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Acute Chest Pain Triage and Management Guideline
Effects on Patient Safety and Physiological Outcomes
in a Primary Care Office Setting

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Abstract

Background: Heart disease remains the number one killer of Americans with an estimated 599,413 deaths in 2013 attributed to this condition and its treatment has inflated to an annual cost of \$190 billion. This mortality is partially attributed to ineffective outpatient triage, management, and treatment of patients with acute chest pain. *Methods:* The purpose of this newly proposed acute chest pain triage and management guideline was: (1) to decrease inappropriate wait times and incongruous office appointments resulting in delay of care, patients being referred to the emergency room (ER) or, direct admissions to the hospital from the primary care office setting, and (2) to increase appropriate management for those patients experiencing the symptom of chest pain in the primary care setting by increasing the skill and comfort level of staff and providers in triaging and managing those patients in the primary care office setting. *Results:* Problem resolution was accomplished via employment of a multi-step acute chest pain guideline. This quality improvement plan (QIP) was successful in decreasing patients presenting to the primary care office with acute chest pain by 30.5%. Office staff and providers acquired a valuable resource and increased personal comfort level when triaging and managing acute chest pain in the outpatient primary care office setting. *Conclusions:* Sustainable use of the new guideline will promote cost savings for the primary care office and, more importantly, reduced delay of care and will reduce mortality rates for patients with acute chest pain.

Keywords: chest pain, acute coronary syndrome, triage, clinical guideline

Introduction and Background

Heart disease remains the number one killer of Americans with an estimated 599,413 deaths in 2013 (Centers for Disease Control and Prevention [CDC], 2013). The treatment of heart disease and its associated complications has inflated to an annual cost of \$190 billion. The most current vital statistics data reveals the Florida state yearly mortality rate for heart disease is 42,249 deaths. Regionally, 3,378 deaths of individuals over the age of 18 were attributed to heart disease in Sarasota County, Florida, with 1,855 being male, 1,523 female, 3,209 Caucasian, 91 African American, 44 Hispanic, and 34 classified as other ethnicity (Florida Department of Health, 2013). Attributed to this mortality is ineffective outpatient triage, poor outpatient management, and delayed treatment of patients with acute chest pain. At the local level, an average of 50 patients per week (2,600 per year) are presenting to the chosen primary care office with acute chest pain symptoms.

Problem Statement

Patients presenting to outpatient primary care offices with acute chest pain symptoms are at risk for compromised safety resulting in poor physiological outcomes, as evidenced by incongruent, inappropriate, and ineffective immediate office triage, follow through, and office provider management due to the lack of use of an established evidenced based nationally recognized acute chest pain guideline and secondary to provider and staff acknowledgment of lack of understanding and use of these guidelines.

Review of the Literature

A comprehensive literature search was performed in anticipating amelioration of the treatment access barriers. Data bases employed were: PubMed of the National Library of Medicine, Cochrane Library, Cumulative Index to Nursing and Allied Health Literature

(CINAL), and OVID Medline. The Medical Subject Headings (Mesh) applied within searches included: (a) chest pain assessment in an ambulatory care setting, (b) chest pain in a primary care setting, (c) acute coronary syndrome (ACS) assessment in a primary care setting, and (d) ACS assessment in an ambulatory care setting. Clinical guideline, clinical decision rule (CDR), and clinical predictive rule are interchangeable terms within this text.

The Stetler model rating system was used with regard to the level of evidence strength and quality of the research with level I being the highest rating of evidence and an A being the highest rating of study quality (National Collaborating Centre for Methods and Tools, 2011) and the Agree II was employed to evaluate one clinical guideline (Brouwer's et al., 2010). Using the Stetler rating system, results of the literature review yielded one level I A, one level II B, and three level III B evidenced based articles and one clinical guideline relevant to the current clinical query/problem.

Chest Pain Assessment

The common complaint and assessment of chest pain was examined by Gencer et al. (2010) through usage of a prospective cohort (Stetler III B) model and also in a similar meta-synthesis (Stetler III B) study by Swap and Nagurney (2005). Gencer et al. (2010) collected data of 672 patients over the age of 16 years experiencing chest pain symptoms from 58 independent primary care offices in Switzerland. This data was used to develop an ambulatory coronary heart disease (CHD) predictive score, based on the patient's history and physical examination in the primary care setting, to rule out CHD without further investigation of patient's chest pain. Gencer and his research team confirmed internal validity and external validation of this study. In an analogous meta-synthesis by Swap and Nagurney (2005), eighty three articles, representative of prospective and retrospective observational studies as well as systematic reviews, were

examined. These 83 articles included sample sizes ranging from 80 to 893 patients experiencing acute chest pain symptoms. The articles objectives were consistently similar in identifying elements of chest pain history and supporting clinicians in identifying ACS in patients presenting with acute chest pain. Validity for this meta-analysis was addressed via comparison of positive likelihood ratios ranging from 0.2 to 4.7 and reliability was addressed using a confidence interval of 95% (Swap & Nagurney, 2005). Swap and Nagurney (2005) concluded that a thorough chest pain history, as an assessment tool, allows the clinician to establish approximate probabilities for acute cardiac ischemia and whether the patient can be sent home safely from the primary care office or if they require immediate emergency room (ER) evaluation. Gencer et al. (2010) similarly concluded that use of an ambulatory CHD score, as a chest pain assessment tool, would allow primary care providers to estimate the risks of discharging a patient from an ambulatory care setting.

Clinical Guideline Application

As evidenced based healthcare has evolved, the use of clinical guidelines within outpatient and inpatient environments has become increasingly widespread. Grijseels et al. (1996), using a prospective cohort study design (Stetler III B), followed 977 patients with suspected acute cardiac pathology in a primary care setting to see if the general practitioner (GP) used and followed the outpatient based acute chest pain clinical guideline developed for this study. For the 977 patients with a complete pre-hospital evaluation, the clinical guideline recommended no hospitalization in 227 patients (23%), with the GP following the guideline recommendation in 44% of the patients. The GP did not hospitalize 19 (2%) of 750 patients for whom the clinical guideline recommended admission. No mention of the study's validity and reliability was addressed within the text of the article. Similarly, Bruins et al. (2011), in a

prospective cohort study (Stetler II B) with a sample of 298 (mean age 66 years and 52% female) patients experiencing acute chest pain in three outpatient ambulatory care settings in the Netherlands, evaluated the diagnostic accuracy of a chest pain clinical decision rule (CDR). Reliability of the study was confirmed using a 95% confidence interval (CI) [0.68-0.082] for the GP risk estimate and 95% CI [0.58-0.73] for CDR (Bruins et al., 2011). The study validity was tested employing sensitivity analysis for the GP estimation and the CDR.

Hess et al. (2008), in a contradictory meta-analysis (Stetler I A), examined the diagnostic accuracy of clinical predictive rules to exclude ACS in the ER setting. Though this meta-analysis does not address the primary care ambulatory setting, the evidence presented is relevant to the current clinical query. This meta-analysis employed eight studies, encompassing 7, 937 patients, and three predictive rules. The predictive rules examined were prospectively validated, sensitivities and specificities ranged from 94% to 100% and 13% to 57%, and positive and negative likelihood ratios ranged from 1.1 to 2.2 and 0.01 to 0.17, respectively (Hess et al., 2008). Not one of the studies reviewed by Hess et al. (2008) adequately supported the implementation of a current acute chest pain predicative rule, but rather urged for more methodologically sound studies to investigate the methodological limitations and current implementation challenges.

Clinical Decision Rule Development

While clinical care guidelines have become more prevalent, those addressing acute chest pain triage and management and treatment within the primary care setting are uncommon. Davis et al. (2012) developed a clinical care guideline (AGREE II, rating of 5) on behalf of the Institute for Clinical Systems Improvement to address triage, diagnosis, and treatment of chest pain and ACS. The guideline was developed with the inclusion of a detailed clinic evaluation

algorithm for outpatient evaluation. Systematic methods were employed in the development of the guideline which included a literature review of 132 germane research articles, and no information regarding the sample size, validity or reliability of the research articles reviewed was available.

In summary, as these five articles and one clinical guideline have revealed, acute chest pain in the primary care setting can be a challenging clinical scenario, and clinical care guidelines are scarce, and when available infrequently employed, but the necessity for evidenced based treatment guidelines is inordinate. The investigations by both Swap and Nagurney (2005) and Gencer et al. (2010), applicable to primary care settings, ameliorate the need for a comprehensive assessment within a primary care office setting as the initial stage of chest pain management and treatment. Both Grijseels et al. (1996) and Bruins et al. (2011) concluded that adoption and utilization of an acute chest pain clinical guideline is an accurate means to identify patients with acute cardiac pathology, may increase the safety and efficiency in the diagnostic workup, and enables the GP to identify patients with an evolving myocardial infarction at an early stage within the primary care setting. Contradictorily, none of the studies reviewed by Hess et al. (2008) adequately supported the implementation of a current acute chest pain predicative rule. The research review by the Doctor of Nursing Practice candidate (DNP-c) concluded that while clinical guidelines should not be solely used and substituted for provider clinical experience and judgment, they are reliable tools that should be included within the assessment triage process for the patients with acute chest pain. Supporting the evidence, the Institute for Clinical Systems Improvement (2011) recommends that timely triage and management of those patients experiencing acute chest pain symptoms be based on validated risk assessment guidelines and clinical findings.

Theoretical Framework

Guiding change is an essential strategic nursing leadership competency, and facilitating organizational change is difficult even when employing a change theory with a strong theoretical framework as its foundation. John Kotter's change theory (Kotter, 1996) was the preeminent fit for the theoretic underpinnings of the quality improvement project (QIP) focused on acute chest pain triage and management within a primary care setting as, at its core, the theory embodies the contemporary view of leading change for translation of new knowledge to practice efforts and stresses the importance of the people involved in the change, their reactions to all aspects of change, linking to context, content, and processes/facilitation, and the fit of the change for the organization. For an inclusive chart representation of the stages of Kotter's change theory and application to the QIP (see Table 1 in Appendix A).

The middle-range change theory proposed by John Kotter is an eight step model framework with detailed specifications for each step in the change process that include: (a) step one, establishing a sense of urgency by scanning the environmental landscape to identify market competitive realities, (b) step two, creating the guiding coalition by assembling a powerful team capable of leading change, (c) step three, developing a vision and strategy by creating a compelling vision and crafting strategies to make the vision a reality, (d) step four, communicating the change vision by crafting effective messages to initially, and on an ongoing basis, communicate the new vision and role model the desired change, (e) step five, empowering broad based action by eliminating obstacles that interfere with the desired vision, (f) step six, generating short-term wins by recognizing short-term milestones, (g) step seven, consolidating gains and producing more change by changing structures, processes and systems that are not

consistent with the desired vision, and (h) step eight, anchoring new approaches in the culture by enhancing performance through new behaviors and effective leadership (Kotter, 1996).

The Plan, Do, Study, and Act (PDSA) model PDSA stages share similar core tenets with the stages of Kotter's change theory and while it is not a theory, the model focused the development of the project stages. For a comprehensive chart representation of the stages of the PDSA model and application to the QIP (see Table 1 in Appendix B). The PDSA model was employed for current quality and safety issues regarding chest pain triage and management during the developmental and actualization phases of the project. The PDSA model is an iterative four step management method used in business for the control and continuous improvement of processes and products. The stages of the PDSA include: (a) Plan, establish the objectives and processes necessary to deliver results in accordance with the expected output, (b) Do, implement the plan, execute the process, and make the product, (c) Study, revise the actual results (measured and collected in Do stage) and compare against the expected results to ascertain any variations, and observe for deviation in implementation from the plan, and also sight for the appropriateness and completeness of the plan to enable the execution, and (d) Act, if your team determined the plan resulted in success, standardize the improvement and begin to use it regularly. After a suitable time allotment, return to plan and reexamine the process to determine where it can be improved. If your team believes a different approach would be more successful, return to plan, and develop a different approach that might result in success (Ransom, Joshi, Nash, & Ransom, 2008).

Project Design and Methods

The methods of evaluation for this quality improvement project (QIP) included both quantitative and qualitative methods. This project employed a non-probability convenience

sampling method. The project quantitative evaluation process included statistical data analysis using parametric with a one sample t-test in the form of chi-square distribution, as well as employment of a SPSS data base. Qualitative approaches used included observation, interviewing, journaling, focus group analysis, staff and providers comments, as well as common thoughts to illustrate results. Data mining occurred through utilization of the hosting clinical sites electronic medical record system and no patient identifiers were disclosed.

Setting and Resources

The quality improvement project (QIP) was implemented in a family practice primary care office in North Port, Florida. North Port is an incorporated city located in southwest Florida with a land mass of 99.58 square miles and a median resident age of 40.9 years (U.S. Census Bureau, 2013). North Port's total estimated population is 59, 212 residents with 47.7 % male, 52.3% female, 85.3% Caucasian, 6.0% African American, 7.7% Hispanic/Latino, and 1.0% Asian (U.S. Census Bureau, 2013).

Description of the group, population or community. The patients served by the chosen clinical site are similar in demographics to the North Port 2013 census population demographics data. The primary care office's median patient age is 45.6 years, 40.6% male, 59.4% female, 85.6% Caucasian, 6.0% African American, 7.9% Hispanic/Latino, and 0.5% Asian. This QIP included a convenience sampling of all patients 18 years of age and older who were experiencing acute chest pain symptoms regardless of gender, ethnicity, educational level, or any other demographic with the exception of the age disqualification.

