A Comparative Analysis of Patients with Chest Pain On and Off a Clinical Decision Unit

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Abstract

Purpose: The purpose of this study was to compare the outcomes, specifically length of stay (LOS) for patients with chest pain referred to an outpatient observation clinical decision unit (CDU) co-managed with Nurse Practitioners with an open admission model of care, compared to patients with chest pain referred to outpatient observation services outside of the CDU. Observation medicine is a continuously evolving practice utilized to improve efficiency while decreasing cost. A discharged inpatient that equates to an observation stay yet reimbursed at a higher inpatient rate creates opportunities for recoupment of payments and possible insurance claim denials. Patients with chest pain are a large portion of emergency department visits annually and frequently referred to outpatient observation units. Low-risk chest pain protocols were utilized to provide streamlined expedited care. Nurse Practitioners have an opportunity to decrease the length of stay and improve efficiency. **Method**: A randomized retrospective chart review was conducted of medical records of patients with chest pain referred to outpatient observation. A descriptive analysis compared patients with chest pain in an observation unit with nurse practitioners to patients with chest pain managed outside of the observation unit. The period was 1 September 2016 and end on 31 August 2017. A total of 128 patients discharged from observation care with a discharge diagnosis of chest pain were analyzed. **Conclusions**: Mean Length of Stay (LOS) was lower and statistically significant (P-value <0.05) for Clinical Decision Unit (CDU) which utilizes Nurse Practitioner services for managing patients with Chest pain compared to any outside unit. This lower LOS can significantly lower our Health care expenses.

Keywords: chest pain, observation units, nurse practitioner efficiency, and protocols

Background and Significance

Observation medicine is not a new concept; it is a continuously evolving practice utilized to improve efficiency while decreasing cost. The process involves placing patients that are evaluated in the emergency department (ED) into an interim status while they are waiting for a safe disposition. This extended evaluation period is often longer than the allowable length of stay (LOS) in an ED. The health assessment is often still in process, and discharge home is not a safe option. Outpatient observation status is the interim status between full inpatient admission and discharge or transfer.

> Observation care is a well-defined set of specific, clinically appropriate services, which include ongoing short term treatment, assessment, and reassessment before a decision can be made regarding whether patients will require further treatment as hospital inpatients or if they can be discharged from the hospital (The Centers for Medicare & Medicaid Services [CMS], 2009, p. 4).

Inpatient hospital admissions reimbursement is higher than the outpatient observation stay, and the expectation is that inpatient hospital admissions are greater than 48 hours (Sheehy et al., 2013). A discharged inpatient with an admission that equates to an observation shorter stay yet reimbursed at a higher inpatient rate creates opportunities for recoupment of payments and possible insurance claim denials. The Tax Relief and Health Care Act was signed into law in 2006 and paved the way for the Recovery Audit Contractor (RAC) program, developed to recoup overpayments for Medicare A & B (The Centers for Medicare & Medicaid [CMS], 2016). The potential for recouped monies forces hospital systems to critique all hospital stays and implement protocols to expedite an efficient and safe discharge.

Chest pain is the second largest reason for all visits to the ED for patients aged 15 to 64 and the largest principal reason for males over the age of 65 (The Ambulatory and Hospital Care Statistics Branch, 2011). Emergency departments across the country are dealing with overcrowding, increased wait times, increased costs and decreased insurance reimbursement. Nearly half of the patients that present to the ED with complaints of chest pain can easily and quickly be ruled out for cardiac-related chest pain utilizing a risk stratification tool and a chest pain protocol (Lee, Dix, Mitra, Coleridge, & Cameron, 2014). Low-risk chest pain (LRCP) protocols recommend serial troponin testing at 0, 2, and 6 to 8 hours and this increase in LOS for the ED patient adds to the backlog of patients perpetuating the current ED crisis increased patient morbidity and mortality (Meek, Braitberg, Nicolas, & Kwok, 2012).

In 2012, chest pain related complaints led to 6 million visits, a cost of over $13,000 per visit, and a LOS of 1.8 days (Yousuf et al., 2016). Placing LRCP patients into an observation status creates an additional avenue to decrease ED and hospital overcrowding while decreasing costs. There are many different names for the medical observations units: short stays units, observation units, or clinical decision units (CDU).

Problem Statement

According to the objectives of the CDU, development of a team approach to observation medication will directly decrease the LOS of patients with chest pain placed on a CDU co-managed by Nurse Practitioners (NPs). However, previous data provided by the quality outcomes department demonstrated no difference in LOS for patients with chest pain referred to observation either on the CDU or placed elsewhere within the same hospital system. Therefore, this research study will provide a comparative descriptive analysis of demographics and LOS of patients with chest pain on and off a CDU. The research question is: Are Nurse Practitioners

(NPs) able to decrease LOS for patients with chest pain referred to an outpatient observation clinical decision unit (CDU) with an open admission model of care, compared to patients with chest pain referred to outpatient observation services outside of the CDU?

Needs Assessment

The CDU is on the seventh floor of a large academic teaching hospital, level II trauma center with greater than 70,000 ED visits annually. This unit is outside of the ED, has NP coverage on the unit and has recently extended that coverage from 12 hours to 20 hours a day, seven days a week. The ED physician determines the current practice for admission to the CDU after consulting with the attending physician. Case management reviews the admitting status for most patients in the ED between the hours of 8 am and 8 pm daily to ensure appropriate admitting status. The admitting orders are obtained either through communication from the attending physician to the ED registered nurse or by direct computer entry by the attending physician.

Patients that present to the ED and are determined through risk stratification to meet the low-risk chest pain (LRCP) probable cardiac or probably non-cardiac diagnosis and then referred to outpatient observation on the CDU when beds are available. The risk stratification tool utilized in the ED is the Thrombolysis in Myocardial Infarction (TIMI) to identify LRCP patients versus acute coronary syndrome (ACS). The TIMI score risk stratifies for discharge versus further cardiac testing. The NPs on the CDU are responsible to co-manage patients along with the attending physician. The NP ensures utilization of the LRCP protocol and safely expedites discharge or referral to inpatient status.

The monthly dashboard details the LOS for chest pain patients in the CDU as 29.13 hours compared to chest pain patients outside of the CDU which was also 29.13 hours, year to date

2016 (Nitti & Schrieber, 2016). There was no difference in LOS for chest pain patients placed in the CDU compared to chest pain patients on a telemetry unit without nurse practitioners. Further review discovered usage of the LRCP protocol was only 12% during July 2016 (Nitti & Schrieber, 2016). Hospital administration supported the hiring of additional NPs, with the expectation of significant decreases in LOS for patients discharged with a diagnosis of chest pain. The completion of NP orientation was finalized by September 1, 2016, and included education regarding the LRCP, risk stratification, CDU goals and expectations, and cardiac stress testing options.

Objective and Aims

The aim of the study was to see if there is a decrease in LOS if the patients with chest pain were admitted to CDU with NPs compared to patients with chest pain referred to other medical-surgical floors within the same hospital. The CDU employs 3.9 full-time equivalents (FTEs) of NPs. Orientation includes an introduction to observation medicine, Milliman & Robertson (M&R) guidelines for appropriate placement, and review of clinical order sets/protocols for expediting care.

The objective was to provide descriptive analysis of the CDU with NPs compared to other medical-surgical floors. The objectives included comparison of the implementation of appropriate protocols, initiation of the correct clinical pathways, identification of the additional of consults, identification of the team members involved, types of patient discharge, and patient demographics.

Review of Literature

The literature review includes the following keywords: chest pain, observation units, nurse practitioner efficiency, and protocols. The search produced a wealth of literature on each

keyword. Multiple articles discussed observation units that utilized chest pain protocols to expedite care. Literature was gathered utilizing the following resources: CINAHL, Ovid, PubMed, and several search engines available online. The excluded research included articles published greater than ten years, though it is interesting that research on chest pain units and protocol-driven care date back to 1970. Most research referenced in this review was within the last five to six years. The research prioritized articles that focused on observation units utilizing chest pain protocols. The gaps in the data included a comparison of outcomes for chest pain observation units provided by nurse practitioners versus other medical providers.

Observation Units

There have been multiple research studies regarding the utilization of observation units for patients with an anticipated discharge of fewer than 24 hours. Baugh et al. (2012) concluded from a systematic review of 197 articles; that the utilization of observation status and the avoidance of full inpatient admissions would be a cost savings of $4.6 billion annually. The same review determined that chest pain was the most studied diagnosis and when patients are admitted to observation compared to an inpatient yields a cost savings of $1,773 per visit (Baugh et al., 2012). Also, non-cardiac chest pain accounted for a large number of ED visits and was estimated to cost the United States greater than $1.8 billion annually (Lee et al., 2014).

Hospital-based observation units come in a variety of different sizes, structure, and locations. There are varying advantages and disadvantages to the four identified observation units. The Type 1 dedicated closed observation units with protocol-driven care have better patient outcomes with a lower duration of stay (Ross et al., 2013). Type 1 units are usually located within or adjacent to the emergency department and managed by emergency department personnel (Ross et al., 2013). According to Ross et al. (2013), the CDU in this study was more

in line with a Type 2 observation unit. This style of observation medicine has multiple providers with multiple clinical guidelines; this style leads to a longer than the expected duration of stay (Ross et al., 2013). Type 3 units utilize specific protocols, though patients are dispersed throughout the hospital; type 4 units do not use protocols and patients are dispersed throughout the hospital (Ross et al., 2013).

The American College of Emergency Physicians (ACEP) defined best practice: observation units as those that are within or adjacent to the emergency department, the emergency department team provided care, and with administratively approved written policies and guidelines (American College of Emergency Physicians, 2011). Outpatient observation units are also known as short-stay units, chest pain units, clinical decision units, and medical observation units. Staffing ratios vary among the different units; physician-led care versus mixed provider care and emergency department teams versus multidisciplinary team are the most common characteristics of observation units.

