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## Implementing a Troponin Trending Toolkit in a Rural Emergency Department to Increase Provider Adherence to Troponin Trending Guidelines

Ace Beam  
abeam2@stu.jsu.edu

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## DNP Manuscript Defense Approval

First Name: \* Ace

Last Name: \* Beam

\*

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Student Signature: Electronically signed by Ace Beam on 07/10/2022 5:25:12 PM

Chair, DNP Manuscript Signature: Electronically signed by Amanda Bullard on 07/10/2022 6:10:58 PM

DNP Clinical Coordinator Signature: Electronically signed by Lori McGrath on 07/12/2022 10:45:57 AM

DNP Program Coordinator Signature: Electronically signed by Heather Wallace on 07/13/2022 11:16:27 PM

Director of Online & Graduate Nursing Programs Signature: Electronically signed by Kimberly Helms on 07/14/2022 10:37:36 AM

Dean of Graduate Studies Signature: Electronically signed by Channing Ford on 07/21/2022 10:36:43 AM

**Implementing a Troponin Trending Toolkit in a Rural Emergency Department to Increase  
Provider Adherence to Troponin Trending Guidelines**

A DNP Project Submitted to the  
Graduate Faculty  
of Jacksonville State University  
in Partial Fulfillment of the  
Requirements for the Degree of  
Doctor of Nursing Practice

By

Ace M. Beam

Jacksonville, Alabama

August 5, 2022

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## Abstract

**Background:** Cardiac biomarkers are used for the diagnosis and risk stratification of patients with chest pain and suspected acute coronary syndrome (ACS) (Kamal, 2021). Cardiac troponin is the only biomarker recommended to be used for the diagnosis of acute myocardial infarction (AMI) at this time due to its superior sensitivity and accuracy (Kamal, 2021). Emergency departments routinely provide care for patients presenting with chest pain symptoms and should be prepared to utilize evidence-based guidelines for troponin trending to effectively evaluate these patients.

**Purpose:** The purpose of the DNP project was to improve emergency department healthcare provider compliance to evidence-based high-sensitivity troponin trending guidelines in patients admitted to the hospital with chest pain as the primary diagnosis.

**Methods:** This quality improvement project involved the implementation of a troponin trending toolkit consisting of an educational in-service and the creation of a new electronic chest pain panel.

**Results:** Key results include statistically significant improvement in healthcare provider adherence to evidence-based troponin trending guidelines, ( $p=0.0451$ ). Numerical increases were also noted. Pre-intervention chart review revealed 58% adherence and the post-intervention chart review revealed 100% adherence to evidence-based troponin trending guidelines.

**Conclusion:** This project emphasized the importance of hospitals implementing a standardized program for improving compliance with evidence-based standards. The troponin trending toolkit was effective at improving emergency department healthcare provider compliance with evidence-based troponin trending guidelines for patients admitted to the hospital with chest pain as the primary diagnosis.

**Keywords:** troponin trending, chest pain, evidence-based practice

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## **Implementing a Troponin Trending Toolkit in a Rural Emergency Department to Increase Provider Adherence to Troponin Trending Guidelines**

Cardiac biomarkers are used for the diagnosis and risk stratification of patients with chest pain and suspected acute coronary syndrome (ACS) (Kamal, 2021). Cardiac troponin is the only biomarker recommended to be used for the diagnosis of acute myocardial infarction (AMI) at this time due to its superior sensitivity and accuracy (Kamal, 2021). Emergency departments routinely provide care for patients presenting with chest pain symptoms and should be prepared to utilize evidence-based guidelines for troponin trending to effectively evaluate these patients and guide clinical decision making. Healthcare provider suboptimal and inconsistent adherence to troponin trending guidelines was observed at the author's primary practice facility. The purpose of this Doctor of Nursing Practice (DNP) Project was to improve healthcare provider compliance with evidence-based troponin trending in the emergency department (ED) setting. As a result of the implementation of this project, regarding patients presenting to the ED with chest pain, troponin trending will be more consistently implemented among ED healthcare providers. Current literature was reviewed to ensure evidence-based practice and updated guidelines for troponin trending were recommended. A new chest pain panel was created within the electronic medical record (EMR) to assist healthcare providers in ordering appropriate diagnostic testing for patients presenting with chest pain. Additional education for ED healthcare providers was provided to ensure an appropriate understanding of current guidelines for troponin trending. A sample of patient charts, including patients admitted to the hospital with chest pain, will be reviewed pre-intervention and post-intervention to evaluate project effectiveness. The project will be implemented over a two-month time frame. Following project implementation, the writer hopes to observe improved compliance with standardized troponin trending guidelines.

## **Background**

The term chest pain is used by patients and applied by clinicians to describe chest discomfort prompting concern for a cardiac problem. Chest pain accounts for approximately 7.6 million annual visits to U.S. emergency departments (Hollander & Chase, 2021). Chest pain is the second most common reason for adults to present to the ED (Gulati et al., 2021). Patients presenting to the ED with non-traumatic chest pain should be rapidly evaluated for ACS and myocardial infarction (MI). Diagnostic testing to evaluate for the presence of myocardial injury includes biomarkers such as cardiac troponin. Current consensus guidelines from the European Society of Cardiology and the American College of Cardiology recommend that cardiac biomarkers should be measured at presentation in patients with suspected MI and that the only biomarker recommended being used for the diagnosis of acute MI at this time is cardiac troponin due to its superior sensitivity and accuracy (Kamal, 2021).

### **High Sensitivity Troponin**

The use of high-sensitivity cardiac troponin (hs-cTn) assays has improved the early diagnosis of MI and allowed the development of several novel high-sensitivity troponin-based strategies that permit a safe and rapid rule-out of MI in the ED (Roos & Holzmann, 2021). High-sensitivity troponin is becoming more widely utilized in emergency departments and will likely continue to become more common following strong recommendations from the American Heart Association and the American College of Cardiology (2021), in the recent guideline update for the evaluation of chest pain. Ample evidence is available for the superiority of hs-cTn assays over conventional troponin assays in patients presenting with chest pain with and without MI. The sensitivity and negative predictive values are greater with hs-cTn compared with previous

generation assays. The time interval from the onset of chest pain until a detectable level at patient presentation allows for more rapid rule-in and rule-out algorithms (Gulati et al., 2021).