Organizational analysis of project site. The clinical site for this QIP was a primary care family practice office which is part of a larger multi-specialty corporation, employing 74 total providers in 18 clinical sites: six nurse practitioners (NP's), three physician assistants (PA's),

five doctors of osteopathic medicine (DO's), and 60 medical doctors (MD's) working within the fields of family medicine, internal medicine, pulmonology, cardiology, endocrinology, physical medicine, pain management, psychiatry, neurology, infection control, rheumatology, ears, nose and throat, urgent care, and podiatry.

This clinical site is a single office in a for-profit multi-specialty corporation and employs three primary care providers which include two physicians and one nurse practitioner, one site manager, one group practice administrator, three nonclinical clerical/phone staff members, and three office based clinical staff members which include one medical assistant (MA) and two licensed practical nurses (LPN's). The three office providers, consisting of one MD, one DO, and one NP, provide primary care services to the North Port region with each provider having their own patient panels as well as accommodating walk-in patients based on schedule availability. The total number of patients serviced by all three providers, on average, ranges between 300 and 450 patients weekly, and each provider currently has an established patient panel of between 800 and 1,000 patients, however due to the continued growth of the practice this data changes on a daily basis.

Goals, Objectives and Outcomes

This quality improvement project (QIP) blended two purposes: (1) both nonclinical (clerical/phone) and clinical (providers and nurses) staff to gain the knowledge, skills, and confidence to effectively triage, via telephone or on-site, a patient experiencing acute chest pain symptoms and (2) increase the skill and comfort level of primary care providers to become proficient in the use of an evidenced based clinical guideline in the management of acute chest pain symptoms in the primary care office setting. For a detailed representation of the quality

improvement project goals, objectives, projected and final outcomes (see Table 1 in Appendix C).

The three target goals for this project were: (a) to increase the knowledge and proficiency of nonclinical and clinical staff in telephone and on-site acute chest pain triage, (b) to increase primary care providers proficiency in the most current evidenced based management of acute chest pain in a primary care setting utilizing a clinical guideline, and (c) to increase nonclinical staff, clinical staff, and primary care providers comfort level and confidence when triaging and/or managing acute chest pain symptoms within the primary care office setting.

The projected outcomes for this QIP included: (a) 95% of staff, clinical and nonclinical, would attend an educational training session, (b) 75% of all staff would validate the usage of both the collection tool and the clinical guideline and demonstrate skills acquisition in a simulated patient case format, (c) 95% of staff would show proficiency in the use of the triage data collection form and the chest pain clinical guideline in the primary care office setting, (d) a 90% decrease in patients presenting to the office /given an office appointment with the ICD-9 and 10 code 786.50, chest pain/angina due to this QIP being employed during the transition from ICD 9 to 10, (e) an 85% decrease in patients being hospitalized from the primary care office with the ICD-9 and 10 code 786.50, chest pain/angina, (f) 95% of staff would attend weekly group huddles, (g) 95% of staff would exhibit comfort approaching the project leader with questions and ongoing project intricacies, (h) 95% of primary care providers would attend the educational training session, (i) 95% of primary care providers would exhibit understanding of the usage and evidenced based underpinning of the management portion of the clinical guideline and demonstrate skills acquisition in a simulated patient case format, (j) 95% of primary care providers would verbally commit to a trial of the management element of the acute chest pain

clinical guideline within their practices, (k) 95% of patient office visits with the ICD-9 and 10 code 786.50, chest pain/angina, would have employed the management element of the clinical guideline, (l) 95% of primary care providers would use the management element of the acute chest pain clinical guideline, (m) 95% of primary care providers would self-report increased skill acquisition and expertise in managing acute chest pain in the primary care setting, (n) 95% of staff, clinical and nonclinical, would complete a post-intervention implementation self-evaluation form describing their comfort level of triage of acute chest pain symptoms, (o) 85% of nonclinical and clinical staff would self-report increased comfort level when triaging a patient with acute chest pain post-implementation of the triage clinical guideline, (p) 95% of primary care providers would complete a post-intervention implementation self-evaluation form relating their comfort level with management of acute chest pain symptoms in the office setting, and (q) 85% of primary care providers would self-report increased comfort level when managing patients with acute chest pain in the office setting when using the clinical guideline.

Implementation Plan

This quality improvement project (QIP) was accomplished by implementing an evidenced based outpatient acute chest pain triage guideline. The triage and clinic evaluation algorithm components of the clinical guideline Diagnosis and Treatment of Chest Pain and Acute Coronary Syndrome (ACS), developed by the Institute for Clinical Systems Improvement (Davis et al, 2012), was chosen as the appropriate fit for the current clinical deficits. The implementation plan for this quality improvement project was sectioned into two main phases, pre-project implementation and project actualization with sub-stages for each implementation phase.

Pre-project implementation. The pre-implementation phase of this QIP included the stages of development, training, and assessment.

Project development. Within these steps of this pre-implementation stage the Doctor of Nursing Practice candidate (DNP-c): (a) established a team of stakeholders including nurses, nonclinical phone staff, office coordinator, physicians, nurse practitioner, and group administrator, (b) identified the need for an acute chest pain triage & management guideline in the primary care setting by key stakeholders, (c) adopted an agreed upon new evidenced based guideline to be implemented in the primary care setting, (d) developed a data collection form to be utilized for those patients with acute chest pain who are triaged via telephone, or in person, and deferred to the ER, and (e) developed a data collection form assessing staff's personal comfort levels with triage and, where applicable, management of acute chest pain in the primary care office setting.

Staff training. Within these steps of this pre-implementation stage the DNP-c: (a) provided nonclinical and clinical staff with a 30 minute educational training session in the usage of the triage data collection form and the acute chest pain clinical guideline, (b) provided primary care providers with a one hour educational training session in the use of the management component of the acute chest pain clinical guideline, and (c) completed ten minute biweekly staff meetings/huddles with all staff members. Personnel were assigned into two focus groups to attend the scheduled huddles in order to provide office coverage during meeting attendance. Topics included clinical implementation of the guideline and data collection form prior to guideline implementation.

Assessment & staff readiness. Within these final steps of this pre-implementation stage the DNP-c: (a) instituted the chest pain data collection form, to be completed by the nonclinical

and clinical staff, consequently capturing the current number and data of patients presenting to the office with acute chest pain, and those patients triaged inappropriately via telephone or in person and subsequently given an office appointment resulting in a direct admission from the primary care setting or deferment to the ER for evaluation of acute chest pain, and serving as an internal benchmark prior to clinical guideline/intervention employment, (b) applied the staff qualitative data collection form and individual staff interviews to assess the nonclinical and clinical staff's current comfort level with triaging patients experiencing acute chest pain prior to clinical guideline/intervention application, and (c) employed the qualitative data collection form and the data collection interview tool with each provider to assess their current comfort level in managing a patient with acute chest pain in the primary care office setting, prior to clinical guideline/intervention execution.

Project actualization. The project actualization phase of this QIP included the stages of implementation, data collection, and amendment.

Implementation. Within these steps of this project actualization stage the DNP-c: (a) employed the acute chest pain triage and management guideline within the primary care office setting, (b) confirmed that each staff member could access a copy of the chest pain data collection tool and the clinical guideline at their work station, and (c) promoted the vision and goals of the new guideline.

Data collection. Within these steps of this project actualization stage the DNP-c : (a) continued to institute the chest pain data collection tool, to be completed by the nonclinical and clinical staff, consequently capturing the current number and data of patients presenting to the office with acute chest pain, and those patients triaged inappropriately via telephone or in person and subsequently given an office appointment resulting in a direct admission from the primary

care setting or deferment to the ER for evaluation of acute chest pain, and serving as an internal benchmark post-employment clinical guideline/intervention, (b) reviewed weekly raw data produced by the staff via the collection tool, and (c) obtained accessory data collection through the review of each medical provider's daily ER and hospital admission list, with an emphasis on monitoring for the International Classification of Diseases (ICD) 9 and 10 code 786.5 (chest pain), and compared with the previous days computer generated schedule and office ICD-9 and 10 billing codes for that primary care providers previous day encounter forms, thereby determining the number of patients who were inappropriately triaged, the number of patients who presented to the office with chest pain/angina, and those patients that were sent to the ER or directly admitted to the hospital from the primary care office setting. No data was collected that required a patient identifier.

Amendment. Within these final steps of this project actualization stage the DNP-c: (a) provided all staff with continuous educational reinforcement, with queries/implementation barriers addressed through the use of biweekly 15 minute staff huddles. Personnel were assigned into two focus groups to attend the scheduled huddles in order to provide office coverage during meeting attendance, (b) employed a biweekly survey, using a four digit Likert scale, regarding the use of the new guideline by all stakeholders, including a comments section to invite feedback, (c) addressed barriers to system usage, breaches in the education processes, and performance issues that require evaluation, (d) worked with stakeholders to identify other interventions or needs for adaptation or modification of the new acute chest pain triage and treatment guideline, (e) monitored for efficiency and improvement needs, and (f) continued to promote the vision and goals of the new guideline.

Cost Analysis/Budget

Implementation of this new acute chest pain triage and management clinical guideline was not without cost to both scarce health care resources and staff utilization. Such expenditures included the components of: (a) training and education, (b) personnel cost in assessment and data collection [Pre-Implementation], (c) personnel cost in assessment and data collection during project, (d) data evaluation cost, and (e) quality improvement project (QIP) evaluation presentation cost. The gross estimated expenses for this QIP, not including DNP-c non-budgeted data collection and evaluation time expenditures, appropriated by the host clinical site, was \$2,306.50.

Training and education. Prior to guideline implementation, nonclinical and clinical staff attended a 30 minute educational training session in the usage of the triage data collection form and the acute chest pain clinical guideline and primary care providers attended a one hour training session in the use of the management component of the acute chest pain clinical guideline. All staff completed ten minute biweekly meetings/huddles during the three month pre-implementation phase and 15 minute biweekly staff huddles post-project implementation. The training cost for this QIP was donated by the hosting clinical site. For a comprehensive chart representation of the cost of training and education for this QIP (see Table 1, 2, and 3).

Table 1

Cost of one time 30 min staff and one hour provider training session pre-project implementation

Project Component	Cost
Trainer /project manager's salary	\$45.00 per hour = \$67.50
Site manager's salary	\$35.00 per hour = \$ 17.50
Regional manager's salary	\$50.00 per hour = \$25.00

Two primary care physicians salaries	\$75.00 per hour ea. = \$150.00
Three nonclinical phone staff member's salaries	\$12.00 per hour ea. = \$18.00
Three licensed practical nurses' salaries	\$17.00 per hour ea. = \$25.50
One medical assistants salary	\$14.00 per hour ea.= \$7.00
Training material printing cost	= \$20.00
Utilities and overhead	= \$50.00
Total cost of training sessions	= \$380.50

Table 2

Ten minute biweekly meetings/huddles pre-project implementation

Project Component	Cost
Trainer/project manager's salary	\$45.00 per hour = \$45.00
Three nonclinical phone staff member salaries	\$12.00 per hour ea. = \$36.00
Three licensed practical nurses salaries	\$17.00 per hour ea. = \$51.00
One medical assistant's salary	\$14.00 per hour ea. = \$14.00
Utilities and overhead	= \$50.00
Additional training material printing cost	= \$10.00
Total 10 minute biweekly meetings/huddles budget	= \$206.00

Table 3

Fifteen minute biweekly meetings/huddles post-project implementation

Project Component	Cost
Trainer/project manager's salary	\$45.00 per hour = \$135.00
Three nonclinical phone staff member salaries	\$12.00 per hour ea. = \$108.00
Three licensed practical nurses' salaries	\$17.00 per hour ea. = \$153.00
One medical assistant's salaries	\$14.00 per hour ea. = \$42.00
Utilities and overhead	= \$75.00
Additional training material printing cost	= \$10.00
Total 15 minute biweekly meetings/huddles budget	= \$523.00

Cost of assessment and data collection. The three months prior to implementation of the QIP was used as institutional internal benchmarking for chest pain phone triage and included data collection utilizing a prospective electronic medical record (EMR) review of office visits using the chest pain/angina ICD-9 and 10 code 786.50 and attempted subsequent cross referencing with the emergency room admission data of each patient. Data was collected by the project manager/DNP-c. Estimated time allocation of eight hours per week was freely contributed by the DNP-c/trainer, total non-budgeted cost of \$360.00 weekly for six months. During both pre-project and post-project implementation phases 30 minute interviews were completed with each staff member and provider. For a comprehensive chart representation of staff interview costs for this QIP (see Table 4).

Table 4

Cost of one time 30 minute staff and provider interviews pre-project and post-project implementation

Project Component	Cost
Trainer /project manager's salary	\$45.00 per hour =\$405.00
Two primary care physicians salaries	\$75.00 per hour ea. = \$150.00
Three nonclinical phone staff member's salaries	\$12.00 per hour ea. = \$36.00
Three licensed practical nurses' salaries	\$17.00 per hour ea. = \$51.00
One medical assistants salary	\$14.00 per hour ea.= \$14.00
Training material printing cost	= \$10.00
Utilities and overhead	= \$50.00
Total cost of interview sessions	= \$716.00

Data evaluation cost. Raw data results, post-implementation phase of the new guideline, were collected from the staff via the collection tool, from the EMR, and the ER data base, weekly. The project manager/DNP-c was the administrator of the data and, based on the results, determined any necessary changes to data presentation tools, i.e., run charts, etc. The cost of this evaluation was freely contributed by the project manager/DNP candidate. Eight hours per week was non-budgeted for this activity, total \$360.00 per week for six months.

Project evaluation presentation cost. A one hour post-implementation chest pain phone triage guideline meeting was conducted once all data had been collected and examined at the conclusion of the six month QIP. All stakeholders and support staff, both clinical and nonclinical, participated. For a comprehensive chart depiction of project evaluation presentation costs (see Table 5).