Hospitals can benefit from dedicated observation units. There was not only a cost saving by utilizing protocol driven observation units; observation units with shortened patient days decrease the risk of falls and hospital-acquired infections in this patient population (Baugh et al., 2012). All the research reviewed supported the need for hospital-based observation units. Observation units that utilize evidence-based protocols reported no major adverse events within 30 days of discharge; this trend supports that the evidence-based protocols are safe when implemented.

Finally, recidivism rates or readmission rates were highly scrutinized by Medicare, though recidivism following an outpatient short-stay from observation units are not frequently measured. A study found that the recidivism rates for patients with chest pain in the emergency

room compared to inpatients were similar (Ross, Hemphill, Abramson, Schwab, & Clark, 2010). A low rate of return to the emergency department for similar complaints supports that the quality of care was similar to those patients admitted to inpatient units. Therefore, observation units that expedite care do not have a negative impact on recidivism.

Protocols

Protocols are similar to algorithms, guidance, checklists, order sets, risk stratification tools, pathways. These terms are used interchangeably, yet for this review, this project used the term protocol. The purpose of a protocol is to provide written guidance to the provider. The guidance aids the provider in properly identifying the correct diagnosis and provides a clinical pathway. Protocols can also aid in determining inpatient versus outpatient status and safely expedite appropriate evaluation and treatment. Richards et al. (2008) utilized both chest pain and case management protocols to direct the correct patient placement and aid in decreasing the number of inappropriate inpatient admissions while decreasing insurance denials.

The diagnosis-related-groups (DRGs) determines the inpatient reimbursement, and the DRGs are assigned upon discharge from the hospital. A one-day hospital inpatient stay will not qualify for inpatient reimbursement, one-day hospital visit equated to an observation stay and was not reimbursed based on DRGs.

Ten acute care hospitals in Florida completed a retrospective review of the inpatient DRG identifier for chest pain, with a similar study in Arizona. The review of chest pain patients revealed that most did not meet the criteria for inpatient admissions, an estimated 81% denial rate (Richards et al., 2008). Before the implementation of protocols, one Arizona hospital had a 93.5% error rate for patients admitted under DRG-143 (Richards et al., 2008). As a result of these combined admission based protocols, inappropriate admissions decreased 36.8% in the

Florida hospitals and the Arizona hospitals were able to decrease their one-day inpatient DRG-143 by nearly 90% (Richards et al., 2008).

Studies that evaluated the use of the LRCP protocols had a common theme and included the following items: low TIMI score, negative serial cardiac enzymes, electrocardiograms without ischemia, atypical chest pain symptoms and a low number of cardiac risk factors. Also, Yousuf et al. (2016) demonstrated that utilizing chest pain protocols for patients diagnosed with chest pain and risk-stratified with the Thrombolysis in Myocardial Infarction (TIMI) tool did decrease LOS and cost per discharge (CPD). The TIMI scores calculates a score by assigning one point for each of the following predictor variables: greater than 65 years of age, three or more risk factors of coronary artery disease (CAD), known CAD, two or more anginal episodes in 24 hours, aspirin use in the previous seven days, ST segment elevation, or elevated cardiac laboratory markers (Hess et al., 2010). The lower the TIMI equates to a decrease risk of death, myocardial infarction, or a need for urgent intervention (MD+Calc, 2016).

Lee et al. (2014) followed 297 chest pain patients that were risk stratified utilizing a chest pain protocol for acute coronary syndrome (ACS) and patients subsequently discharged with no adverse events within 30 days and a low-risk of adverse events at 12 months. George et al. (2013) reported that safely discharged patients identified as LRCP after risk stratification for ACS without cardiac stress testing and revealed no adverse events within 30 days. Frequently patients can be cleared for discharge and reserve further cardiac testing for the outpatient setting. The discharge chest pain protocols included the scheduling of outpatient cardiac stress testing within 14 days, follow-up appointments, and symptom-related education before discharge from the hospital (George et al., 2013). Education focused on likely outcomes, follow-up care,

medication reconciliation, and healthy life choices. This data supported utilizing risk stratification tools to expedite discharge.

Nurse practitioners

Nurse practitioners (NP) are certified and licensed independent medical providers that provided patient care in multiple settings. Consumer Reports identified six notable benefits with nurse practitioners: quicker appointments, team approach, convenience, faster emergency room care, the ability to manage chronic disease, and associated with lower hospital admissions. ("Nurse practitioners and physician assistants," 2015). Research has shown that NP outcomes are similar to the physician in the following areas: safety of care, effectiveness, patient satisfaction, perceived health status, and hospital length of stay (Stanik-Hutt et al., 2013). The same systematic review reported NPs had a shorter LOS for inpatients compared to physicians, yet other research showed the outcomes to be comparable amongst the two provider types (Stanik-Hutt et al., 2013).

The current admitting practice for this research study involves communication between the emergency department physician and the patient's primary provider. The patient was referred to the CDU where the patient was co-managed with the NPs. Co-management involved the NP collaborating with either an attending provider or with a hospitalist physician. The medical doctor (MD) NP model of care demonstrated a decrease LOS, enhance continuity of care, and expedite discharge in an inpatient acute care setting (Cowan et al., 2006).

The research did support having a closed unit model of care as the best practice, and most data was synthesized from emergency department observation units. The gaps in research include the comparison of outcomes for observation patients co-managed by nurse practitioners versus traditional care outside of an identified observation unit. Further research is

necessary to determine if LRCP protocols are more likely to be used by nurse practitioners and will that usage change the LOS compared to LRCP outside of the CDU.

Theoretical Model

Avedis Donabedian was a front-runner in the quality improvement process as it relates to healthcare. The Donabedian model dates back to the 1960s and was adopted by the Joint Commission on Accreditation of Hospitals (JCAHO) in 1987 as a three-step quality assurance process (Chassin & O'Kane, n.d.). The Donabedian process includes three components: Structure-Process-Outcome (Donabedian, 2003).

The first component, structure, refers to the material resources of the facility or environment, characteristics of both the personnel and organizational leadership and its culture (Donabedian, 2003). The structure of the facility must be willing to dedicate the time and resources necessary to facilitate change. The process component in this model describes the steps that a patient goes through to include: evaluation, treatment, diagnosis, prevention, education, and included all persons that contribute to patient care (Donabedian, 2003). The third component is the outcome or change; whether the outcome was considered positive or negative, it was the result of the structure and process.

Donabedian's process model was utilized to determine if there was a change in LOS for all patients with chest pain referred to the CDU versus the usual care. The structure component was supported by hospital administration and included the development of the CDU on an inpatient unit of a level II university trauma hospital.

The Process component includes utilization of the bed management team to assign the patients to the CDU after completion of the evaluation, appropriate treatment, and appropriate diagnosis by the Emergency Department physician. The process was improved to include:

utilizing risk stratification tools, evidence-based chest pain protocols, multidisciplinary team, and expanded nurse practitioner coverage.

The initial process did not allow for usage of protocols or consistent utilization of risk stratification tools. As a result of structure and process modification, the final component of Donabedian Model was to determine if a change in the outcome was identified (see **Appendix A)**. The desired outcome of this process change was a decrease in LOS compared to similar patient units.

Methodology

This project was a retrospective chart review of patients who met the inclusion criteria. The study design was descriptive comparative. A descriptive comparison of the two groups was completed using the identified variables from the data abstraction tool.

Setting

This project took place at [redacted]. [redacted] is a 550-bed academic medical hospital, level II trauma center, and has an emergency department volume greater than 70,000 annually. The CDU was co-located on a medical-surgical inpatient unit. The maximum capacity for observation patients in the CDU was 38. Frequently, observation patients were located outside of the CDU, on medical surgical general care units. Placements outside of the CDU were considered "usual care." The following patient units admitted chest pain patients to observation and were used for comparison: Mehandru 5, North West 6, and Booker 3. In 2015, approximately 1358 chest pain patients were admitted to JSUMC, and 999 of those patients were assigned to the CDU (Nitti & Schrieber, 2016).

Study Population

The charts were reviewed and screened from a computer-generated list of patients received from the hospital outcomes department. The study population included patients with chest pain referred to observation care, September 1, 2016, through August 31, 2017. The screening process included the inclusion and exclusion criteria. There are no recruitment strategies in a retrospective chart review. The sample size was determined by utilizing the 'GPower' calculator. There were no predictions made regarding the outcomes of this review. A total sample size of N=128 (64 in each of the 2 groups) was required, using a medium effect size of 0.50, level of significance=0.05, 2- tailed test, to achieve a recommended statistical power of 80%.

The inclusion and exclusion criteria were the same for both groups. The independent variables were the same for both groups. The chart review looked for the multiple variables: group assignment (Nurse Practitioner versus usual care), utilization of TIMI risk stratification tool, ordering of non-invasive cardiac testing, the ordering of serial biomarkers as per the LRCP protocol, and multiple additional demographics (see **Appendix B**.) The independent variables were compared between the two groups, along with a comparison of the dependent variable of LOS. The LOS in hours represented the outcome.

Assistance was sought from both a nurse scientist and a biostatistician employed at the medical center. The assistance sought aided in the completion of the data analysis and did not include the data collection or entry.

Inclusion criteria. Patients referred to outpatient observation with a discharge diagnosis of chest pain were included in this study. This review will include adults aged 18 years and above.

Exclusion criteria. Patients referred to outpatient observation with a diagnosis of chest

pain, yet discharge with a diagnosis other than chest pain will be excluded. Efforts were made to exclude vulnerable populations. Vulnerable populations were defined as children, pregnant women, prisoners, and mentally disabled (Rutgers, the State University of New Jersey, 2014). Patients with the following discharge delays were also excluded from this project: Social issues, unsafe discharges, or lack of community placement.

Study Interventions

The study design was a retrospective chart review and comparative analysis of patients referred to CDU compared to the usual care; no interventions were used for this study.

Outcome Measures

The information technology department was asked to compile a list of all patient discharged from the medical center with the following diagnosis and ICD-10 codes: R07.09 chest pain unspecified, R07.82 intercostal pain, and R07.89 other chest pain. Once the list was received, data extraction began using the electronic health record (EHR). All data collected was completed over a secure server at the medical center. Patient identifiers were not transcribed from the data received from IT; patients were logged into the data based numerically without a link to protected health information (PHI) (see **Appendix B**).

