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Implementing the HEART Score Guideline to Decrease Length of Stay in Low-Risk Chest Pain Patients in a Rural Hospital

Tonja D. Walker
Georgia College and State University

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Implementing the HEART Score Guideline to Decrease Length of Stay in Low-Risk Chest Pain Patients in a Rural Hospital

CP is one of the most common complaints seen in the ED in the United States (U.S.) and worldwide (CDC, 2019). Over eight million patients visited the ED in the U.S. with complaints of CP (CDC, 2019). CP is rated as high, intermediate, or low-risk (Brady & deSouza, 2018). Patients presenting with low-risk CP are unlikely to have an acute coronary syndrome (ACS) (ACC, 2018). Providers often admit low-risk CP patients into the hospital for extended times and cardiac tests to rule out a critical illness (Majeed, et al., 2016). The HEART score guideline is a risk stratification tool created for ED providers to delineate evidence-based care for high, intermediate, and low-risk CP patients (Brady & deSouza, 2018). The use of the HEART score guideline empowers ED providers and enhances their knowledge of low-risk CP and can decrease the LOS.

Statement of Problem

Evaluating the underlying cause of a patient's CP to offer expeditious care is of vital importance. Low-risk CP patients are not at risk of having a life-threatening cardiac event (Allen et al., 2018). Approximately 15% of patients presenting with CP are emergent (Huis, 2017). Many times, low-risk patients are admitted to the hospital for more extended periods than recommended by evidence-based guidelines (Majeed, et al., 2016). During the admission workup, low-risk CP patients receive unnecessary cardiac tests that are expensive (Yang, et al., 2016). A contributing factor to extended LOS is that ED providers are unaware of evidence-based guidelines related to risk stratification in the treatment of low-risk CP patients (Huis, 2017). Using an evidence-based guideline can increase providers' knowledge of low-risk CP metrics and decrease LOS in low-risk CP patients (Byrne, Toarta, Backus, & Holt, 2018)

Definition of Terms

Emergency Department

The ED is one of the busiest departments in a hospital. In 2017, ED's in the U.S. had approximately 140 million visits (Niven et al., 2018). Of those, about 5% present with a chief complaint of CP (CDC, 2019). These visits result in CP being one of the most common complaints seen in the ED (CDC, 2019). Triage protocols advance the most severe cases expeditiously through a continuum of care to decrease the chances of mortality or morbidity (Brady & deSouza, 2018).

Rural Hospital

Rural hospitals comprise 38% of all hospitals in the U.S. (CDC, 2019). These facilities have smaller case volumes than non-rural hospitals and often have limited beds for admission (Casey, Klingner, & Moscovice, 2012). These hospitals have more limited resources of bed space and nursing staff than other larger hospitals. Many times, these facilities have reduced staff. Because of size and limitations, the ED has a decreased likelihood of becoming proficient at treating either emergent or non-emergent CP patients (Casey, Klingner, & Moscovice, 2012). Early risk stratify in CP patients is essential to expedite treatment for patients with life-threatening illnesses (Baugh, et al., 2016).

Low-Risk Chest Pain

Not all complaints of CP are life-threatening. Patients with low-risk CP are often admitted into the hospital for tests to rule out a critical illness (Reid, 2016). A cardiac workup can reflect a non-lethal EKG findings, normal cardiac enzymes, minimal risk factors for ACS, and vital signs that are within normal limits. These findings are the determinants of a low-risk CP presentation in the ED (ACC, 2018). The hospital stay can exceed five days and is expensive

to the patient. These patients admitted to rural hospitals can be more problematic (Reid, 2016). ED providers continue to admit these patients for fear of missing a fatal cardiac problem (Baugh et al., 2016). However, providers are beginning to realize that unnecessary hospital admissions are not beneficial in the care of low-risk CP patients (Reinhardt, Lin, Novak, & Brown, 2018) . The hospital stay can be expensive for patients and expose them to nosocomial infections (Batalden & Davidoff, 2007).

Clinical Practice Guidelines

Clinical practice guidelines and updates are suggested protocols that can be used to improve outcomes and quality in patient care encouraging interventions of proven benefit and discouraging the use of ineffective or potentially harmful interventions (Fihn, et al., 2016). Clinical guidelines are statements intended to assist providers' decision-making regarding treatment pathways to reduce unnecessary variation in healthcare practices (Murad, 2017).

Purpose

The purpose of this project is to implement an evidence-based practice guideline to improve healthcare providers' knowledge of low-risk CP metrics to decrease LOS in a rural ED located in Milledgeville, Georgia. The QI Department where the project took place currently collects LOS data for CP patients evaluated in the ED and discharged as well as those CP patients admitted to the hospital. This is the only avenue responsible for collection for this data matrix. This data is provided to the medical director of the ED and the Director of Nursing (DON).

Specific Aims and Clinical Questions

The aims of this project are to improve ED providers' awareness of low-risk CP metrics and to implement an evidence-based guideline instrumental in decreasing LOS in low-risk CP

patients. The first clinical question asks, **"**Will an educational intervention, provided before the implementation of the HEART score guideline, increase ED providers' knowledge regarding the use of the low-risk chest pain metrics?" The second clinical question asks, "Will implementation of the HEART score guideline be instrumental in decreasing LOS in low-risk CP patients?"

Opportunities and Challenges

Knowledge and Perception

Implementation of an evidence-based guideline can be a useful tool in changing practices in hospitals (Forsener, 2016). When utilized, these guidelines can be helpful in the improvement of quality metrics such as LOS. A typical occurrence in the ED is a patient less than 40 years old will present with complaints of CP. After being monitored in the ED for a short period, the current practice was to repeat the physical exam and the patient is admitted into the hospital for additional tests before discharge. If the initial workup findings remain unchanged, research supports that the patient can be discharged home without a hospital admission.

Providers who follow evidence-based guidelines can decrease LOS in low-risk CP patients (Murad, 2017). While many providers are reluctant to discharge patients directly from the ED, there are credible guidelines to support this practice. Providers using an evidence-based guideline can decrease LOS in low-risk CP patients, minimize the risks of patients acquiring a nosocomial infection, and have a cost-saving benefit for patients (Byrne, Toarta, Backus, & Holt, 2018).