Table 5

Cost of the one hour post-project evaluation presentation for all stakeholders

Project Component	Cost
Trainer/project manager's salary	\$45.00 per hour = \$45.00
Site manager's salary	\$35.00 per hour = \$35.00
Regional manager's salary	\$50.00 per hour = \$50.00
Two primary care physicians' salaries	\$75.00 per hour ea. = \$150.00
Three nonclinical phone staff members' salaries	\$12.00 per hour ea. = \$36.00
Three licensed practical nurses' salaries	\$17.00 per hour ea. = \$51.00
One medical assistants salary	\$14.00 per hour ea. = \$14.00
Presentation material printing cost	= \$50.00
Utilities and overhead	= \$50.00
Total one hour presentation budget	= \$481.00

Estimated benefits/cost savings & value. Implementation of the new guideline has continuous potential significant cost savings for the primary care office and, more importantly, value in terms of decrease in delay of care and potentially reduced mortality rate. For example, if a patient is inappropriately triaged and presents to the office for acute symptomatic chest pain, and is then given an electrocardiogram (EKG), and both a provider and a clinical staff member allocates 60 minutes each to stabilize the patient for further transport, under the current Medicare guidelines, the primary care office provider may not be reimbursed for their services and those monetary losses would include: (1) EKG = \$26.00, (2) LPN= \$17.00 hr., and (3) 99215 office visit = \$150.00. Based on this example, there would be a net minimum loss of \$193.00 for this office visit, and over the three months quality improvement implementation phase, if all projected 50 patients, presuming data capture occurred, calling weekly to the office with

suspected acute symptomatic chest pain were triaged appropriately and sent to emergency room for timely evaluation, the theoretical cost saving to the outpatient primary care office would be an estimated \$115,800.00.

Timeline

This quality improvement project followed a multi-step implementation chronology originating with pre-implementation stratagems and terminating with post-implementation processes over a six-month period. For an inclusive chart representation implementation project timeline (see Table 1 in Appendix D). The initial three months of data collection acted as an internal benchmark. All data three months post-employment of the new guideline was employed for data comparison. Unfortunately, this may have biased the quality of the data due to staff vigilance with regard to phone triage awareness of process evaluation. This benchmarking process guided effectiveness evaluation of the new guideline and as this quality improvement project evolved, alterations were required based on feedback and data obtained from stakeholders as the new guideline implementation enthusiasm began to diminish.

Ethics and Human Subjects Protection

Inclusion criteria for this quality improvement project included those patients 18 years of age and older who were experiencing acute chest pain symptoms regardless of gender, ethnicity, educational level, or any other demographic with the exception of the age disqualification. Although this project was completed in a primary care site that services a small racial minority, the DNP student was mindful throughout the quality improvement project that socioeconomic differences between racial groups have a positive correlation for the observed patterns of racial disparities in health status (LaVeist, 2005). Institutional Review Board (IRB) approval was not required for this QIP. There were no potential human subject risks involved

with this project. No data was collected that required a patient identifier. Data was obtained from individual EMR charts utilizing the International Classification of Diseases (ICD) 9 and 10 code for chest pain (786.5). All project data was secured in the DNP-c office and confidentiality was maintained in compliance with the Health Insurance Portability and Accountability Act [HIPPA] (U.S. Department of Health & Human Services, 2016).

Results

Outcomes

Quantitative component. For the quantitative element of this quality improvement project (QIP) a pre- and post-implementation data collection questionnaire was developed and administered to both staff and providers (see Table 1 in Appendix E). These questionnaires consisted of seven of twelve relevant questions that the provider or staff member could mark as either agreeing with= *yes* or disagreeing= *no*. The questionnaires were developed and data is presented in such manner that the dichotomous choice of *no* is presented before *yes* to illustrate that a decrease in *no* responses and an increase in *yes* responses, over time, demonstrated improved knowledge, skill, and proficiency in the triage and management of their patients experiencing acute chest pain. Due to the inability to obtain data from a significant volume of walk-in patients and those patients subsequently seeking treatment at ER's in which no data access was available, the data for *Pt admitted* was not included in the final analysis.

Six of the seven relevant statements were grouped into two sets and responders' had the choice to check no or yes for each statement. The data was divided for evaluation in this manner so that the first set of three questions represented triage quandaries and the second set were more representative of clinical choices with regard to management and triage by clinical staff and providers. The first group of questions included queries about: (a) *patient triaged on phone*, (b)

patient triaged in person, and (c) *patient deferred to ER*. The second group of questions included queries about: (a) *patient triaged by clinical staff*, (b) *patient given appt.*, and (c) *patient deferred to ER from office post-provider assessment*. The seventh statement *Guideline used* was applicable only post-implementation and was analyzed independently.

The percent of no and yes responses for staff and providers for the first and second group of questions per month both in the pre- and post-implementation phases are presented in Table 6.

Table 6

Percent of no and yes responses of the staff and providers for the first and second group of questions per month pre- and post-implementation

Month	Sample Size	Response	First Group of Questions	Second Group of Questions
September	n = 7	Yes	42.86	57.14
		No	57.14	42.86
October	n = 31	Yes	44.09	54.84
		No	55.91	45.16
Early November	n = 14	Yes	45.24	52.38
		No	54.76	47.62
Late November	n = 13	Yes	48.72	46.15
		No	51.28	53.85
December	n = 36	Yes	48.15	48.15
		No	51.85	51.85
January	n = 34	Yes	50.98	50.00
		No	49.02	50.00
February	n = 41	Yes	54.47	44.72
		No	45.53	55.28

For the first group of questions from the questionnaire in the pre-implementation months of September, October and early November the percentage of yes responses varied between 42.86% and 45.24%. In the post-implementation months of late November, December, January and February the percentage of yes responses varied between 48.72% and 54.47%. The percentage of yes responses increased with the passage of time, indicating more patients were triaged by phone, triaged in person and deferred to the ER. These results are illustrated in Figure 1 and Figure 2.

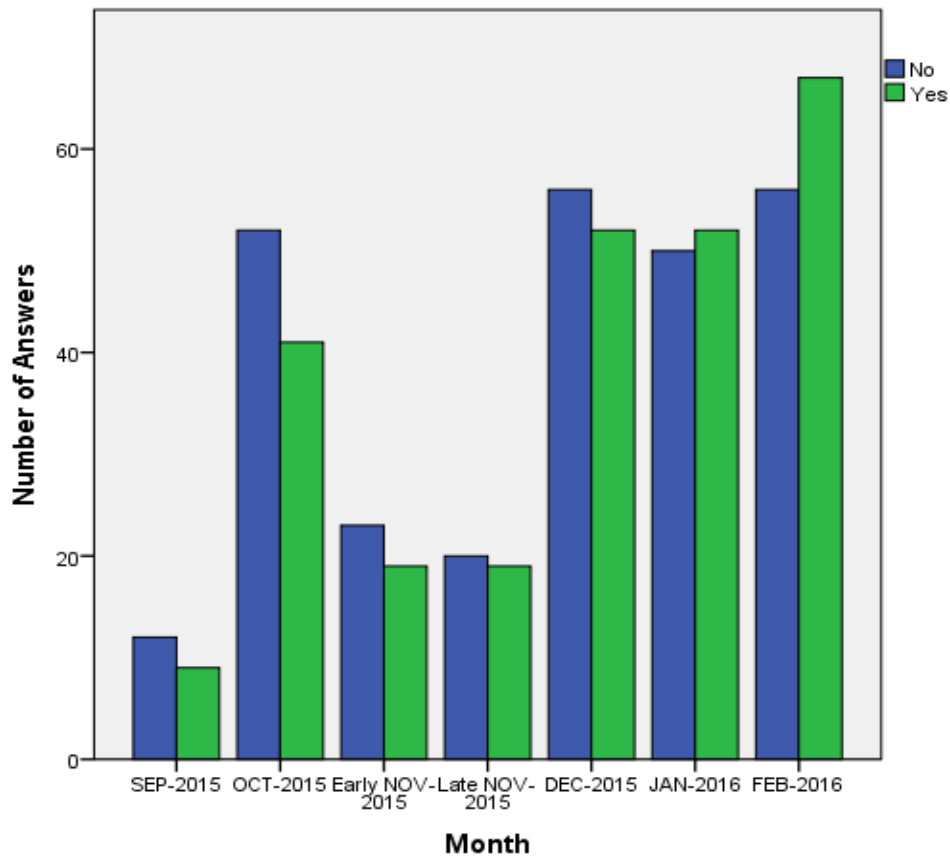
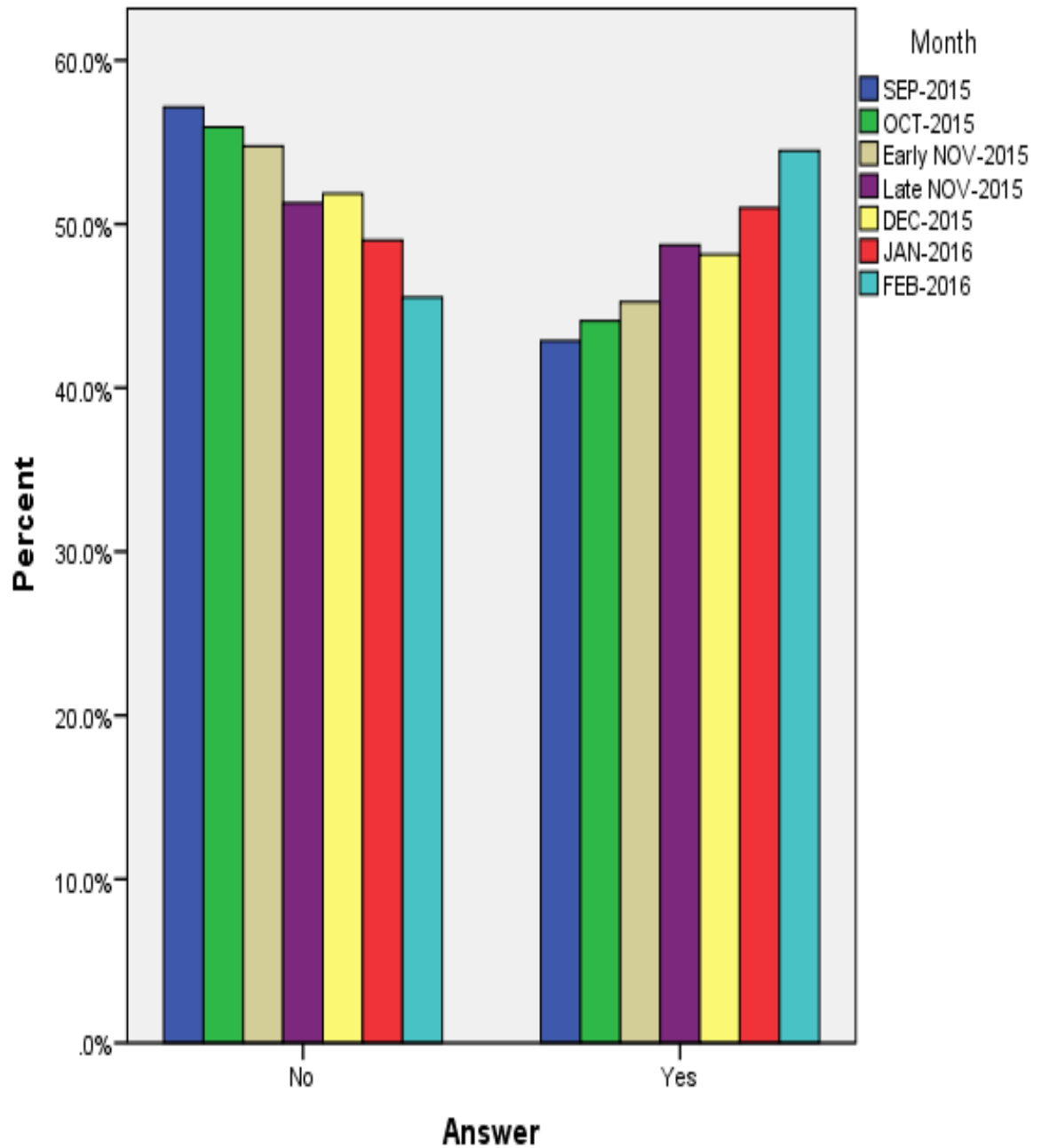


Figure 1. Number of no and yes responses per month from the questionnaire for staff and providers for first group of questions.

note: There was an increase in numbers of responses over time. The months of December, January, and February were during the peak of the 'snow bird' season in Florida resulting in an increase number of elders in FL thereby increasing the number of patient visits and office activity/flow. For providers and staff: No's shifted to yes's over time indicating learning, skill, and comfort level increased.



note: This is a pictorial view of provider and staff responses--no's decreasing and yes's increasing signifying that for three of the four triage responses there was an increase in comfort and skill level beginning in the pre-implementation phase.

Figure 2. Percentage of no and yes responses from the questionnaire for staff and providers per month for the first group of questions.

For the second group of questions in the pre-implementation months of September, October and early November, the percentage of yes responses varied between 57.14% and 52.38%. In the post-implementation months of late November, December, January and February, the percentage of yes responses varied between 50.00% and 44.72%. Overall, the percentage of yes responses decreased with the passage of time, indicating less patients were given an appointment, less patients were deferred to ER from office post-provider assessment and less patients were triaged by clinical staff. The months of December and January experienced a slight increase in the percentage of yes responses compared to early November. However, the percentage of yes answers in the month of February (44.72%) was the lowest over all the time periods. These results are illustrated in Figure 3 and Figure 4.