A data abstraction tool (DAT) was utilized to keep the data free of bias. The purpose of this tool was to aid the author in collecting accurate data. The tool included the inclusion/exclusion criteria, the measurable variables, and helped to maintain data consistency (see **Appendix C**.).

Benefits/Risks

A retrospective chart review had minimal or no risk of harm. Safeguards were implemented to maintain privacy and confidentiality of data.

Subject Recruitment

A retrospective chart review did not involve subject recruitment. There was a limited number of participants for chest pain patients placed outside of the CDU. Therefore, all chest pain patients on the other floors were reviewed and considered to meet minimum participation requirements. The observation unit saw the majority of outpatient observation patients, and the number of available charts was numerous. Therefore, utilizing the same time frame, September 1, 2016, through August 31, 2017, every 8th patient was reviewed for inclusion criteria on the nurse practitioner managed CDU.

Consent Procedures

A retrospective chart review did not require informed consent. A waiver from IRB was obtained, as no identifiable PHI was included in the data collection.

Subject Costs and Compensation

There are no expected subject costs, and therefore no compensation was warranted.

Project Timeline

Completion of this capstone was projected for December 2017 (see Appendix D). The capstone proposal was completed and presented to the capstone project chair and committee member. Immediately following the project chair's approval, the Nursing Research Committee approval was sought followed by IRB. Data collection commenced after IRB approval was obtained. Based upon the current volume of patients was estimated that one year of data would be required to achieve the minimum number of charts necessary to obtain the appropriate number of participants. Immediately following the data collection, the analysis began.

Resources Needed/Economic Considerations

There were no expected costs for this project.

Data Maintenance/Security and **Evaluation Plan**

A formal request to information technology (IT) was completed. This request included a listing of all patients discharged from [redacted] with a diagnosis of chest pain that meets the inclusion criteria. This computer listing was sent securely from IT over a secure network. This information was not shared or printed. The data collection was the sole responsibility of this researcher.

The data received from Quality Outcomes Manager was not printed out. The electronic chart numbers had a sequential numbering system added. This additional numerical identifier matched the sequential numbering system on the DAT and was available only on the electronic patient list received from the manager of Quality Outcomes. As charts were reviewed, each chart had a corresponding DAT. The only printed data was the data abstraction tool for each chart review. The data abstraction tools were secured in a locked cabinet behind a locked door on Mehandru 7 in the APN office. No additional team members had access to this locked cabinet. All data reviewed was completed on campus utilizing the medical center's secure network.

Data Analysis

SPSS Version 22.0 was utilized for Statistical analysis of data. A retrospective chart review with a comparative descriptive design utilizing demographics from two independent groups was completed. Utilizing appropriate statistical tests for comparing the differences in the mean LOS between the groups. Descriptive statistics were used to describe the demographic, structure, and process data. The data included: age, gender, CDU vs. usual care, insurance type, resident coverage, attending service, cardiology consultations, LRCP protocol utilized, troponins order per protocol, identify who placed the orders, additional consultations, discharge

destination, discharge mode of transportation, TIMI score, LOS, and charges (see **Appendix C**.). Assistance was received from a biostatistician employed at the [redacted]. The assistance aided in completing the data analysis and did not include the data collection or entry.

Findings

The data analysis determined gender was equally represented in the CDU with both 32 males and 32 females; outside of the CDU, the gender differences were close with 30 males and 34 females (Fig. 1).

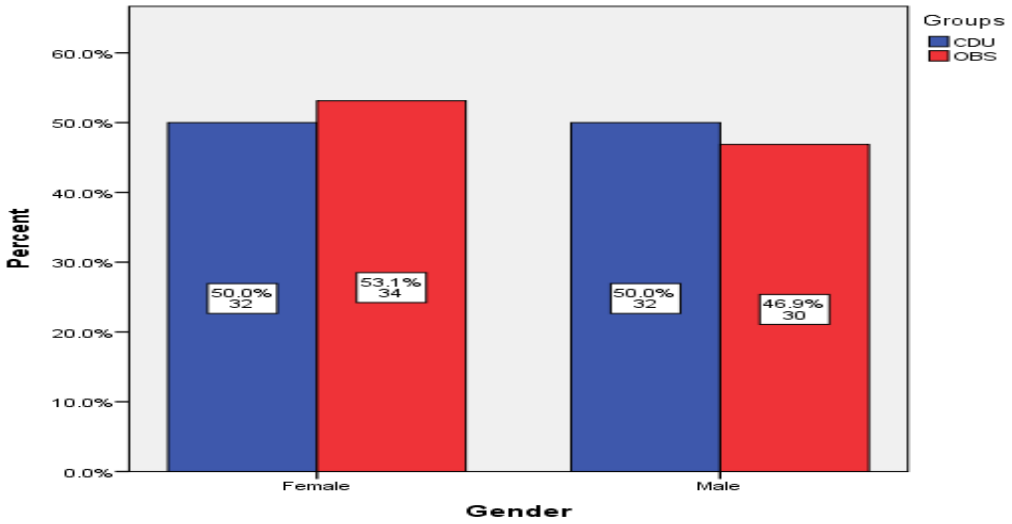

Figure 1. Gender Category. This figure illustrates the distribution of age in the CDU and the observation patients with chest pain in the identified comparison units.

The age categories for both the CDU and the usual care units were also similar in distribution, the highest percentage of patients were between the ages of 56-65 years of age with 25% in the CDU and 28.1% in the usual care. The lowest represented age group for patients were those greater than 85 years of age, 6.3% in the CDU and 10.9% in the usual care units (Fig. 2). Approximately 75% of the patients were between the ages of 45 to 75 years of age.

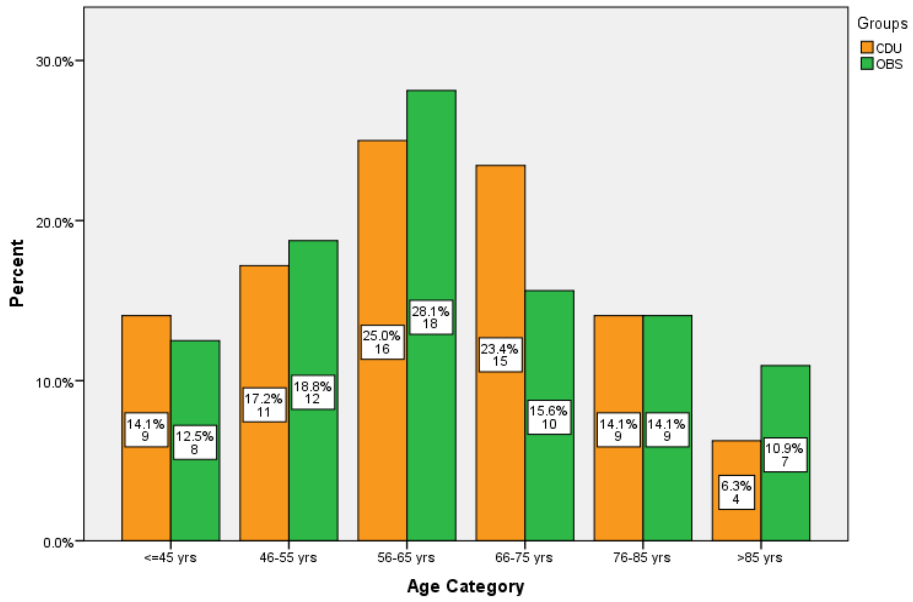

Figure 2. Age Category. This figure illustrates the distribution of age in the CDU and the observation patients with chest pain in the identified comparison units.

Additional demographics illustrated a slightly higher distribution of Medicare patients at 57.8% on the CDU vs. 42.9% on the usual care units. Medicaid and uninsured patients were represented on both units with Medicaid at 17.2% on CDU and 14.3% and the uninsured at 3.1% on CDU and 6.3% on the usual care units (Fig. 3). Medicare patients represented 50% of all the patients with chest pains. The smallest group of patients represented here were the uninsured.

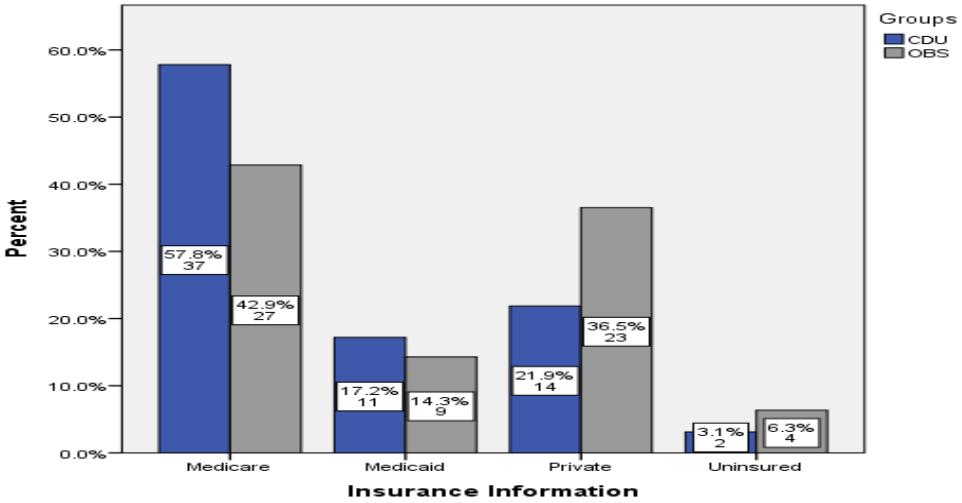

Figure 3. Insurance Category. This figure illustrates the distribution of insurance information for patients in the CDU and the observations patients with chest pain in the identified comparison units.

The Nurse Practitioners were only involved with the care of the patients on the CDU. Patients with chest pain can be placed for observation throughout the hospital and under multiple services. Nurse Practitioners do not have privileges to admit. Therefore the distribution of attending physicians was as follows: Hospitalist 40.6%, private attendings 31.3%, Ward Medicine 14.1%, and specialist (cardiologist) was 9.4%. The data for patients with chest pain on the usual care units was similar at 42.2%, 34.4%, 12.5%, and 7.8% respectively (Fig. 4).

