's methodology, findings, and implications will be prepared for submission to peer-reviewed clinical journals. The goal is to contribute to the broader body of knowledge within the medical community, particularly in the areas of emergency care and STEMI management. Additionally, the findings will be presented at national or international healthcare conferences, where they will be shared with a wider audience of clinicians, researchers, and healthcare administrators. This dissemination approach aims to foster

best practices in STEMI care and contribute to the ongoing efforts to improve the timeliness and quality of care for chest pain patients in emergency settings.

Component 2: ***Results, Discussion and Conclusions, Implications and Recommendations***

Results

The retrospective chart review combined STEMI cases to evaluate adherence to the AHA guideline, which mandates that an ECG be performed within 10 minutes of patient arrival for chest pain. The data covered the periods of 2023 Q1 through Q4. A run chart was made illustrating the percentage of STEMI patients who met the 10-minute ECG requirement. A detailed summary of this data is provided in **Appendix C and Appendix D**. During 2023 Q1, 62.5% of STEMI patients received an ECG within the 10-minute target window, while 37.5% did not meet this benchmark. This represents a critical gap in care and indicates the need for further refinement of triage protocols and workflow adjustments to meet the guidelines consistently. In contrast, 100% of STEMI patients met the ECG target during 2023 Q2, demonstrating successful protocol adherence and perhaps reflecting effective interventions or operational improvements implemented within the ED. However, performance dropped slightly in 2023 Q3, with 80% of STEMI patients meeting the 10-minute benchmark and 20% not meeting the target. By Q4 of 2023, 100% of STEMI patients met the target, showing an improvement over the earlier quarters but still indicating room for growth in meeting the AHA adherence of guideline goal consistently.

The survey of 33 nurses identified several critical barriers to meeting the 10-minute ECG benchmark for patients presenting with chest pain **(Appendix B)**. A majority of respondents (52%) reported that limited technician availability was a primary factor delaying ECG acquisition. Additionally, 44% highlighted restricted access to ECG booths as a significant challenge, while 20% pointed to delays in patient registration as another contributing factor. These logistical

barriers often hinder timely diagnostics and create variability in meeting the AHA guideline of meeting the 10-minute ECG benchmark.

Nurses also reported frequently encountering atypical presentations of ACS, such as patients experiencing nausea, vomiting, or arm pain, complicates triage decisions that warrant an immediate ECG-within the 10-minute benchmark. This variability in symptoms often delays the initiation of ECGs for patients who may not initially appear to be high-risk. Although most respondents indicated that ECGs are completed within the 10-minute timeframe "most of the time," sustaining this performance consistently remains a significant challenge.

The survey further revealed that while nurses have moderate familiarity with national and hospital-specific guidelines for chest pain management, there is room for improvement in protocol awareness and implementation. These findings emphasize the need for increased education on the importance of timely ECGs, enhanced resource allocation to address technician and booth shortages, and streamlined administrative processes to prioritize high-risk cases effectively. Addressing these issues will be critical to improving protocol adherence and enhancing outcomes for patients with chest pain at ESJH.

Explanation of Analysis Used

Run chart analysis was used to evaluate patient data, tracking quarterly trends in STEMI cases meeting the AHA 10-minute ECG requirement. This approach allowed for the identification of patterns in time-to-ECG performance across four quarters in 2023, focusing on patients with ECGs indicating ST-Elevation. For the survey data, descriptive statistics were applied to quantify the barriers reported by nursing staff, offering a comprehensive understanding of operational issues within the ED. This analysis provided insights into staff-perceived challenges in meeting the 10-minute ECG target, which informed targeted interventions aimed at optimizing the triage process and enhancing adherence to the guideline.

Discussions and Conclusions

The findings from this project offer valuable insights into the challenges and opportunities in adhering to the AHA guideline of obtaining an ECG within 10 minutes for patients presenting to the ED with chest pain at ESJH. Data analysis focused on STEMI cases revealed variability in compliance with the AHA benchmark across the four quarters reviewed. These variations reflect the inherent complexities of emergency department workflows, where the interplay of patient volume, staff availability, and competing priorities can significantly impact the timeliness of care.