### **Acute Coronary Syndrome**

Acute coronary syndrome, the acute manifestation of ischemic heart disease, remains a major cause of morbidity and mortality worldwide and is responsible for more than one million hospital admissions in the United States annually (Eisen et al., 2016). The term acute coronary syndrome is applied to patients in whom there is confirmation or suspicion of acute myocardial ischemia or infarction. The use of hs-cTn has increased the frequency of the diagnosis of non-ST-elevation myocardial infarction in patients who were formerly diagnosed with unstable angina as almost all patients with clinical and electrocardiographic (ECG) evidence of myocardial ischemia have abnormally elevated levels of hs-cTn (Braunwald et al., 2013).

### **Differential Diagnosis**

Patients presenting with non-traumatic chest pain present a diagnostic dilemma due to multiple potential causes of chest pain which may include aortic dissection, pulmonary thromboembolism, various nonvascular syndromes such as esophageal rupture, and tension pneumothorax (Gulati et al., 2021). The fast paced and inherently stressful environment of the emergency department can potentially jeopardize clinician's ability to rule out life-threatening causes of chest pain rapidly and effectively. To further complicate the diagnosis, the severity of chest pain does not necessarily correlate with the acuity of the disease. A comprehensive history regarding the characteristics of chest pain can assist the clinician in making the appropriate diagnosis. These include the nature of pain, presence or absence of pain radiation, onset, duration, precipitating and alleviating factors, and associated symptoms including nausea and diaphoresis (Gulati et al., 2021).

## **Troponin Trending Guidelines**

Chest pain protocols are intended to add structure to the process of patient evaluation (Gulati et al., 2021). The initial assessment of patients presenting with chest pain is focused on the rapid identification of life-threatening conditions to facilitate appropriate medical interventions (Gulati et al., 2021). The 2021 clinical practice guidelines for chest pain evaluation published by the American Heart Association and American College of Cardiology recommend utilizing hs-cTn. Clinical decision tools such as the HEART Pathway should be utilized to classify patients as low, intermediate, or high risk for guidance on additional testing after acute MI has been excluded. Those patients considered to be at low risk of major adverse cardiac events (MACE) may be safely discharged from the emergency department. Whereas patients considered intermediate to high-risk warrant further observation and testing. hs-cTn assays may be used to guide disposition by repeating sampling at one, two, or three hours from emergency department arrival (Gulati et al., 2021).

## **Needs Analysis**

The emergency department where the DNP project was implemented is part of a 160-bed rural hospital in North Alabama. A gap was identified in the emergency department regarding provider adherence to troponin trending guidelines. The hospital provides critical access to services in an area with very few healthcare resources. The emergency department includes a staff of ten healthcare providers including five physicians, three nurse practitioners, and two physician assistants. The emergency department is designated a level three trauma center and the facility can treat patients presenting with chest pain and ACS with interventional cardiology services.

## **Chest Pain Protocol**

The electronic medical record (EMR) includes an electronic chest pain protocol with troponin trending recommendations. The identified gap in service involves healthcare provider non-adherence to established chest pain protocol, specifically troponin trending. The reviewer realized the gap in service after reviewing charts of patients admitted from the emergency department into the hospital for chest pain and ACS. Chart review included 12 charts of patients admitted to the hospital in December 2021. Only seven charts or 58% met the two-hour time frame for repeating the hs-cTn as recommended by the American Heart Association. A troponin trending tool kit including a new chest pain panel and evidence-based education was presented to emergency department healthcare providers. The chest pain panel is evidence-based and includes hs-cTn drawn upon emergency department arrival with a repeat hs-cTn at two hours per the 2021 American Heart Association guidelines (Gulati et al., 2021). The panel will also include other evidence-based and common orders for patients presenting with chest pain including ECG, aspirin, radiology, and labs to increase the likelihood of provider utilization. Healthcare provider education will include information regarding the identified gap in service, instructions for utilizing the chest pain panel, and the updated 2021 American Heart Association guidelines for chest pain evaluation.

## **Problem Statement**

Troponin trending is a core component of the evaluation of patients presenting to the emergency department with chest pain to rapidly diagnose MI and ACS. Emergency department healthcare providers are not consistently following recommendations for hs-cTn trending at the identified emergency department. A troponin trending toolkit was implemented to improve healthcare provider adherence to evidence-based troponin trending guidelines while

disseminating education of the recently updated 2021 American Heart Association guidelines for chest pain evaluation.

The question that was answered through this project is: Among healthcare providers in a rural emergency department (P), does implementing a troponin trending toolkit (I) for patients presenting with chest pain (C), increase provider adherence to troponin trending protocol (O) over one month (T)?

### **Aims and Objectives**

The overarching aims of this project were to:

1. Increase healthcare provider adherence to evidence-based troponin trending protocol in patients presenting with chest pain over one month.
  - a. Increase healthcare provider knowledge of evidence-based troponin trending guidelines.
  - b. Increase healthcare provider adherence to guidelines.
2. Create a chest pain panel to include evidence-based troponin trending guidelines.
  - a. Include click options to initiate evidence-based troponin trending protocol.
3. Increase healthcare provider knowledge of current evidence-based troponin trending guidelines.
  - a. Increase knowledge through literature review and dissemination of evidence-based recommendations.
4. Improve the efficiency of diagnosing elevated troponin levels in patients presenting to the emergency department with chest pain.
  - a. Effective diagnosis of elevated troponin levels will guide care and improve patient outcomes.

## Review of Literature

A review of the literature was performed with the following primary considerations: (a) best practice guidelines for troponin trending in patients presenting to the emergency department with chest pain, (b) interventions to improve healthcare provider adherence to troponin trending guidelines, and (c) pathophysiology and considerations for patients presenting to the emergency department with chest pain. The findings will be presented here.

The databases utilized for literature review were PubMed and the Cochrane Library using MeSH terms and keywords to facilitate search results. The following MeSH terms were applied in PubMed: *chest pain* and *high-sensitivity troponin* yielding 144 results. The results were narrowed by applying filters including full-text, articles published within the last 5 years, and articles published in English. These filters reduced the search results to 33. Additional articles were excluded based on relevance and applicable content. Articles including guidelines for high-sensitivity troponin trending and chest pain evaluation were selected for review.

The Cochrane Library was accessed through the Jacksonville State University Library. The following keywords were included in the database search *chest pain* and *high-sensitivity troponin* yielding 115 search results. A filter was applied to only include articles published within the previous 5 years effectively reducing the total search result to 48 results. Additional results were eliminated secondary to content irrelevance, absence of full-text availability, and if chest pain evaluation was not included in the study.