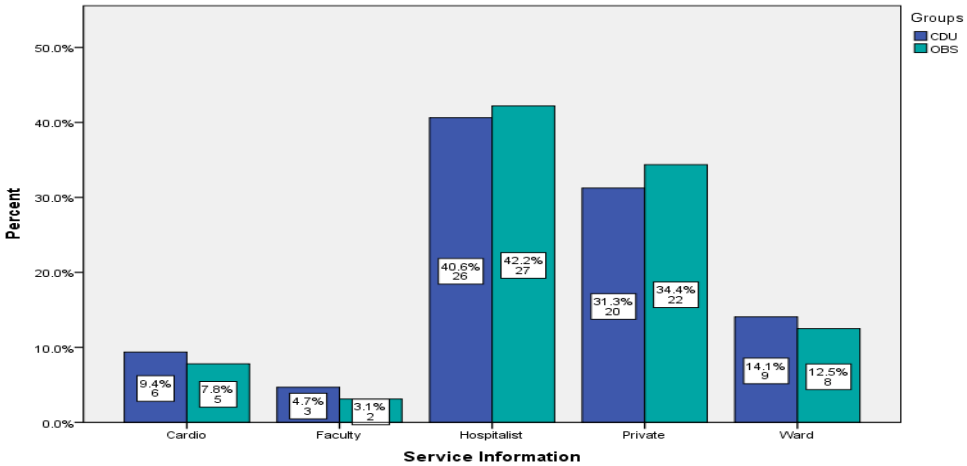

Figure 4. Service Category. This figure illustrates the distribution of service information in the CDU and the observation patients with chest pain in the identified comparison units.

Consultations were ordered for most patients being admitted to the hospital regardless of admitting service. Cardiology was consulted on greater than 90% of the patients with chest pain on the CDU compared to nearly 82% of the patients with chest pain in the comparison units (Fig. 5.).

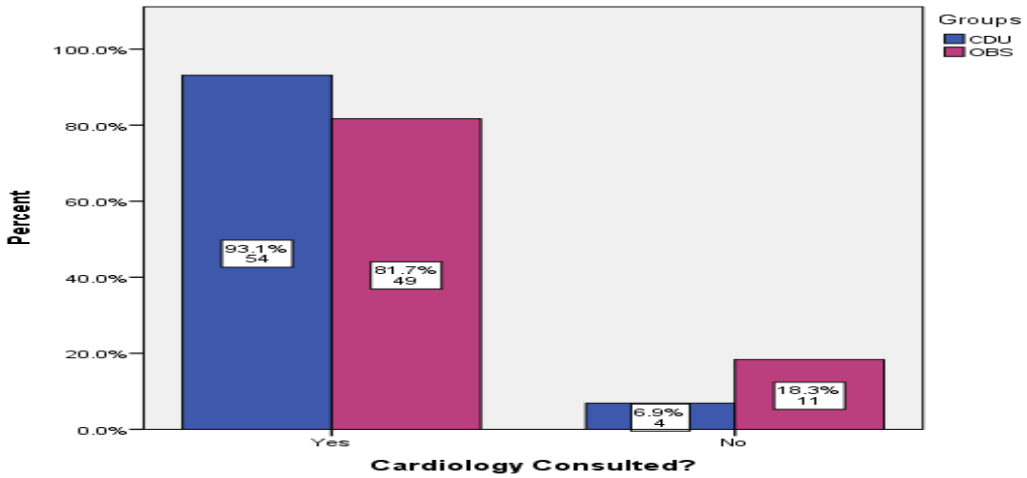

Figure 5. Cardiology consultation. This figure illustrates the distribution of cardiology consults in the CDU and the observation patients with chest pain in the identified comparison units.

Additional consults were sometimes necessary depending upon the patient's presenting complaints or co-morbidities. The perception is that additional consults can potentially prolong a patient's hospital stay. The data illustrated a low consultation rate of 17.2% on the CDU and 23.4% on the comparison units. The consultation rate was lower on the CDU (Fig. 6). Though, when taking into consideration the rate of cardiology consults and "other" consultations the consultation rate on all units remain high. The cardiology consults were ordered on 103 patients, while an additional 26 consults were placed.

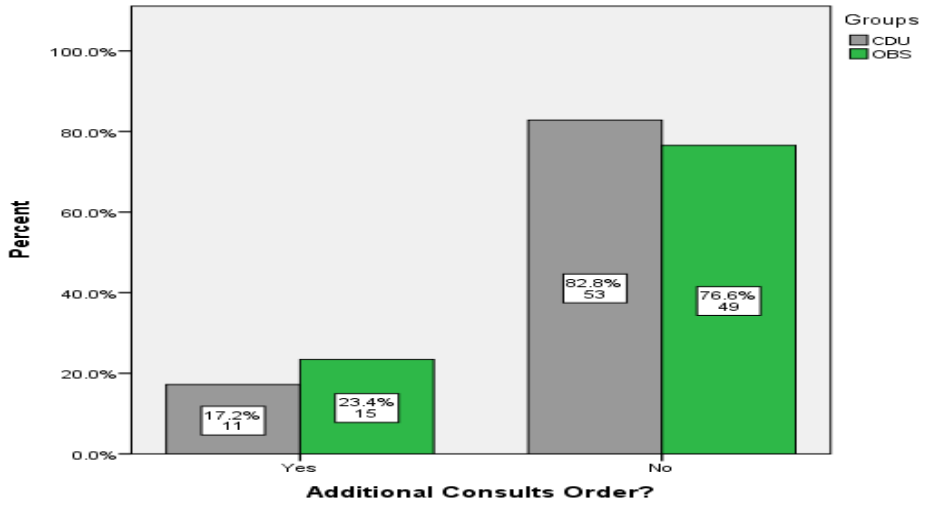

Figure 6. Additional consults. This figure illustrates the distribution of cardiology consults in the CDU and the observation patients with chest pain in the identified comparison units.

Residents were often deployed to assist with the evaluation and treatment of patients referred to observation with chest pain. The utilization of residents often represents a learning opportunity for the resident; the resident works alongside a teaching physician. The perception was that additional resident coverage could potentially prolong a patient's hospital stay. The data illustrated a lower than expected resident participation rate. The resident participation rate for CDU patients was 25% while the rate on comparison units was at 31.3% (Fig. 7).

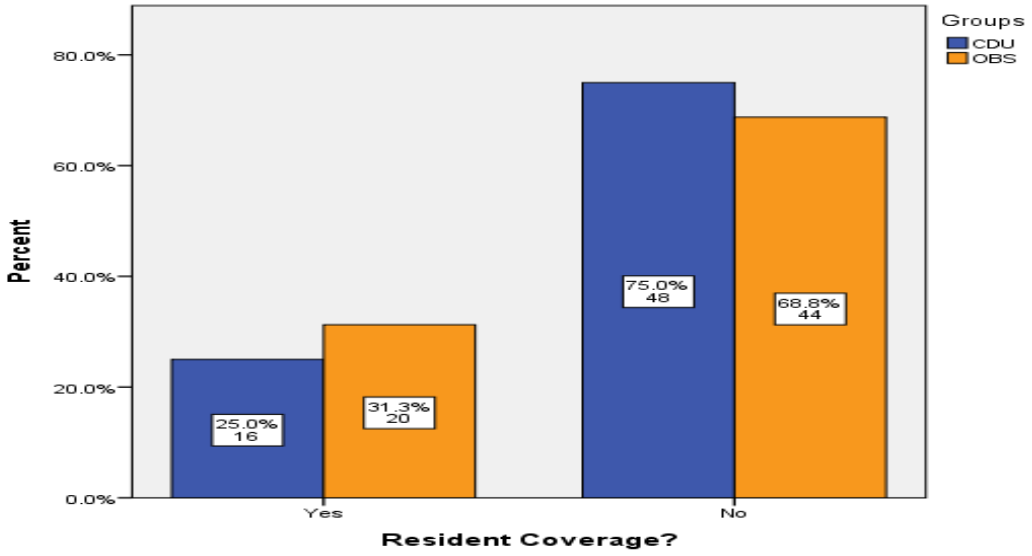

Figure 7. Resident coverage. This figure illustrates the distribution of resident coverage in the CDU and the observation patients with chest pain in the identified comparison units.

The ER physician calculated the TIMI Score. The score aided in the decision to either admit, refer to observation, or discharge home from the ER. The TIMI score was calculated on only twelve CDU patients and nine chest pain patients referred to observation on the comparison units (Fig. 8). Emergency room physicians calculated a TIMI score on only twenty-one patients out of 124 patients with chest pain.

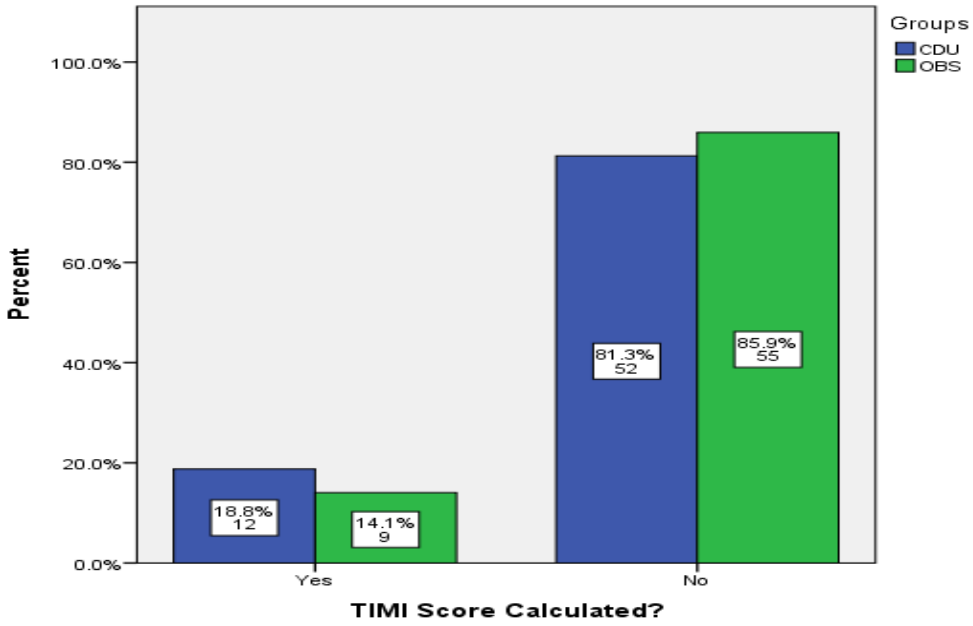

Figure 8. TIMI Score calculated. This figure illustrates the distribution of calculated TIMI Scores in the CDU and the observation patients with chest pain in the identified comparison units.