The providers' awareness of low-risk CP must be assessed before initiating an educational session on the guideline. Evidence shows that ED providers have a good understanding of low-risk CP care and risk stratification guidelines (Huis, 2017); however, the median LOS at the project site remains high because providers continue to admit patients for

extended times. In the assessment of prolonged LOS, providers observe patients with low-risk CP because of fear of missing a fatal cardiac event (Baugh et al., 2016). Equipping providers with evidence-based practice guidelines and encouraging education on the tool can result in increased provider knowledge of low-risk CP and decrease LOS in these patients.

Education

Implementing guidelines into practice by providers can be influenced in many ways. Educational strategies include lectures, workshops, and the use of electronic prompts in the health record (Okene & Zapka, 2017). The information session should stress the objectives of the proposed guideline, the process improvement objectives for making the providers aware of the guideline to be implemented, and include discussions of the supporting evidence used in the creation of the guideline (Okene & Zapka, 2017). Research supports making the providers knowledgeable of the effectiveness and appropriateness of the guideline maximizes the guideline's efficiency (Okene & Zapka, 2017).

Making providers aware of evidence-based guideline and educating them on the guideline's use was intended to help to decrease the LOS in low-risk CP patients. Engaging and practical techniques such as face to face learning sessions are useful tools in informing providers of evidence-based guidelines (O'Doherty, Leader, O'Regan, Dunne, 2019). Face to face educational sessions are the preferred teaching method because it allows interactions between the instructor and the participants (Okene & Zapka, 2017). Better acceptance of practice changes occurs when educational interventions occur face to face rather than using an electronic format (Okene & Zapka, 2017). In-person educational sessions to improve provider knowledge are recommended to educate the ED providers on newly implemented CP guidelines.

Implementation of an evidence-based guideline used in the ED evaluates patients with CP resulted in less inpatient care and non-invasive cardiac testing (Reinhardt, Lin, Novak, & Brown, 2018). This implementation standardizes care and improves efficiency to patients undergoing treatment for CP (Ogedegbe et al., 2018). The research evaluates the appropriate use of clinical guidelines in risk stratification of CP patients and treatment. Research shows that the use of a clinical guideline for risk stratification is approximately 20% more likely to appropriately classify low-risk CP than using provider's judgment (Brady & deSouza, 2018).

Chapter II

Review of Literature and Synthesis

A literature review evaluated articles that related to risk stratification tools and providers' knowledge of low-risk CP. The analysis of literature led to currently used guidelines that were effective in educating ED providers on low-risk CP characteristics and proposed care recommendations (Baugh et al., 2016).

Search for Evidence

An initial search of the literature regarding CP used the database Cumulative Index to Nursing and Allied Health Literature (CINAHL) in Galileo, ProQuest, and Google Scholar. Search terms included CP, low-risk CP, guidelines, risk stratification and, LOS. The search contained articles from the years 2010 to 2019. Other articles included articles related to provider knowledge of cardiology guidelines. Many of the articles related to areas outside of the U.S. such as Australia and England. These articles were excluded. Other excluded articles included those related to acute coronary syndromes (ACS) or any life-threatening cardiac diagnoses. This search provided over 1500 articles. A repeated search limited the years of research to 2015 to 2019 using additional keywords of non-emergent and non-cardiac CP. A total of 186 articles resulted. Twelve articles were duplicates from the first search, and 163 articles were found impertinent to the project. Only eleven articles were appropriate. All eleven articles were reviewed and used in this translational project.

Summary of Evidence

The literature search provided evidence of the importance of assessing providers' knowledge of low-risk chest pain metrics and using an evidence-based guideline to decrease LOS in these patients. Literature findings focused on the common reasons for patients being

admitted for low-risk chest pain as well as educational interventions directed toward providers applying evidence-based practice guidelines when evaluating patients with this complaint. Research has shown that the use of an evidence-based guideline can be a useful tool in the care of CP patients, many ED providers are unaware of these guidelines (Brady & deSouza, 2018). Research also supports that ED providers admit CP patients to avoid missing an ACS (Baugh, et al., 2016). In addition, the literature search supports that patients with low-risk chest pain can discharged from the ED after a brief stay without being admitted into the hospital (Fernando, et al., 2019).

The use of the HEART score guideline as a tool to risk stratify low-risk chest pain has been seen as both a positive and negative topic through research. Decreasing LOS is a positive outcome. Although the HEART score has been shown to decrease LOS in low risk chest pain patients (Allen, et al., 2018) (Fernando, et al., 2019) (Mahler, et al., 2015), one of the most frequently mentioned use of the guideline was for intermittent and high risk chest pain (Byrne, Toarta, Backus, & Holt, 2018). Two additional articles support the use of the HEART score guideline as a risk stratification tool to decrease LOS in low-risk chest pain patients (Majeed, et al., 2016) (Niven, et al., 2018).

In research, physician judgement is even sometimes used to supersede the HEART score guideline precepts (Edelstein, 2016). This can be viewed as both positive and negative in research (Edelstein, 2016). Providers based their clinical decisions on personal experience and feel this yields better outcomes than adherence to clinical guidelines like the HEART score (Kenefick, Lee, & Fleishman, 2008). This reason can lead to non-adherence to guideline usage and contribute to prolonged LOS (Cabana, Rand, & Powe, 2019) (Forsener, 2016).

The literature review shows few articles are found regarding how ED providers are educated on guidelines used in the care of chest pain patients. Research is also limited in how chest pain guidelines are implemented into practice in the clinical setting.

Summary of Expert Evidence

Limitations

Little evidence is available that focuses on educating cardiologists regarding the use of cardiac and risk stratification guidelines. Many studies focus on the effective use of guidelines, but little is known on methods to inform providers on implementing the guideline into practice. Another limitation is the lack of research on providers' knowledge of guideline usage in the U.S.