The literature review provided key findings from systematic reviews and recent guideline updates from the American Heart Association and the American College of Cardiology. Some of these key findings were included in the planning of the intervention for this DNP project. Chest pain is a common reason for patients to seek medical attention. According to Hollander and



Chase (2021), chest pain accounts for approximately 7.6 million annual visits to U.S. emergency departments. After injuries, chest pain is the second most common reason for adults to present to the emergency department (Gulati et al., 2021). For patients presenting to outpatient settings with acute chest pain, the initial evaluation is based on determining if the patient should be transferred to a higher level of care to evaluate for acute coronary syndrome (McConaughy, 2020).

Chest pain protocols are intended to add structure to the process of patient evaluation (Gulati et al., 2021). Patients presenting to the emergency department with non-traumatic chest pain should be rapidly evaluated for acute coronary syndrome and myocardial infarction. Diagnostic testing to evaluate for the presence of myocardial injury includes the use of biomarkers such as cardiac troponin. Current consensus guidelines from the European Society of Cardiology and the American College of Cardiology recommended that cardiac biomarkers should be measured at presentation in patients with suspected MI and that the only biomarker recommended to be used for the diagnosis of acute MI at this time is cardiac troponin due to its superior sensitivity and accuracy (Kamal, 2021). The use of high-sensitivity cardiac troponin assays has improved the early diagnosis of MI and allowed the development of several novel high-sensitivity troponin-based strategies that permit a safe and rapid rule-out of MI in the emergency department (Roos & Holzmann, 2021). Cardiac troponin is the cornerstone for ruling out acute myocardial infarction in patients presenting with suspected acute coronary syndrome (Park et al., 2017).

Gulati et al. (2021) provided recommendations for hs-cTn trending protocols as part of the routine evaluation for patients presenting to the emergency department with chest pain and possible myocardial infarction. These guidelines recommended drawing hs-cTn level at presentation with repeat draw at 2 hours. The time interval from the onset of chest pain until a

detectable level at patient presentation allows for more rapid rule-in and rule-out algorithms (Gulati et al., 2021). Higher accuracy at emergency department presentation enabled the development and extensive validation of early hs-cTn based diagnostic algorithms, which substantially reduced the time required for the safe rule-in or rule-out of myocardial infarction (Twerenbold et al., 2017). The use of hs-cTn has increased the frequency of the diagnosis of non-ST-elevation myocardial infarction (NSTEMI) in patients who were formerly diagnosed with unstable angina as almost all patients with clinical and electrocardiographic (ECG) evidence of myocardial ischemia have abnormally elevated levels of hs-cTn (Braunwald et al., 2013).

High-sensitivity cardiac troponin assays with their superior analytical performance were designed to further facilitate clinical decision-making (Kozinski et al., 2017). Evaluation of chest pain in the emergency department should include strict adherence to established evidence-based protocols for troponin trending. Implementation of hs-cTn protocols possesses the potential to improve healthcare quality while maintaining safety (Vigen et al., 2020). The literature review supported the implementation of a troponin trending toolkit to improve adherence to troponin trending guidelines. Patient outcomes will be positively impacted by improved emergency department provider adherence to troponin trending guidelines.

### **Theoretical Model**

The theoretical framework utilized in this DNP project was Roger's Diffusion of Innovation. Getting a new idea adopted, even when it has obvious advantages, is difficult (Rogers, 2003). The Diffusion of Innovation theory is often regarded as a valuable change model for guiding technological innovation where the innovation itself is modified and presented in ways that meet the needs across all levels of adopters. It also stresses the importance of communication and peer networking within the adoption process (Kaminski, 2011). Roger's

theory proved to be helpful throughout the process of translating recent evidence regarding troponin trending into clinical practice.

Roger's diffusion of innovation model theorized there are four stages of change a clinical practitioner must go through to adopt a new practice (See Appendix A). These stages included knowledge acquisition, persuasion, decision, and adoption (Mohammadi et al., 2017).

Knowledge is produced by the understanding of new innovations. Persuasion involves the individual developing a favorable attitude toward the innovation. For a decision to occur, an individual must be exposed to an opportunity to utilize the innovation. Finally, adoption occurs once the individual utilizes the innovation, decides it is effective and continues utilizing the innovation (Mohammadi et al., 2017). According to the study by Mohammadi et al., 2017, Roger's diffusion of innovation theory can be an effective basis for the design of training programs intended to enhance the adoption of evidence-based practice.

### **Methodology**

The DNP project was planned to improve emergency department provider adherence to evidence-based troponin trending protocol. The primary intervention for this project was the implementation of a troponin trending toolkit consisting of an educational in-service and the creation of a new chest pain panel (see Appendix B). The educational session was focused on ED providers including nurse practitioners, physician assistants, and physicians regarding evidence-based troponin trending guidelines and the identified practice gap. The information was presented in writing and in PowerPoint presentation with adequate time allotted for questions and answers (see Appendix C). The new chest pain panel was reviewed in detail including the supporting evidence and potential for improving ease of workflow. A literature review was conducted to support the implementation of the above-mentioned aims and objectives.

**Setting**

The DNP project was implemented in the emergency department of a 160-bed hospital in rural north-central Alabama. The emergency department consists of 22 beds and provides around-the-clock services to the community for patients presenting with a variety of medical problems. The primary population focus included all healthcare providers working in the emergency department. The primary patient focus included all patients admitted to the hospital through the emergency department with the primary diagnosis of chest pain.

**Population**

Project participants involved 10 emergency department healthcare providers consisting of nurse practitioners, physician assistants, and physicians. Participants included all full-time and part-time employees working both night and day shifts. The principal investigator (PI) and project preceptor were excluded from this project, making the sample size 10 providers.

**Inclusion/Exclusion criteria**

Inclusion criteria were as follows:

- healthcare providers working in the emergency department
- employment status: full-time and part-time

Exclusion criteria are listed below:

- unit administrators
- nursing staff
- PI
- project preceptor

**Recruitment**

The emergency department medical director was contacted via email to inform about the DNP project and request permission to proceed with implementation. Permission was granted and the PI individually approached project participants and requested permission to include them in the project. The educational sessions were conducted in the emergency department dictation area during working hours when it was convenient for the healthcare providers.

**Consent**

Consent was obtained in writing from study participants (see Appendix D). Participants were informed that this was a student-led project with the sole purpose of improving troponin trending adherence in the emergency department. Interventions to achieve this goal including education and the institution of the new chest pain panel were disclosed. The participants were informed that the PI had no influence over administration in the emergency department and that all participant information would be kept confidential. Participants were informed that they were free to withdraw from the project at any point without penalty.