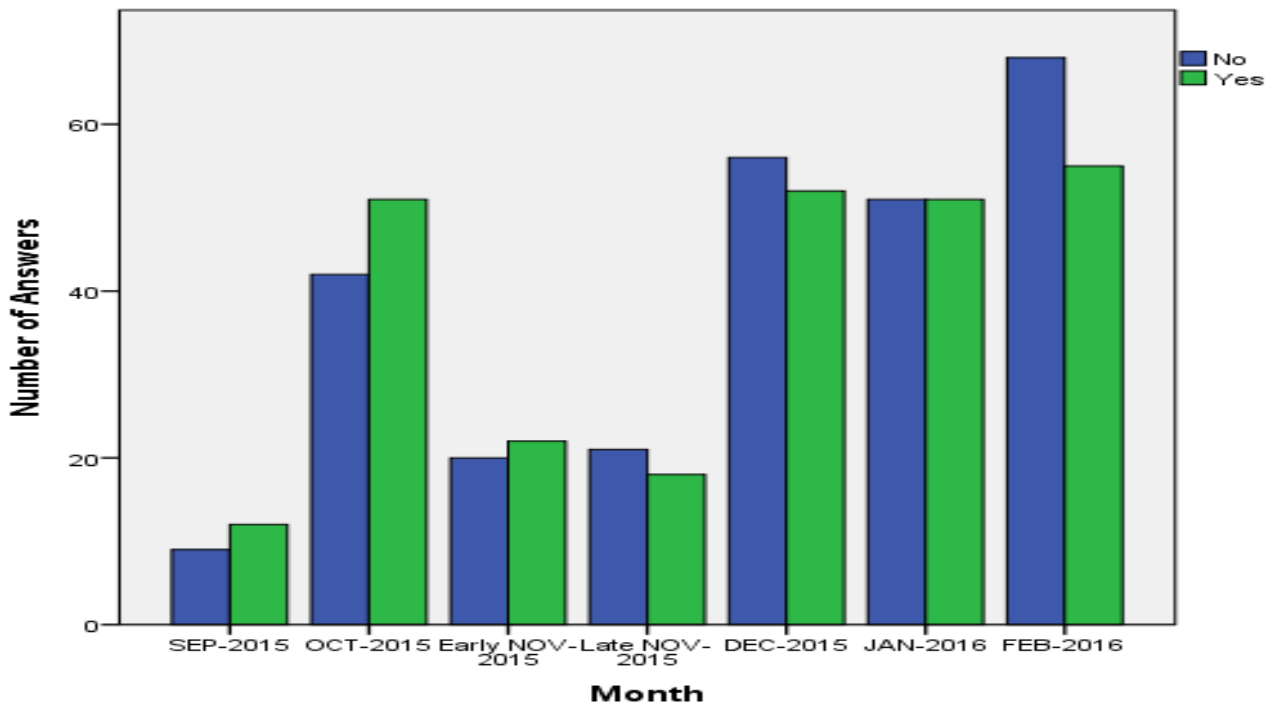
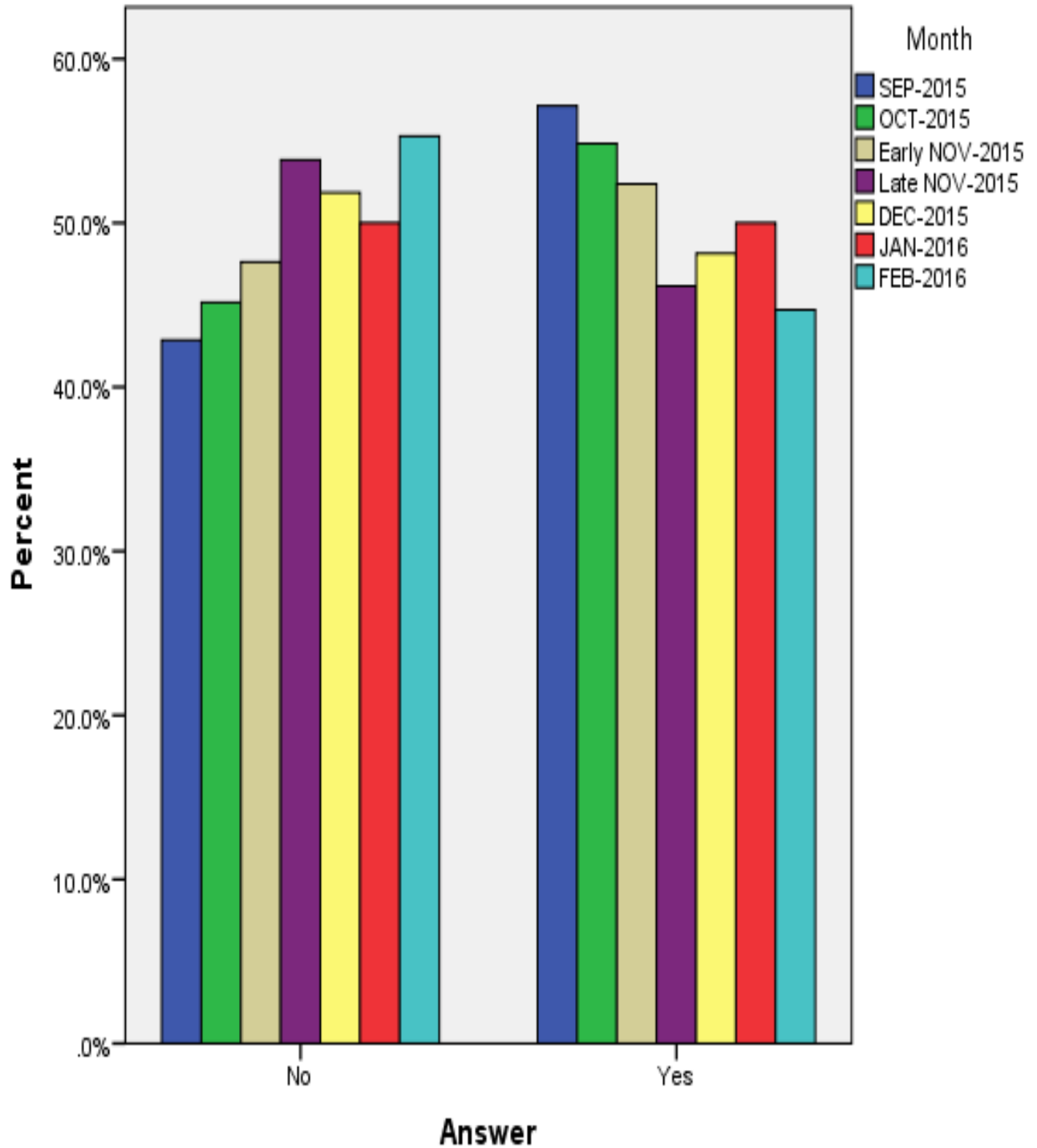


Figure 3. Number of no and yes responses per month from the questionnaire for staff and providers per month for the second group of questions.



note: This figure shows a converse relationship when looking at the responses choices regarding office visits and referrals made. After intervention, there were more patients appropriately triaged and not given office visits or referrals, thereby increasing number of no responses over yes responses over time.

Figure 4. Percentage of no and yes responses per month from the questionnaire for staff and providers for the second group of questions.

The number of no and yes responses for the first and second group of questions was tallied pre/post-implementation. For the first group of questions the percentage of yes responses pre-implementation was 44.23%, while the percentage post-implementation was 51.08%. These results are illustrated in Figure 5.

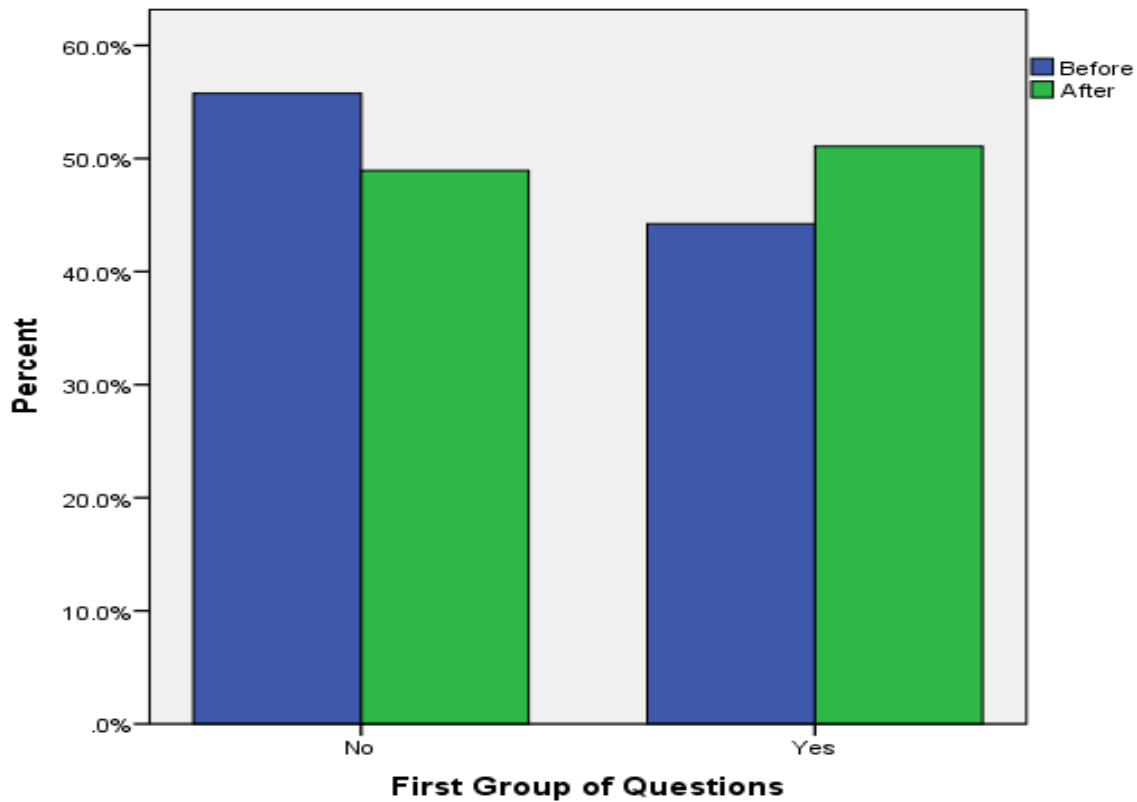


Figure 5. Percent of no and yes responses for the first group of questions for the staff and providers pre- and post-implementation.

Similarly, for the second group of questions the percentage of yes responses pre-implementation was 54.49%, while the percentage post-implementation was 47.31%. The percentages of yes and no responses for the second group pre- and post-implementation are illustrated in Figures 6.

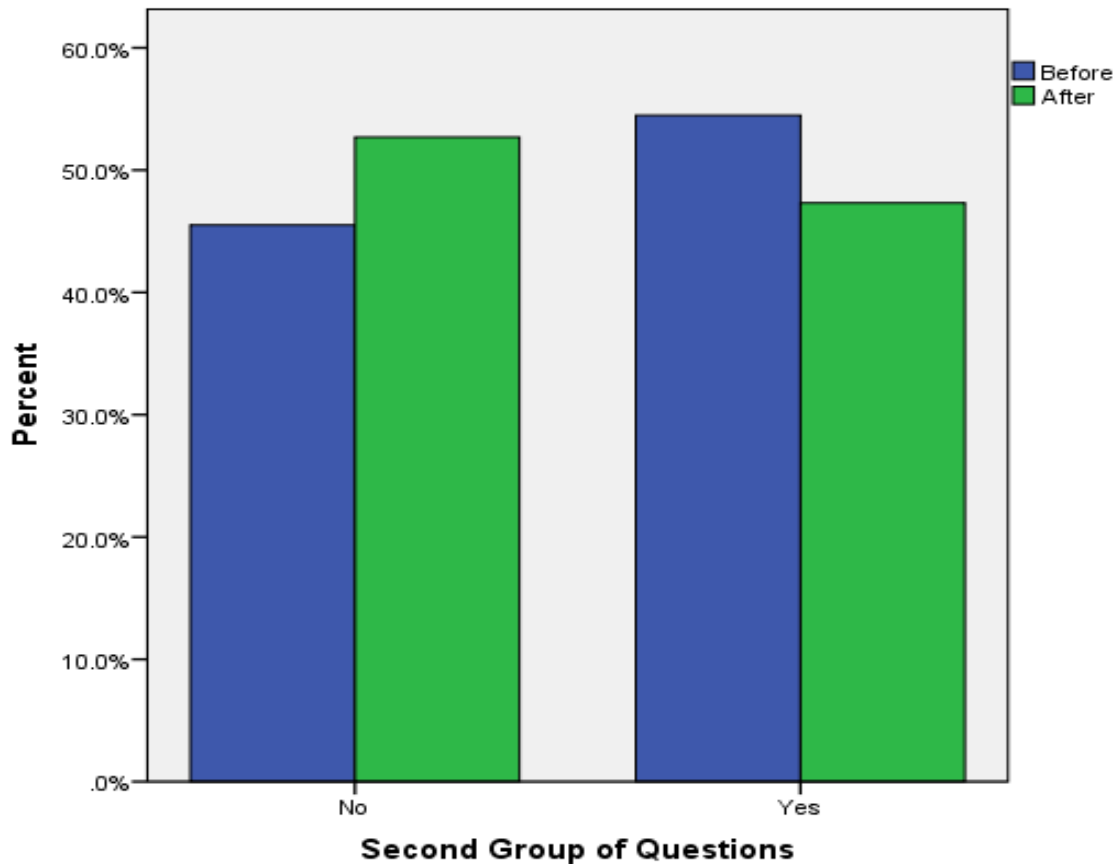


Figure 6. Percent of no and yes responses for the second group of questions for the staff and providers pre- and post-implementation. There was a marked decrease in yes's and an increasing in no's over time indicating less patients were given an appointment, less patients were deferred to ER from office post-provider assessment and less patients were triaged by clinical staff.