After the decision has been made to refer a patient with chest pain to observation, the LRCP protocol should be initiated when admitting orders are entered. The LRCP protocol was used as a care plan for providers to expedite the care of the LRCP paint. The CDU was more likely to use the LRCP protocol compared to the other patient care units. The usage rates were 64.1% and 35.9% respectively (Fig. 9). Therefore, of the forty-eight patients that had an LRCP protocol ordered only six patients had it ordered by the primary provider at the time of the initial order entry.

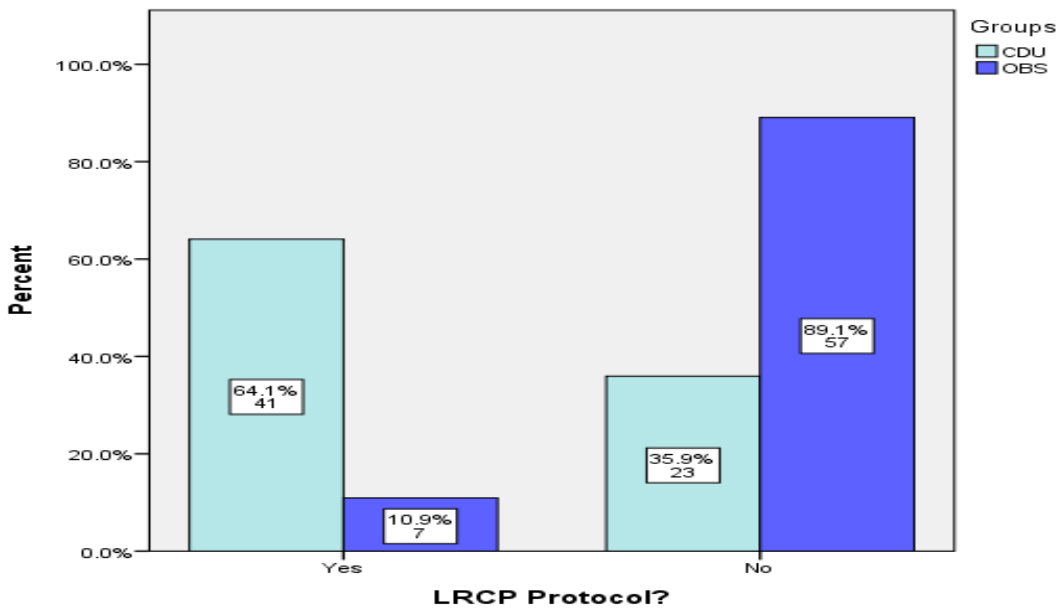

Figure 9. LRCP Protocol usage. This figure illustrates the distribution of the usage of LRCP Protocols in the CDU and the observation patients with chest pain in the identified comparison units.

As mentioned previously, the LRCP protocol was available in the EMR as a picklist type of order entry. It was preferable to order the desired cardiac stress testing at the time of order entry into observation status, before leaving the ER. Statistics currently show that only 10.9% of all LRCP protocol order sets included a cardiac risk stratification testing at the time of initial entry. The comparable units, initiated stress testing with the LRCP on only one patient (Fig. 10.).

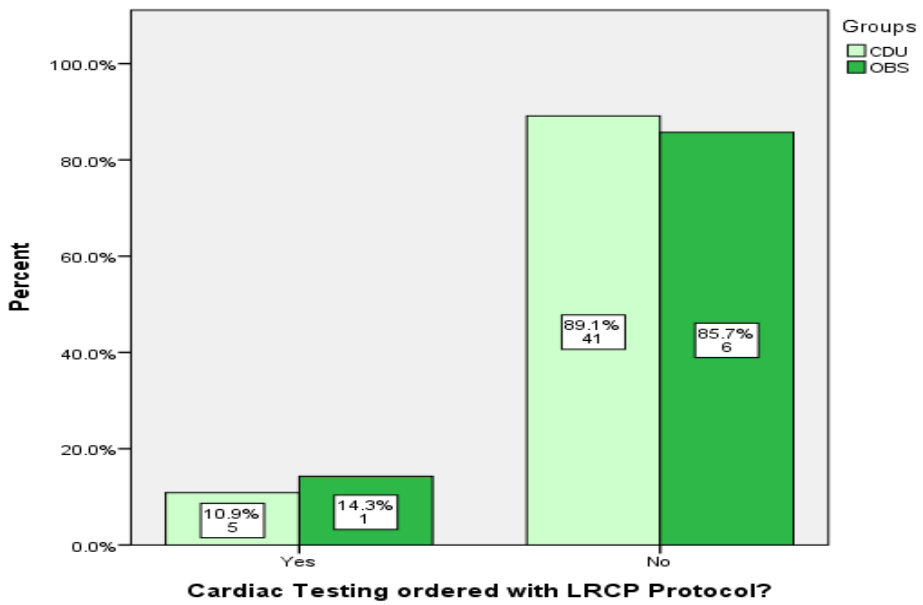

Figure10. Cardiac testing ordered at the time of LRCP Protocol order entry. This figure illustrates the distribution of cardiac testing ordered with the LRCP protocol order entry in the CDU and the observation patients with chest pain in the identified comparison units.

Cardiac stress testing can be ordered by either the attending physician, the nurse practitioner on the CDU, or by the cardiologist if consulted. The preference was that the stress testing should not be delayed. The attending physician places the orders for a referral to observation, and the expectation was that the cardiac stress testing order was accomplished with the initial order entry. Currently, the cardiologist and attending physician account for 87.5% of the cardiac stress testing orders on the CDU. The NPs have entered 12.5% of the orders for stress testing (Fig. 11).

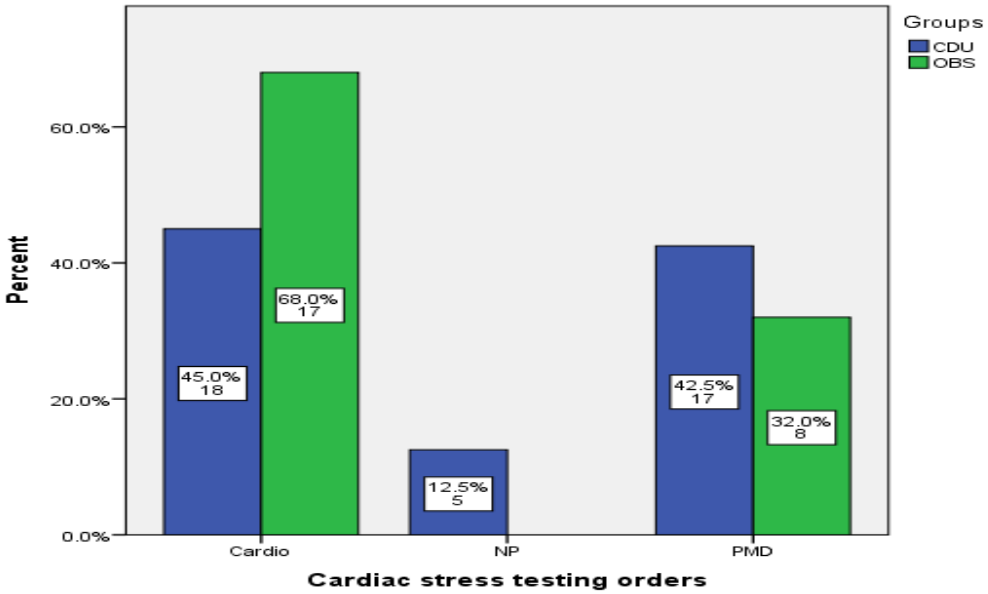

Figure 11. Cardiac stress testing orders. This figure illustrates the distribution of cardiac stress testing order by either the PMD, cardiologist or NP on the CDU and the observation patients with chest pain in the identified comparison units.

Risk stratification was completed through the utilization of serial troponin lab samples. The current practice was to initially draw the troponin on entry into the ER, two hours later, and at six hours from the first. The statistic depicts that the chest pain patients on the CDU have troponins ordered per the protocol at a rate of 28.1%, while the other comparable units follow this protocol 6.3%, or four patients (Fig.12.). Therefore, 106 patients had a potential delay in disposition due to lack of timely serial troponins.

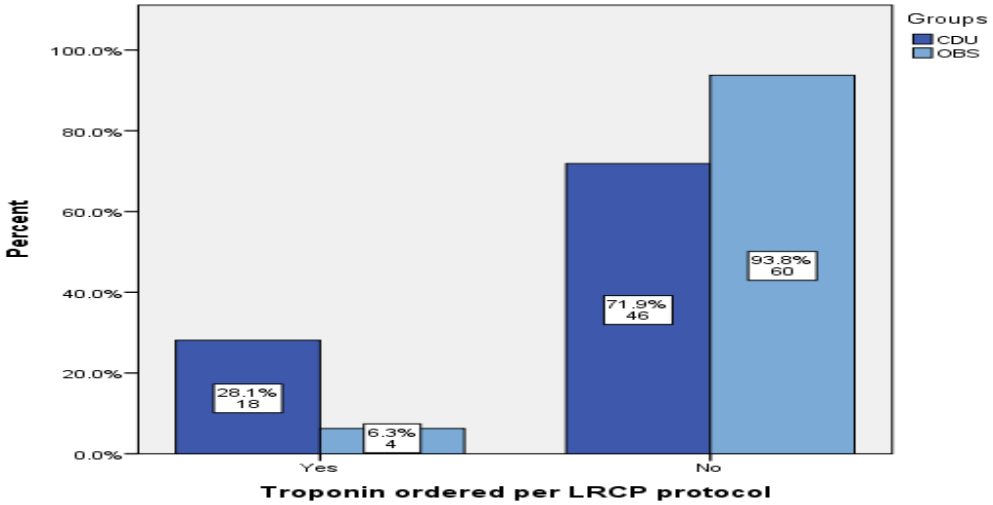

Figure 12. Troponin ordered per LRCP protocol. This figure illustrates the distribution of troponins ordered per LRCP protocol in the CDU and the observation patients with chest pain in the identified comparison units.