**Design**

This process improvement project was conducted in an emergency department setting including all full-time and part-time healthcare providers, excluding the PI and project preceptor. The project was implemented following Institutional Review Board (IRB) approval and began with an educational session including emergency department nurse practitioners, physician assistants, and physicians (see Appendix E). The educational sessions were conducted in the emergency department dictation area during working hours when it was convenient for the providers. The education was organized and delivered through a PowerPoint presentation narrated by the PI. The PI led the educational sessions and informed the participants of the

identified problem and evidence-based recommended solution. Participants were educated about the recommendations retrieved from the literature review regarding troponin trending guidelines. Participants were also introduced to the new Chest Pain Protocol including other guideline-recommended interventions for patients presenting to the emergency department with the chief complaint of chest pain (see Appendix B). Implementation of the project toolkit occurred over a two-week time frame in January 2022. Surveys were provided to project participants following the educational program in the form of a Likert scale with five response options (see Appendix F). The survey was vetted by the project preceptor.

### **Chart Review**

Following IRB approval, a pre-intervention chart review was conducted. Charts selected for review included all patients admitted to the hospital through the emergency department with the admitting diagnosis of chest pain over a one-month period in December 2021. The charts were evaluated for adherence to troponin trending guidelines as recommended by the review of the literature and presented in the education. A post-intervention chart review was conducted following the intervention for a one-month period in February 2022. Charts were selected for review following the same criteria as mentioned above. Exclusion criteria included charts of patients admitted to the hospital with a primary diagnosis other than chest pain.

The electronic medical record utilized at the facility for chart selection was EPIC and this was the only system utilized in the project. Medical record numbers and patient names were removed from the data following the chart review. The PI and project preceptor were the only researchers involved in the data review (see Appendix G).

**Risks and Benefits**

Participation was voluntary and associated with minimal risk. All participant information was kept confidential. Upper-level management did not have influence or information regarding participation. Participants were free to withdraw from the study at any point without penalty.

Benefits included knowledge attainment regarding evidence-based troponin trending per the most recent guidelines. Furthermore, patient outcomes could be improved following the implementation of the DNP project.

**Timeline**

Project planning and development began in October 2021 and continued for six months. Approval was granted from the DNP Project Proposal Evaluation Review Committee in November 2021. The agency letter of support was obtained in December 2021. Approval was obtained from the Jacksonville State University Institutional Review Board in November 2021. Project implementation began in January 2022 and continued for one month. Data collection began in February 2022 and continued for one month. Data analysis began in March 2022 and continued for one month. Writing of the DNP manuscript began in April 2022 and continued for two months. Project presentation and dissemination took place on July 15, 2022. (See Appendix H)

**Compensation**

No compensation was provided for project participants.

**Budget and Resources**

Project expenses totaled \$260 dollars. This included \$250 dollars for statistical analysis and \$10 dollars for paper copies of surveys and handouts. (See Appendix I)

## **Evaluation Plan**

### **Statistical Considerations**

Descriptive statistics including percentages and frequencies were utilized to describe the project findings. Pre-intervention and post-intervention chart review was conducted, and findings were reported as percentages. Fisher's exact test was used to evaluate for statistical significance of the project findings. The Likert scale post-education surveys were evaluated and reported using an ordinal scale. Data analysis was achieved by utilizing the statistical software package (SPSS).

### **Data Maintenance and Security**

Collaborative Institutional Training Initiative (CITI) certification was achieved (see Appendix J). The PI asked emergency department healthcare providers to complete a post-education survey. These surveys did not include the healthcare providers' names. The surveys were retained in a locked cabinet inside the primary practice facility. Patient identifiers including names and medical record numbers were removed from the data for chart review purposes. The results of the chart review were retained inside a locked cabinet at the primary practice facility. All data was destroyed following the implementation of the DNP project and the completion of the manuscript.

## **Results**

The results of the data analysis will be reviewed in this section. Data review includes quantitative results from chart review and post-implementation course evaluation forms organized into a Likert scale framework.



### **Results of Chart Review**

Chart review included all charts of patients admitted to the hospital through the emergency department with the primary diagnosis of chest pain in a 30-day time period pre and post DNP project implementation. Pre-intervention included 12 patient charts with 7 of these charts (58%) meeting the guideline-recommended 2-hour goal for repeat high-sensitivity troponin trending. Post-intervention included nine charts of patients admitted through the emergency department with the primary diagnosis of chest pain. All nine charts met the guideline-recommended 2-hour goal for high-sensitivity troponin trending (100%). Fisher's exact test was utilized to evaluate the statistical significance of the chart review findings. The Fisher exact test statistic value is 0.0451. The result is statistically significant at  $p < 0.05$ .

### **Results of Survey Responses**

Post-education course participant surveys were collected from all 10 emergency department healthcare providers that participated in the DNP project. Survey questions were designed to evaluate the participants' perceptions of the relevance of course content and the implications for clinical practice. Survey questions were designed based on a Likert scale model with response options including strongly agree, agree, neutral, disagree, and strongly disagree. All 10 participants responded "strongly agree" to questions regarding content relevance and clinical applicability (see Appendix F). A pre-education survey was not included in the DNP project.

### **Discussion**

The purpose of this DNP project was to improve emergency department healthcare provider compliance with evidence-based high-sensitivity troponin trending guidelines. The DNP project was developed around the most recent guideline recommendations for high-

sensitivity troponin trending per an extensive literature review. The project included a toolkit composed of an educational piece and the development of an electronic chest pain panel. Quantitative data sets were used to measure outcomes. Significant findings of the DNP project included the statistically significant improvement in emergency department healthcare provider adherence to evidence-based high-sensitivity troponin trending guidelines. These findings support the need for educational programs to improve the delivery of high-quality healthcare services. Additional significant findings included the healthcare providers' positive perceptions of the educational program per the results of post-course participant surveys.

### **Implications for Clinical Practice**

The project aims were met as demonstrated by the statistically significant increase in emergency department healthcare provider adherence to evidence-based high-sensitivity troponin trending guidelines. The results of this project demonstrate the effectiveness of implementing a troponin trending tool kit to increase healthcare provider adherence to troponin trending guidelines. This project can support clinical practice recommendations to standardize education regarding healthcare provider adherence to evidence-based practice guidelines.

### **Implications for Healthcare Policy**

The results of this DNP project could influence healthcare policy by demonstrating the positive impact of standardized education on healthcare provider adherence to evidence-based guidelines. Centers for Medicare and Medicaid Services (CMS) could require healthcare institutions to develop standardized education programs for core measures to improve the quality of healthcare services provided.