With respect to the seventh statement *Guideline Use*, the frequency and the percentage of respondents with no and yes responses per month post-implementation were tabulated in Table 7. The percentage of yes responses varied from 69.2% in November to 90.2% in February. The highest percentage of yes responses was registered in January (94.1%). Overall, between the months of November and February, 87.1% of all respondents indicated that they are using the guideline.

Table 7

Frequency and percentage of respondents with no and yes responses per month for guideline usage post-implementation

Month	Sample Size	Response	Frequency	Percent
November	n = 13	No	4	30.8
		Yes	9	69.2
December	n = 36	No	6	16.7
		Yes	30	83.3
January	n = 34	No	2	5.9
		Yes	32	94.1
February	n = 41	No	4	9.8
		Yes	37	90.2

Qualitative component. For the qualitative element of this quality improvement project (QIP), a pre- and post-implementation questionnaire was developed and administered to both staff and providers. For the frequency and percentage of respondents' responses (see Table 1 in Appendix F and Table 1 in Appendix G). The pre-implementation questionnaire consisted of five questions aimed at assessing providers and staff readiness, their current comfort level with triaging a patient with acute chest pain symptoms, and their experience and comfort level in using a clinical guideline. The post-implementation questionnaire consisted of seven questions aimed at assessing current comfort level of providers and staff in triaging a patient experiencing acute chest pain symptoms, their ease and frequency of guideline usage and their planned continued use of the clinical guideline. The possible responses for each statement were Likert-type responses: *Strongly Agree*, *Agree*, *Disagree* and *Strongly Disagree*. The questionnaires were developed and data is presented in such manner that the dichotomous choice of *Strongly Disagree* and *Disagree* are presented before the neutral and positive responses of *Agree* and *Strongly Agree* to illustrate that a decrease in *Strongly Disagree* and *Disagree* responses and an increase in *Agree* and *Strongly Agree* responses demonstrates improved knowledge, skill,

proficiency, and comfort level in the triage and management of patients experiencing acute chest pain.

The median, mode and quartiles for the pre-implementation phase of the qualitative questionnaire are presented in Table 8. The most common response for all five questions was *Agree*. The number of respondents agreeing and disagreeing with the question *You are comfortable triaging a patient with chest pain?* was the same, with the two responses most often appearing for this question. The 75th percentile answer for the questions *You know the symptoms of acute chest pain?* and *You are comfortable triaging a patient with chest pain?* was *Strongly Agree*, while the 25th percentile answer for the questions *You are comfortable triaging a patient with chest pain?* and *You know how to use a clinical guideline?* was *Disagree*. The results indicate that respondents varied in their responses for the questions relating to their comfort in triaging a patient with chest pain and their knowledge in using a clinical guide.

Table 8

Descriptive statistics for pre-implementation provider and staff responses of the qualitative questionnaire

Question	Sample Size	Median	Mode	Percentiles		
				25	50	75
You know the symptoms of acute chest pain?	n = 35	Agree	Agree	Agree	Agree	Strongly Agree
You are comfortable triaging a patient with chest pain?	n = 35	Agree	Agree Disagree	Disagree	Agree	Strongly Agree
You know how to use a clinical guideline?	n = 35	Agree	Agree	Disagree	Agree	Agree
You are comfortable managing acute chest	n = 11	Agree	Agree	Agree	Agree	Agree

pain in the office setting? (Providers only)						
You are interested in increasing your triage and management skills?	n = 35	Agree	Agree	Agree	Agree	Agree

The median, mode and quartiles for the post-implementation phase of the questionnaire are presented in Table 9. The most common answer for all seven questions was *Agree*. The question relating to respondents' comfort with managing an acute chest pain patient using the clinical guideline had *Strongly Agree* as the 75th percentile answer.

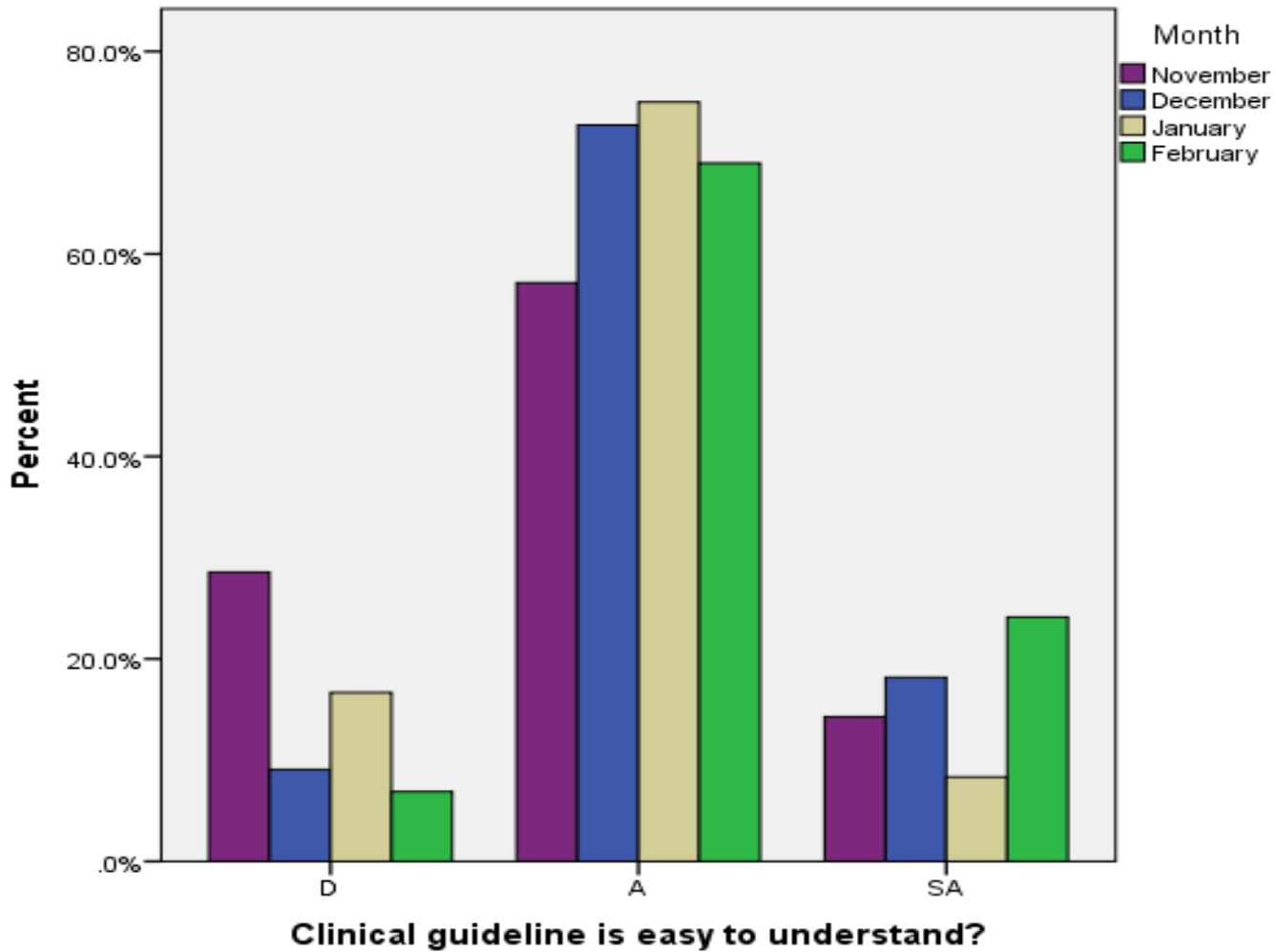
Table 9

Descriptive statistics for post-implementation provider and staff responses of the qualitative questionnaire

Question	Sample Size	Median	Mode	Percentiles		
				25	50	75
Clinical guideline is easy to understand?	n = 66	Agree	Agree	Agree	Agree	Agree
Clinical guideline is easy to use?	n = 66	Agree	Agree	Agree	Agree	Agree
You use the clinical guideline?	n = 66	Agree	Agree	Agree	Agree	Agree
You feel comfortable triaging a patient using the clinical guideline?	n = 66	Agree	Agree	Agree	Agree	Agree
You feel comfortable managing an acute chest pain patient using the clinical	n = 19	Agree	Agree	Agree	Agree	Strongly Agree

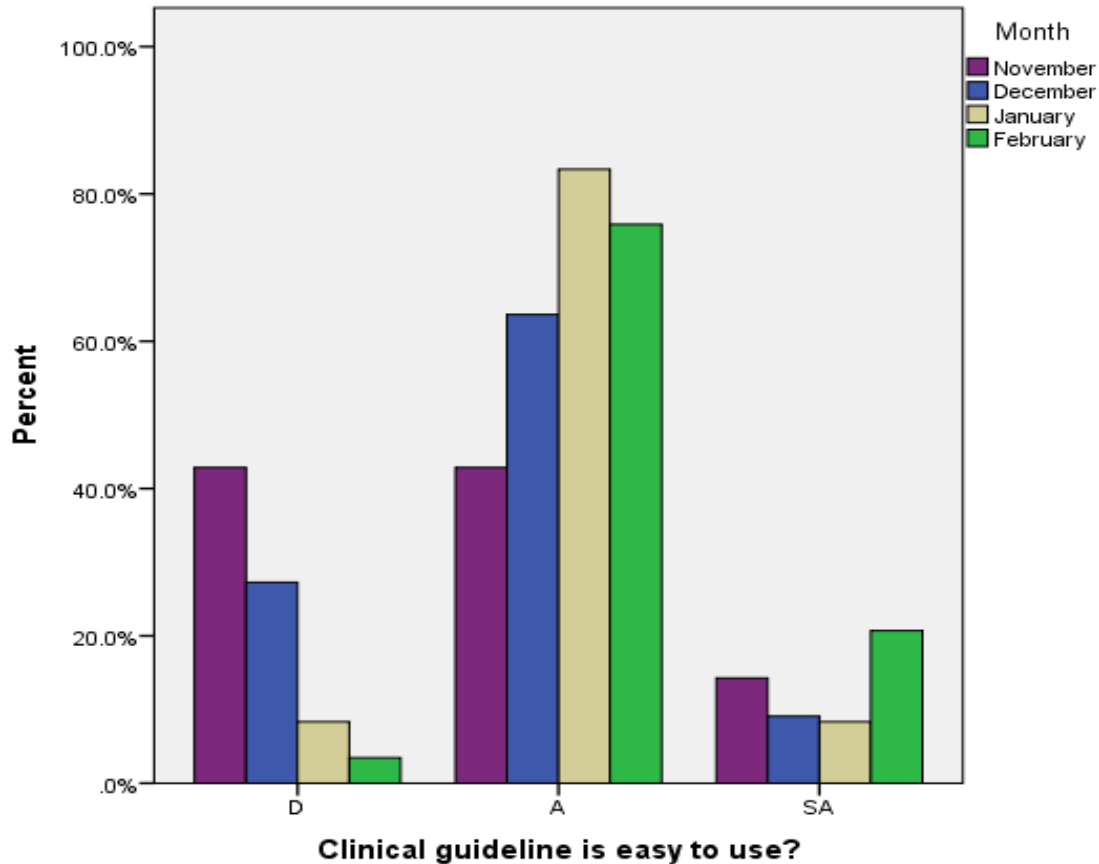
guideline? (Providers only)						
You plan to continue to use the clinical guideline?	n = 66	Agree	Agree	Agree	Agree	Agree
You have been adequately supported in the implementation of the clinical guideline?	n = 66	Agree	Agree	Agree	Agree	Agree

For the question *Clinical guideline is easy to understand?* the percentage of respondents that disagreed decreased between November and February, while the percentage of respondents that agreed or strongly agreed increased, indicating more respondents were comfortable in their understanding of the guideline by the end of the implementation phase versus the beginning of the implementation phase as illustrated in Figure 7. The same pattern can be observed for the question *Clinical guideline is easy to use?* suggesting more respondents found the guideline easy to use after the implementation phase was complete as shown in Figure 8.