The nurse survey results provided additional context, identifying technician availability, access to ECG booths, and logistical delays as key barriers. Although nurses reported a moderate level of familiarity with both national and hospital-specific protocols, challenges in recognizing atypical ACS presentations and resource limitations were cited as major contributors to delays. These operational gaps underscore the complexity of implementing time-sensitive protocols in a dynamic ED environment. This project aligns with themes discussed earlier, where studies identified barriers such as gender disparities, atypical symptom presentations, and workflow inefficiencies as critical impediments to timely diagnostics. However, this project adds a localized perspective by focusing on specific operational barriers at ESJH, providing actionable insights for improving compliance with the 10-minute ECG benchmark. The variability observed in compliance highlights the need for continuous performance monitoring and adjustments to processes.

In conclusion, this project underscores the multifaceted nature of achieving consistent adherence to the AHA guideline of initial ECG acquisition within 10 Minutes of arrival at the Emergency Department in patients presenting with chest pain. Addressing barriers such as staffing shortages, resource allocation, and operational inefficiencies will be essential to

improving outcomes for STEMI patients. These findings serve as a foundation for future quality improvement initiatives at ESJH, aimed at optimizing processes, enhancing staff education, and refining protocols to ensure timely and equitable care for all chest pain patients.

Limitations and Lessons Learned

The primary limitation of this project lies in its relatively small sample size. A total of 61 STEMI patients diagnosed at ESJH were included in the analysis, distributed as follows: 24 in Q1 2023, 10 in Q2 2023, 10 in Q3 2023, and 17 in Q4 2023. Additionally, the survey component was conducted with 33 nurses from the ESJH ED. The limited number of cases, particularly in Q2 and Q3, affects the generalizability of the findings, as smaller sample sizes may not fully capture variations in patient presentations, staffing, or operational factors. Moreover, the survey results, while offering valuable insights, may not reflect the full spectrum of nurse perspectives due to the small respondent pool and potential biases, such as differences in experience levels or familiarity with chest pain protocols.

The project also faced design-related limitations. The observational nature of the study restricted its ability to establish causal relationships between interventions and improvements in meeting the 10-minute ECG guideline. The survey, while insightful, relied on self-reported barriers, which could introduce response bias and limit the precision of the findings. Another critical limitation was the lack of direct observation or additional data sources to validate the survey responses. A key lesson learned was the importance of comprehensive data collection methods, such as workflow observations and larger patient samples, to provide a more nuanced understanding of the challenges and successes. The project underscored the necessity of continuous monitoring, agile protocol adjustments, and real-time feedback to sustain improvements. Additionally, regular staff education and simulation drills emerged as vital

strategies to address operational hurdles and enhance protocol adherence, particularly for managing atypical presentations of ACS. These lessons highlight the need for ongoing evaluation and flexibility to optimize patient outcomes and maintain high standards of care.

Application for Practice, Theory, Policy, and Research

The results of this project support the IOM Six Aims of Healthcare Quality framework, emphasizing the importance of timeliness, efficiency, and safety within the ED, emphasizing the importance of timely diagnostic testing for patients presenting with chest pain. The findings demonstrate that adhering to time-based guidelines, such as the AHA requirement for performing an ECG within 10 minutes of arrival, significantly impacts patient outcomes by reducing the risk of adverse cardiac events (Gulati et al., 2021). These results underscore the need for hospitals to prioritize compliance with this time-based quality measure, ensuring that the 10-minute ECG requirement is consistently met to support equitable and effective care for high-risk ACS patients. The project's findings provide actionable insights that can help streamline diagnostic processes, enhancing both patient outcomes and the overall quality of ED care.