### **Implications for Quality/Safety**

Quality improvement was demonstrated by the improvement of healthcare provider compliance with evidence-based high-sensitivity troponin trending guidelines. Patients presenting to the emergency department where this DNP project was implemented may experience higher quality healthcare services when presenting with chest pain symptoms. As a result of this DNP project, patient safety may be positively impacted with emergency department providers becoming more knowledgeable regarding evidence-based guidelines for high-sensitivity troponin trending.

### **Implications for Education**

The results of this DNP project demonstrate the effectiveness of standardized education regarding evidence-based high-sensitivity troponin trending guidelines. It is reasonable to assume these results could be generalized to include other content areas for the improvement of patient care. In a healthcare facility setting, nursing education departments could be tasked with developing similar educational programs to address identified areas where the delivery of quality evidence-based healthcare services is lacking. These educational pieces could be included in new employee orientation for healthcare professionals and yearly reviews.

### **Limitations**

The major limitations of this DNP project include the small sample size of charts reviewed, time constraints, and limiting the inclusion criteria to only emergency department providers. It could be argued the small sample size of charts was insufficient for statistical measurements. The short time frame between project implementation and outcomes measurement may not be truly reflective of the long-term impact of the DNP project. The outcomes of the DNP project could have been more generalized if all emergency department

healthcare staff members were included in the education piece. The results of the DNP project might have been more impactful in the clinical setting by including all members of the healthcare staff.

### **Dissemination**

The findings of this project have been externally disseminated through the three P's: poster, presentation, and paper. The DNP project was presented by poster and presentation at Jacksonville State University. The DNP manuscript will be archived by Jacksonville State University (JSU) Library's Public Repository System. The project findings were also shared with the emergency department healthcare providers involved in the study and organizational leadership.

### **Sustainability**

The DNP project will be continued after graduation through the knowledge obtained by emergency department healthcare providers and by the addition of the new chest pain panel. The emergency department healthcare providers will be aware of the data supporting a structured troponin trending protocol and will be more likely to follow the evidence-based practice guidelines. The PI has encouraged the emergency department nursing educator to include the educational piece of this project into routine department education and update as appropriate. Other emergency departments throughout the hospital system may benefit from this education and troponin trending toolkit. By implementing the educational program and new electronic chest pain panel, the DNP will ensure long-term improvement in the quality of care for patients presenting to the ED with chest pain.

### **Plans for Future Scholarship**

Future research could include larger sample sizes collected over a longer period to further validate the findings of this project. Emergency department nursing staff could be included in the educational session to formally train all healthcare personnel about evidence-based troponin trending recommendations. Similar problems could be addressed throughout other healthcare facilities utilizing the same strategies that were implemented during this DNP project. Future projects could focus on identifying barriers associated with hospital systems leading to reduced adherence to troponin trending protocol.

### **Conclusion**

Acute coronary syndrome remains a major cause of morbidity and mortality worldwide and is responsible for more than one million hospital admissions in the United States annually (Eisen et al., 2016). Cardiac biomarkers should be measured at presentation in patients with suspected ACS and the only biomarker recommended being used for the diagnosis of acute MI at this time is cardiac troponin due to its superior sensitivity and accuracy (Kamal, 2021). This project sought to improve emergency department healthcare provider compliance with evidence-based troponin trending guidelines. This project emphasized the importance of implementing a standardized program for improving compliance with evidence-based standards. The troponin trending toolkit was effective at improving emergency department healthcare provider compliance with evidence-based troponin trending guidelines for patients admitted to the hospital with chest pain as the primary diagnosis.

Further research is necessary to evaluate the barriers associated with poor evidence-based guideline adherence in clinical settings. Identifying and addressing all barriers involving the healthcare provider's ability to effectively implement evidence-based guidelines may increase

compliance. The results of this DNP project stress the importance of implementing formal educational programs and electronic tools to improve compliance with evidence-based guidelines.

## References

- Braunwald, E., & Morrow, D. A. (2013). Unstable angina: Is it time for a requiem?. *Circulation*, 127(24), 2452–2457. <https://doi.org/10.1161/circulationaha.113.001258>
- Eisen, A., Giugliano, R. P., & Braunwald, E. (2016). Updates on Acute Coronary Syndrome: A review. *JAMA Cardiology*, 1(6), 718. <https://doi.org/10.1001/jamacardio.2016.2049>
- Gulati, M., Levy, P. D., Mukherjee, D., Amsterdam, E., Bhatt, D. L., Birtcher, K. K., Blankstein, R., Boyd, J., Bullock-Palmer, R. P., Conejo, T., Diercks, D. B., Gentile, F., Greenwood, J. P., Hess, E. P., Hollenberg, S. M., Jaber, W. A., Jneid, H., Joglar, J. A., Morrow, D. A., & O'Connor, R. E. (2021). 2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR guideline for the evaluation and diagnosis of chest pain: A report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation*, 144(22). <https://doi.org/10.1161/cir.0000000000001029>
- Hollander, J., Chase, M. (2021). Evaluation of the adult with chest pain in the Emergency Department. *UpToDate*. [https://www.uptodate.com/contents/evaluation-of-the-adult-with-chest-pain-in-the-emergency-department?source=history\\_widget](https://www.uptodate.com/contents/evaluation-of-the-adult-with-chest-pain-in-the-emergency-department?source=history_widget)
- Kamal, G. (2021). Cardiac markers: Definition and efficacy, markers of Myocardial Necrosis and Ischemia, Acute Coronary Syndrome testing strategy. Medscape. <https://emedicine.medscape.com/article/811905overview#:~:text=Indeed%2C%20cardiac%20troponin%20is%20central,at%20presentation%20in%20patients%20with>
- Kaminski, J. (2011) Diffusion of Innovation Theory. *Canadian Journal of Nursing Informatics*, 6(2). Cjni.net. <https://cjni.net/journal/?p=1444>
- Kozinski, M., Krintus, M., Kubica, J., & Sypniewska, G. (2017). High-sensitivity cardiac troponin assays: From improved analytical performance to enhanced risk