The discharge disposition or final destination is perceived to have an impact on the LOS of all patients admitted or observed in the hospital. It was a multidisciplinary effort to discharge a patient from a hospital to a facility. The perceived delays are due to patient delays, ambulance services, and bed availability at the receiving facility. The statistic for patients with chest pain illustrated that greater than 90% of patients on both units were discharged home (Fig. 13).

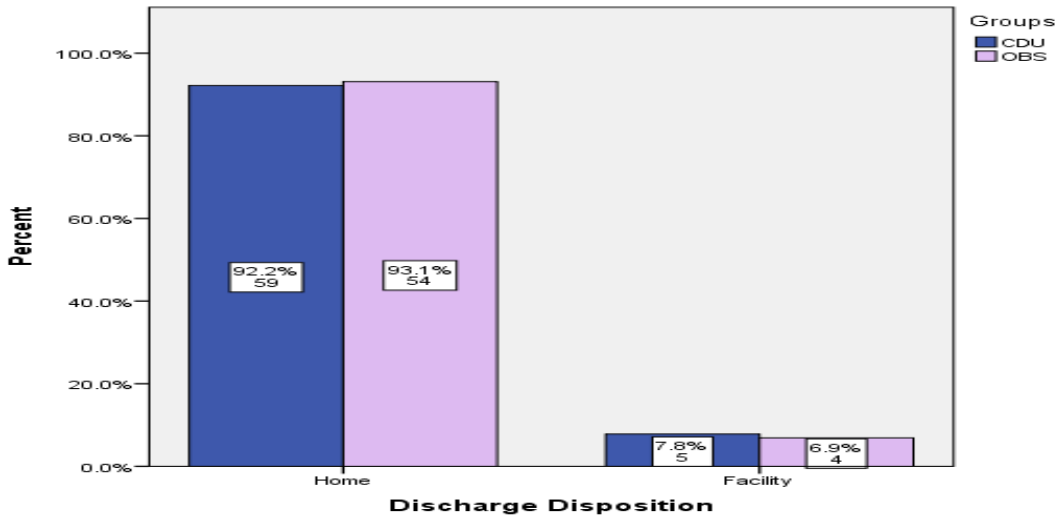

Figure 13. Discharge disposition. This figure illustrates the distribution final discharge disposition or destination for the CDU and the observation patients with chest pain in the identified comparison units.

Ambulance services required either a nurse or social worker to call and set up transportation. There was often a three-hour waiting period for an ambulance, frequent delays, and cancellations. The statistics demonstrated that greater than 90% of all patients with chest pain on all floors travel home via personal automobile and only six patients required ambulance services (Fig. 14).

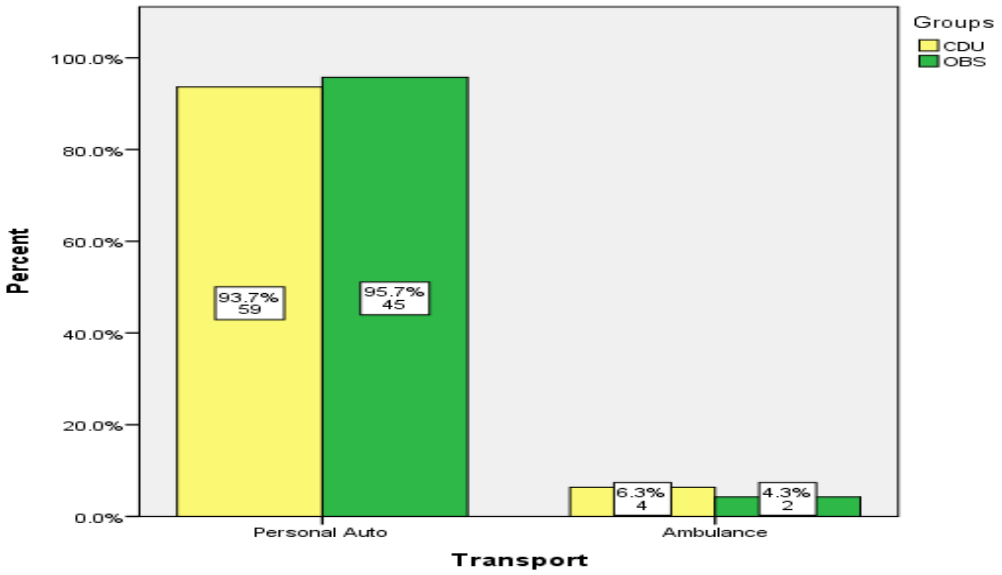

Figure 14. Transport. This figure illustrates the distribution of mode of transportation home for the CDU and the observation patients with chest pain in the identified comparison units.

Table 1. shows the descriptive statistics and the p-value for the difference of means for Total charges and LOS between the two groups. Though the mean Total charges for CDU were less than the OBS unit, there was no statistically significant difference between the two groups. Mean Length of Stay was lower for CDU than for OBS and was also statistically significant (p-value<0.05).

Table 1. Statistics of LOS and Total Charge between groups.

Descriptive Statistics and T-Test results (LOS and Total Charge)						
	Groups	N	Mean	Std. Deviation	Std. Error Mean	T-Test (p-value)
Total Charge	CDU	64	**2686.83**	2611.788	326.473	0.949
	OBS	64	**2712.08**	1785.536	223.192	
Length of Stay (in Hours)	CDU	64	**25.66**	14.275	1.784	**0.015***
	OBS	64	**36.48**	31.789	3.974	

The mean LOS of the two groups was further stratified by Insurance Information, as seen in Table 3. The LOS in hours was itemized demographically by insurer between the groups. The statistics demonstrated that the shortest LOS were with patients that were privately insured on the CDU with 21.71 hours, while the same insured patients outside of the CDU had a LOS of 26.83 hours. The LOS for Medicare patients on the CDU was 26.78 hours which is approximately 21 hours less than the LOS on the comparison units (47.26 hours). Also, there was no difference in LOS between units with uninsured patients. The lowest LOS was demonstrated on the CDU for all insurance types; only the uninsured had the same LOS on all units.

Table 3. Length of Stay (in Hours).

Insurance Information	Groups	Mean	N	Std. Deviation	Minimum	Maximum
Medicare	CDU	26.78	37	16.090	6	83
	OBS	47.26	27	43.706	13	229
	Total	35.42	64	32.251	6	229
Medicaid	CDU	25.73	11	13.936	8	55
	OBS	30.22	9	16.902	12	66
	Total	27.75	20	15.092	8	66
Private	CDU	21.71	14	8.516	6	43
	OBS	26.83	23	12.601	12	62
	Total	24.89	37	11.382	6	62
Uninsured	CDU	32.00	2	16.971	20	44
	OBS	32.00	4	28.729	15	75
	Total	32.00	6	23.512	15	75
Total	CDU	25.66	64	14.275	6	83
	OBS	36.40	63	32.037	12	229
	Total	30.98	127	25.219	6	229

The mean LOS of the two groups was stratified by Attending Physician, as seen in Table 4. The LOS was itemized further by attending physician. The patients with chest pain that were

referred to observation under the direct care of cardiology had the shortest LOS at 15.83 hours compared to all the CDU patients. The cardiologist had the shortest LOS on and off the CDU. The private physicians were a close second with a low LOS of 25.75 on the CDU.

Table 4. Length of Stay by attending (in Hours)

Service Information	Groups	Mean	N	Std. Deviation	Minimum	Maximum
Cardio	CDU	15.83	6	9.600	6	28
	OBS	27.60	5	12.260	15	48
	Total	21.18	11	11.998	6	48
Faculty	CDU	29.67	3	15.011	21	47
	OBS	19.00	2	4.243	16	22
	Total	25.40	5	12.300	16	47
Hospitalist	CDU	26.27	26	13.101	11	72
	OBS	32.11	27	17.621	13	87
	Total	29.25	53	15.699	11	87
Private	CDU	25.75	20	16.069	7	83
	OBS	47.59	22	47.449	12	229
	Total	37.19	42	37.346	7	229
Ward	CDU	28.89	9	15.807	8	55
	OBS	30.63	8	21.320	12	75
	Total	29.71	17	18.017	8	75
Total	CDU	25.66	64	14.275	6	83
	OBS	36.48	64	31.789	12	229
	Total	31.07	128	25.138	6	229

Discussion & Recommendations

The CDU opened seven years ago since that opening multiple perceptions had developed regarding factors that affected the LOS. The CDU accepts all patients that are referred to observation regardless of diagnosis. This retrospective chart review focused only on patients discharged with a diagnosis of chest pain. Gender was represented nearly equally on both units, and the distribution of age groups remained comparable between units. Transportation home

was thought to delay discharged, though with only six patients discharged via ambulance and nine discharged to a facility the LOS was not calculated based on the mode of transportation or discharge destination. It was recommended that further research is conducted to identify the possible cause of delays related to transportation.