Guideline

The HEART score was developed in the Netherlands in 2008 by Six, Backus, and Kelder as a rapid risk stratification tool for patients with CP (Brady & deSouza, 2018). This physician group consisted of a cardiologist, an internal medicine provider, and an ED provider. This provider team approach added credibility to the guideline creation. The HEART score has been independently validated in several studies worldwide in the Netherlands and in the Asia Pacific Cohort Studies (Six, et al., 2013). The HEART score developers used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to assess the strength of the evidence (Fernando et al., 2019). A total of nine studies included over 11,000 patients in the primary meta-analysis. Utilizing the PRISMA assessment of the reporting quality of systematic reviews added credibility to the guideline.

Credibility

Evidence is needed to improve ED providers' knowledge of low-risk CP patients matrixes and to improve chest pain LOS. Not only is the evidence necessary, but guidelines

must show credibility and reliability before being implemented in the clinical setting. Once validity and reliability are proven, these guidelines are appropriate for use. This translational project focuses on implementing an evidence-based clinical practice guideline to improve the knowledge of providers in the rural hospital's ED. The HEART score is the first model to be derived, validated, and undergo clinical impact studies in ED patients with possible ACS (Byrne, Toarta, Backus, & Holt, 2018). Developers used physicians from multiple disciplines, including an internal medicine provider specializing in nuclear medicine, emergency medicine and, a cardiologist (Baugh, et al., 2016). The use of a team increases the credibility of this guideline by decreasing biases (Byrne, Toarta, Backus, & Holt, 2018). When more than one health specialist offers their expertise on a topic, this reduces the threats to credibility and validity.

Funding

Although the HEART score guideline was created in the Netherlands, it has been used in the U.S. since 2012 (Huis, 2017). The European Society of Cardiology received funds from its members paying dues and activities such as seminars, journal publications, and educational programs (Fernando et al., 2019). Before use in the U.S., a randomized trial compared this guideline with the prior practice of provider evaluation only (Mahler, et al., 2015). Funding for this trial was received from the AHA Clinical Research Program (Mahler et al., 2015). The AHA disclosed they had no role in the design, analysis, interpretation, or writing study or HEART score development at the time of the clinical trial (Fernando, et al., 2019). The corresponding authors had complete access to all study data and final responsibility for article submission (Mahler, et al., 2015). The guidelines noted that all developers disclosed any conflict of interest before the development of the guideline and no conflicts were noted (Fernando, et al., 2019). Revealing this information is what makes this guideline more credible.

Critical Analysis of Current Evidence

The first step to the development of the HEART score guideline implementation project was a literature review. Google Scholar and PROQUEST were databases used in the literature review. The limited review used articles from 2008-2012. This timeframe was higher than five years, and the research material can be seen as outdated and weaken the credibility of the guidelines. Also, much of that research took place outside of the U.S. Another search narrowed the years of research to articles after 2013 and conducted within the U.S. The most relevant articles regarding low-risk CP were used. Articles related to high and intermediate CP were excluded. Twenty-two recommendations were approved from this search.

Strength of Current Evidence

The guideline search revealed over twenty recommended articles that use the HEART score guideline in risk stratifying low-risk CP patients. The developers of the HEART score guideline used the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) tool to assess the strength of the evidence (Fernando et al., 2019). A level of strength of evidence based on the GRADE system followed each recommendation. The strength of evidence helps clinicians understand each supporting recommendation; however, substantial evidence is not used to support every recommendation. An example of this is the first recommendation of the HEART score details performance of the guideline in the prognosis as a scoring tool for intermediate and high-risk CP patients versus the prognosis of low-risk CP patients (Fernando et al., 2019). The HEART score has above average sensitivity for recognizing low-risk CP patients (Fernando et al., 2019). Less than four percent of patients were at risk for adverse cardiac events like death and ACS when identified as low-risk using the

HEART score guideline. The GRADE findings support the risk stratification of CP patients (Baugh, et al., 2016).

Application of the Evidence

QI is the approach this translational project explored. This chosen method impacts the LOS quality metric in a rural hospital's ED. The ACC/AHA uses guidelines for the early risk stratification of low-risk CP patients. Two aims of this project pertain to the improvement of providers' knowledge of the treatment of low-risk CP patients and to decrease the LOS in those patients by implementing the HEART score guideline.

Needs and Feasibility

The extended LOS in low-risk CP patients is a global issue. The American College of Cardiology and American Heart Association (ACC/AHA) have adopted guidelines to standardize the approach to patients with CP in the U.S. ('t Veld et al., 2017). One area where the guidelines were useful in decreasing LOS in non-emergent CP patients (ACC, 2018). Using an evidence-based practice guideline can help reduce the LOS in low-risk CP patients.

In Milledgeville, Georgia, there is a need for ED providers to become more knowledgeable of the care of low-risk CP patients (Navicent Health, 2018). Navicent Health Baldwin is in Milledgeville, Georgia (GA). This non-profit hospital primarily serves three rural counties: Baldwin, Hancock, and Wilkinson Counties. It is a subsidiary of Central Georgia Health Systems and has a sister hospital located approximately 30 miles away in Macon, GA. The facility is licensed to occupy 140 patients. The hospital has a 24-bed medical-surgical/telemetry unit and a 12 bed ICU area. 24-hour care is available in the ED (Navicent Health, 2018). Currently, the hospital is expanding to add approximately 20 beds in a step-down

unit. Navicent Health Baldwin has a full-service ED with seventeen providers employed. These providers are either a physician, NP, or a PA.

In June and July of 2019, there were 127 patients seen at the project site with a diagnosis of atypical or unspecified CP with a median LOS of approximately 26 hours (Navicent Health, 2018). The LOS range from one hour to 46 hours (Navicent Health, 2018). This data exceeds the recommended timeframe of fewer than 12 hours (ACC, 2018). The cost of this hospitalization is estimated for each patient approximately $4100 per day (Yang, et al., 2016). This cost can be reduced by about 20% by lowering LOS to less than 16 hours (Yau, Lockett, Michaud, & Nguyendo, 2017). The hospital will benefit by decreasing LOS in low-risk CP patients because it now beds to admit other patients. Prolonged admissions can unfavorably affect a hospital's ability to move patients on through the continuum of higher care efficiently (Majeed et al., 2016). Open and accessible beds present opportunities for hospitals to treat more patients. Occupied hospital beds can hinder the facility's ability to treat more patients.