Further research is necessary to explore the long-term impacts of adhering to these guidelines, such as reductions in morbidity and mortality rates, and to assess the scalability of these practices across different clinical environments, including rural or resource-limited settings. Additionally, this project highlights the critical role of education in the successful implementation of these guidelines, emphasizing the ongoing need for staff training and development. The findings underscore the importance of training ED staff to recognize atypical presentations of ACS such as nausea, vomiting, or dizziness and respond promptly, ensuring timely diagnostic testing (Khan et al., 2023). Ongoing simulations, drills, and feedback mechanisms will help reinforce these practices, ensuring sustained improvements in patient care and adherence to national guidelines.

Relevance to Change in Practice and/or Leadership Role of the Doctoral-Prepared Nurse

This project highlights the critical leadership role that doctoral-prepared nurses can play in driving evidence-based changes in practice within the emergency department. By leading the implementation of the AHA guideline and overseeing the continuous refinement of triage protocols, doctoral-prepared nurses can directly impact patient outcomes, ensuring timely and accurate cardiac assessments. The ability to lead teams in the evaluation of current practices, identify barriers to adherence, and implement targeted interventions underscores the nurse leader's role in fostering a culture of continuous quality improvement. This project serves as a model for how doctoral-prepared nurses can guide improvements in high-stakes areas of healthcare, ensuring adherence to national benchmarks and improving patient safety.

Recommendations and Implications for Practice

One of the key implications for practice involves enhancing training for emergency department staff. The results demonstrated that delays in meeting the ECG target were more likely to occur in patients presenting with non-traditional ACS symptoms. This highlights the need for focused education on recognizing the broader spectrum of ACS presentations, particularly in high-risk populations such as older adults and patients with multiple comorbidities. Regular training sessions and simulations should be conducted to ensure that staff are equipped to respond rapidly, regardless of the patient's presenting symptoms. Another area for improvement involves refining triage protocols. This project identified gaps in meeting the 10-minute ECG target for STEMI patients, suggesting that more explicit prompts within the triage workflow are necessary. Revising the protocol to flag atypical symptoms, such as nausea and dizziness, as potential indicators of

ACS may help reduce delays in diagnostic testing and ensure that all high-risk patients receive timely care.

Technology integration also presents an important avenue for enhancing clinical practice. Implementing decision support tools within the hospital's EHR system can prompt clinicians to consider ACS in cases where symptoms may not be immediately indicative of cardiac issues. Automated reminders for performing ECGs within the 10-minute window can help mitigate delays and support compliance with the AHA guideline. Continuous feedback and monitoring will be essential for maintaining high levels of performance. The results of this project demonstrate that while improvements can be made, sustaining these gains requires ongoing attention. Regularly reviewing cases where the ECG target was not met, providing constructive feedback to ED staff, and making data-driven adjustments to the triage protocol will support continuous improvement efforts.

Further research is needed to explore the scalability of these protocols across different clinical settings. While this project was conducted at a high-volume STEMI receiving center, it would be valuable to examine how similar protocols perform in rural or resource-limited environments. Additionally, expanding the study to include a larger sample size across multiple quarters and centers would provide a more comprehensive understanding of the protocol's effectiveness in achieving timely ECGs for all ACS patients.

In conclusion, the findings of this project underscore the importance of continuous protocol refinement, targeted training, and the integration of technology to improve adherence to the AHA guideline. By addressing the challenges identified in this study, particularly the recognition of atypical ACS symptoms and the timely acquisition of ECGs, the emergency department can further enhance patient outcomes and maintain a high standard of care.

Component 3: Evaluation of the Process and Experience

The experience of completing this DNP Scholarly Project was both challenging and rewarding, providing deep insights into the complexities of emergency care improvement. The dynamic nature of the emergency department required a high degree of flexibility and adaptability. Unforeseen challenges, such as variations in patient volume and staffing levels, necessitated adjustments to the implementation timeline and strategies. Continuous data monitoring and feedback were vital for the project's success; regularly reviewing and analyzing data on ECG times provided valuable insights into the effectiveness of triage protocols. This iterative process helped identify areas for improvement and ensured the protocol was implemented effectively. Engaging stakeholders throughout the project was essential for gaining support and ensuring the sustainability of the protocol changes. Regular meetings provided opportunities for feedback and fostered a sense of ownership and commitment to the project's success. This engagement was instrumental in addressing potential barriers and fostering a collaborative environment.