Legend: SD = Strongly Disagree, D = Disagree, A = Agree, & SA = Strongly Agree

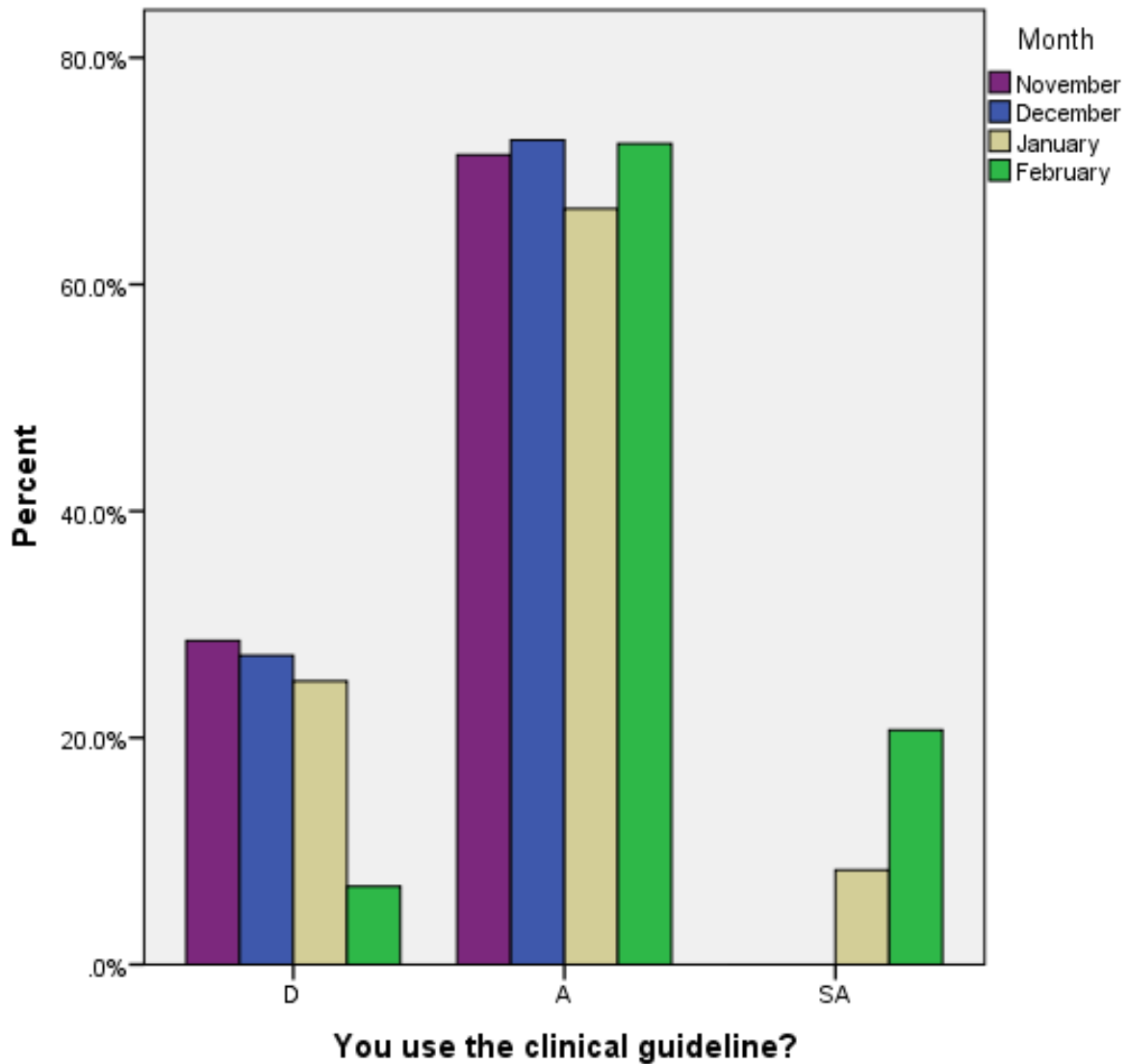
Figure 7. Percent of responses for question *Clinical guideline is easy to understand?* in post-implementation phase per month. (Although all choices were offered for each question no SD responses were noted during data evaluation).



Legend: SD = Strongly Disagree, D = Disagree, A = Agree, & SA = Strongly Agree

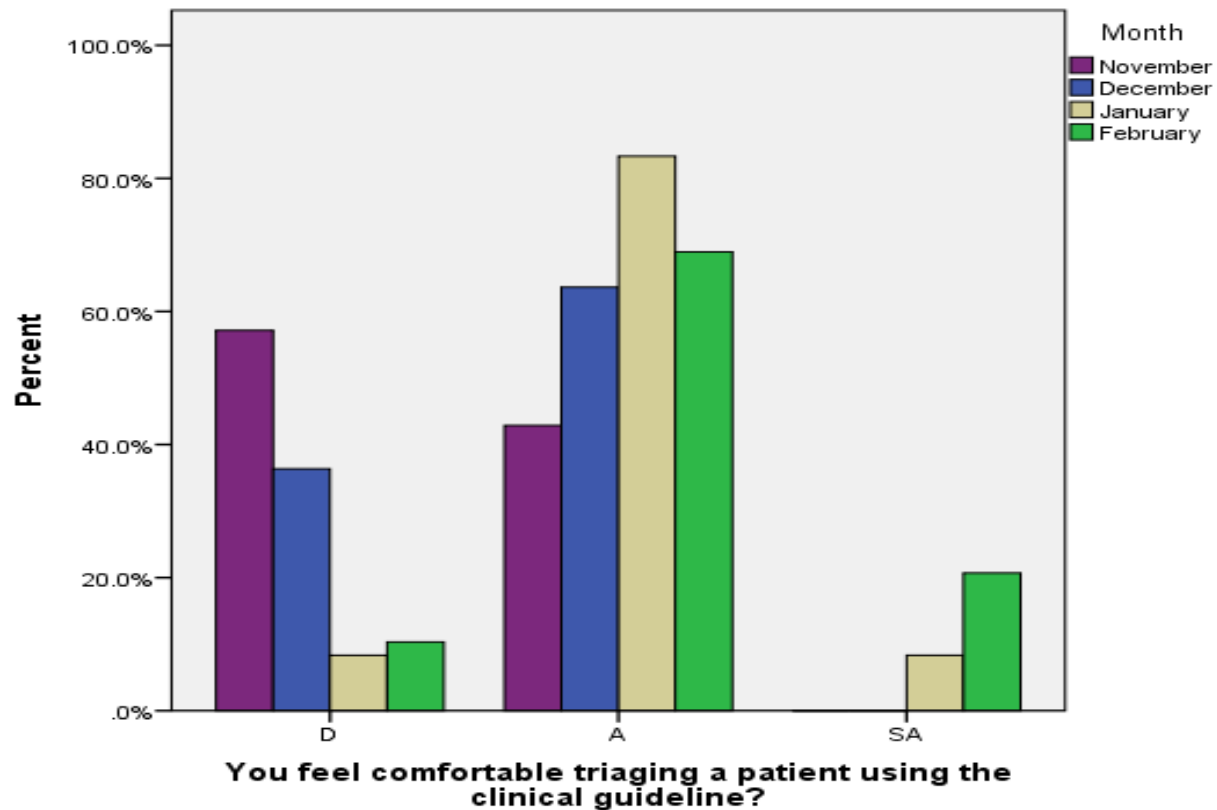
Figure 8. Percent of responses for question *Clinical guideline is easy to use?* in post-implementation phase per month. (Although all choices were offered for each question no SD responses were noted during data evaluation).

Most respondents agreed that they are using the guideline throughout the implementation phase, with less respondents disagreeing with the question *You use the clinical guideline?* and more respondents strongly agreeing with the same question by the end of the implementation stage as illustrated in Figure 9. The agreement with the comfort in triaging the patients using the clinical procedure peaked in the month of January, while the disagreement with the question decreased and the strong agreement increased between November and February as shown in Figure 10.



Legend: SD = Strongly Disagree, D = Disagree, A = Agree, & SA = Strongly Agree

Figure 9. Percent of responses for question *You use the clinical guideline?* in post-implementation phase per month. (Although all choices were offered for each question no SD responses were noted during data evaluation).

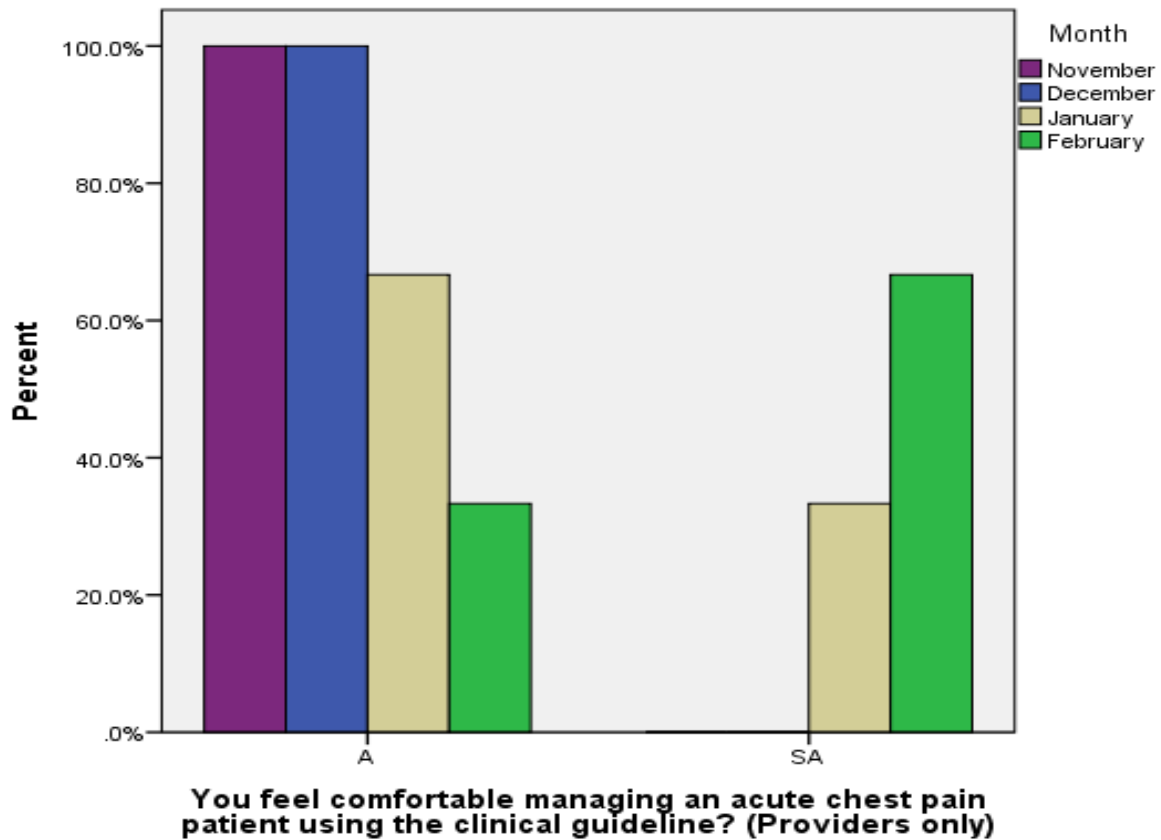


Legend: SD = Strongly Disagree, D = Disagree, A = Agree, & SA = Strongly Agree

Figure 10. Percent of responses for question “You feel comfortable triaging a patient using the clinical guideline?” in post-implementation phase per month. (Although all choices were offered for each question no SD responses were noted during data evaluation).

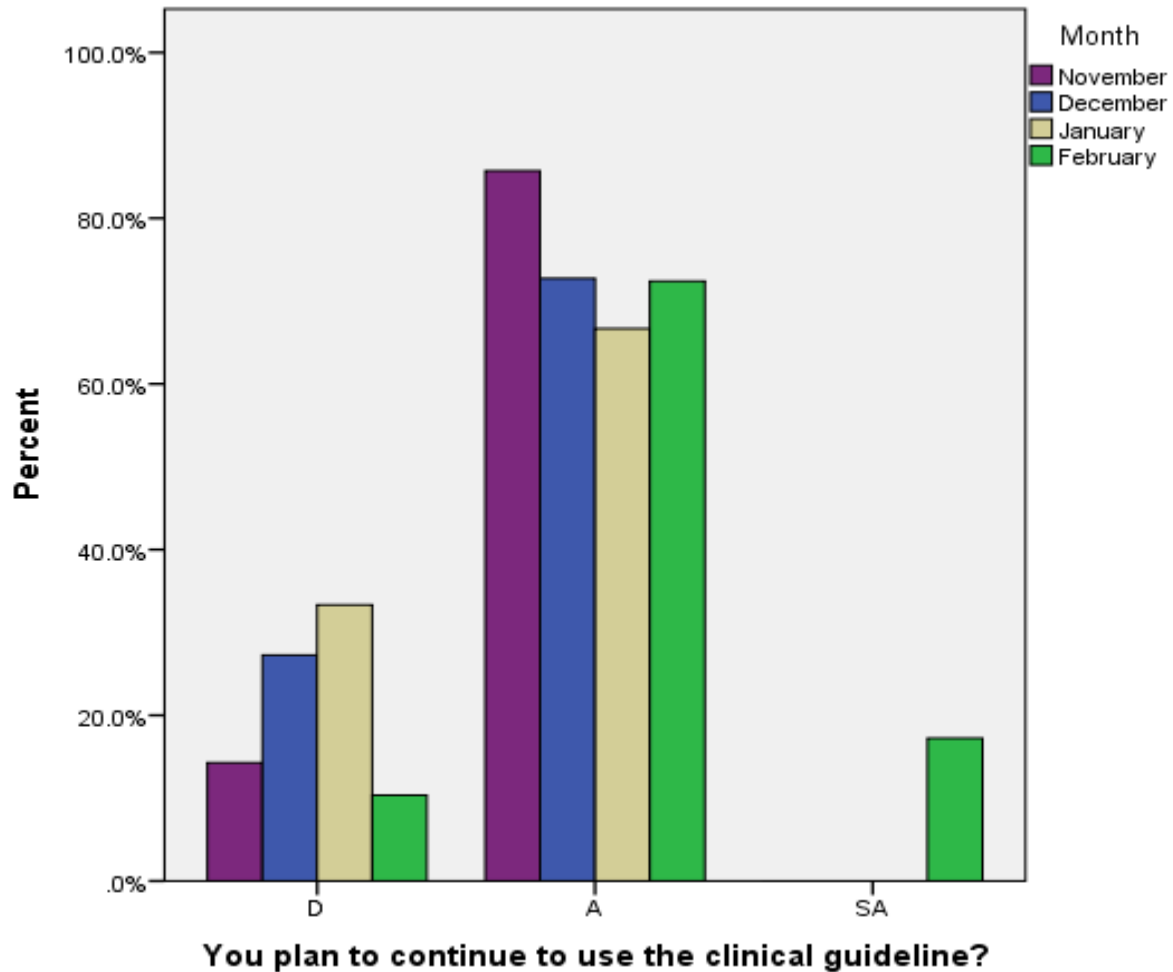
While all respondents agreed that they are comfortable managing an acute chest pain patient using the clinical guideline in the months of November and December, some of the respondents became in strong agreement with the question in the months of January and February. This indicates that the respondents’ level of comfort with the management of acute chest pain using the clinical guideline increased by the end of the implementation stage as illustrated in Figure 11. Most respondents agreed that they are planning to use the guideline, with

some strongly agreeing with this in the month of February. The percentage of respondents disagreeing with the question initially increased between November and January, with a decrease in the month of February. Thus, respondents indicated that they were more likely to continue using the guideline by the end of the implementation phase as shown in Figure 12.