- stratification. *Critical Reviews in Clinical Laboratory Sciences*, 54(3), 143–172.  
<https://doi.org/10.1080/10408363.2017.1285268>
- McConaghy. (2020). Acute Chest Pain in Adults: Outpatient Evaluation. *American Family Physician*, 102(12). <https://pubmed.ncbi.nlm.nih.gov/33320506/>
- Mohammadi, M. M., Poursaberi, R., & Salahshoor, M. R. (2017). Evaluating the adoption of evidence-based practice using Rogers’s diffusion of innovation theory: A model testing study. *Health Promotion Perspectives*, 8(1), 25–32. <https://doi.org/10.15171/hpp.2018.03>
- Park, K. C., Gaze, D. C., Collinson, P. O., & Marber, M. S. (2017). Cardiac troponins: From myocardial infarction to chronic disease. *Cardiovascular Research*, 113(14), 1708–1718.  
<https://doi.org/10.1093/cvr/cvx183>
- Rogers, E. M. (2003). *Diffusion of innovations* (5). Free Press.
- Roos, A., & Holzmann, M. J. (2021). Use of historical high-sensitivity cardiac troponin T levels to rule out myocardial infarction. *Open Heart*, 8(1), e001682.  
<https://doi.org/10.1136/openhrt-2021-001682>
- Sahin, I. (2006). Detailed review of Rogers’ diffusion of innovations theory and educational technology-related studies based on Rogers’ theory. *The Turkish Online Journal of Educational Technology*, 5(2), 14-23.
- Twerenbold, R., Boeddinghaus, J., Nestelberger, T., Wildi, K., Rubini Gimenez, M., Badertscher, P., & Mueller, C. (2017). Clinical use of high-sensitivity Cardiac Troponin in patients with suspected Myocardial Infarction. *Journal of the American College of Cardiology*, 70(8), 996–1012. <https://doi.org/10.1016/j.jacc.2017.07.718>
- Vigen, R., Diercks, D. B., Hashim, I. A., Pandey, A., Zhong, L., Kutscher, P., Fernandez, F., Yu, A., Bertulfo, B., Molberg, K., Metzger, J. C., Soto, J., Alzubaidy, D., Thibodeaux, L.,



Joglar, J. A., Das, S. R., & de Lemos, J. A. (2020). Association of a novel protocol for rapid exclusion of Myocardial Infarction with resource use in a US Safety Net

Hospital. *JAMA Network Open*, 3(4), e203359.

<https://doi.org/10.1001/jamanetworkopen.2020.3359>

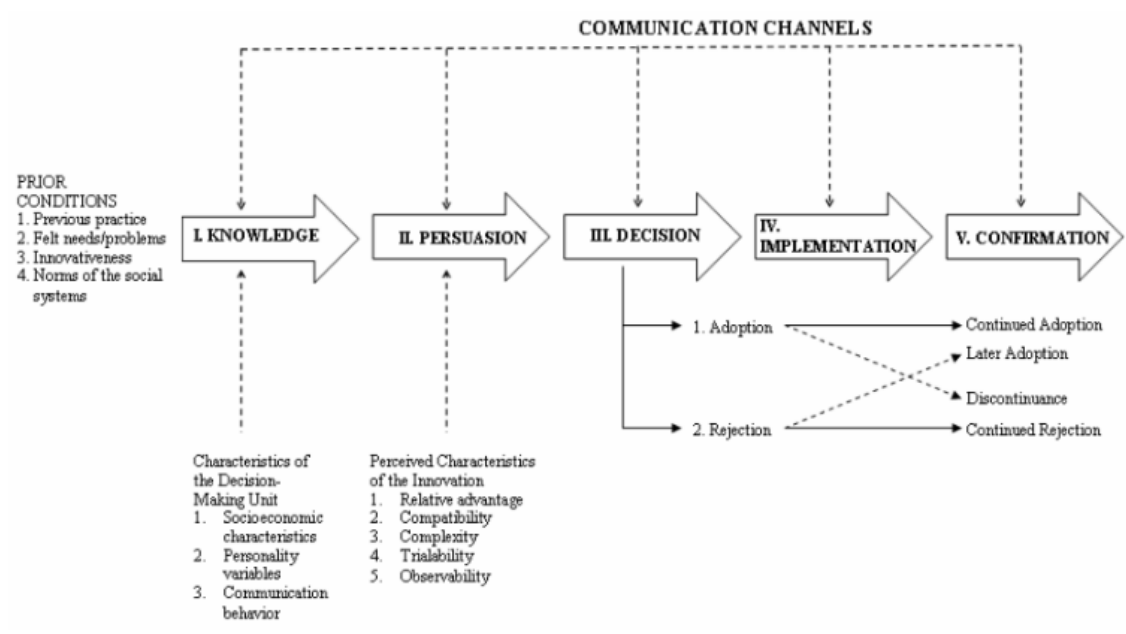
**Table 1**  
Fisher's Exact Test

Results			
	Pre-intervention	Post-intervention	<i>Marginal Row Totals</i>
Compliant	7	9	16
Non-compliant	5	0	5
<i>Marginal Column Totals</i>	12	9	21 (Grand Total)

The Fisher exact test statistic value is 0.0451. The result is significant at  $p < .05$ .

### Appendix A


Roger's Diffusion of Innovation Theoretical Model (Sahin, 2006)



## Appendix B

### Chest Pain Panel

#### High-Sensitivity Troponin x2 Sets 2 Hours Apart


New Orders

Chest Pain Panel

★ ✕


aspirin tablet 325 mg

1 325 mg, Oral, Once, today at 1730, For 1 dose

CBC W/Diff

1 Once, today at 1719, For 1 occurrence

Comprehensive metabolic panel

1  Once, today at 1719, For 1 occurrence

Troponin HS

Now then every 2 hours, First occurrence today at 1719, Last occurrence today at 1919, For 2 occurrences

EKG (12 Lead Electrocardiogram)

2 STAT, Now then every 2 hours, First occurrence today at 1719, Last occurrence today at 1919, For 2 occurrences

XR Chest 1 View

1 STAT, 1 time imaging, today at 1719, For 1 occurrence  
Reason for exam? Chest Pain  
Transport Method? Portable

Insert peripheral IV

1 Routine, Once, today at 1719, For 1 occurrence

NaCl 0.9 % flush 10 mL

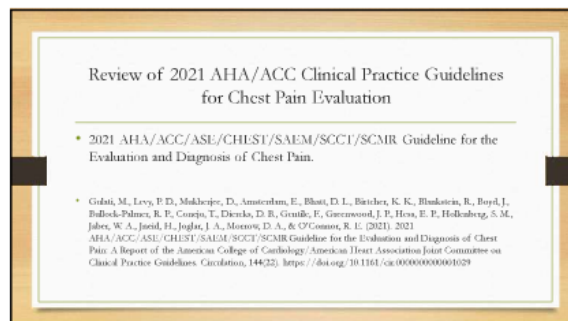
3 10 mL, Intravenous, Administer over 1 Minutes, Once, today at 1730, For 1 dose