The ED medical director, nursing, and QI leaders at a rural hospital have identified possible causes for extended LOS. The primary reason for the gaps in the desired quality metrics and current data is providers' lack of knowledge of low-risk chest pain patient metrics and triage guidelines instrumental in decreasing LOS. This practice leads to patients being admitted to the hospital for additional tests and observation. Another reason for prolonged LOS is related to the lack of oversight of the LOS metrics. The QI department collects data on all patients admitted with a diagnosis of CP; however, no monitoring of the metric occurs for QI opportunities. Before beginning this QI project, ED providers were unaware of the LOS for CP patients at the facility. Making hospital and ED providers knowledgeable of LOS statistics and an evidence-based guideline can lead to LOS improvement.

Theoretical Framework

Created in 1998, the conceptual framework that offers a means to execute research into practice is the PARIHS framework. PARIHS is an acronym for Promoting Action on Research Implementation in Health Services (Kitson, Harvey & McCormack, 2016). The PARIHS model examines interactions between the evidence, context, and setting when implementing research into practice.

This framework suggests the setting where new evidence where implementation occurs, and the method of introduction is as important as the quality of the evidence. The PARIHS model uses four themes from evidence and applies them to research. The first theme is implementing research into practice is an organizational issue. The next theme is justification for evidence implementation is research evidence must be strong by using such evidence as systematic reviews. The next theme is the plans for implementation should require participant education, plans for audits, and managerial oversight. The last theme is the evaluation criteria for implemented evidence must be agreed upon before it is initiated (Kitson, Harvey, & McCormack, 2016).

Implementation of an evidence-based guideline into practice into the ED in a rural hospital will use all the themes of PARIHS. The DON and ED medical director support the guideline implementation from an organizational standpoint. The evidence-based guideline to be implemented serves as justifiably strong evidence. Provider education and monthly audits of low-risk CP LOS were components of implementation plans. Utilizing the PARIHS theory was instrumental in implementing the evidence-based guideline into practice to decrease LOS in low-risk CP patients.

Chapter III

Project Design

This QI project utilized a pre and post-survey evaluated providers' knowledge of low-risk chest pain for statistical significance. A comparison of LOS for low-risk chest pain patients was compared for clinical and statistical significance seen at the facility. Approval from Georgia College & State University's Institutional Review Board (IRB) was obtained, prior to the recruitment of study participants. A letter of support for the project was obtained from the DON at the clinical setting where the project was conducted.

Sample

The participants for this project were a convenience sample of physicians or non-physician providers who currently work in the ED at the rural hospital. All adult ED providers, ages 18-75, employed at Navicent Health Baldwin, were eligible for recruitment. Other providers employed at Navicent Health Baldwin but not in the ED do not qualify for participation in this project. The sampling method for LOS data included an evaluation of all patients seen in the project site with a diagnosis of "atypical chest pain" or "chest pain unspecified" during the project time. The LOS data evaluated the time periods from arrival time at the project site through the discharge time and is measured in hours. Patients with intermediate or high risk chest pain are excluded from the project. A total of 329 patients LOS were reviewed with findings of 180 charts that had data that met criteria for low-risk chest pain. Charts were divided into 91 pre-intervention and 89 post-intervention groups.

Pre-Intervention Phase

The preintervention phase began on August 15th, 2019 after receiving Institutional Review Board (IRB) approval from Georgia College and State University (GCSU). This first

phase consisted obtaining the LOS for patients seen at the project site between June 1st and July 31st, 2019. The necessary LOS data consisted of patients seen and diagnosed with either "atypical chest pain" or "chest pain unspecified". In the second phase, the primary investigator met with the ED providers on August 15, 2019 to gain informed consent and administered the pre-test using an electronic survey method. After the pretest, the participants received education on the HEART score guideline. The participants were able to ask questions at any time during or after the educational session. The principal investigator provided a contact number for the subjects to call if needed. The providers received a printed copy of the HEART score guideline to have as a reference. Observation of guideline usage would occur for 60 days.

Intervention Phase

Phase three began September 1st and continued until through October 31st, 2019 and consisted of the principal investigator contacting the QI department at Navicent Health Baldwin to get the LOS data for each month during the project time. The LOS data was shared with the ED providers each month at the monthly staff meeting

Post Intervention Phase

The fourth phase began November 1st through November 15th, 2019 and consisted the primary investigator administering an electronic post-test to assess changes in knowledge of low-risk chest pain and discussion of LOS data and relevant trends during project time.

Participants

The participants for this project were a convenience sample of physicians and non-physician providers who currently work in the ED at the rural hospital. All adult ED providers, ages 18-75, employed at Navicent Health Baldwin, were eligible for recruitment. Other providers employed at Navicent Health Baldwin but not in the ED do not qualify for

participation in this project. Participation in the project is voluntary. Providers may leave the project at any time by notifying the PI.

Methodology

This study was designed as a four-phase learning experience using a pre and post survey as the basis for evaluating provider knowledge of low-risk chest pain and evaluation of LOS before and after the implementation of an evidence-based clinical guideline.

Measures

Data collection included the participants' responses to the pretest and post-test. No information obtained identified the subjects. The QI department provided the principal investigator the monthly total of all patients presenting to the ED with complaints of CP. To ensure confidentiality, the PI was the only person in contact with the participants' information. Project data is stored the personal computer that is locked in a safe with a code that is only known by PI. Data was analyzed using Statistical Package for the Social Sciences (SPSS) software. Records will be retained for three years and subsequently destroyed according to GCSU policy.

Design

The QI department of the project site has observed an elevated LOS in CP patients over 60 days. Evaluating the contributing factors to these high rates is the focus of this translational project. Risk stratification categories for CP patients in the ED include history (H), ECG (E); Age (A); Risk factors (R); and Troponin (T). These five categories comprise the algorithm HEART. This project measured ED providers’ knowledge of low-risk CP and providing them with the HEART score guideline as a treatment pathway.