Legend: SD = Strongly Disagree, D = Disagree, A = Agree, & SA = Strongly Agree

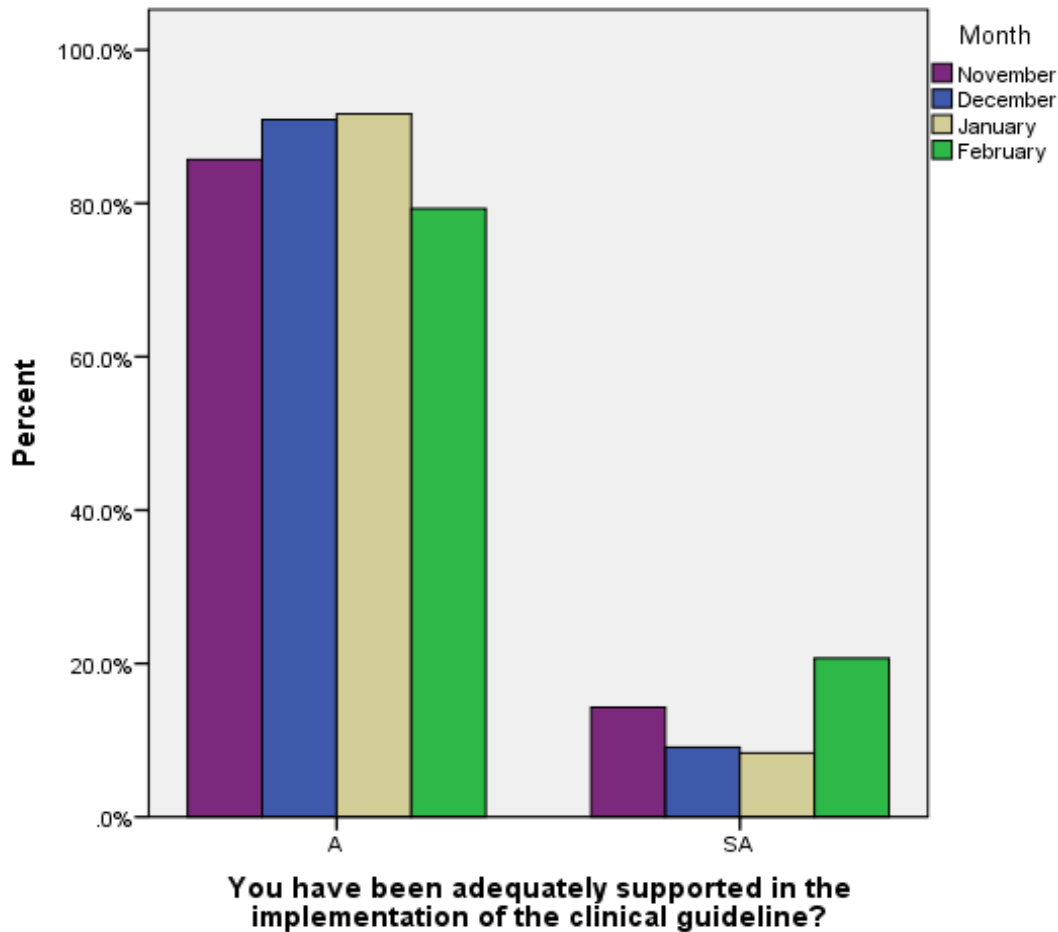
Figure 11. Percent of responses for question *You feel comfortable managing an acute chest pain patient using the clinical guideline? (Providers only)* in post-implementation phase per month.



Legend: SD = Strongly Disagree, D = Disagree, A = Agree, & SA = Strongly Agree

Figure 12. Percent of responses for question *You plan to continue to use the clinical guideline?* in post-implementation phase per month.

Lastly, all respondents either agreed or strongly agreed with the question *You have been adequately supported in the implementation of the clinical guideline?* indicating that the level of support was adequate. In the last month of the implementation phase, February, a higher percentage of respondents strongly agreed with this question as illustrated in Figure 13.



Legend: SD = Strongly Disagree, D = Disagree, A = Agree, & SA = Strongly Agree

Figure 13. Percent of responses for question *You have been adequately supported in the implementation of the clinical guideline?* in post-implementation phase per month.

Facilitators and barriers. In the prevailing fast paced, production driven, health care environment, all clinical and nonclinical staff have limited time to engage in quality/research translation improvement projects. Time constraints were a barrier to surmount during the development and implementation of this quality improvement project. The time allocation barrier was addressed through formal corporate channels and included making a scheduled appointment with all key stakeholders at the various stages of the quality improvement project. These formal

appointments had a secondary effect of keeping the project fresh in stakeholders' thoughts and mentally corroborating the gravity of the project. Through the support and "buy in" of the group practice administrator, the physicians, and active facilitators, the site staff recognized the value of the project. The perception of loss of control of the health care encounter was another constraint that was addressed during the implementation phase of this quality improvement project and was combated through the use of transparency throughout all phases of the project, with an open exchange of ideas and feedback from each stakeholder regardless of corporate position. Barriers to implementation throughout the project were fluid as the chaos of inexperienced staff changes continued to be the major theme throughout the pre-implementation and implementation phases of the QIP. A barrier that became visible only after data analysis involved the manner in which the data was split because it became difficult to discern between clinical and clerical staff triage data. In the next implementation of the clinical guideline, to combat this barrier, data will not be split or will be split by all triage options and their outcome responses. As the primary care office selected for the project is included within a larger health care organization, ample resources of administrative, financial, and meeting space allocations were not seen as barriers for implementation.

One of the providers within the primary care office had used clinical guidelines in her previous practice and was a facilitator of the implementation process within the practice site. Without her continued support, encouragement, and visible use of the clinical guideline, this project would not have obtained the objectives that were met.

Discussion/Interpretations

The DNP student was gratified with the success of this QIP not only from a patient prospective but also from a provider and staff education and comfort level. When the project

began patients were, daily, being inappropriately triaged and given office appointments that were resulting in delay of care and direct admissions from the office setting to the ER, and inexperienced clerical and clinical staff were uncomfortable triaging a patient with acute chest pain. Providers were not consistently adhering to current evidenced based management treatment of office patients experiencing acute chest pain.

Prior to project implementation, both staff and providers completed individual interviews and the results depicted anecdotal comments as presented in Table 10.

Table 10

Pre-Implementation Interview Anecdotal Comments

Staff	Anecdotal Comments
MD	<ul style="list-style-type: none"> • <i>“I have used clinical guidelines in the past and feel they have a place in the office setting and may help the current problems in the office”.</i> • <i>“I feel comfortable to a degree managing acute chest pain in the office setting but I feel I can always improve”.</i> • <i>“I feel the staff need a guideline to follow when triaging patients with acute chest pain as we have too many patients given office appointments inappropriately for chest pain”.</i>
DO	<ul style="list-style-type: none"> • <i>“I have limited experience using clinical guidelines and I do not know if I trust a guideline over my clinical judgement.”</i> • <i>“I will try the protocol with reservations as I know there is a problem in the office regarding patient triage.”</i> • <i>“I will support the project regardless of my personal feelings.”</i>
LPN	<ul style="list-style-type: none"> • <i>“I have office used clinical guidelines in my previous practice experience in New York and I feel comfortable triaging patients with acute chest pain”.</i> • <i>“I feel that I can improve my skills and a refresher is never a bad thing”.</i> • <i>“Our office staff need a guideline to follow as they have varying experience levels, most with little or no experience”.</i>
MA	<ul style="list-style-type: none"> • <i>“I have used clinical guidelines in the past when I worked at the health department”.</i> • <i>“I feel that I know when to defer to a licensed nurse but I would like a refresher”.</i> • <i>“I feel that we have a problem in this office that a guideline might help”.</i>
Clerical	<ul style="list-style-type: none"> • <i>“I have never worked in a medical office and I am not comfortable triaging patients, especially experiencing chest pain”.</i>

Staff	<ul style="list-style-type: none"> • <i>"I have never used a clinical guideline but I think it might make things easier".</i>
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To the DNP-c's satisfaction, the staff member's anecdotal comments post-implementation and provider's individual interview results depicted an increased comfort level with triage and management of patients experiencing acute chest pain as evidenced by the anecdotal comments presented in Table 11.

Table 11

Post-Implementation Interview Anecdotal Comments

Staff	Anecdotal Comments
MD	<ul style="list-style-type: none"> • <i>"I feel the project has been successful as I have less patients making it to the office and given an apt with chest pain than before".</i> • <i>"I would like to continue to use the protocol in the office setting as it has streamlined the triage process as well as a good clinical guideline for the nurses and providers to follow".</i> • <i>"I will recommend to administration that we role the protocol out to all the primary care offices and urgent care centers".</i>
DO	<ul style="list-style-type: none"> • <i>"I was unsure about the protocol in the beginning but after I saw it in use I found it to be beneficial to the office staff".</i> • <i>"I like the protocol but I still feel my clinical judgment should precede the guideline".</i> • <i>"I am glad I took part in the project".</i>
LPN	<ul style="list-style-type: none"> • <i>"In the beginning I didn't think I needed a refresher in chest pain triage but after using the guideline".</i> • <i>"I found my knowledge was outdated".</i> • <i>"I will continue to use the guideline after the project is over".</i>
MA	<ul style="list-style-type: none"> • <i>"As the oldest staff member in the office I felt I knew the proper way to triage a chest pain patient, I was wrong".</i> • <i>"I plan to continue to use the guideline after the project ends".</i>
Clerical Staff	<ul style="list-style-type: none"> • <i>"I feel more comfortable triaging a chest pain patient".</i> • <i>"I know that there were more patients than forms I filled out but sometimes I would forget".</i> • <i>"I want to see the final results of the study".</i>

In comparison to this QIP's goals, objectives, and projected outcomes, the final outcomes did produce positive changes, though not as significantly in several categories as

projected. For examples it was projected that: (a) a 90% decrease in patients presenting to the office /given an office appointment with the ICD-9 and 10 code 786.50 would occur, yet there was only a 30.5 % decrease, (b) an 85% decrease in patients being hospitalized from the primary care office with the ICD-9 and 10 code 786.50, chest pain/angina would occur however due to the inability to obtain data from a significant volume of walk-in patients and those patients subsequently seeking treatment at ER's in which no data access was available, data was not requisite for final analysis, (c) 95% of patient office visits with the ICD-9 and 10 code 786.50, chest pain/angina, would have employed the management element of the clinical guideline, and there was an 87.1% utilization, (d) 85% of nonclinical and clinical staff would self-report increased comfort level when triaging a patient with acute chest pain post-implementation of the triage clinical guideline, when only 77.7% self-reported an increase, and (e) 85% of primary care providers would self-report increased comfort level when managing patients with acute chest pain in the office setting, and when using the clinical guideline this projection was surpassed with a 100% self-reported effect, (see Table 1 in Appendix C) for full chart comparison.

This QIP's results were similar to Swap and Nagurney's (2005) study that concluded that a thorough chest pain history, as an assessment tool, allows the clinician to establish approximate probabilities for acute cardiac ischemia and whether the patient can be sent home safely from the primary care office or if they required immediate emergency room (ER) evaluation, and Grijseels et al.'s (1996) and Bruins et al.'s (2011) studies that concluded that adoption and utilization of an acute chest pain clinical guideline is an accurate means to identify patients with acute cardiac pathology, and may increase the safety and efficiency in the diagnostic workup, and enables the provider to identify patients with an evolving myocardial infarction at an early stage within the primary care setting.

Future Recommendations

As this QIP employed a relatively small convenience sampling size and the acute chest pain triage guideline was only implemented in one primary care setting with a small staff, it is recommended that this project be repeated in multiple and larger primary care settings with a larger sampling size. As there are relatively few clinical guidelines addressing triage and management of patients with acute chest pain for the primary care office setting, more evidenced based research and development of additional guidelines would be a useful tool in the primary care setting. Additional research endeavors should comprise a nurse researcher comparing primary care office data results between a larger number of primary care offices using the clinical guideline and those not using the guideline, and then comparing staff comfort levels, direct admission rates to the ER from the primary care office setting for acute chest pain and provider management skills of acute chest pain, etc.

Conclusion

The necessity for this QIP was based on evidenced based research and clinical site datum which revealed that patients, presenting to outpatient primary care offices with acute chest pain symptoms, were at risk for compromised safety resulting in poor physiological outcomes, as evidenced by incongruent, inappropriate, and ineffective immediate office triage, follow through, and office provider management, due to an absence of an established nationally recognized acute chest pain guideline and secondary to provider and staff acknowledgment of this deficiency and use of such guidelines. The current clinical deficit within the chosen primary care setting was addressed by adopting an acute chest pain triage guideline via employment of a multi-step algorithm specific to each staff member's educational/clinical expertise, beginning with telephone and on-site triage, and resulting in office evidenced based management interventions.