## Appendix C

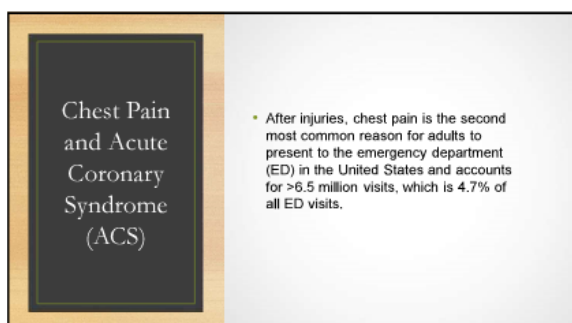
### Provider Training



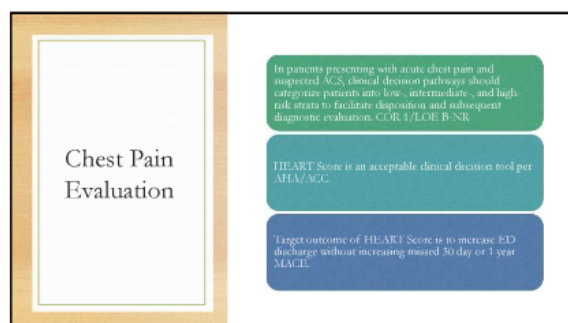
1



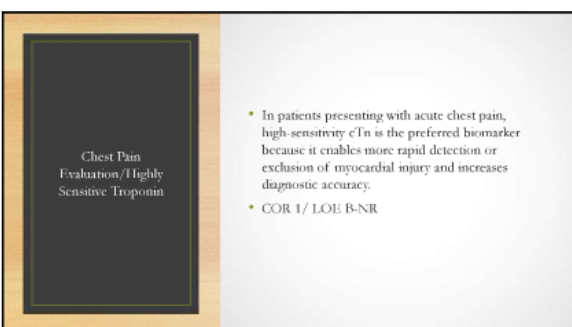
2



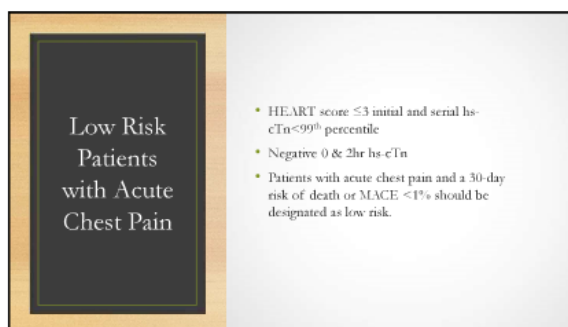
3



4



5



6

### Intermediate Risk Patients with Acute Chest Pain

- HEART Score 4-6
- For intermediate-risk patients with acute chest pain, management in an observation unit is reasonable to shorten length of stay and lower cost relative to an inpatient admission.
- COR 2A/ LOE A

7

### High Risk Patients with Acute Chest Pain

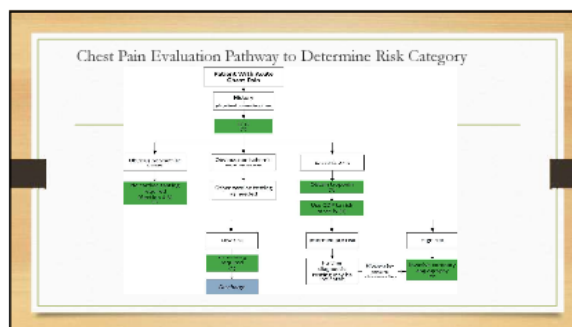
- HEART Score 7-10
- Patients with symptoms suggestive of ACS who are at high risk of short-term MACE include those with new ischemic changes on the ECG, troponin-confirmed acute myocardial injury, new-onset left ventricular systolic dysfunction (ejection fraction <40%), newly diagnosed moderate-severe ischemia on stress imaging, and/or a high-risk score on CDE

8

### Chest Pain Evaluation

- For patients with acute chest pain, a normal ECG, and symptoms suggestive of ACS that began at least 3 hours before ED arrival, a single hs-cTn concentration that is below the limit of detection on initial measurement (time zero) is reasonable to exclude myocardial injury.
- COR 2A/ LOE B-NR

9



10

### Chest Pain Evaluation/ EKG

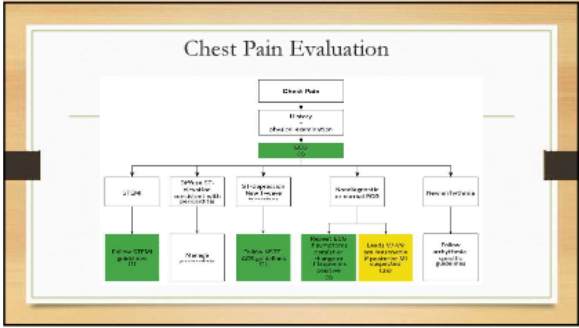
- In patients with chest pain in which an initial ECG is nondiagnostic, serial ECGs to detect potential ischemic changes should be performed, especially when clinical suspicion of ACS is high, symptoms are persistent, or the clinical condition deteriorates.
- COR 1/ LOE C-EO
- The 12-lead ECG, which should be acquired and interpreted within 10 minutes of arrival to a medical facility.

11

### Chest Pain Evaluation/ CXR

- In patients presenting with acute chest pain, a chest radiograph is useful to evaluate for other potential cardiac, pulmonary, and thoracic causes of symptoms
- COR 1/ LOE C-EO

12



13

- Chest Pain Panel Added to Electronic Medical Record.**
- Obtain 12 lead EKG and repeat in 2 hours x1
  - Obtain hs cTn now and repeat in 2 hrs x1
  - CXR PA/Lat
  - Aspirin 325mg p.o.
  - CBC w/diff
  - BMP

14

**Reference**

• Galati, M., Levy, P. D., Mukherjee, D., Amsterdam, E., Bhatt, D. L., Birtcher, K. K., Blankstein, R., Boyd, J., Bullock-Palmer, R. P., Coiro, T., Detsch, D. B., Goff, F., Greenwood, J. P., Hess, E. P., Holmberg, S. M., Jahn, W. A., Jurek, H., Jugha, J. A., Morrow, D. A., & O'Gorman, R. P. (2021). 2021 AHA/ACC/AHA/ASE/CHEST/SAFM/SCCT/SCMR Guideline for the Evaluation and Diagnosis of Chest Pain: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation*, 144(25). <https://doi.org/10.1161/cir.0000000000001029>