Each of the five elements of the HEART score guideline has a score of 0, 1, or 2 points (Appendix C). The sum of all sections yields the result of the HEART guideline. The HEART score guideline is a rapid risk stratification tool to categorize CP patients. It has three category levels that identify CP patients as high-risk, intermediate-risk, or low-risk. For this project, the scoring tool used to identify low-risk CP patients (Brady & de Souza, 2018). The use of the HEART score guideline promotes timely and proper assessment, treatment, and early release from the ED rather than admission to the hospital for low-risk CP patients. Implementation of this guideline could reduce LOS to less than 12 hours if the provider discharges the patient from the ED with outpatient follow-up. The use of the HEART score guideline is not a substitution for the ED providers using clinical judgment. If a patient's presentation is suspicious of ACS or if CP persists or worsened during the ED stay, the patient underwent an in-depth clinical workup and was excluded from the project.

This study used a pretest and posttest survey for assessment of provider knowledge of low-risk chest pain metrics. A comparison of each question in an eleven item survey was evaluated for statistical significance using a convenience sample of ED providers. LOS metrics and HEART score objectives were taught to participants during an educational session led by the primary investigator. The educational sessions took place at the hospital during the providers' monthly staff meeting. The educational concepts were evaluated through pre- and posttest survey results and use of previously developed and validated HEART Score Knowledge Survey tool.

Human Subjective Protection

The project site was in the ED of Navicent Health Baldwin. The principal investigator (PI) is a Georgia College and State University (GCSU) and a DNP student. After IRB approval from GCSU Institutional Review Board (IRB), the DON submitted a letter in support of the translational project. The PI arranged a meeting with the Navicent Health Baldwin's ED providers to obtain informed consent. After informed consent is received, the PI provided a demographic survey and pretest for the participants to complete. Upon completion of a pretest, the providers received education on the HEART score tool.

Copies of the HEART score tool was provided to each provider to use when CP patients present to the ED. Patients with a cumulative HEART score of 3 or less were considered low-risk. A repeat examination of the chest pain patient occurred 6-8 hours after presenting to the ED. If the examination remains unchanged, the patient can be discharged home. The PI obtained the average LOS from the staff QI department of Navicent Health Baldwin at the end of each month during the project. The QI manager did not disclose any patient or provider information to the PI. At the end of the 60-day project, the ED providers were given a post-test to evaluate their understanding of low-risk CP and the HEART guideline.

No potential stress or harm is anticipated for the participants. The pretest and HEART score guidelines were brief and easy to complete. The timeframe for completion is not lengthy and should not add stress to the providers. Participation in this project is entirely voluntary, and participants can withdraw at any time by notifying PI.

Measurement Tools

The demographic survey section was self-made by the principle investigator. For confidentiality reasons, participants were identified by gender (male or female) and profession (doctor or non-physician provider). The tool used for this project was a psychometric tool that

was developed by A. Rodrigues et al. (See Appendix # A). The instrument was developed in Portugal and did not have a specific name. The analytical tool was created in 2015. This tool established validity and test-retest reliability utilizing both inpatient and outpatient providers (Rodrigues, 2015). The instrument measures the providers' knowledge and understanding of antibiotics. The tool was used once to test hospital providers versus outpatient providers' perception of antibiotic use. The instrument has a Cronbach alpha of 0.77 and an intra-correlation coefficient (ICC) of greater than 0.4 in the outpatient setting. The tool is reliable but needs further testing to show validity.

Although the tool was created to assess provider knowledge of antibiotics, it was modified to be used to evaluate providers' knowledge of low-risk CP in this project. An example of how the tool was changed is as follows. Question one in the original tool asks: Antibiotic resistance is a significant Public Health problem in our setting with options to answer as:

5. Strongly Agree, 4. Agree; 3. Neither Agree or Disagree, 2. Disagree and, 1. Strongly Disagree. For the low-risk CP project, the question was to ask: Complaints of CP is an important problem in our setting with options to answer as 5. Strongly Agree, 4. Agree; 3. Neither Agree or Disagree, 2. Disagree and, 1. Strongly Disagree

This project was named the Heart Score Knowledge Tool. The instrument measures the providers' knowledge and understanding of low-risk CP. Participants answered 11 questions on a 5-point Likert scale to evaluate their knowledge of low-risk CP risk stratification in the ED (Appendix B There was no right or wrong answer for this survey. Each item has a score with values ranging from 1 to 5. Results were interpreted as a lower average score resulting in a better understanding of low-risk chest pain metrics. Reliability for this tool pre-intervention produced a Cronbach alpha score of 0.75 and a post-intervention score of 0.70. Combined

pretest and posttest reliability produced a Cronbach alpha score of 0.72. The publishers have granted utilization of the tool provided the author receives credit.

Chapter IV

Results

A discussion of the results of the HEART Knowledge Guideline Quality Improvement project is in this section. This project focused on increasing providers' knowledge of low-risk CP and the use of the HEART score guideline for determining if a patient met the parameters of low-risk CP criteria. The specific aim of this project was to decrease LOS for patient's presenting to ED who met the criteria for low-risk CP utilizing the HEART score guideline. Providers' knowledge of low-risk CP and LOS for low-risk CP patients at two different times using an electronic survey tool are reported. Descriptive statistics for providers are also reported.

Sample Description

Based on inclusion criteria, a total of 17 ED providers were eligible to participate in this survey. The provider staff includes seven physicians and ten non-physician providers. The entire provider staff received the mandatory educational training about low-risk CP guidelines to be implemented for the QI project. Nine of the seventeen providers elected to participate in the pretest and posttest evaluation of knowledge regarding low-risk CP. Of the nine participating providers, there were four physicians (44.4%) and five non-physician providers (55.6%). Three physicians and five non-physician providers elected not to complete and return the pretest or posttest. Seven female (78%) and two male (22%) providers participated in the project. When asked about their perception on if the use of clinical practice guidelines would be beneficial in reducing LOS in low-risk CP patients; 100 % of the participants reported yes that it would be useful. No other demographic information was collected because of the small sample size to ensure the anonymity of the participants.