The project significantly contributed to my personal and professional growth. It enhanced my skills in data-driven decision-making, project management, and evidence-based practice, reinforcing the importance of considering social determinants of health and striving for health equity in clinical practice. The transformative potential of the project lies in its ability to improve patient outcomes and operational efficiency in the ED by achieving timely ECG administration and adhering to protocols. The skills and knowledge gained from this project will be invaluable in my future practice. I plan to apply these insights to drive quality improvement initiatives, advocate for evidence-based practices, and foster collaborative environments in any healthcare setting. This experience has prepared me to take on leadership roles and contribute to the

advancement of emergency care practices. Overall, completing this DNP Scholarly Project has strengthened my ability to lead initiatives that enhance clinical outcomes and optimize care delivery.

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Emory Saint Joseph's Hospital Triage Protocol for Acute Chest Pain

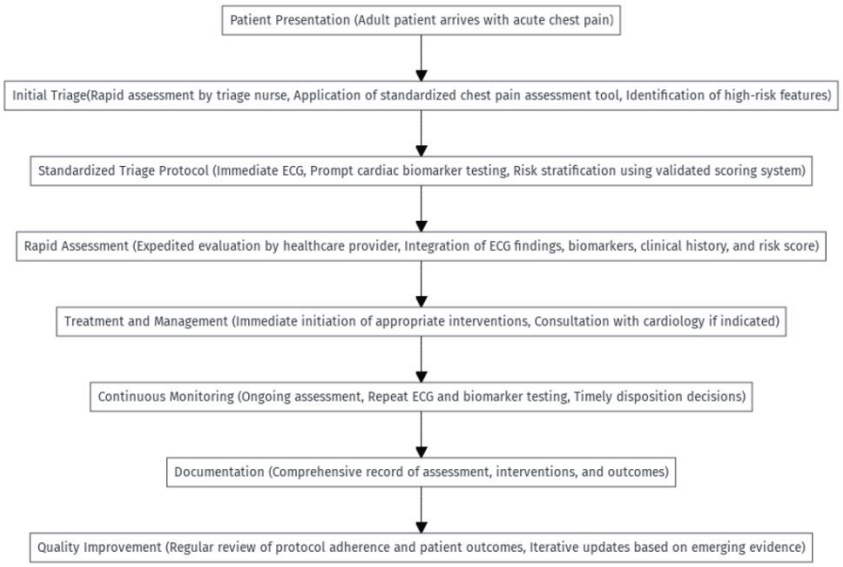
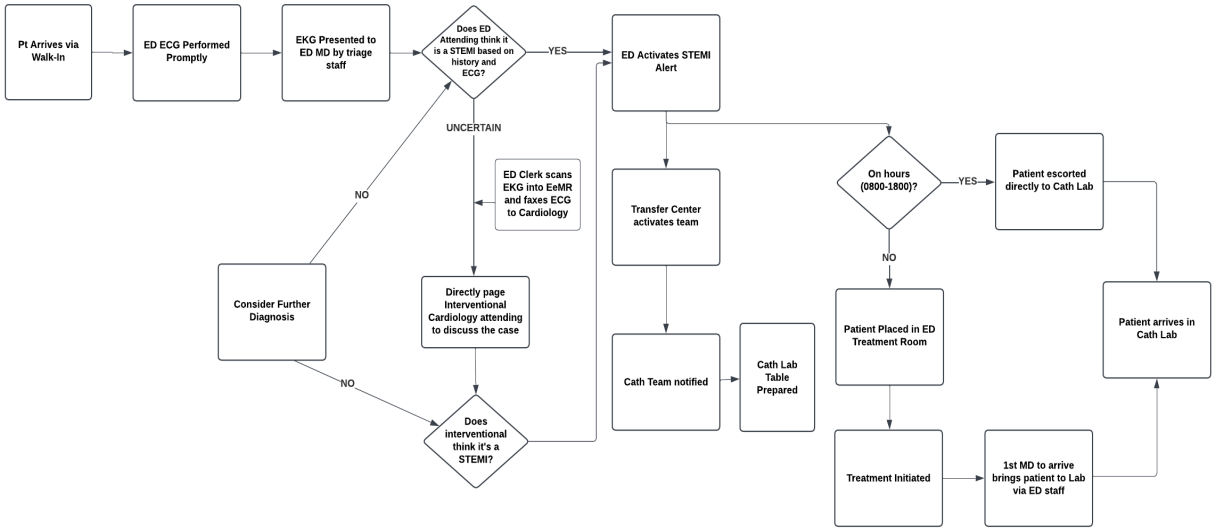