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## **Appendix D**

### **Participant Consent Form**

#### **Participant Consent Form**

**Title of Study: Implementing a Troponin Trending Toolkit in a Rural Emergency Department to Increase Provider Adherence to Troponin Trending Guidelines.**

**Principal Investigator: Ace Beam, MSN, CVNP-BC**

**This consent form is part of an informed consent process for a student-led DNP project. This consent will provide necessary information to assist the reader in deciding to participate in the study. Participants will be asked to attend an educational session, regarding troponin trending recommendations, delivered by PowerPoint presentation with in-person teaching.**

**Project Purpose: The purpose of the project is to improve provider adherence to troponin trending recommendations for patients presenting with chest pain to the emergency department. Interventions to achieve this goal include education, creating an EMR based best-practice alert, and making changes to the existing chest pain protocol to improve user-friendliness.**

**Risks to Participants: Participation is voluntary. All participant information will remain confidential. Upper-level management does not have influence or information regarding participation. Participants are free to withdraw from the study at any point without penalty. The author does not anticipate any risks to participants.**

**Questions: You may contact the PI with any questions.**

**Ace Beam, MSN, CVNP-BC**



256.606.0167

## AGREEMENT TO PARTICIPATE

### 1. Participant consent:

I have read this entire form, or it has been read to me, and I believe I understand what has been discussed. All of my questions about this form or this study have been answered. I agree to take part in this research study.

Participant Name: \_\_\_\_\_

Participant Signature: \_\_\_\_\_ Date: \_\_\_\_\_

### 2. Signature of Investigator/Individual Obtaining Consent:

To the best of my ability, I have explained and discussed the study's complete contents, including all of the information contained in this consent form. All questions of the research subject and those of their parent or legally authorized representative have been accurately answered.

Investigator/Person Obtaining Consent (printed name): \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## Appendix E

### IRB Approval Letter



**Institutional Review Board for the Protection of Human Subjects in Research**

203 Angle Hall  
700 Pelham Road North  
Jacksonville, AL 36265-1602

**December 7, 2021**

Ace Beam  
Jacksonville State University  
Jacksonville, AL 36265

Dear Ace:

Your protocol for the project titled "Implementing a Troponin Trending Toolkit in a Rural Emergency Department to Increase Provider Adherence to Troponin Trending Guidelines" 12072021-04 has been granted exemption by the JSU Institutional Review Board for the Protection of Human Subjects in Research (IRB). If your research deviates from that listed in the protocol, please notify me immediately. One year from the date of this approval letter, please send me a progress report of your research project.

Best wishes for a successful research project.

Sincerely,

A handwritten signature in black ink, appearing to read 'Lynn Garner', written in a cursive style.

Lynn Garner  
Associate Human Protections Administrator, Institutional Review Board

**Appendix F**

## Course Evaluation Form

Date:

Presenter: Ace Beam, MSN, CVNP-BC

1. The course material was clearly presented.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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2. The information is relevant and useful to my work.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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3. The information presented will affect my practice.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
----------------	-------	---------	----------	-------------------

**Appendix G**

## Chart Review Log

<b>Medical Record Number</b>	<b>Patient identified as presenting to ED with chest pain?  Yes/No</b>	<b>Provider initiated troponin trending protocol  Yes/No</b>	<b>Troponin collected at hours 0 and 2?  Yes/No</b>

## Appendix H

### Project Timeline

**Proposal Development 10/21-> PERC Approval / IRB Approval 11/21->Obtain Agency  
LOS 12/21->Implementation 1/22->Data Collection 1/22-2/22->Data Analysis 3/22->Final  
Writing 4/22-6/22àFinal Presentation 7/22**

<b>TASK</b>	<b>START</b>	<b>DURATION</b>
<b>Project planning/proposal development</b>	<b>10/2021</b>	<b>Six months</b>
<b>Proposal Approval by PERC</b>	<b>11/2021</b>	<b>1 week</b>
<b>Obtain Agency Letter of Support</b>	<b>12/2021</b>	<b>2 weeks</b>
<b>JSU IRB Submission/Approval</b>	<b>11/2021</b>	<b>2 weeks</b>
<b>Implementation</b>	<b>1/2022</b>	<b>1 month</b>
<b>Data Collection</b>	<b>2/2022</b>	<b>1month</b>
<b>Data Analysis</b>	<b>3/2022</b>	<b>1 month</b>
<b>Writing DNP Manuscript Results, Discussion, and Implications</b>	<b>4/2022-6/2022</b>	<b>2 months</b>
<b>Final Presentation and Dissemination</b>	<b>7/15/2022</b>	<b>1 Day</b>

## Appendix I

### Projected and Actual Expenses

PROGRAM EXPENSE	PROJECTED COST	ACTUAL COST <i>(Add Later)</i>
<b>Salaries, wages</b> <i>(Admin support, practitioners, statistics, or writing consultation)</i>	<b>\$250</b>	<b>\$250</b>
<b>Start-up costs</b> <i>(copies, charts, displays)</i>	<b>\$30</b>	<b>\$10</b>
<b>Capital costs</b> <i>(hardware, equipment)</i>	<b>\$0</b>	<b>\$0</b>
<b>Operational costs</b> <i>(heat/electricity)</i>	<b>\$0</b>	<b>\$0</b>
<b>Other:</b>	<b>\$50</b>	<b>\$0</b>
<b>Total Project Expenses</b>	<b>\$330</b>	<b>\$260</b>

**Appendix J**

## CITI Training



Completion Date 11-Sep-2021  
Expiration Date 10-Sep-2024  
Record ID 44623279

This is to certify that:

**Ace Beam**

Has completed the following CITI Program course:

Not valid for renewal of certification  
through CME.

**Social and Behavioral Responsible Conduct of Research**

(Curriculum Group)

**Social and Behavioral Responsible Conduct of Research**

(Course Learner Group)

**1 - RCR**

(Stage)

Under requirements set by:

**Jacksonville State University**

**CITI**  
Collaborative Institutional Training Initiative

Verify at [www.citiprogram.org/verify/?w566e6cc0-c1e4-4b57-ac4a-1446b932092c-44623279](http://www.citiprogram.org/verify/?w566e6cc0-c1e4-4b57-ac4a-1446b932092c-44623279)