Normality

Initial analysis of the data for normality was performed. Data for nine questions of the eleven-question HEART Score Knowledge Survey were normally distributed and met the assumptions for parametric tests. A paired-samples *t* Test was used for this analysis. Non-parametric tests were used for all questions in the HEART Score Knowledge Survey that were not normally distributed. The assumptions were not met for parametric analysis in questions 1 and 6 of the knowledge survey. A Wilcoxon Signed-Rank test was used for this analysis.

Quality Improvement Aim 1: To improve ED providers' knowledge of low-risk chest pain metrics.

Clinical Question 1: Will an educational intervention, provided before the implementation of the HEART score guideline, increase ED providers' knowledge regarding the use of the low-risk chest pain metrics?

Results: Seven of the HEART Score Guideline Knowledge Survey had identical pretest to posttest mean scores. These results were listed in Table 1. In these questions, provider knowledge of low-risk CP patient metrics was unchanged pretest to posttest.

Table 1. *Heart Score Knowledge Survey*

	Low-Risk CP Survey	Pretest	Posttest	Results
Question 1	CP is a significant problem in the facility	M: 4.78 SD: 0.411	M: 4.78 SD: 0.411	Unchanged
Question 2	Rapid techniques required for CP diagnosis	M: 4.67 SD: 0.500	M: 4.67 SD: 0.500	Unchanged

Question 3	CP admission does not influence ACS.	M: 3.56 SD: 1.01	M: 3.56 SD: 1.01	Unchanged
Question 4	In doubt, CP observation preferred to rule out ACS.	M: 4.44 SD: 0.527	M: 4.44 SD: 0.527	Unchanged
Question 6	In doubt of life-threatening, admission preferable for testing	M: 4.56 SD: 0.88	M: 4.56 SD: 0.88	Unchanged
Question 7	CP patients insist on admission.	M: 2.67 SD: 0.50	M: 2.67 SD: 0.50	Unchanged
Question 10	Low-risk CP LOS should be tightly controlled.	M: 3.44 SD: 1.51	M: 3.44 SD: 1.51	Unchanged

Analysis of three questions on the HEART Score Knowledge Survey was assessed and showed statistical insignificance; however, provider knowledge improved in these questions. These results were in Table 2.

Table 2. *Heart Score Knowledge Survey*

	Low-Risk CP Survey	Pretest	Posttest	Results
Question 5	CP patients admitted for systematic follow-up.	M: 3.78 SD: 1.20	M: 3.67 SD: 1.12	$t(8)= -1.00$, $p=0.35$
Question 8	CP patients admitted for continued provider trust.	M: 2.56 SD: 0.53	M: 2.44 SD: 0.53	$t(8)= -1.00$, $p=0.35$
Question 9	CP patients admitted – no time for explanations	M: 3.89 SD: 1.45	M: 3.56 SD: 1.33	$t(8)= -0.71$, $p=0.50$

Quality Improvement Aim 2: To decrease the LOS in hours that patients with low-risk spend in a rural hospital after HEART score guideline implementation?

Clinical Question 2: Will implementation of the HEART score guideline be instrumental in decreasing LOS in low-risk CP patients?

Results: A paired sample *t*-test evaluated if the implementation of the HEART score guideline in low-risk CP patients would be instrumental in decreasing the LOS for patients with this condition. The independent-sample *t*-test demonstrated no significant difference between LOS before or after the implementation of the use of HEART score guidelines in the ED. The LOS increased post implementation (M28.93, SD 14.54), although not statistically significant to pre-

implementation (M 26.03. SD 12.16). The median LOS is found in Table 3. The use of the HEART score guideline was not instrumental in decreasing LOS in patients with low-risk CP.

Table 3. *Length of stay*

Pre-Test	Post Test	Statistical Test
Mean: 26.03	Mean: 28.93	$t(87) = -0.95$, $p = 0.138$
SD: 12.16	SD: 14.54	

Chapter V

Conclusion

The findings and conclusion of this QI project will be discussed in this chapter. Demographic analysis of participating versus non-participating ED providers in the rural hospital will also be addressed. Additional discussion will encompass project limitations, strengths, and future implications for ED providers in the rural hospital.

Discussion

Clinical Question 1: Knowledge

Previous studies have shown that providers were familiar with the HEART score guideline and low-risk CP metrics. Research findings support that knowledge and adherence to this guideline were beneficial to patient care by decreasing the LOS (Allen et al., 2018). Despite knowledge of the HEART score, some ED providers were hesitant to discharge low-risk patients without additional testing during a prolonged observation admission (Brady & deSouza, 2018).

In this translational project, ED providers were already knowledgeable of the HEART score guideline and low-risk CP metrics. Some ED providers currently use the guideline in the rural hospital before the project implementation.

In the results of the eleven question HEART Score Guideline Knowledge Survey, seven questions had identical results pretest to posttest. In these questions, provider knowledge of low-risk CP patient metrics was unchanged. Analysis of three other questions on the knowledge survey showed improved provider knowledge but without statistical significance.

Analysis of three questions on the HEART Score Knowledge Survey was assessed and showed statistical insignificance; however, provider knowledge improved in these questions. These results were in Table 2. A paired sample *t* test was used to test the assumption that

provider knowledge improved was related to providers admitting low-risk CP patients in situations in which it is impossible to conduct a systematic follow-up for the patient. Pretest knowledge (M 3.78, SD 1.20) to posttest knowledge (M3.67, SD 1.12) indicates an increased provider knowledge although the results were not statistically significant.

The next question where provider knowledge increased were related to providers admit low-risk CP patients so patients will continue to trust the provider. A paired sample *t* test was used to test the assumption that provider knowledge will increase. Pretest knowledge (M 2.56, SD 0.53) to posttest knowledge (M 2.44, SD 0.53) showed improved provider knowledge; however, these results were not statistically significant.

The last question where provider knowledge increased were related to providers admit low-risk CP patients unnecessarily because lack of time for explanations why the admission is not necessary. A paired sample *t* test was used to test the assumption that provider knowledge will increase. Pretest knowledge (M 3.89, SD 1.45) to posttest knowledge (3.56, SD 1.33) indicates an increased provider knowledge although the results were not statistically significant.