There was a perception that utilizing an LRCP protocol will shorten LOS by expediting cardiac stress testing. The data demonstrated that only forty-eight patients had an LRCP protocol initiated and of those ordered only six patients had stress testing ordered at the same time. The usage of this protocol was not enough to determine its effectiveness. Also, usage of the TIMI score was also not enough to determine its effectiveness. A recommendation could be the continuous re-enforcement regarding risk stratifying patients while in the ER and the value of consistently utilizing the TIMI score or a comparative tool, early request for cardiac stress testing, and appropriate serial troponins ordered and drawn per protocol. After a designated time, repeating a retrospective chart review to determine if compliance with TIMI and LRCP protocol decreases the LOS could be conducted. The Nurse Practitioners on the CDU would benefit from additional education regarding cardiac stress testing, as the NP ordered only five tests on CDU.

Resident coverage was also perceived as a potential for delay. The LOS was not directly analyzed by resident coverage; residents are involved with both Faculty and Ward patients. The Faculty team had the second lowest LOS, and the Ward teams LOS was comparable to both the Hospitalist and private attendings. Lastly, it had been suggested that a closed unit that prevents private attending physicians from referring to observation would aid in decreasing LOS. This misconception was due to the private attending rounding on their patients either early before

results or very late into the evening. The data demonstrates that the private attendings in collaboration with the NPs on the CDU had a low LOS, second only to cardiology.

Further research could be accomplished to determine the effect of additional consults on the LOS. Determining which attending was more likely to add additional consults may support the need for diagnosis oriented clinical pathways. The data demonstrate that cardiology had the fastest turn around time for patients with chest pain, consideration for more direct admits to cardiology could be considered. Further research could be accomplished to determine the value of cardiology managed chest pain unit. Minimally, encouraging cardiologist to remain the attending in charge over consultation could potentially decrease LOS, another revenue-generating intervention.

The average reimbursement for patients with chest pain referred to observation with Medicare was approximately $2160.00 per visit (M. Koczan, personal communication, August 3, 2018). The reimbursement did not change or increase based on LOS. The distribution of Medicare patients in this study determined that 50% of the patients reviewed had Medicare as their primary insurance. The average LOS for Medicare patients with chest pain on the CDU was 26.78 hours; one bed on the CDU could be potentially turned over 304 times in one year (allowing two hours for cleaning). Bed turn over was a potential revenue of $656,640 for one bed on the CDU annually. The same bed on the comparison units has an average LOS of 47.26; one bed on the comparison units could potentially be turned over only 178 times in one year (allowing two hours for cleaning). The potential revenue for one bed in the comparison units was only $384,117. The difference in revenue was a loss of $272,523 for each Medicare bed annually on the comparison units. Also, in 2017 there were 347 patients with chest pain assigned

beds outside of the CDU (*Scorecard*, 2018). Patients inappropriately placed outside the CDU represents 347 missed opportunities to decrease the LOS and generate revenue.

Translation

Utilization of NPs on the CDU was statistically demonstrated to decrease LOS. Expanding the usage of NPs to all medical-surgical or telemetry units ould decrease LOS throughout the hospital. Replicating the current NP model of care on the comparison units could generate revenue.

Dissemination

The result of this study will be presented at the monthly CDU collaborative meeting. The CDU committee is comprised of representatives from the following hospital departments: CDU Nurse Practitioner leadership, Hospitalist Medical director, Case Management, Utilization Review, Admitting & Bed Management, Physician Advisor, Director of Quality Outcomes, Nursing leadership, and Faculty/Resident Advisor.

Professional Reporting

Initially, a poster presentation of the proposed research study was displayed at the annual Poster Presentation Research Day. The results from this research study will be submitted to the Journal of Cardiovascular Nursing, Journal of Emergency Nursing, and Journal of Hospital Medicine.

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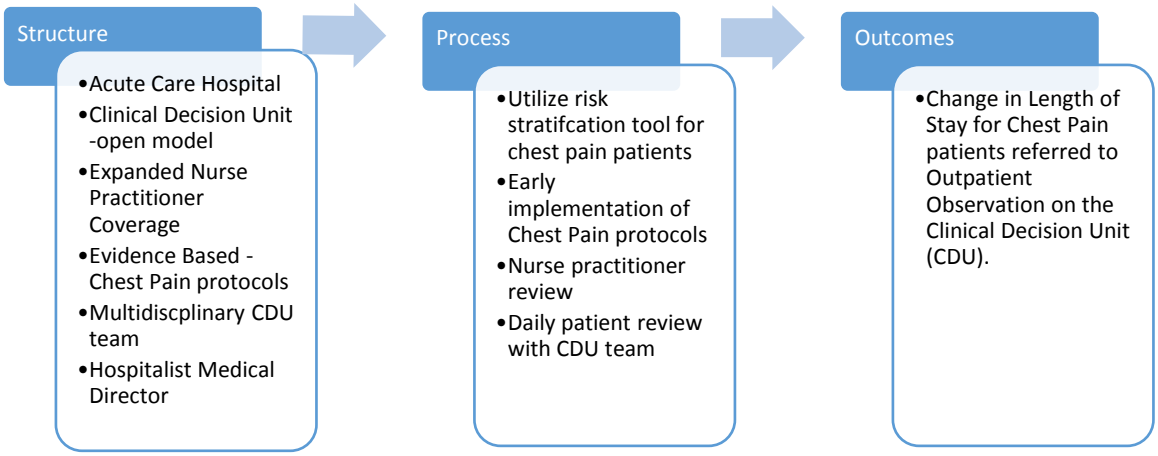
Appendix A

Appendix A. Donabedian Quality Assurance Framework Model



Appendix A. Donabedian Framework Model depicting the structure, process, and outcomes for process improvement on a clinical decision unit. Adapted from Donabedian, A. (2003). *An introduction to quality assurance in health care*. New York, NY: Oxford University Press.

Appendix B

Appendix B. Excel – Example Variables

Example:					
Patient #	Group (IV)	TIMI (IV)	Tests (IV)	LRCP/TNI (IV)	LOS (DV)
1	0	0	1	0	24
2	0	1	1	0	42
3	1	1	1	0	36
4	1	1	3	1	33
5	0	0	2	0	29
6	1	1	1	0	18
	0= CDU	0 = No	0 = No	0 = No	Hours
	1= Other	1 = Yes	1 = Yes	1 = Yes	
Legend:	Nominal	Nominal	Nominal	Nominal	Continuous

Figure 2. Example: Excel spreadsheet with corresponding variables.

Appendix C

Appendix C. Data Abstraction Tool

Observation on CDU_____Observation on Other floor_____

Gender: _____Male_____Female_____

Age:_____

Uninsured: _____Medicare_____Medicaid_____Private Ins._____

Service: _____Ward_____Private_____Hospitalist_____Faculty_____Cardiology_____

Cardiology consulted: _____Yes_____No_____
Additional Consults order: _____Yes_____No_____
Resident Coverage: _____Yes_____No_____

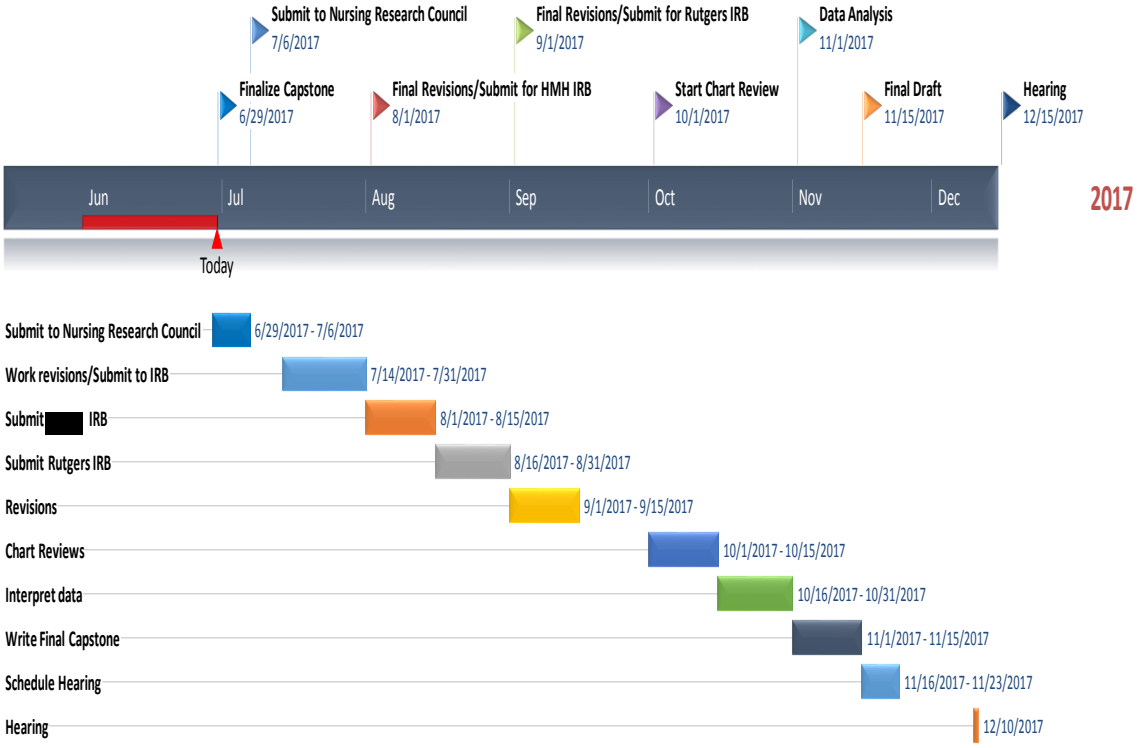
TIMI Score calculated: _____Yes_____No_____TIMI score_____

LRCP Protocol: _____Yes_____No_____
Cardiac testing ordered w/LRCP protocol: _____Yes_____No_____
Troponin Ordered per LRCP protocol: _____Yes_____No_____
Cardiac stress testing ordered by:_____
Cardiac stress test ordered:_____
Testing delays:_____
Reasons for discharge delays:_____

Discharge to Home: _____Discharge to facility_____
Transport via Personal Auto_____via Ambulance_____
Length of Stay in Hours:_____
Total Charge:_____