Figure 1. This figure illustrates the ESJH protocol for acute chest pain management, focusing on the initial triage and early ECG screening. Created by the author based on internal protocols.

Appendix A: Process Map for Chest Pain



This process map illustrates the workflow for managing "walk-in" patients presenting with chest pain at Emory Saint Joseph's Hospital Emergency Department. It outlines the sequence of steps from patient arrival to ECG completion and subsequent decision-making processes, including STEMI evaluation, alert activation, and patient transfer to the Cath Lab. The map highlights critical points where delays may occur, providing a visual framework for analyzing and optimizing adherence to the American Heart Association's 10-minute ECG guideline (Gulati et al., 2021).

Appendix B: Nurse Survey Results

This appendix presents the results of the survey conducted with 33 nurses at Emory Saint Joseph's Hospital. The survey explored barriers to meeting the 10-minute ECG target, frequency of encountering chest pain patients, and familiarity with chest pain management.

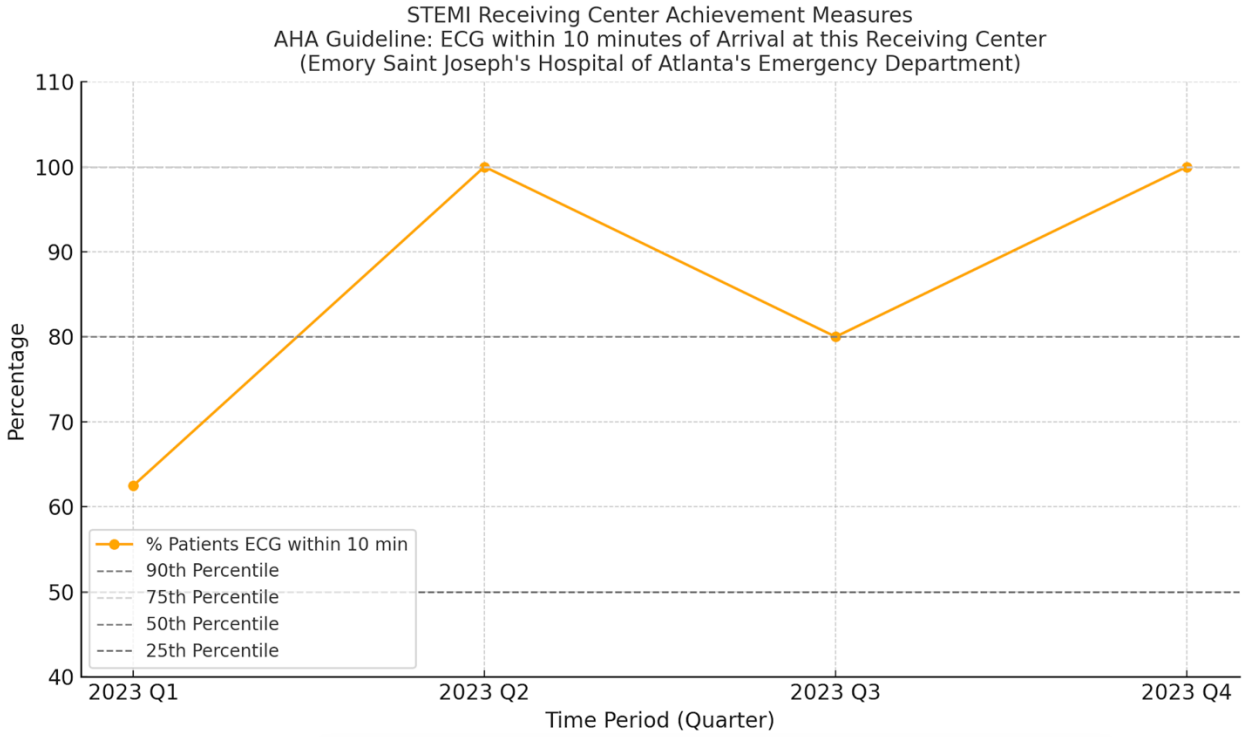
Question	Answer Choices	Responses (%)	Responses (#
How long have you been working as a nurse?	Less than 1 year	4	1
	1-3 years	16	4
	3-5 years	28	7
	More than 5 years	52	13
How long have you been working at Emory Saint Joseph's Hospital?	Less than 1 year	20	5
	1-3 years	32	8
	3-5 years	24	6
	More than 5 years	24	6
On average, how often do you encounter patients presenting with chest pain during your shif	Rarely (1-2 times per week)	4	1
	Occasionally (3-5 times per week)	16	4
	Frequently (1-2 times per day)	80	20
	Very frequently (3 or more times per day	0	0
How would you rate the efficiency of the current triage process for chest pain patients?	Very efficient	12	3
	Efficient	44	11
	Neutral	32	8
	Inefficient	12	3
What are the most common challenges you face when triaging chest pain patients?	Delays in patient registration	0	0