Clinical Question 2: Length of stay

Studies have shown that implementation of the HEART score guideline is instrumental in reducing LOS in low-risk chest patients in hospitals. A decrease of approximately 12 hours in LOS and early discharges from the hospital by around 21% occurred post guideline implementation. In another project, LOS in low-risk CP patients decreased by the elimination of additional cardiac testing previously used for diagnosing CP (Reinhardt, Lin, Novak, & Brown, 2018). This research further supported low-risk CP patients should only undergo a brief clinical evaluation without additional cardiac testing. This practice alone accounts for the shorter LOS. LOS reduction occurred because the newly implemented guideline was uploaded into the

electronic medical record in the ED system in this project, and the providers were acutely aware of the new process.

In the translational project, LOS in low-risk CP patients was evaluated. A comparison of LOS before and after guideline implementation was completed. The LOS increased rather than decrease. Although the guideline was already in use at this hospital, the pre-project LOS for low-risk CP patients exceeded the median recommended timeframe. ED providers' inconsistent application of the guideline contributed to the extended LOS. Lastly, despite the fact that the providers indicated when questioned that the use of clinical practice guidelines is beneficial in reducing LOS in low-risk CP patients, this had no effect on the LOS.

Strengths and Limitations

The HEART score is a risk stratification tool used in the ED to delineate appropriate care for high, intermediate, and low-risk CP patients (Brady & deSouza, 2018). An initial strength of this research is the HEART score guideline is already in use in the ED. This fact substantiates the providers' knowledge of the guideline.

There were seventeen ED providers eligible to participate in this translational project. Nine physicians and non-physician providers elected to participate. The other eight providers did not complete the survey; thereby, choosing not to participate in the project. Lack of participation was the main limitation of this project. Another limitation of the study includes the inconsistent use of the HEART score guideline by ED providers for low-risk CP patients. The electronic survey tool was used for providers to complete the pretest and posttest surveys. Electronic parameters prohibited the submission of the survey without participants answering all questions. These parameters were set to inhibit missing data during the project. If this project should be repeated, eliminating this parameter may allow for more providers to participate.

Lastly, the limited timeframe of 60 days was another limitation. Repeating this project should include a consideration to extend the project time to both six months before and after guideline implementation. This consideration would allow an evaluation of a full year of data for this QI project.

Implications for Practice

This translational project intended to decrease LOS in low-risk CP patients. The results revealed LOS increased. Evaluation of providers' knowledge of the HEART score and low-risk CP metrics was another aim of this project. An assessment of knowledge included a pretest-posttest survey. The results of the project showed ED providers' knowledge was uninfluenced. No statistical significance resulted in the electronic survey. The HEART score guideline was already in use in ED before the translational project started. Nonuse or inconsistent use of the guideline by providers were possible reasons for the prolonged pre-project LOS. This project can be used in future research to evaluate why providers were reluctant to begin use or consistently use the HEART score guideline. Hospitals can provide educational workshops to enable providers to understand the benefits of using evidence-based guidelines, such as decreased LOS.

Barriers to Providers Implementing Clinical Guidelines

Providers may not always comply with clinical guidelines. Noncompliance with guidelines can occur for many reasons. Lack of awareness, provider attitude toward the guideline, and external barriers were reasons that ED providers do not adhere to clinical guidelines (Navicent Health, 2018). Clinical practice guidelines assist providers in making patient decisions regarding appropriate clinical circumstances (Cabana, Rand, & Powe, 2019). This change happens by decreasing the variation in individual provider practice (Cabana, Rand,

& Powe, 2019). Successful implementation of guidelines should have a positive impact on the quality of care for patients (Edelstein, 2016). Other reasons to use clinical guidelines include improved patient safety and decreased cost of care (Edelstein, 2016). To best impact healthcare quality and cost efficiency, guidelines must remain current, credible, and evidence-based. Treatments with medications and diagnostic tests were dependent on guidelines remaining current (Batalden & Davidoff, 2007). Research shows that providers agree with guidelines based on how credible they find the evidence-base guidelines to be (Kenefick, Lee, & Fleishman, 2008). If providers feel the guidelines were not grounded in evidence, they were less likely to follow the guideline.

Knowledge barrier

The first barrier to provider adherence to guidelines is the knowledge barrier. Guidelines must first impact provider knowledge before it can impact patient outcomes (Cabana, Rand, & Powe, 2019). Lack of awareness or familiarity is a barrier to guideline implementation. Not all guidelines receive widespread recognition (Allen, et al., 2018). Childhood immunization guidelines were examples of guidelines that have extensive knowledge (Kenefick, Lee, & Fleishman, 2008). Guidelines such as the HEART score may lack familiarity. One reason for this may be that it is relatively new to the U.S. (Byrne, Toarta, Backus, & Holt, 2018).

Provider attitude barrier

The next barrier to provider adherence to guidelines is attitude. This barrier pertains to providers not agreeing with the implemented guideline (Allen, et al., 2018). Historically, providers based their clinical decisions on personal experience and feel this yields better outcomes than adherence to clinical guidelines he lack of motivation to change (Kenefick, Lee, & Fleishman, 2008). This belief yields low self-efficacy and low outcome expectancy in

providers (Forsener, 2016). Research shows that many providers feel their practice when compared to clinical guidelines (Cabana, Rand, & Powe, 2019). Another attitude barrier that exists is if providers believe the guideline will not result in improved outcomes (Forsener, 2016). They were less likely to adhere to the guideline.

External barriers

The next barrier to provider guideline adherence is external barriers. External barriers include patient, guideline, and environmental factors. Examples of external barriers include patient preferences about the guideline and other factors that are outside of a provider's control, such as a lack of required resources. This lack of resources can include insufficient staff, increased costs or liability, and inadequate reimbursement. In many instances, the lack of time is the reason used as an external barrier. These barriers inhibit the ability to perform the guideline requirements.