Appendix D

Appendix D. DNP capstone timeline



Article	Purpose of Study or Review	Design & Methods, Sampling Method, Population, Sample Size, Description of Interventions, Instruments Used, & Outcomes	Major Findings/ Findings Relevant to the Project	Critique of Study/ Review for the Project
1. Baugh, C. W., Venkatesh, A. K., Hilton, J. A., Samuel, P. A., Schuur, J. D., & Bohan, J. S. (2012, October). Making greater use of dedicated hospital observation units for many short-stay patients could save $3.1 billion a year. *Health Affairs*, *31*, 2316-2323. http://dx.doi.org/10.1377/hlthaff.2011.0926	The purpose of this study was to find the average cost saving per observation unit visit. To estimate the number of avoidable inpatient admissions.	The study was a systematic literature review of studies that directly compared the cost of observation versus inpatient care. A total of 197 articles were identified for review.	Findings: Overall cost savings per observation unit was $1572 per visit. Savings based upon over utilization of inpatient status with possible savings $3.1 billion. Recommended additional observation units/beds	Limitations: Did not identify observation units run by ER physicians or units located elsewhere in the hospital. The cost savings were subject to interpretation and not considered trustworthy. Possible selection bias was present in two studies. Possible overestimate could affect cost savings.
2. Cowan, M. J., Shapiro, M., Hays, R. D., Afifi, A., Vazirani, S., Ward, C. R., & Ettner, S. L. (2006, February). The effect of a Multidisciplinary hospitalist/physician an and advanced practice nurse collaboration on hospital costs. *Journal of Nursing*	To compare nurse practitioner/physician management of hospital care, multidisciplinary team-based planning, expedited discharge, and assessment after discharge to usual management	Comparative, 2-group, quasi-experimental design. 1,207 general medicine patients (n=581 in the experimental group & n=626 in the control group). The control unit provided usual care. The care management in the experimental unit had three different components: an advanced practice nurse who followed	Average LOS was significantly lower for patients in the experimental group than the control group (5 vs. six days, P<.0001). The "backfill profit" to the hospital was US$1591 per patient in the experimental group (SE, US$639). There were no significant group differences	Limitations: the results of this study cannot be generalized to other facilities

Administration, *36*(2), 79-85.		the patients during hospitalization and 30 days after discharge, a hospitalist medical director and another hospitalist, and daily multidisciplinary rounds.	in mortality or readmissions.	
3. George, T., Ashover, S., Cullen, L., Larsen, P., Gibson, J., Bilesky, J., ... Parsonage, W. (2013, June 13). The introduction of an accelerated diagnostic protocol in the assessment of emergency department patients with possible acute coronary syndrome: The Nambour Short Low-Intermediate Chest pain project. *Emergency Medicine Australasia*, *25*(), 340-344. http://dx.doi.org/10.1111/1742-6723.12091	Purpose of this study was to implement existing published research findings into clinical practice and assess outcomes, rather than investigating a research hypothesis.	Retrospective chart review along with a quasi-experimental design. Implementing the usage of an accelerated diagnosis protocol.	No MACE following 30 days after discharge. Chest pain LOS was decreased from 425 minutes to 163 minutes for patients with low intermediate chest pain	Limitations: Follow-up was not able to be completed on all patients. Therefore a possible MACE could have occurred. It was not able to complete a pre & post analysis due to a change in process and development of new protocols.
4. Lee, G., Dix, S., Mitra, B., Coleridge, J., &	The purpose of this study was to evaluate the long-term safety	A questionnaire was designed for the one-year follow-up, and it	Major findings: patients had a low risk of adverse events 12 months	Limitations: the study included a convenience sample, and all

Cameron, P. (20*14*, May 11). The efficacy and safety of a chest pain protocol for short stay unit patients: A one-year follow-up. *European Journal of Cardiovascular Nursing*, 14, 416-422. http://dx.doi.org/	of the chest pain protocol; a one-year follow-up was completed.	was administered via a telephone interview by ED nurses to document adverse cardiac events and health care utilization.	after discharge, but substantial continuing health care utilization was observed. 43% of patients received cardiology referrals, while 43% were referred to GI	patients were not available for follow-up. Small sample size. Only one facility was involved with this study.
5. Meek, R., Braitberg, G., Nicolas, C., & Kwok, G. (2012). Effect on Emergency Department efficiency of an accelerated diagnostic pathway for the evaluation of chest pain. *Emergency Medicine Australasia*, *24*, 285-293. http://dx.doi.org/	The purpose was to compare the efficiency indicators for both chest pain patient subgroups and the ED as a whole between a period was traditional methods were done compared to an accelerated diagnostic method	This study was a quasi-experimental design. STEMI patients were excluded.	Major Findings: an accelerated diagnostic pathway (ADP) for chest pain evaluation led to significantly shorter ED LOS for both discharged and admitted chest pain patients.	Limitations: the quasi-experimental study design raises the possibility of selection bias. Also the ordering of serial troponins by the doctor's discretion could affect the outcomes. Staff was aware of which patients were participants in the study allowing for preferential treatment.
6. Richards, F., Pitluk, H., Collier, P., Powell, S., Dion, C., Struchen-Shellhorn, W., & Plunkett, M. (2008, March/April). Reducing	The purpose of this study was to determine if utilizing a case management tool for chest pain patients to determine the correct admission type was effective in	This study was a retrospective chart review to include 30 charts from 11 hospitals in Arizona and approx. 300 record reviews from a hospital in Florida.	Major findings included a 67% reduction in projected admission denials and 48% overall reduction in chest pain discharges utilizing the chest pain interventions.	Limitations: different case management tools between the hospitals allowed for differences. Review of cases did not consider what the care providers saw at

Unnecessary Medicare Hospital admissions for chest pain in Arizona and Florida. *Professional Case Management, 13*(2), 74-84.	decreasing denials.			the time of admission. Case management was different throughout the facilities; standardization would be reviewed.
7. Ross, M. A., Hemphill, R. R., Abramson, J., Schwab, K., & Clark, C. (2010, July). The recidivism characteristics of an emergency department observation unit. *Annals of Emergency Medicine, 56*(1), 34-41. http://dx.doi.org/10.1016/j.annemergmed.2010.02.012	The purpose of this study was to describe the recidivism characteristics of an adult emergency department observation unit population and determine whether rates differ according to demographic or clinical features	The study type was a prospective observational cohort study of a protocol-driven ED observation unit of patients that returned within 14 days; charts were reviewed	Major Findings included that patients who return after an ED observation unit visit were demographically similar to patients that did not return. Also, patients with painful conditions have the highest recidivism rates.	Limitations: the findings are representative on only one facility and not clear how these protocols may apply to other hospitals. If patients returned to another facility, they were not captured in this study.
8. Ross, M. A., Hockenberry, J. M., Mutter, R., Barrett, M., Wheatley, M., & Pitts, S. R. (2013, December). Protocol-driven Emergency department observation units offer savings, shorter stays, and	The purpose of this study was to determine the cost-savings of a Type 1 Observation Unit. To evaluate the number of patients admitted that could have been referred to out patient observation.	The study type was a retrospective observational cohort study of observation services using data from three distinct sources.	Major findings included a potential savings of $5.5 to 8.5 billion a year. There are financial hardships for Medicare patients. It was determined that 11.7% of all admissions could have been observation referrals.	Very opinion based. Limited to the hospitals within the system being reviewed. Depending upon the region will determine if the results can be applied to other systems.

reduced admissions. *Health Affairs, 12*, 2149-2156. http://dx.doi.org/10.1377/hlthaff.2013.0662				
9. Sheehy, A. M., Graf, B., Gangireedy, S., Hoffman, R., Ehlenbach, M., Hiedke, C., ... Jacobs, E. A. (2013, November 25). Hospitalized but not admitted: Characteristics of patients with "observation status" at an academic medical center. *JAMA Internal Medicine*, *173*, 1991-1998. http://dx.doi.org/10.1001/jamainternmed.2013.8185	The purpose of this study was to describe inpatient and observation care	Retrospective chart review, descriptive study of all inpatient and observation stays between July 1, 2010, and December 31, 2011, at the University of Wisconsin Hospital and Clinics, a 566-bed tertiary academic medical center.	44.4% of patients with observation status were discharged in less than 24 hours, and 16.5% stayed more than 48 hours. 26.4% of observation patients stayed more than 48 hours. 4578 observation stays, there were 1141 distinctly billed observation codes. Chest pain, the most common diagnosis, accounted for just 12.1% of observation stays.	Limitations include: the study was completed at one hospital and cannot be generalized to another setting.
10. Stanik-Hutt, J., Newhouse, R. P., White, K. M., Johantgen, M., Bass, E. B., Zangaro, G., ... Weiner, J. P. (2013, September). The quality and effectiveness of care provided by nurse practitioners. *The Journal for*	The purpose of this study was to determine the impact of Nurse Practitioners compared to physicians on health care quality and effectiveness.	Systematic Review of Randomized Controlled Trials or observational study between 1990 and 2009, determining against patient outcomes on care quality, safety, and effectiveness. 63 studies met inpatient criteria.	NP care was associated with better lipid control, similar results with BP management.	Limitations included lack of defined NP role and responsibilities, relationships, the frequency of collaboration or quality of collaboration. There were a limited number of randomized designs and inadequate statistical data

Nurse Practitioners, *9*(8), 492-500.				among the studies reviewed.
11. Yousuf, T., Keshmiri, H., Ziffra, J., Dave, A., Hussain, S., Iskander, J., ... Nand, B. (2016). The impact of chest pain protocol targeting intermediate cardiac risk patients in an observation unit of an academic tertiary care center. *Journal of Clinical Medicine Research*, *8*, 111-115. http://dx.doi.org/10.14740/jocmr2441w	The purpose of this study was to determine the cost per discharge and decrease the LOS due to the utilization of observation units, chest pain protocols for intermediate chest pain patients.	A retrospective chart review of 30 patients with chest pain considered to be an intermediate risk. Between-group analysis was performed with independent samples t-test for primary outcomes of cost and LOS and as well as by age.	Major findings: The protocol group had a LOS of r23.854 hours for the protocol group and 25.5 hours for the control group. The avg cost of the control group was statistically significantly higher than the protocol group.	Limitations: included a small sample size that did not produce statistically significant results.