Data from this QIP supported current evidenced based knowledge that implementing an applicable evidenced based clinical guideline has the potential to decrease the level of inappropriate wait times and incongruous office appointments resulting in delay of care and, more importantly, to potentially reduce mortality rates. This QIP was successful not only in patients presenting to the primary care office with acute chest pain, but office staff and providers acquired a valuable resource and increased personal comfort level when triaging and managing acute chest pain in the outpatient office setting. It is unclear at present if the participatory corporation will utilize the chest pain triage and management protocol throughout regional primary care and urgent care offices, but the pilot site plans to continue its use and make this a sustainable new guideline.

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Appendix A

Table 1

Review of Kotter's Change Theory

Kotter's Eight Step Change Theory	Application to Acute Chest Pain Guideline
1. Establishing a sense of urgency <ul style="list-style-type: none"> • Scanning the environmental landscape to identify market competitive realities. 	1. Identify the need for an acute chest pain triage & management guideline in the primary care setting by key stakeholders.
2. Creating the guiding coalition <ul style="list-style-type: none"> • Assembling a powerful team capable of leading change. 	2. Form a team of stakeholders including nurses, nonclinical phone staff, office coordinator, physicians, NP's, and group administrator.
3. Developing a vision and strategy <ul style="list-style-type: none"> • Creating a compelling vision and crafting strategies to make the vision a reality. 	3. Adopt or adapt an agreed upon new evidenced based guideline to be implemented in the primary care setting.
4. Communicating the change vision <ul style="list-style-type: none"> • Crafting effective messages to initially and on an ongoing basis communicate new vision and role model the desired change. 	4. Share the project results with the team and stakeholders using graphs, run charts etc. to convey the vision of the project prior to the role out of the new guideline.
5. Empowering broad-based action <ul style="list-style-type: none"> • Eliminating obstacles that interfere with the desired vision. 	5. Address barriers to system usage, breaches in the education processes, and performance issues that require evaluation.
6. Generating short-term wins <ul style="list-style-type: none"> • Recognizing short-term milestones 	6. Share improvement data with stakeholders.
7. Consolidating gains and producing more change <ul style="list-style-type: none"> • Changing structures processes and systems that are not consistent with the desired vision. 	7. Work with stakeholders to identify other interventions or need for adaptation or modification of the new acute chest pain triage and treatment guideline.
8. Anchoring new approaches in the culture <ul style="list-style-type: none"> • Enhancing performance through new behaviors and effective leadership. 	8. Monitor for efficiency and improvement needs. Continue to promote the vision and goals of the new guideline.

(Kotter, 1996)

Appendix B

Table 1

PDSA Quality Improvement Model

PDSA Model Cycle	Application to Acute Chest Pain Guideline
Plan: <ul style="list-style-type: none"> • Goals & objectives. • Plan to carry out the plan. 	<ul style="list-style-type: none"> • All key stakeholders should be included in the planning stages. • Best evidenced based guideline will be identified to adopt or adapt.
Do: <ul style="list-style-type: none"> • Educate & train staff. • Carry out the plan. • Document the problems and unexpected observations. • Begin analysis of the data. 	<ul style="list-style-type: none"> • Develop a new standardized acute chest pain guideline. • Educate and train the nonclinical and clinical staff in the use of the new guideline. • Ongoing documentation of guideline utilization barriers will be noted and evaluated.
Study: <ul style="list-style-type: none"> • Assess the effect of the change and determine the level of success as compared to the goal/objective. • Compare the results to predictions. • Summarize the lessons learned. • Determine what changes need to be made and what actions will be taken next. 	<ul style="list-style-type: none"> • Assessment of the effectiveness of the new guideline will be appraised. • Sharing of results of the research translation project with all stakeholders using graphs, run charts, and other quality improvement techniques. • Work with stakeholders to identify other interventions or need for adaption of the new guideline.
Act: <ul style="list-style-type: none"> • Act on what one has learned. • Determine whether the plan should be repeated with modifications or new plan should be created. • Perform necessary changes. • Identify remaining gaps in process or performance. • Carry out additional PDSA cycles until the goal/objective is met. 	<ul style="list-style-type: none"> • Make necessary modifications to the acute chest pain guideline or begin new PDSA cycle. • Address barriers to system usage, breaches in the education process, and performance issues that require evaluation.

(Ransom, Joshi, Nash, & Ransom, 2008)

Appendix C

Table 1

Goal, Objectives, Projected Outcomes, and Final Outcomes

Goals	Objectives	Projected Outcomes	Final Outcomes
1. To increase the knowledge and proficiency of nonclinical and clinical staff in telephone and onsite acute chest pain triage.	A. Nonclinical and clinical staff will attend a 30 minute educational training session in the usage of the triage data collection form and the acute chest pain clinical guideline.	1. 95% of staff, clinical and nonclinical will attend the educational training session. 2. 75% of attendees will verbalize understanding of the usage of both the collection tool and the clinical guideline and demonstrate skills acquisition in a simulated patient case format.	1. 100% of staff, clinical and nonclinical attended the educational training session. 2. 90% of attendees verbalized understanding of the usage of both the collection tool and the clinical guideline and demonstrated skills acquisition in a simulated patient case format.
	B. Nonclinical and clinical staff will demonstrate usage of the triage data collection form and acute chest pain clinical guideline in a real world format.	1. 95% of staff, clinical and nonclinical, will demonstrate proficiency in the correct usage of the triage data collection form and the chest pain clinical guideline in the primary care office setting.	1. 90% of staff, clinical and nonclinical, demonstrated proficiency in the correct usage of the triage data collection form and the chest pain clinical guideline in the primary care office setting.
	C. Nonclinical and clinical staff will appropriately triage a patient, via telephone or onsite, and defer to an emergency room (ER).	1. 90% decrease in patients presenting to the office /given an office appointment with the ICD-9/10-code 786.50, chest pain/angina. 2. 85% decrease in patients being hospitalized from the primary care office with the ICD-9/10-code 786.50, chest pain/angina.	1. 30.5% decrease in patients presenting to the office /given an office appointment with the ICD-9/10-code 786.50, chest pain/angina. 2. Due to the inability to obtain data from a significant volume of walk-in patients and those patients subsequently seeking treatment at ER's in which no data access was available, data was not requisite for final analysis.
	D. All staff will have continuous educational	1. 95% of staff will attend weekly group huddles.	1. 66.7% of staff attended weekly group

	reinforcement and queries/implementation barriers addressed through the utilization of weekly 15 minute staff huddles.	2. 95% of staff will verbalize comfort approaching the project leader with questions and ongoing project intricacies.	huddles. 2. 77.7% of staff verbalized comfort approaching the project leader with questions and ongoing project intricacies.
2. To increase primary care providers proficiency in the most current evidenced based management of acute chest in a primary care setting utilizing a clinical guideline.	A. Primary care providers will attend a one hour educational training session in the usage of the management component of the acute chest pain clinical guideline.	1. 95% of primary care providers will attend the educational training session. 2. 95% of primary care providers will verbalize understanding of the usage and evidenced based underpinning of the management portion of the clinical guideline and demonstrate skills acquisition in a simulated patient case format.	1. 100% of primary care providers attended the educational training session. 2. 100% of primary care providers verbalized understanding of the usage and evidenced based underpinning of the management portion of the clinical guideline and demonstrated skills acquisition in a simulated patient case format.
	B. Primary care providers will properly utilize the management component of the acute chest pain clinical guideline.	1. 95% of primary care providers will verbally commit to a trial of the management element of the acute chest pain clinical guideline within their practices. 2. 95% of patient office visits with the ICD-9/10-code 786.50, chest pain/angina, will have utilized the management element of the clinical guideline.	1. 100% of primary care providers verbally committed to a trial of the management element of the acute chest pain clinical guideline within their practices. 2. 87.1% of patient office visits with the ICD-9/10-code 786.50, chest pain/angina, utilized the management element of the clinical guideline.
	C. Primary care providers will demonstrate proficiency in managing patients with acute chest pain symptoms utilizing the management component of the acute chest pain clinical guideline.	1. 95% of primary care providers will utilize the management element of the acute chest pain clinical guideline. 2. 95% of primary care providers will self-report increased skill acquisition and expertise in managing acute chest pain in the primary care setting.	1. 100% of primary care providers utilized the management element of the acute chest pain clinical guideline. 2. 100% of primary care providers self-reported increased skill acquisition and expertise in managing acute chest pain in the primary care

			setting.
3. To increase both nonclinical and clinical staff, as well as primary care providers, comfort level and confidence when triaging and managing acute chest pain symptoms within the primary care office setting.	A. Nonclinical and clinical staff will concede their comfort level in triaging acute chest pain symptoms.	1. 95 % of staff, clinical and nonclinical, will complete a post-intervention implementation self-evaluation form acknowledging their comfort level with triage of acute chest pain symptoms. 2. 85% of nonclinical and clinical staff will self-report increased comfort level when triaging a patient with acute chest pain post-implementation of the triage clinical guideline.	1. 77.7% of staff, clinical and nonclinical, completed a post-intervention implementation self-evaluation form acknowledging their comfort level with triage of acute chest pain symptoms. 2. 77.7% of nonclinical and clinical staff self-reported increased comfort level when triaging a patient with acute chest pain post-implementation of the triage clinical guideline.
	B. Primary care providers will disclose their comfort level in managing acute chest pain in the office setting.	1. 95% of primary care providers will complete a post-intervention implementation self-evaluation form stating their comfort level with management of acute chest pain symptoms in the office setting.	1. 100% of primary care providers completed a post-intervention implementation self-evaluation form stating their comfort level with management of acute chest pain symptoms in the office setting.
		2. 85% of primary care providers will self-report increased comfort level when managing patients with acute chest pain in the office setting and utilization of a clinical guideline.	2. 100% of primary care providers self-reported increased comfort level when managing patients with acute chest pain in the office setting and utilization of a clinical guideline.

Appendix D

Table 1

Project Implementation Timeline

Task	September	October	November	December	January	February	March
Form a team of stakeholders.	X						
Adopt or adapt an acute chest pain triage and management guideline.	X	X					
Devise an acute chest pain data collection form, staff personal awareness/comfort level form, and an employee guideline feedback survey.	X	X					
Data collection of pre-implementation phase underway by project manager for bench marking comparison via EMR review.	X	X	X				
Share and convey the vision of the project.			X				
Educate and train nonclinical, clinical staff, and providers in the usage of the new guideline and data collection form through the use of one-time 30 minute nonclinical/clinical staff and one hour provider training sessions.			X				
Begin implementation of the clinical guideline and data collection forms.				X	X	X	
Begin 10 minute bi-weekly feedback/follow-up meetings and weekly 15 minute huddles.				X	X	X	

Ongoing review of data collection.				X	X	X	
Work with stakeholders to identify need for adaptation or modification of the guideline.				X	X	X	
Final analysis of data collection with results of project.							X
One hour post-chest pain guideline implementation meeting with all stakeholders.							X
Monitor for efficiency and improvement needs.							X

Appendix E

Table 1

Quantitative questionnaire provider and staff responses per month pre- and post-implementation

Month	Answer	Pt triaged on phone Clerical	Pt triaged in person Clerical (for walk in only)	Pt deferred directly to ER without office visit	Pt triaged by clinical staff on phone or in office	Pt given an office apt.	Pt deferred to ER from office post provider assessment
September	Yes	4	3	2	4	5	3
	No	3	4	5	3	2	4
October	Yes	19	12	10	15	22	14
	No	12	19	21	16	9	17
Early November	Yes	7	7	5	8	9	5
	No	7	7	9	6	5	9
Late November	Yes	10	3	6	8	7	3
	No	3	10	7	5	6	10
December	Yes	22	14	16	23	20	9
	No	14	22	20	13	16	27
January	Yes	19	15	18	25	16	10
	No	15	19	16	9	18	24
February	Yes	26	16	25	31	16	8
	No	15	25	16	10	25	33

Appendix F

Table 1

Frequency and percentage of provider and staff responses for the qualitative questionnaire pre-implementation

Question	N	SD* Freq	%	D* Freq	%	A* Freq	%	SA* Freq	%
You know the symptoms of acute chest pain?	35	0	0	5	14.3	16	45.7	14	40.0
You are comfortable triaging a patient with chest pain?	35	2	5.7	12	34.3	9	25.7	12	34.3
You know how to use a clinical guideline?	35	4	11.4	10	28.6	17	48.6	4	11.4
You are comfortable managing acute chest pain in the office setting? (Providers only)	11	0	0.0	0	0.0	9	81.8	2	18.2

You are interested in increasing your triage and management skills?	35	0	0.0	0	0.0	28	80.00	7	20.0
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*SD = Strongly Disagree, D = Disagree, A = Agree, & SA = Strongly Agree

Appendix G

Table 1

Frequency and percentage of provider and staff responses for the qualitative questionnaire post-implementation

Question	N	SD* Freq	%	D* Freq	%	A* Freq	%	SA* Freq	%
Clinical guideline is easy to understand?	66	0	0.0	9	13.6	45	68.2	12	18.2
Clinical guideline is easy to use?	66	0	0.0	11	16.7	45	68.2	10	15.2
You use the clinical guideline?	66	0	0.0	12	18.2	47	71.2	7	10.6
You feel comfortable triaging a patient using the clinical guideline?	66	0	0.0	16	24.2	43	65.2	7	10.6
You feel comfortable managing an acute chest pain patient using the clinical	19	0	0.0	0	0.0	12	63.2	7	10.6

guideline? (Providers only)									
You plan to continue to use the clinical guideline?	66	0	0.0	12	18.2	49	74.2	5	7.6
You have been adequately supported in the implementation of the clinical guideline?	66	0	0.0	0	0.0	56	84.8	10	15.2

*SD = Strongly Disagree, D = Disagree, A = Agree, & SA = Strongly Agree