Lack of flexibility and relevance

The next barrier to provider guideline adherence is the lack of provider autonomy (Cabana, Rand, & Powe, 2019). Providers feel justification for treatment decisions causes many providers to view clinical guidelines as intrusive (Kenefick, Lee, & Fleishman, 2008). Providers feel clinical guidelines place limits on their treatment options (Fernando, et al., 2019). Lastly, providers feel clinical guidelines disregard their judgment and perceive the clinical guideline as a threat to their practice autonomy (Fernando, et al., 2019). Lack of flexibility is another reason providers do not adhere to clinical practice guidelines.

Conclusion

In conclusion, this QI project found that implementation and reinforcement of the HEART score guideline had no impact on low-risk CP LOS in the rural ED. A statistically

insignificant increase in LOS 60 days post-project guideline initiation resulted. Furthermore, the project found that provider knowledge low-risk CP improve in three questions on the knowledge survey according to the pretest-posttest results. Although knowledge improved, the results showed several no statistical significance. Future research should focus guideline adherence by uploading the HEART score tool into the electronic health record (EHR). Also, continued monitoring of LOS metrics and HEART score guideline usage in low-risk CP patients is needed to reduce LOS in the future.

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Appendix A

Original Tool

1. Antibiotic resistance is an important Public Health problem in our setting.

5. Strongly Agree
4. Agree
3. Neither Agree nor Disagree
2. Agree
1. Strongly Disagree

2. Rapid and effective diagnostic techniques are required for the diagnosis of infectious diseases.

5. Strongly Agree
4. Agree
3. Neither Agree nor Disagree
2. Agree
1. Strongly Disagree

3. The prescription of an antibiotic to a patient does not influence the possible appearance of resistance

5. Strongly Agree
4. Agree
3. Neither Agree nor Disagree
2. Agree
1. Strongly Disagree

4. In case of doubt, it is preferable to use a wide-spectrum antibiotic to ensure that the patient is cured of an infection.

5. Strongly Agree
4. Agree
3. Neither Agree nor Disagree
2. Agree
1. Strongly Disagree

5. I frequently prescribe an antibiotic in situations in which it is impossible for me to conduct a systematic follow-up of the patient.

5. Strongly Agree
4. Agree
3. Neither Agree nor Disagree
2. Agree
1. Strongly Disagree-

6. In situations of doubt as to whether a disease might be of bacterial etiology, it is preferable to prescribe an antibiotic.

5. Strongly Agree

4. Agree
3. Neither Agree nor Disagree
2. Agree
1. Strongly Disagree

7. I frequently prescribe antibiotics because patients insist on it.
5. Strongly Agree
4. Agree
3. Neither Agree nor Disagree
2. Agree
1. Strongly Disagree

8. I sometimes prescribe antibiotics so that patients continue to trust me.
5. Strongly Agree
4. Agree
3. Neither Agree nor Disagree
2. Agree
1. Strongly Disagree

9. I sometimes prescribe antibiotics, even when I know that they are not indicated because I do not have the time to explain to the patient the reason why they are not called for.
5. Strongly Agree
4. Agree
3. Neither Agree nor Disagree
2. Agree
1. Strongly Disagree

10. Dispensing antibiotics without a prescription should be more closely controlled.
5. Strongly Agree
4. Agree
3. Neither Agree nor Disagree
2. Agree
1. Strongly Disagree

11. Clinical practice guidelines will be useful in the treatment of respiratory tract infections
1.True 2. False

Appendix B

HEART Score Knowledge Survey

1. Complaints of CP is an important problem in our setting.
    5. Strongly Agree
    4. Agree
    3. Neither Agree nor Disagree
    2. Agree
    1. Strongly Disagree

2. Rapid and effective diagnostic techniques are required for the diagnosis of low-risk CP.
    5. Strongly Agree
    4. Agree
    3. Neither Agree nor Disagree
    2. Agree
    1. Strongly Disagree

3. The admission of a low-risk CP patient does not influence the possible appearance of acute coronary syndrome (ACS).
    5. Strongly Agree
    4. Agree
    3. Neither Agree nor Disagree
    2. Agree
    1. Strongly Disagree

4. In case of doubt, it is preferable to admit a low-risk CP patient for observation to ensure that the patient is not at risk for ACS.
    5. Strongly Agree
    4. Agree
    3. Neither Agree nor Disagree
    2. Agree
    1. Strongly Disagree

5. I frequently admit CP patients in situations in which it is impossible for me to conduct a systematic follow-up of the patient.
    5. Strongly Agree
    4. Agree
    3. Neither Agree nor Disagree
    2. Agree
    1. Strongly Disagree

6. In situations of doubt as to whether a condition might be ACS, it is preferable to admit the patient to the hospital for additional testing.
    5. Strongly Agree
    4. Agree
    3. Neither Agree nor Disagree

2. Agree
1. Strongly Disagree

7. I frequently admit patients for CP because patients insist on it.
5. Strongly Agree
4. Agree
3. Neither Agree nor Disagree
2. Agree
1. Strongly Disagree

8. I sometimes admit patients so that patients continue to trust me.
5. Strongly Agree
4. Agree
3. Neither Agree nor Disagree
2. Agree
1. Strongly Disagree

9. I sometimes admit patients, even when I know that it is not indicated because I do not have the time to explain to the patient the reason why it is not called for.
5. Strongly Agree
4. Agree
3. Neither Agree nor Disagree
2. Agree
1. Strongly Disagree

10. Length of stay (LOS) for low-risk CP patients should be more closely controlled.
5. Strongly Agree
4. Agree
3. Neither Agree nor Disagree
2. Agree
1. Strongly Disagree

11. The use of clinical practice guidelines will be useful in decreasing the LOS in low-risk CP patients.
1.True 2. False

Appendix C
HEART Score Guideline

The HEART score for chest pain patients at the ED

History	Highly Suspicious	2
	Moderately Suspicious	1
	Slightly Suspicious	0
EKG	Significant ST-depression	2
	Nonspecific repolarization disturbance	1
	Normal	0
Age	≥ 65 years	2
	>45 - <65 years	1
	≤45 years	0
Risk Factors	≥ greater or 3 or history of atherosclerotic disease	2
	1-2 risk factors	1
	No risk factors	0
Troponin	≥ 3 x normal limit	2
	>1- < 3 x normal limit	1

	≤ Normal limit	0