	Lack of available ECG machines	64	16
	Delays in technician availability	36	9
	Incomplete patient information	0	0
How often are ECGs completed within 10 minutes of patient arrival?	Always	20	5
	Most of the time	52	13
	About half the time	8	2
	Rarely	20	5
Which symptoms typically indicate the need for an immediate ECG order?	Chest pain/pressure	100	25
	Shortness of breath	96	24
	Diaphoresis (sweating)	64	16
	Radiating pain	88	22
How often do you encounter patients with atypical symptoms that warrant an ECG?	Always	40	10
	Most of the time	36	9
	About half the time	16	4
	Rarely	8	2
How familiar are you with national quality metrics for chest pain management?	Very familiar	52	13
	Somewhat familiar	24	6
	Neutral	8	2
	Somewhat unfamiliar	8	2
How familiar are you with quality metrics for chest pain management at Emory Saint Joseph'	Very familiar	52	13
	Somewhat familiar	24	6
	Neutral	8	2
	Somewhat unfamiliar	8	2

Appendix C: Key Table Summary of ECG performance

Quarter	STEMI (Met Target)	STEMI (Not Met)
Q1 2023	**62.5%**	**37.5%**
Q2 2023	**100%**	**0%**
Q3 2023	**80%**	**20%**
Q4 2023	**100%**	**0%**

This appendix presents a comprehensive table summarizing the quarterly performance of Emory Saint Joseph's Hospital Emergency Department in meeting the AHA guideline, which mandates an ECG to be performed within 10 minutes of patient arrival for STEMI cases. The table provides a clear comparison of the percentage of patients who met or did not meet the 10-minute ECG target across the four quarters of 2023. It allows for an easy visualization of performance trends and highlights critical areas for improvement in achieving timely ECG administration.

Appendix D (Run Chart)



For the measure of adherence to the AHA guideline: ECG within 10 minutes of arrival at ESJH ED, the run chart visualizes the percentage of STEMI patients who received an ECG within the 10 minutes benchmark, across four different quarters.